Annex A

Terms of Reference Approval from ZEMA and Prospectus Approval from EMA

ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

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In reply please quote

No. ZEMA/DEPT/101/1/3

December 21, 2015

The Chief Executive Officer
Zambezi River Authority
Kariba House
32 Cha Cha Cha Road
P.O.BOX 30233
Lusaka.

RECEIVED
24 DEC 2015
REGISTRY

Attention: Mr. Chisense C., Director–Water Resources and Environmental Management

Dear Sir,

REF: BATOKA GORGE HYDROELECTRIC SCHEME SCOPING REPORT AND TERMS OF REFERENCE

The Zambia Environmental Management Agency (ZEMA) is in receipt of the second draft Terms of Reference (ToR) and Scoping Report for the Proposed Batoka Gorge Hydroelectric Scheme. The submission was in accordance with the provisions of the Environmental Impact Assessment Act No 12 of 2011 as read together with the Environmental Impact Assessment Regulations Statutory Instrument No. 28 of 1997.

Kindly be advised that the review of the Terms of Reference and Scoping Report indicates that the general objectives are acceptable. The Agency therefore, has **no objection** in you proceeding with the study provided that:

i. The Environmental Impact Statement will be submitted in volumes corresponding with the different project components in the approved ToRs (Dam wall and impoundment, also including a spillway; Power houses; Transmission lines in Zambia and Zimbabwe; Access roads in Zambia and Zimbabwe; and Permanent villages and other ancillary infrastructure); and

ii. Kaizen Consulting International, in consultation with ZEMA and the Environmental Management Agency (EMA) of Zimbabwe, replaces the Social Specialist with one who has appropriate qualifications and experience.

Please do not hesitate to contact the undersigned should there be any issue during the study needing our attention.

Yours faithfully,

Patson Zulu
Manager-Inspectorate
For/ Director General
ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

ENVIRONMENTAL MANAGEMENT AGENCY

All communications should be addressed to "The Director General"
Makombe Complex (Block 1),
Harare Street / Herbert Chitepo Avenue,
P.O. Box CY 385, Causeway, Harare, Zimbabwe
Telephone (04) 705671/3 /705681/5 Fax 795133

E-mail: ema@ema.co.zw,

Ref: 17/1/1/3A

25 JUNE 2014

THE DIRECTOR

CLUB CHAMBERS

NELSON MANDELA AVENUE

P.O. BOX 630

HARARE

PROPONENT: 04 704 011 CONSULTANT: 04 334361

RE: PROSPECTUS REVIEW FOR BATOKA GORGE HYDRO-ELECTRIC SCHEME (PROJECT NUMBER 7090)

The above subject matter refers.

A decision for you to carry out a full EIA was taken in compliance with the provisions of the **Environmental Management Act [Chapter 20:27].** However you are being advised to include the following over and above the terms of reference you have already presented in your prospectus:

1. Public consultation should include all Government extension offices and should be presented on official letterheads.
2. Any other critical issues relevant to the mitigation of impacts likely to be caused by the project implementation.
3. Critically outline and examine the project processes through a comprehensive and clear project description.

Your EIA presentation should also be able to satisfy the provisions of the statutory regulations of the **Environmental Management Act** and be of professional standard in quality and presentation

However, let it be known that several factors will play a determining role in the consideration of the EIA study and, as such, the acceptance of this prospectus shall in no way be interpreted as implied acceptance and granting of the EIA certificate by the Agency.

ENVIRONMENT MANAGEMENT BOARD MEMBERS
Prof S. Mpopetsa (Board Chairperson), Mr. A Mlalazi, Mr. D Marongwe, Mrs F. Mukoshi, Mrs C. Muchatuta, Mr F. Moyo, Ms N. Saungweme, Mr I D Kunene, Mrs M D Chas (Director General)

ENVIRONMENTAL MANAGEMENT AGENCY

Please do not hesitate to contact us on any environmental issues related to the implementation of your project and you are advised not to implement the project until an EIA certificate has been granted.

Thank you

P. SHOKO

DIRECTOR – ENVIRONMENTAL PROTECTION

FOR DIRECTOR GENERAL

CC: PEM –MATABELELAND NORTH PROVINCE

RECEIVE BY: ..... DATE: .....

DESIGNATION: ..... ID NUMBER: .....

CONTACT NUMBER: .....

EMA - PROTECTING THE ENVIRONMENT

ENVIRONMENT MANAGEMENT BOARD MEMBERS
Prof S. Mosperski (Board Chairperson), Mr. A Mbiwa, Mr. D Manongwa, Mrs F. Mufuda, Mrs C. Muchawa, Mr F. Muyo, Ms N. Saungweme, Mr I.D Kunene, Mrs M O Chasi (Director General)

Annex B

Stakeholder Engagement Plan

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LIST OF ACRONYMS

Abbreviation	Full Definition
BID	Background Information Document
CBO	Community Based Organizations
CLO	Community Liaison Officer
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ERM	Environmental Resources Management
EP	Equator Principle
ESMP	Environmental and Social Management Plan
FGDs	Focus Group Discussions
IA&Ps	Interested and Affected Parties
IFC	International Finance Corporation
KII	Key Informant Interviews
NGOs	Non-Governmental Organizations
NTS	Non-technical Summary
SEP	Stakeholder Engagement Plan

B1 OVERVIEW

B1.1 INTRODUCTION

This Stakeholder Engagement Plan (SEP), has been developed to inform and guide the ESIA stakeholder engagement process. The SEP seeks to define a technically and culturally appropriate approach to consultation and disclosure. The goals are to ensure that adequate and timely information is provided to Project-affected people and other stakeholders, that these groups are given sufficient opportunity to voice their opinions and concerns, and that these concerns influence Project decisions.

The SEP for the Project is a "living document" that will be updated and adjusted as the ESIA progresses and Project planning evolves. It thus provides – and will continue to provide – a framework to manage effective and meaningful engagement with stakeholders. This SEP has been updated following the completion of the first round of Scoping engagement and subsequent interim engagement. It has been included as an annex to the ESIA Reports.

B1.2 PURPOSE OF THE STAKEHOLDER ENGAGEMENT PLAN

The overall aim of this plan is to ensure that a consistent, comprehensive, coordinated and culturally appropriate approach is taken to stakeholder engagement and Project disclosure. It is intended to demonstrate the commitment of ZRA to an 'international best practice' approach to engagement. ZRA is committed to full compliance with all Zambian and Zimbabwean Environmental Impact Assessment (EIA) Regulations. The applicable legislation on stakeholder engagement in Zimbabwe is the Statutory Instrument No. 7 of 2007 the Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations and in Zambia, the Environmental Management Act, 2011 and Salutatory Instrument 28 of the 1997 EIA Regulations. In addition, ZRA will align itself to the World Bank Operational Safeguards, the International Finance Corporation (IFC) Performance Standards and African Development Bank Safeguards, and any other directly relevant policies of the IFC, World Bank and African Development Bank.

In line with current international best practice, this SEP aims to ensure engagement that is free of manipulation, interference, coercion and intimidation.

To this end the SEP:

- Outlines the approach to be adopted to engagement, showing how this will be integrated into the rest of the ESIA process;

- Identifies stakeholders and mechanisms through which they will be included in the process;

- Serves as a way to document the process; and

- Identifies ZRA's responsibilities with respect to Zambian and Zimbabwean legislative requirements and international best practice.

This plan focuses on stakeholder engagement activities proposed for the ESIA and should be expanded upon for subsequent Project phases.

B1.3 OBJECTIVES OF STAKEHOLDER ENGAGEMENT

The objectives of engaging stakeholders during the ESIA process include the following.

- **Ensuring Understanding**: An open, inclusive and transparent process of culturally appropriate engagement and communication will be undertaken to ensure that stakeholders are well informed about the proposed Project. Information will be disclosed as early and as comprehensively as possible.

- **Involving Stakeholders in the Assessment**: Stakeholders were included in the scoping of issues, and will be included in the assessment of impacts, the generation of mitigation and management measures and the finalisation of the ESIA report. They will also play an important role in providing local knowledge and information for the baseline to inform the impact assessment.

- **Building Relationships**: Through supporting open dialogue, engagement will help establish and maintain a productive relationship between the ESIA team and stakeholders.

- **Engaging Vulnerable Groups**: An open and inclusive approach to consultation increases the opportunity of stakeholders to provide comment on the proposed Project, and to voice their concerns. Some stakeholders however, need special attention in such a process due to their vulnerability. Special measures will be considered to ensure that the perspectives of vulnerable stakeholders are heard and considered.

- **Managing Expectations**: It is important to ensure that the proposed Project does not create or allow unrealistic expectations to develop amongst stakeholders about proposed Project benefits. The engagement process will serve as a mechanism for understanding and managing stakeholder and community expectations, where the latter will be achieved by disseminating accurate information in an accessible way.

- **Ensuring Compliance**: The process is designed to ensure compliance with both local regulatory requirements and international best practice.

One of the key outcomes of engagement should be free, prior and informed consultation of stakeholders, where this can be understood to be:

- **Free**: Engagement free of external manipulation or coercion and intimidation;

- **Prior**: Engagement undertaken in a timely way, for example the timely disclosure of information before a development is undertaken and or participation is sought with regard to the identification of issues of concern; and

- **Informed**: Engagement enabled by relevant, understandable and accessible information.

B1.4 STRUCTURE OF THE PLAN

The SEP is organised in the following subsequent sections.

Section 3 outlines the national and international legislative context that will govern the manner in which stakeholder engagement is conducted for the ESIA engagement process.

Section 4 provides an overview of the likely stakeholder groups that will be interested in or affected by the proposed Project.

Section 5 proposes an engagement process that will comply with the national and international standards.

Section 6 details the approach to engagement, which has been designed to comply with the national and international standards

Section 7 outlines the ESIA Scoping stakeholder engagement and interim notification processes that were undertaken and the proposed way forward for ESIA engagement.

Section 8 outlines the feedback mechanism that was developed through the stakeholder engagement process.

Section 9 presents an overview of how records of the process will be kept and monitored.

B2 KEY STANDARDS AND LEGISLATION GUIDING STAKEHOLDER ENGAGEMENT

B2.1 INTRODUCTION

The stakeholder engagement process has been designed to ensure compliance with both Zambian and Zimbabwean legislative requirements, as well international good practice standards defined in the IFC's Performance Standards for Environmental and Social Sustainability (2012).

This *Section* presents the relevant standards and legislation identifying the key Zambian and Zimbabwean and international requirements for engagement. The following section will present the process that has been designed to meet these standards.

B2.2 ZAMBIAN AND ZIMBABWEAN LEGISLATIVE REQUIREMENTS

B2.2.1 *Zimbabwean Legislation*

Statutory Instrument No. 7 of 2007 the Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations provides the requirements for stakeholder engagement in respects of the development of EIAs. Developers are required to consult widely with all stakeholders: "*Before any environmental impact report is furnished to the Director-General, the developer shall carry out wide consultations with stakeholders*". The use of print and electronic media is recognised.

The Director General of the EMA has a right to verify whether full stakeholder participation was undertaken; the Environmental Management Agency will not issue a licence to the developer if they are not satisfied that stakeholder engagement has been undertaken to the manner required: "D*uring a prospectus and environmental impact assessment report review period, the Director-General shall verify whether full stakeholder participation was undertaken when the environmental impact assessment report was prepared*". Statutory Instrument No 7 also provides that "*the Director-General may advertise in the print and electronic media when a prospectus or environmental impacts assessment report is being reviewed*".

B2.2.2 *Zambian Legislation*

In Zambia, the Environmental Management Act, 2011 and Statutory Instrument 28 of the 1997 EIA Regulations are the key legislation that provide the requirements for stakeholder engagement in respects of the development of EIAs.

The Environmental Management Act 2011 provides that the public have the right to be informed of the intention of public authorities to make decisions affecting the environment and of available opportunities to participate in such

decisions. The legislation obliges the developer to consult with the public: "*the Agency and the appropriate authorities shall establish mechanisms to collect and respond to public comments, concerns and questions relating to the environment including public debates and hearing*".

The 1997 EIA Regulations states that stakeholder engagement needs to involve government agencies, local authorities, non-governmental and community based organisations and interested and affected parties.

"The developer shall, prior to the submission of the EIS to the Council, take all measures necessary to seek the views of the people in the communities which will be affected by the Project. In seeking the views of the community in accordance with sub-regulation, the developer shall:

> *(a) publicise the intended Project, its effects and benefits, in the mass media, in a language understood by the community, for a period not less than fifteen days and subsequently at regular intervals throughout the process; and*
> *(b) after the expiration of the period of fifteen days, referred to in paragraph (a), hold meetings with the affected communities to present information on the Project and to obtain the views of those consulted".*

The Government is responsible for distributing the ESIA for public comment. The public are notified via the media including radio. Public meetings may be called, as advertised in the media. Media notices shall be published three times a week for two consecutive weeks in the national papers at least fifteen days prior to the public hearing. Comments can be received 20 days from the date of the last media notice however, the Government may extend this period up to a period of 15 days. Such hearings can only be scheduled twenty-five days after the last public notification.

B2.2.3 International Requirements

In addition to aligning to Zambian and Zimbabwean requirements and standards, the SEP is designed to ensure alignment with international good practice standards, in particular the IFC Performance Standards for Environmental and Social Sustainability (2012) and African Development Bank Safeguards.

The following *Section* sets out the engagement-specific requirements aligning to international good practice standards.

The IFC Performance Standards

The following section sets out the engagement-specific requirements aligning to international good practice standards.

Box 2.1 Requirements for Stakeholder Engagement in IFC Performance Standard 1

Aims:
To ensure that affected communities are appropriately engaged on issues that could potentially affect them; to build and maintain a constructive relationship with communities; and to establish a grievance redress mechanism.

Who to Consult:
Specifically with:
- Directly and indirectly affected communities;
- Positively and negatively affected communities/individuals;
- Those with influence due to local knowledge or political influence;
- Elected representatives;
- Non-elected community officials and leaders;
- Informal/traditional community institutions and/or elders;
- Indigenous peoples, where the Project is identified to have adverse impacts on them;
- Non-Governmental Organisations (NGOs) and community based organisations;
- Key interest groups; and
- Communities in the wider area of influence (AoI).

When to Consult:
As early as possible, or at the latest consultation should begin prior to construction. Consultation should be an on-going process throughout the life of the Project, i.e. iterative. Consultation should also allow for a feedback mechanism where affected people are able to present their concerns and grievances for consideration and redress.

What to Consult on:
Specifically:
- Disclosure of Project information (purpose, nature, scale);
- Disclosure on the Action Plan as a result of consultation, with periodic reports to demonstrate implementation;
- Risks and impacts of the Project; and
- Updates actions and proposed mitigation measures to address negative impacts and areas of concern for affected communities.

How to Consult:
Consultation should:
- Be inclusive and culturally appropriate;
- Allow for free, prior and informed participation of affected communities;
- Be in the language preferred by the affected communities;
- Consider the needs of disadvantaged and vulnerable groups;
- Be fed into the decision making process including proposed mitigation, sharing of benefits and opportunities;
- Be iterative;
- Be documented;
- Be responsive to community concerns and grievances;
- Be easily understood and transparent; and
- Allow for differentiated means of engagement particularly for disadvantaged or vulnerable groups.

* *Where engagement relies substantially upon a community representative the client will aim to ensure that the views of affected communities are communicated, and that the results of consultation are communicated back to the community.*

Source: IFC Performance Standard 1, (paragraphs 25-35), (2012)

Consultation with Sensitive or Vulnerable Groups

Vulnerable stakeholders require special attention according to the IFC. The proposed Project may have impacts on vulnerable / marginalised or sensitive groups. Vulnerable people include those who, by virtue of their gender, ethnicity, age, physical or mental disability, economic disadvantage or social status may be more adversely affected by a Project than others, and who may be limited in their ability to take advantage of a Project's development benefits.

The IFC Performance Standards outline requirements for engagement with vulnerable people which should include differentiated measures to allow for the effective participation of these people. Thus, the stakeholder engagement process needs to be designed to address the needs of these vulnerable groups.

Identification and analysis of potentially vulnerable groups will be further defined during baseline data collection and as the ESIA progresses.

African Development Bank Safeguards

There is significant overlap between the African Development Bank Operational Safeguards and the IFC Performance Standards. Operational Safeguard 1 (OS 1) amongst others outlines environmental and social assessment requirements, public consultation processes, appraisal and treatment of vulnerable groups and grievance redress mechanism.

In order to develop an effective SEP it is necessary to determine exactly who the stakeholders are and understand their priorities and objectives in relation to the proposed Project. For the purposes of this plan, a stakeholder is defined as any individual or group who is potentially affected by the proposed Project, or who has an interest in the proposed Project and its potential impacts. By classifying and analysing the stance, influence, capacity and interests of stakeholders, it will be possible to develop a plan that is tailored to the needs of different stakeholder groups.

It is likely that a diverse range of stakeholders will be identified that could be involved in the SEP process. Different issues are likely to concern different stakeholders, and so different types of stakeholders will be grouped based on their connections to the proposed Project. Having an understanding of the connections of a stakeholder group to the proposed, Project helps identify the key objectives of engagement.

As part of this, it is important to identify individuals and groups who may find it more difficult to participate and those who may be differentially or disproportionately affected by the Project because of their marginalised or vulnerable status. It is also important to understand how each stakeholder may be affected - or perceives they may be affected – so that engagement can be tailored to inform them and address their views and concerns in an appropriate manner.

Details of individual stakeholders have been compiled in a stakeholder register, which will be periodically updated throughout the ESIA engagement process. Such information may be kept on a database for ease of use, but will not be shared with any third party. The stakeholder records are 'living documents' that can be updated as engagement progresses.

Table 3.1 sets out the stakeholder groups that were identified following the inception phase. These stakeholder groups were expanded on during the scoping phase according to the individuals and groups who were consulted and / or who registered as stakeholders, also referred to as Interested and Affected Parties (I&APs). The full list of stakeholders are presented in a stakeholder database (refer to *Annex C2*).

Table 3.1 Stakeholder Groups

Stakeholder Categories	Stakeholder Groups	Connection to the proposed Project
Government	• National regulatory bodies	National government are of primary importance in terms of establishing policy, granting permits or other approvals for the Project, and monitoring and enforcing compliance with Zimbabwean and Zambian law throughout all stages of the Project life-cycle.
	• Provincial regulatory bodies • Key local authorities (rural and urban district councils / municipalities/ District Commissioners (Zambia)/ District Administrator (Zimbabwe)/ Councillors)	Several provincial, district and local authorities are impacted by the proposed Project and will be informed of progress and plans in their areas, to consider the proposed Project activities in their policy-making, regulatory and other duties and activities.
Traditional Authorities	• Chiefs • Village heads	Local community leaders and educational leaders, acting as representatives of their local community. Meetings with traditional authorities will follow local practices and be held prior to any wider communication in local communities in order to respect the political and social structures.
Communities	Project affected communities including: • Registered and customary land owners • Residents and occupiers of land • People who use and/ or access land and resources • People who use the Zambezi River	Households and communities that will be directly or indirectly affected by the proposed Project and its activities. This includes people who use the Zambezi River, people living on land affected by the Project, either through direct land take or by social and environmental impacts, and other people who visit or use land or resources that may be affected.
Vulnerable groups	• Women headed households • Children headed households • Elderly, physically, mentally disabled • Youth • Low-income households (dependent on subsistence activities) • Ethnic minorities eg Tonga. (The Tonga people were forcibly evicted to make way for the Kariba Dam in the 1950s. They are reported to suffer from political marginalisation and extreme poverty [(1)]).	Vulnerable groups may be affected by the proposed Project by virtue of their physical disability, social or economic standing, limited education, lack of access to land etc. They may also have difficulty in engaging with the stakeholder consultation process and thus may not be able fully express their concerns regarding the proposed Project. Specific vulnerable groups will be identified during ESIA baseline data collection and strategies for effective engagement will be developed.

(1)http://www.minorityrights.org/4504/zimbabwe/zimbabwe-overview.html, http://www.mulonga.net/index.php?option=com_content&view=article&id=236:spotlight-on-basilwizi&catid=43:tonga-culture&Itemid=93

Stakeholder Categories	Stakeholder Groups	Connection to the proposed Project
Civil Society	• Cooperatives • Community Based Organisations (CBOs) • Associations • Cultural groups	Organisations with direct interest in the proposed Project, and its social and environmental aspects and that are able to influence the Project directly or through public opinion. Such organisations may also have useful data and insight and may be able to become partners to the proposed Project in areas of common interest.
Non-governmental Organisations (NGOs) / Institutions / Academic	• International • National • Local	NGOs and academic institutions with direct interest in the proposed Project, and its social and environmental aspects and that are able to influence the Project directly or through public opinion.
Commerce and Industry	• Local businesses, (most notably in the tourism industry) and entrepreneurs affected by potential social and / or environmental impacts • Businesses from elsewhere in Zimbabwe and Zambia who may benefit by providing goods and services to the Project • Potential suppliers and contractors	Individuals or organisations with direct economic interest in the Project. This may be through gaining contracts with the proposed Project or due to economic impacts caused by the proposed Project (e.g. reduction of white water rafting opportunities on the Zambezi River). They may also be potential business partners. As the proposed Project develops and new contractors and service providers are identified, it is likely that these businesses will become important stakeholders as they establish contractual relationships with the proposed Project.
Bilateral and Multilateral Organisations	• Development Agencies • Financial Institutions	A range of different international organisations may have an interest in the proposed Project and may have useful data or insight into local and national issues of relevance to the proposed Project.

Following the completion of the initial round of consultations, the following parties have been registered on the stakeholder database:

B3.1.1 *Zimbabwe*

Government: Stakeholders from selected National, Provincial, District and Local Departments as well as relevant Ward Councillors and elected political representatives. Specifically these have included:

- Civil Aviation Authority of Zimbabwe;
- Civil Protection Unit;
- Civil Service Commission;
- Department of Immigration;
- Department of Physical Planning;

- Department of Veterinary Services;
- District Development Fund;
- Environmental Management Agency;
- Hwange District Administrator;
- Hwange Local Board;
- Hwange Rural District Council;
- Meteorological Services Department
- Ministry of Defence, Security and War Veteran's
- Ministry of Energy and Power Development
- Ministry of Environment, Tourism and Hospitality Industry
- Ministry of Finance and Economic Development
- Ministry of Health and Child Care
- Ministry of Higher Education, Science and Technology Development
- Ministry of Home Affairs and Cultural Heritage
- Ministry of Industry and Commerce
- Ministry of Information, Publicity & Broadcasting Services
- Ministry of Justice, Legal and Parliamentary Affairs
- Ministry of Local Government, Public Works and National Housing
- Ministry of Mines and Mining Development
- Ministry of Primary and Secondary Education
- Ministry of Public Service, Labour and Social Welfare
- Ministry of Transport and Infrastructural Development
- Ministry of Women Affairs, Community, Small and Medium Enterprises
- National Museums and Monuments of Zimbabwe;
- Registrar General's Office;
- Rural Electrification Agency;
- Social Services Department;
- Victoria Falls Municipality;
- ZESA Holdings;
- Zimbabwe Council of Tourism;
- Zimbabwe Electricity Transmission and Distribution Company;
- Zimbabwe Energy Regulatory Authorities;
- Zimbabwe Forestry Commission;
- Zimbabwe National AIDS Council;
- Zimbabwe National Statistics Agency (ZIMSTATS)
- Zimbabwe Parks and Wildlife Management Authority;
- Zimbabwe Parks and Wildlife Management Authority;
- Zimbabwe Tourism Authority;
- ZIMRA;
- ZINARA;
- ZINWA; and
- ZRP.

Traditional Leadership: areas are governed by Traditional Leaders, Village Heads and Village Headmen:

- Bishop Matata Sibanda;

- Chief Hwange;
- Chief Shana; and
- Headmen of the affected wards.

Tourism Stakeholders: these include stakeholders having an economic interest in the Project area as a result of tourism activities and include:

- Adventure Zone;
- African Paddling Association;
- African Predator Diving;
- Azambezi Hotel;
- Backpackers Lodge;
- Bonisair;
- CANSAF;
- Cheziya Crocodile Ranch;
- Croc Cage Diving;
- Dabula Safari;
- Dingane Tours;
- Eco Elements;
- Elephant Hills Hotel;
- Employers Association of Tourism and Safari Operators;
- Hotel Association for Matabeland North;
- Ilala Lodge;
- Imvelo Safari Lodges;
- Imvilo Gorges Lodge;
- Khanando;
- Kingdome Hotel;
- Lion Encounter Alert;
- Rafting Association;
- Rainbow Hotel;
- Regional Tourism Organisation of Southern Africa;
- Shearwater Adventures;
- Shock Wave;
- Spray View Hotel (Cresta);
- Stanley and Livingstone;
- The Elephant Camp (Wild Horizons);
- Victoria Falls Hotel;
- Victoria Falls Publicity Association;
- Victoria Falls Safari Lodge
- Victoria Falls Wonders Online;
- Wild Horizons; and
- Zambezi Helicopter Company (Shearwater).

Community/Development Organisations: these involve stakeholders involved in community development and social improvement Projects in the area

- CAMPFIRE Project;

- Chisuma Clinic;
- Rose of Charity;
- Intengwe; and
- Catholic Development Commission / Caritas.

Interest Groups: these are organisations with an environmental or other interest in the Project

- *Non-Governmental Organisations*
  - Bird Life Zimbabwe;
  - Environment Africa;
  - Green Fund;
  - KAZA (Kavango-Zambezi Transfrontier Conservation Area);
  - The Victoria Falls Wildlife Trust;
  - Victoria Falls Anti-Poaching Unit;
  - Zambezi River Society;
  - Zambezi Society; and
  - Zimbabwe Conservation Task Force.

- *International Organisations*
  - International Rivers;
  - Man & the Biosphere (MAB);
  - South African Development Community (SADC);
  - UNESCO;
  - UNICEF;
  - United Nationals Development Programme;
  - University of California;
  - WWF;
  - Gayathi Paper; and
  - Department of Environmental Sciences, Unisa.

- *Other Interest Groups*
  - Batoka Clan;
  - CADEC Hwange;
  - EMRAS Ambulance Services;
  - Finx;
  - Friends of Victoria Falls ;
  - Hwange Colliery;
  - Hwange Power Station (HPS);
  - Hwange Show Society;
  - Jafuta Foundation;
  - Matetsi ECS;
  - Mputalo hunters;
  - PSMI Medical Clinic (VF);
  - The Chronicle;
  - The Falls Private Medical Centre - Health Bridge;
  - Tree Society of Zimbabwe;
  - University of Zimbabwe's Centre for Applied Social Studies;

- UZ Department of Biological Sciences;
- VFM;
- Victoria Falls Communications Bureau;
- Zimbabwe Power Company (ZPC); and
- Zim Construction.

Affected Communities: these entail those both directly and indirectly affected by the proposed Project. On the commencement of the resettlement work, this will be expanded to include affected individuals within communities:

- *Directly Affected Villages*

  In Jambezi, Nemangana, Kattchecheti, Chidobe, Chikandukubi, Matetsi, Mbhizi, Sidinda and Mashala wards

- *Neighbouring villages and those experiencing indirect benefits*

B3.1.2 Zambia

Government: Stakeholders from selected National, Provincial, District and Local Departments as well as relevant Ward Councillors and elected political representatives. Specifically these have included:

- Choma District Council;
- Department of National Parks and Wildlife of Zambia
- Department of Water Affairs;
- Energy Department;
- Energy Regulation Board;
- Environment Department;
- Geological Survey Department;
- Human Rights Commission;
- Kazungula District Council;
- Kalomo District Council;
- Legal, Social and Governance;
- Livingstone City Council;
- Livingstone Museum;
- Ministry of Agriculture;
- Ministry of Chiefs and Traditional Affairs;
- Ministry of Community Development and Social Welfare;
- Ministry of Energy;
- Ministry of Finance;
- Ministry of Fisheries and Livestock;
- Ministry of General Education;
- Ministry of Health;
- Ministry of Higher Education;
- Ministry of Housing and Infrastructure Development;
- Ministry of Labour and Social Security;
- Ministry of Lands and Natural Resources;
- Ministry of Local Government;

- Ministry of Mines and Mineral Development;
- Ministry of National Development and Planning;
- Ministry of Tourism and Arts;
- Ministry of Transport and Communication;
- Ministry of Water Development , Sanitation and Environmental Protection;
- Ministry of Works and Supply;
- National AIDS Council;
- National Council for Construction;
- National Heritage Conservation Commission (NHCC)
- National Parks and Department of Maritime and Inland Waterways;
- National Road Fund Agency;
- Planning and Information Department;
- Road Development Agency;
- Road Transport & Safety Agency;
- Southern Water and Sewerage Company Limited;
- The National Water Supply and Sanitation Council;
- Water and Sanitation Association of Zambia (WASAZA);
- Water Authority Board;
- Zambia Environmental Management Agency
- Zambia National Commission for UNESCO;
- Zambia National Museums and Monuments;
- Zambian National Commission for Development Planning;
- Zamtel;
- ZESCO Ltd; and
- Zimba District Council

Traditional Leadership: areas are governed by Traditional Leaders, Village Heads and Village Headmen:

- Chief Mukuni;
- Chief Musokotwane;
- Chief Sipatunyana;
- Chief Simwatachela;
- Chief Singani;
- Chief Chikanta; and
- Headmen of the affected wards.

Tourism Stakeholders: these include stakeholders having an economic interest in the Project area as a result of tourism activities and include:

- Adventure logic;
- Bundu Adventures Ltd.;
- Euma Tours;
- Fawlty Towers;
- Limbo lodge;
- Livingstone Business District Association;
- Livingstone Tourism Association;

- Maramba River Lodge;
- Mukwa Travel & Tours Zambia;
- Munga Eco Lodge;
- Raft Extreme;
- Safari Par Excellence;
- Safari Trek International Group;
- Savannah Southern Safaris
- Stanley Exploration & Safari;
- Tabonina Guesthouse;
- Taita Falcon Lodge;
- United Air Charter;
- Wasawange Lodge & Tours
- Water Rafters Association; and
- Zambezi Rafting Company.

Community/Development Organisations: these involve stakeholders involved in community development and social improvement Projects in the area

- Alliance for Sustainable Agriculture(ASA);
- Catholic Development Commission / Caritas.
- Cheshire Homes;
- Community Based Natural Resources Management Forum;
- Integrating Climate Change in Water Resource Monitoring in Zambia;
- Jesuit Centre for Theological Reflection;
- Livingstone & Kazungula Farmers Association ;
- MS Zambia;
- Mukuni Health Centre;
- Non-Governmental Coordinating Council;
- Republic of Zambia (Ministry of Agriculture and Livestock (MAL) Policy and Planning Department;
- Southern Medical Centre;
- The Butterfly Tree;
- Water and Sanitation Association of Zambia (WASAZA);
- Wildlife and Environmental Conservation Society of Zambia;
- Zambia Climate Change Network;
- Zambia Community Based Natural Resource Management Forum; and
- Zambia Vulnerability Assessment Committee.

Interest Groups: these are organisations with an environmental or other interest in the Project

- *Non-Governmental Organisations:*
  - Environment Africa.

- *International Organisations:*
  - Care International;
  - International Rivers;

    - OWA;
    - Oxfam;
    - Red Cross;
    - Southern African Development Committee (SADC)
    - UNESCO;
    - World Vision; and
    - WWF.
- *Other Interest Groups:*
    - EAG;
    - AZMEC, WECSZ, ZAMDEX;
    - Copperbelt University;
    - Hearth Earth Art (Permaculture Fundi)
    - Livingstone Chamber;
    - Livingstone General Hospital;
    - Private Sector Development Association;
    - The Livingstone Man;
    - University of California;
    - Zambezi Memories;
    - Zambia Chamber of Small and Medium Business Associations;
    - University of Zambia;
    - The Copperbelt University;
    - University of Lusaka;
    - Information and Communication University; and
    - Mulungushi University.

Affected Communities: these entail those both directly and indirectly affected by the proposed Project. On the commencement of the resettlement work, this will be expanded to include affected individuals within communities:

- *Directly Affected Villages*

In Livingstone, Zimba, Kalomo and Choma Districts

- *Neighbouring villages and those experiencing indirect benefits*

A stakeholder database has been compiled and will continue to be updated throughout the PPP. The existing detailed stakeholder database is appended as *Annex C2*.

It is evident that stakeholder engagement has been undertaken as part of the previous studies however, it is believed that the degree of engagement is insufficient compared to international standards and that further engagement will be required as part of ERM's forthcoming ESIA studies. For the 1993 Feasibility Study on the Batoka Gorge Hydro Electric Scheme, BJVC consulted with ministers and executives in Zambia, Zimbabwe and other countries in Southern Africa. These included the ZRA, relevant government authorities including relevant departments under the Ministry of Environment and Natural Resources and the Ministry of Local Government and Housing in Zambia and the Ministry of Energy and Water Resources and Development, and Ministry of Natural Resources and Tourism and Ministry of Finance, Economic Planning and Development in Zimbabwe, as well as lender organisations such as the IFC, African Development Bank and the World Bank. Representatives from the Southern African Development Community were also consulted. Nevertheless, little evidence is provided in the report on the outcome of the consultations, nor how frequently people were consulted. In addition, there is little mention of consultation that was undertaken with the general public, most notably, the directly affected communities (BJVC 1993). This is further substantiated by the findings of the 1998 EIA Report. The authors of the report note that as a result of limited public consultation that was undertaken for previous studies, in general, there was a low level of understanding of the Project. They found that many of the opinions of people they spoke to during data collection activities had been shaped by rumours. This was reported to have served to hamper some of their studies, e.g. tourism. Whilst PVT did undertake some consultation, e.g. discussions were held with traditional leadership and local administration staff and some communities, this was more weighted to Zimbabwean stakeholders. They also noted that they were not tasked to hold public meetings and, that this activity was not been provided for in the budget. As a result, the 1998 report recommends that public consultation should be undertaken for the Project to ensure that people are adequately informed of it and, are able to voice concerns and give recommendations. Suggested outlets included workshops and open house meetings, with media including broad casts, press releases, feature articles and radio programmes being utilised to reach mass audiences (PVT 1998).

Prior to the 1993 EIA, a workshop was convened by The World Conservation Union in Victoria Falls, Zimbabwe in 1992 to discuss the scope of the forthcoming EIA. More than thirty participants attended who represented the ZRA, the consultants who were due to undertake the study, local community representatives, NGOs and government agencies. One of the objectives of the workshop was to inform interested parties about the nature of the Project, and to receive views on the potential impacts and the scope of the EIA. This therefore formed in part a public consultation exercise. However, some invitees were critical of the process undertaken and complained that

inadequate notice had been given to participants to facilitate their attendance (1992 World Conservation Union Scoping Workshop, 1992).

The Karangona Master Thesis notes that meetings were undertaken with traditional chiefs in both countries, which oversee the villages likely to be affected by the Project. This was related to the development of the construction roads. However, little information is provided on the nature of these meetings. It also reports that the Energy Ministers in both Zambia and Zimbabwe wrote a letter to the other six riparian countries (Angola, Botswana, Malawi, Mozambique, Namibia and Tanzania) that share the Zambezi River Basin informing them of the proposed Project. The Karangona Master Thesis, published in May 2014, implies that public consultation to date has been limited. It notes that at the time of writing, the ZRA website had been dysfunctional for several months and that the organisation has not embraced social media as a communication tool (The Karangona Mater Thesis, 2014). The ZRA website was accessed on 16th June 2014 and now includes some information, albeit limited, on the Project.

The key issues raised during various stakeholder meetings as part of previous studies include:

- **Environmental Issues:** negative impacts on biodiversity, including endangered species; potential to induce high seismic activity; rock erosion.
- **Resettlement**: potential for economic and physical displacement as a result of land take, especially land required for township developments.
- **Health:** likely effects to human health.
- **Tourism:** detrimental effect on white water rafting industry.
- **Visual Impact:** loss of aesthetic beauty of the gorge areas and its surrounds.
- **Cultural Heritage, Archaeology and Palaeontology:** potential to cause damage to archaeological remains and fossils during construction, impact on World Heritage site.
- **Project Awareness:** inadequate provision of Project information; insufficient notice given to attend stakeholder meetings.
- **Impact Assessment Methodology:** scope of impact assessment and its input on Project authorisation.

B5 APPROACH TO ESIA STAKEHOLDER ENGAGEMENT

ESIA engagement activities provide an opportunity for affected and interested stakeholders to express views and concerns about the proposed Project. It also enables the ESIA team to consider and respond to stakeholder comments, and incorporate these into the identification of impacts and development of appropriate and relevant mitigation.

This *Section* tables an approach to engagement, which has been designed to comply with the national and international standards, described in *Section B2*.

The stakeholder engagement was initially planned to include three stages. However, in late 2015 the ESIA process was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced. An interim round of public participation was undertaken by ERM. The process now includes four key phases and include:

- Inception Phase;
- Notification and Scoping;
- Interim notification for recommencement of ESIA; and
- ESIA Disclosure.

The stages of stakeholder engagement are described in more detail below in *Table 5.1*, which includes a summary of the objectives and activities for each stage.

All stakeholder engagement activities will be informed by, and regularly updated according to an iterative process of stakeholder identification, analysis and mapping and on the basis of comments received on the stakeholder engagement process. The final SEP will then be carried forward into Project execution, i.e. construction and operation.

Table 5.1 Stages of Engagement

Stage	Objective	Key Activities	Key Outputs
Inception Engagement	• To gain a preliminary understanding of the scope of the proposed Project, appropriate and legislated engagement requirements and relevant stakeholders.	• Inception meeting with ZRA and personnel involved in the stakeholder engagement activities; • Field visit; and • Stakeholder identification process.	• SEP for the ESIA; and • Potential list of stakeholder groups.

Scoping Engagement	• To meet key stakeholders and introduce them to the proposed Project and ESIA Process;
	• To disclose the Project in the public domain to all interested and affected stakeholders;
	• To gather issues of concern and through this identify a list of potential impacts;
	• To refine the terms of reference of specialist work on the basis of stakeholder comment received;
	• To consult key stakeholders on the next steps in the ESIA process; and
	• To generate feedback on the Draft Scoping Report, including the scope, approach and key issues to be investigated further for the ESIA.
		• Meetings with key stakeholders to facilitate the broader stakeholder engagement process;
		• Dissemination of engagement materials (background information document, posters, media notices etc.);
		• Consultation on the proposed Project and associated ESIA through meetings and workshops with identified stakeholders. Details may include:
		  ○ Contextualisation of the Project with respect to other neighbouring Projects and any previous consultation undertaken
		  ○ Nature, purpose and scale of the proposed Project
		  ○ ESIA & stakeholder engagement process
		• Distribution of draft Scoping Report or non-technical summaries to stakeholders to confirm issue identification and receive comment on the revised terms of reference; and
		• Formal submission of Scoping Report to Authorities.
			• Stakeholder database;
			• Engagement tools and proof of their dissemination;
			• Meeting minutes/issues and response report;
			• Updated SEP; and
			• Feedback material for the Draft Scoping Report.

Stage	Objective	Key Activities	Key Outputs
Interim Notification	• Notify stakeholders of the recommencement of the ESIA Process and its associated timeline for delivery; • Inform them of further opportunities for the engagement of Stakeholders; • Update stakeholders on changes to the Project Team; • Provide updated contact information for further communication; • Invite new stakeholders to register as an I&AP for the Project; and • To allow stakeholders an opportunity to raise questions or comment on the Project and ESIA process.	• Update stakeholder database; • Email/ postal notification letter to inform stakeholders of the recommencement of the ESIA; • Meetings with Local and Traditional Leaders in Zambia and Zimbabwe; and • Update comments and responses report.	• Updated stakeholder database; • Proof of email/ postage; • Meeting notes; and • Updated comments and responses report.
ESIA Disclosure	• To discuss the identified impacts and proposed mitigation measures with stakeholders allowing for their input; and • To provide stakeholders with the opportunity to comment on the Draft ESIA report.	• Submission of the draft ESIA Report to relevant environmental authorities and dissemination to other key authorities and stakeholders. In Zambia, ZEMA is responsible for public dissemination of the report. They will be responsible for distributing copies of an environmental impact assessment statement to relevant ministries, local government units, parastatals, nongovernmental and community-based organisations, interested and affected parties. They also need to place copies of an environmental impact statement in public buildings in the vicinity of the site of the proposed Project. In Zimbabwe, the public can request a copy of the report from the EMA however, there may be a cost incurred for this. In accordance with best practise, ERM will make the Draft ESIA Report available in public places for comment. • Availability of the draft ESIA Report will be advertised through newspaper announcements (and also radio announcements in Zambia) and made available for public review. .In Zambia, comments can be received 20 days from the date of the last media notice. The Government may extend this period by a further 15 days. In Zimbabwe, no time period is specified as there is	• Draft ESIA Report; • Non-technical summary of • identified impacts and mitigation measures; • Notification material; • Meeting minutes and/or issues and response report; and • Updated SEP.

Stage	Objective	Key Activities	Key Outputs

		no obligation to disclosure the report however, the timeframe will be aligned with that required for Zambia.
		• Dissemination of engagement materials (NTS, posters etc.) disclosing findings of the draft Impact Assessment Report.
		• Consultation on the draft Impact Assessment Report. This will include:
		  ○ Identification of impacts in the draft ESIA and proposed mitigation;
		  ○ Identification of stakeholder concerns and opinions on the impacts identified;
		  ○ Involvement of stakeholders in assessing the efficacy and appropriateness of the proposed mitigation measures; and
		  ○ Identification of revisions or additions to the draft ESIA report where necessary.	

Formal Submission of Final ESIA	• To formally submit the final ESIA to the authorities with comments incorporated from the ESIA engagement and disclosure stage.	• Submission of the Final ESIA to the Zimbabwean authorities. There is no requirement for this in Zambia as Draft ESIA circulated by Zambian authorities in any case.	• Final ESIA Report; and • Final SEP.

B5.1 COMMUNICATION METHODS

A variety of communication methods will be used during ESIA engagement. This will be determined by the level and objective of engagement, as well as the target stakeholder group.

English is the official language of both Zambia and Zimbabwe; however, the communities affected by the Project speak a variety of languages, including in Shona, Ndebele, Nambya and Tonga in Zimbabwe and Tonga or Leya in Zambia. Oral communication will be undertaken in the local languages in the communities but English will be used for high-level stakeholder meetings.

Table 5.2 outlines the various communication channels that will be utilised during the ESIA stakeholder engagement process, with the relevant target audience also identified. Approaches to engagement and communication channels used will also be verified and updated where necessary during the stakeholder engagement process.

All engagement materials in Zimbabwe and Zambia will be produced in English including at the local level. ERM's Zimbabwean consultants advised against the use of translation into local languages as the vocabulary of these languages is reported to be limited and would not be able to describe the terms necessary. For both countries however, given that lower literacy levels are anticipated at the local level, the primary focus of engagement will be on verbal communication via public meetings and other socio-economic engagement tools using the local languages noted above.

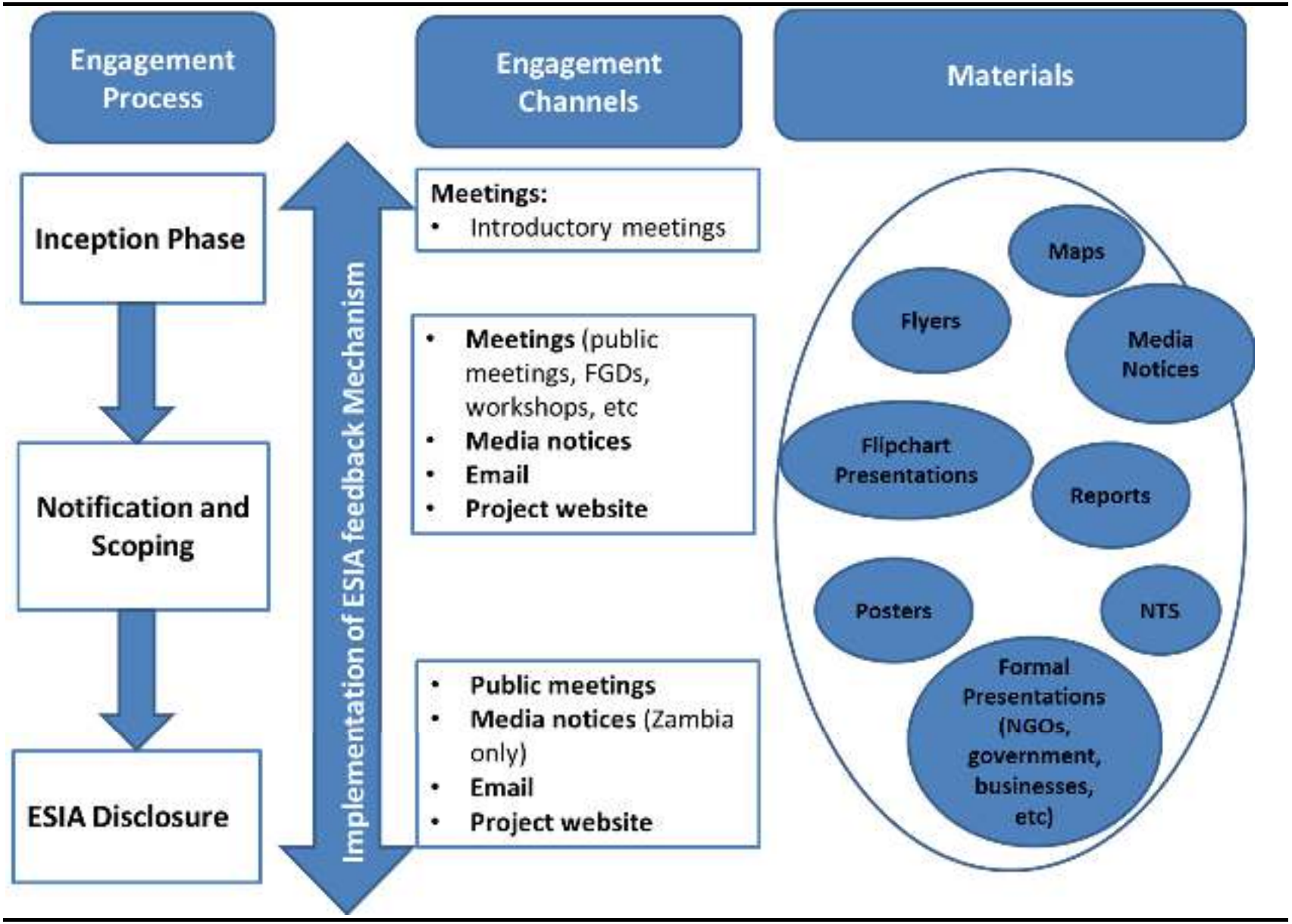
During face-to-face meetings, particularly with customary authorities and communities, local facilitators will be used. The use of facilitators will be according to cultural norms and local languages and will include both men and women facilitators that speak the required languages of the communities.

A variety of materials will be used during stakeholder engagement, in particular during face-to-face engagement. *Table 5.1* outlines the stakeholder engagement tools that will be used throughout the various stages of the ESIA process.

Table 5.2 Communication Channels for Engagement

Communication Channel	Objective	Target Stakeholders
Project website	• Dedicated ESIA webpage on the website designed to engage all affected and interested stakeholders who have access to the internet. • The webpage provides links to available documents including the Draft Scoping and ESIA Reports and materials. • It also provides contact details for stakeholders to provide comments and ask questions.	• National, provincial, district and local government • Non-Governmental Organisations (NGOs) • Media • Academics and research institutes • Commerce and industry • Bilateral and multilateral organisations
Media (newspaper) Posters	• Used to make announcements regarding the proposed Project and ESIA process. • Encourage stakeholders to register as stakeholders for the ESIA Process. • Inform stakeholders of meetings or the availability of Project information.	• National and state stakeholders • Traditional authorities • Communities • Community Based Organisations (CBOs) • Associations • Cultural groups
Email	• To distribute all Project notification material to those parties with access to this facility. • To inform stakeholders of availability of Project information including tabling of ESIA reports (Scoping report, draft ESIA report etc.).	• National, provincial, district and local government • NGOs • Academics and research institutes • Commerce and industry • Bilateral and multilateral organisations
Face to face meetings: • Workshops • Formal meetings • Community meetings • FGDs (socio-economic engagement tool)	• To transmit information about the proposed Project and ESIA process and reinforce two-way dialogue. Some of these methods will be employed as part of the socio-economic studies (FGDs).	All stakeholder groups to be targeted through one of these engagement needs.

Figure 5.1 Stakeholder Engagement Materials



B5.2 CONSIDERATIONS FOR THE ENGAGEMENT PROCESS

Focused efforts will be made to engage with directly impacted stakeholders, including vulnerable groups at the local level. Affected individuals will be consulted directly and via their representatives including elected and traditional leaders, and other influential people within communities.
In addition, special efforts will be made to meet with representatives of potentially vulnerable groups who may not be reached through traditional leadership structures.

ERM will also ensure that meetings are culturally appropriate allowing stakeholders to openly voice their opinions and / or concerns. Identification of vulnerable groups was confirmed during the Scoping and Baseline Data Collection stages and subsequent data analysis.

All meetings will follow local practices and norms. Meetings with the local administration and with traditional leaders will be held prior to any wider communication in the villages in order to respect traditional structures.

All affected communities and groups will be made aware of the Project feedback and Grievance Redress Mechanism (refer to *Section B7*). Please note, the Grievance Redress Mechanism remains to be developed and communicated to all stakeholders.

B6 THE STAKEHOLDER ENGAGEMENT PROGRAMME

B6.1 SCOPING ENGAGEMENT ACTIVITIES

B6.1.1 *Objectives of Scoping Engagement*

Formal Scoping engagement aims to integrate stakeholder issues within the ESIA process from an early stage. It enables stakeholders to raise issues of concern and make suggestions for enhancing benefits from the proposed Project. It also provides stakeholders with an opportunity to evaluate alternatives and to contribute relevant local knowledge to the process. Scoping engagement provides an opportunity to refine the on-going stakeholder mapping and analysis process.

Subsequent to desk based stakeholder mapping, analysis and planning, the ESIA consultants undertook scoping engagement in order to:

- Engage with key stakeholders so as to introduce the Project, the ESIA process and obtain clarification with regard to community engagement;
- Notify stakeholders of the proposed Project and the ESIA process;
- Identify stakeholder issues of concern;
- Formally initiate the engagement process and introduce the engagement team;
- Provide stakeholders with an opportunity to ask questions and give input on the proposed Project; and
- Table and elicit comment on the findings from the draft Scoping Report.

Engagement methods were tested during the Scoping Phase and a proposed way forwarded for future engagement for the rest of the ESIA is presented in *Section B6.3.*

B6.1.2 *Stakeholder Engagement undertaken during the Scoping Phase*

Prior to the commencement of stakeholder engagement activities, meetings were scheduled with all relevant traditional authorities and the relevant District Commissioners/Administrators. The purpose of these meetings was to refine the stakeholder engagement strategy so as to meet the requirements of the leadership and ensure that future communication is effective and sensitive to cultural sensitivities. Support for the broader community engagement process was also sought.

B6.1.3 *Preparation and Distribution of Notification Material*

The formal Scoping engagement stage involved various activities leading up to and during the in-country engagement trip. The preparatory activities undertaken are outlined in *Figure 6.1*.

Figure 6.1 *Preparatory Engagement Activities*

Review of existing stakeholder mapping and analysis
Preparation and review of the Scoping stakeholder engagement programme
Planning and confirmation of logistics
Development of stakeholder engagement tools, including translation where necessary.
Publication of media announcements

A stakeholder database was compiled and updated during the Project Registration period as per comments and registrations received.

Stakeholder engagement tools included the following:

- A Background Information Document (BID);
- Media announcements;
- Letters of invitation;
- Response sheets;
- Posters; and
- Flyers.

During the key stakeholder discussions, stakeholders reported on the best media to be utilised.

Advertisements were placed in newspapers in English and were accompanied by the local consultants and the ZRA's logo to facilitate legitimacy. In Zimbabwe, the notices were placed in *the Herald* and the *Chronicle*. In Zambia, it was placed in *The Times of Zambia* and *The Post*.

In addition, ERM created a web portal (http://www.erm.com/batokaHESESIA) for the dissemination of Project information, and collection of input from stakeholders, such as the Scoping Report. This web portal will be maintained throughout the ESIA process.

Materials were distributed 21 days in advance of the stakeholder engagements that were held. Stakeholders were afforded 35 days to register as Interested and Affected Parties for the Project.

B6.1.4 *Engagement Activities*

Public participation for the Scoping phase was held between September and October 2014 and in January 2015. Scoping phase engagement involved engaging with stakeholders at the provincial, regional and local level, including with the groups highlighted in *Table 3.1*. Differentiated approaches to engagement were utilised depending upon the degree to which groups are likely to be impacted, as well as type and level of interest in the proposed Project. In addition, the design of the stakeholder engagement programme took into account whether stakeholder groups had been engaged previously.

Meetings were scheduled as follows in each country (Zambia and Zimbabwe):

- Meetings with regulators and government officials at the national, provincial, district and local level.

- Public meetings / Open days in Livingstone and Lusaka in Zambia and Victoria Falls and Harare in Zimbabwe. These meetings were advertised in the media announcements and all interested parties were invited to attend, including members of the public and Key Interest Groups such as NGOs, CBOs, Business and Industry (most notably the tourism industry) and Environmental Groups.

- Meetings with affected communities. In Zambia, these took place at the chiefdom level. In Zimbabwe, due to the geographical extent of the Project area and hence the distance between villages, these meetings took place at the ward level.

Comments raised by stakeholders were recorded in a Comments and Response Register which can be found in *Annex C5*.

A summary of the meetings is presented in *Table 6.1*. The total number of participants given has been obtained from attendance registers that meeting participants were asked to sign. However, at the majority of meetings more attendees were present than that highlighted by the attendance sheets. This is largely due to the perception of some stakeholders that signing the register equated to giving permission / agreement for the Project.

Stakeholders who were unable to attend the meetings were asked to submit their comments in writing on a Comments and Response Form to a member of the Project team, either in person, via email or by post.

Table 6.1 Summary of Scoping Meetings

	No of Meetings Held	Total Number of Participants
Zambia		
Open Days	2	73
Open Day – Meeting Format	1	80

	No of Meetings Held	Total Number of Participants
Regulatory meetings	3	32
Community meetings	2	130
Zimbabwe		
Open Days	2	34
Open Day – Meeting Format	1	55
Regulatory meetings	2	25
Community meetings - Zimbabwe	9	1,071
TOTAL	20	1,500

At all of the meetings, details of the Project were presented and stakeholders were invited to ask questions and raise concerns. Stakeholders were also invited to comment on potential impacts and appropriate mitigation measures. Contact details were also presented to allow stakeholders to submit any additional comments after the meetings.

Table 6.2 shows the engagements undertaken with stakeholders during the scoping phase. At the Livingstone Open Day, a specific request was made for a rerun of the engagement in a meeting format with the provision of technical expertise to be able to respond to technical and engineering questions. It was requested that this be undertaken during the Scoping Phase of the Project. Accordingly, additional information sharing meetings were held in Victoria Falls and Livingstone in January 2015.

Table 6.2 Stakeholder Engagements Undertaken During the Scoping Phase of the Study

Meeting	Venue	Date
Public Open Day, Harare	Harare Royal Golf Club	30th Sep 2014
Authorities Meeting, Bulawayo	Bulawayo Club	1st Oct 2014
Community meeting, Jambezi	Chief Shana's homestead	2nd Oct 2014
Hwange Rural District Council Meeting	Hwange Rural District Council Offices	3rd Oct 2014
Community meeting, Nemangana	Sacred Heart Mission	4th Oct 2014
Victoria Falls Open Day	Victoria Falls Municipal Offices	4th Oct 2014
Community meeting, Kattchecheti	Ndhlovu Business Centre	5th Oct 2014
Community meeting, Chidobe	Chisuma Primary School	6th Oct 2014
Community meeting, Chikandukubi	Mashake Secondary School	6th Oct 2014
Livingstone Open day	Livingstone Municipal Offices	6th Oct 2014

Community meeting, Matetsi	Matetsi Police Station	7th Oct 2014
Community meeting, Mbhizi	Milonga Clinic	7th Oct 2014
Lusaka Open Day	Long Acres Lodge	7th Oct 2014
Regulatory authority meeting, Lusaka	Long Acres Lodge	8th Oct 2014
Community meeting, Sidinda	Lumbora Primary School	8th Oct 2014
Community meeting, Mashala	Mashala Secondary School	8th Oct 2014
Livingstone Council Meeting	Provincial Conference Room, Livingstone	9th Oct 2014
Kazangulu District Council Meeting	Kazungula Council Chambers	10th Oct 2014
Community meeting for Chief Musokotwane villages	Musokotwane Primary School	11th Oct 2014
Community meeting for Chief Mukuni villages	Njando Primary School	13th Oct 2014
Victoria Falls Information Sharing Meeting	Victoria Falls Municipal Offices	22nd Jan 2015
Livingstone Information Sharing Meeting	Livingstone Lodge	23rd Jan 2015

B6.1.5 Summary of Outcomes of Scoping Phases Engagement

Most stakeholders generally knew about the proposed Project and expressed their appreciation for the meetings. Many participants stated that they were happy to have the opportunity to express their opinions about the Project and requested that further stakeholder meetings should be held.

Although the perceptions of the Project varied by stakeholder group, common themes during the meetings. These have been broadly categorised and are detailed below:

Biodiversity: The threat to biodiversity (including aquatic, terrestrial and avifaunal) was a key concern raised. There is a perception that livelihoods may also be disrupted as a result of increased human-wildlife conflict.

Physical and Economic Displacement /Loss of Livelihoods: Stakeholders were concerned about issues related to resettlement and compensation. Further information on who would be affected, as well as the timing of resettlement activities, was requested. The location, availability and suitability of replacement land were raised as key concern, in addition to potential disruption of traditional governance and community networks.

Community Development: Demands for local communities to benefit from the Project were made. This included economic benefits, such as the use of local companies for the supply of goods and services to the Project, as well other social benefits including improvements to the road network and development of social infrastructure (e.g. water and sanitation and recreational facilities).

Cultural Heritage: Due to prospective resettlement and the importance of cultural heritage to local communities, there was concern that sacred sites and graves would be impacted. Further information was requested about how or if these would be relocated.

Water Impacts: Upstream and downstream water impacts, such as the impact on Victoria Falls and Zambezi rapids and downstream water users were raised as concerns. Further information on water quality and flow as requested.

EIA Process: Further details about the EIA process were requested. This included information pertaining to the duration of the ESIA, the validity of the environmental authorisation decision and change to baseline conditions during this period and the independence of the ESIA consultant. In addition, requests for copies of the ESIA were made.

Employment: There are high expectations and demands for employment, especially among the youth. Communities called for employment opportunities to be shared equally amongst Zambia and Zimbabwe.

Impacts on Livelihoods: Disturbance to fishing activities, agriculture and the impacts on the white water rafting industry were raised as concerns.

Project Details: Clarity was requested regarding the exact positioning of Project infrastructure, including the rationale for the locations selected. Frustration was expressed that the consultants were unable to give detailed information in this regard. The issue of Project alternatives was also raised.

Health and Safety: Fear of the spread of Ebola and the increase of HIV/AIDs prevalence if the Project results in in-migration, the safety of employees during construction, as well as compensation for work related injuries were raised by stakeholders.

Stakeholder Engagement: Further information about stakeholder engagement activities undertaken was called for, as well as a request for further meetings to be undertaken to disclose findings of the ESIA. Some stakeholders noted that the notice period for the Livingstone open day was poor and a request for a further meeting was made.

Other issues included the sustainability of the dam, the need to include climate change in the dam design, funding arrangements and the potential of the Project to create an odour due to the presence of stagnant water.

B6.1.6 Scoping – Feedback

Comments, issues of concern and suggestions received from stakeholders have been captured in the Comment and Response Report. A Draft Scoping Report (DSR) was compiled on the basis of comments received. This included a component detailing the public participation activities that were undertaken to date. A letter was sent to all stakeholders included on the stakeholder

databases along with a copy of the comments and response report and non-technical summary of the DSR.

Stakeholders were encouraged to review these documents to ensure that all relevant issues had been identified and that the terms of reference for the ESIA has been appropriately scoped.

A Non-Technical Summary (NTS) of the Scoping Report was released, which presented the following in non-technical language:

- The background and description of the proposed Project;
- The environment in which the proposed Project will be developed;
- Information on the client;
- Information on the ESIA process and timelines;
- Typical impacts associated with similar Projects; and
- Information on ESIA consultants and their independence.

The DSR and/or accompanying documents and summaries were placed in public places within the Project area as follows:

Zimbabwe

- Hwange Rural District Council Office
- District Administrators Office in Hwange
- Jambezi Clinic
- Chisuma Clinic
- Harare Black Crystal Office
- Provincial Administrators Office
- Victoria Falls Municipal Office
- Victoria Falls Environment Africa Office

Zambia

- Livingstone City Council
- Livingstone District Office
- Kazungula District Council
- Kazungula District Office
- Lusaka Kaizen Consulting Office
- District Commissioners offices in Zimba, Kalomo and Choma
- District Council Offices in Zimba, Kalomo and Choma
- National Assembly Offices Zimba, Kalomo and Choma
- Chiefs Palaces (Sipatunyana, Singani, Simwatachela & Chikanta)

The reports were made available for a 30 day comment period, after which comments received were included in the comments and responses report as part of the Final Scoping Report, which was submitted to the EMA and the ZEMA.

B6.2 INTERIM ENGAGEMENT ACTIVITIES

Given the length of time that has lapsed between the public participation undertaken as part of the Scoping Phase (late 2015), and the recommencement of the ESIA process in late 2018, an interim round of public participation was undertaken with the following objectives:

- Notify stakeholders of the recommencement of the ESIA Process and its associated timeline for delivery;
- Inform them of further opportunities for the engagement of Stakeholders;
- Update stakeholders on changes to the Project Team;
- Provide updated contact information for further communication
- Invite new stakeholders to register as an I&AP for the Project; and
- To allow stakeholders an opportunity to raise questions or comment on the Project and ESIA process.

The activities undertaken in furtherance of the above stated objectives are described below.

B6.2.1 *Stakeholder Database Update*

ERM undertook an exercise to verify and update contact details for stakeholders on the existing stakeholder database, which was developed as part of the ESIA scoping phase in 2015. The database has also been updated with the details of additional communities and leadership identified as part gathering of additional baseline information in the proposed Project area, particularly downstream of the proposed BGHES and in the areas proposed for the sourcing of quarry materials.

B6.2.2 *Notification of Recommencement of ESIA*

Stakeholders on the database were notified of the recommencement of the ESIA via email or post on 6 December 2018. A copy of the letter is attached in *Annex C7*, together with proof of distribution.

In addition, a series of meetings were held District Authorities and Traditional Leaders. These meetings afforded key stakeholders the opportunity to raise concerns and ask questions. *Table 6.3* presents a schedule of the meetings.

Table 6.3 Stakeholder Engagements undertaken during Interim Stakeholder Engagement

Meeting	Date
Zambia	
Southern Province Secretary	3 December 2018
HRH Chief Mukuni	4 December 2018
Kazungula District Council	4 December 2018
Livingston City Council	5 December 2018
Zimba District Council	6 December 2018
Chief Simwatachela	10 December 2018
Chief Sipatunyama	11 December 2018

Meeting	Date
Zimbabwe	
DA	27 November 2018
AREX	27 November 2018d
Hwange District Administration	27 November 2018
Hwange Rural District Council	28 November 2018
Ward Councillors from Chidobe Ward and Mbizha Ward	28 November 2018
Chief Shana	30 November 2018

B6.3 IMPACT ASSESSMENT ENGAGEMENT ACTIVITIES

This *Section* provides detail on the activities that were undertaken for ESIA Disclosure.

The ESIA Phase stakeholder engagement was scheduled to be undertaken in March 2020, however, due to COVID-19 restrictions on physical gatherings, the activity was put on hold. In July 2020, the Zambezi River Authority saw it necessary to resume the stakeholder engagement process, and ERM developed an alternative approach to engagement that included virtual platforms, limited in-person meetings, and radio broadcasts to make the engagement accessible to a broad range of stakeholders.

Due to COVID-19 restrictions on physical gatherings, different platforms were used to disclose the ESIA with the public which include:

- Virtual Meetings- ZOOM;
- Radio Broadcasts in local languages; and
- Small physical controlled gathering in rural communities.

In addition to the above, newspaper adverts were published in both countries informing stakeholders about the ESIA Disclosure process and directing them to the project website to access the draft ESIA and encouraging stakeholders to comment on the Draft ESIA.

The intensions of the ESIA Disclosure was to engage with the public, government stakeholders, traditional leaders, NGOs and water users in both countries in disclosing both positive and negative impacts findings of the proposed BGHES development to stakeholders and allow stakeholders to comment on the findings.

B6.3.1 Initial ESIA Discloser Activities

The Draft ESIA and Non-Technical Summary were released in 03 March 2020 for public review and comment on the project website: www.erm.com/BGHES-ESIA

Draft ESIAs were also placed in:

- Livingstone City Council (Zambia)
- District Council Offices in Kazungula, Zimba, (Zambia)

- Kalomo and Choma (Zambia)
- ZRA offices in Lusaka(Zambia)
- Hwange District Council (Zimbabwe)
- Victoria Falls Municipal Offices (Zimbabwe)
- Black Crystal's Office in Harare (Zimbabwe)

Non-Technical Summaries was place in:

- Livingstone District Council (Zambia)
- Chiefs Palaces (Mukuni, Sipatunyana and Simwatachela) (Zambia)
- Hwange District Council (Zimbabwe)
- Jambezi Clinic Chisuma Clinic (Zimbabwe)
- Matebeleland North Provincial Administrators Office (Zimbabwe)

Stakeholders were encouraged to access the documents and comment.

B6.3.2 ESIA Disclosure Activities

In July 2020, a decision was made to resume ESIA Disclosure activities using a mix of engagement forums as noted above. ERM contacted a sample of stakeholders (including government officials, NGOs, tourism outfitters) to confirm their access resources and capacity to join webinars via ZOOM platform. Most stakeholders confirmed to have necessary resources and willingness to be part of the engagement and confirmed that morning meetings would be most suitable. Local and traditional authorities noted that radio broadcasts would be a preferred means of communication for people in rural areas and advised ERM on which stations people listen to.

It was decided that the following engagement methods would be used to disclose the ESIA findings:

- In-person meetings with Traditional Authorities and Local Government
- Virtual ZOOM open house
- Virtual ZOOM focus group meetings with specific stakeholder groups
- Radio broadcasts on local radio stations in the Project Area

Summary on each of these is provided on Table 6.4 of all the engagement activities.

Table 6.4 below provides summary of the public participation activities that were undertaken for the impact assessment phase of the ESIA.

Table 6.4 Public Participation Activities Undertaken during the ESIA Phase of the Project

Date	Engagement	Stakeholders	Activities	Number of attendees
Zambia In-person Meetings				
23 November 2020	In-person meeting see Annex C8.9.7	• Ng'andu Village –Chief Mukuni(Zambia) • Kazungula District Council Office (Zambia)	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.5.5	• 40 • 16
24 November 2020	In-person meeting see Annex C8.9.7	• Physical engagement Disclosure meeting - Katapazi Village, Mukuni Chief	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.5	• 29
25 November 2020	In-person meeting see Annex C8.9.7	• Syamwamvwa • Chuundwe All under Chief Siphatunyana	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.5	• 3 • 42
26 November 2020	In-person meeting see Annex C8.9.7	• Muziya Village • Lugobo Village • Kalomo District Council Office • Monde Village	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.5	• 47 • 48 • 8 • 33
27 November 2020	In-person meeting see Annex C8.9.7	• Zimba District Council Office	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.5	• 18
Zimbabwe In-person Meetings				
30 November 2020	In-person meeting see Annex C8.9.8	• Physical engagement with Chief Mvuthu and Chief Mvuthu's Headmen representing Chisuma and Chidobe Villages • Physical engagement with Chief Mvuthu and Chief Mvuthu's Headmen at Vulindlela	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.6	• 31 • 30
01 December 2020	In-person meeting see Annex C8.9.8	• Physical engagement with Chief Hwange and his headmen/village heads representing Kasibo village head, Shatchatunda Village 1 head, Shatchatunda Village 2 head, Shatchatunda 3 village head, Shatchatunda 4 village	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.6	• 23

Date	Engagement	Stakeholders	Activities	Number of attendees
		head, Mashala Top village head, Mashala Down village head, Mashala Down 2 village head, Mr Neshavi Headman village, Chief Hwange and Mrs Hwange • Physical engagement with Chief Hwange and his headmen/village heads at Hwange Rural District Council		• 21
02 December 2020	In-person meeting see Annex C8.9.8	• Physical engagement with Chief Shana and his village headmen at Chief Shana's homestead • Physical engagement with Chief Shana's village headmen at Jambezi Clinic	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.6	• 16 • 17
03 December 2020	In-person meeting see Annex C8.9.8	• Physical engagement with identified ministries representatives and government departments • Physical engagement with Chief Hwange's Headman	Meeting to disclose findings followed by Q&A session Meetings notes are presented in Annex C8.7.6	• 24 • 19
Virtual Meetings				
02 December 2020 9h00	ZOOM Open House Engagement see	Range of stakeholders see attendance register in Annex C8.9.1	Presentation followed by Q&A session. A copy of the presentation can be found in Annex C8.6.1. Meeting recording is available on the project website www.erm.com/BGHES-ESIA	• 45
04 December 2020- 9h00	ZOOM Water Users Focus Group Discussion	Range of stakeholders see attendance register in Annex C8.9.2.3	Presentation followed by Q&A session. A copy of the presentation can be found in Annex C8.6.2. Meeting recording is available on the project website www.erm.com/BGHES-ESIA	• 63
04 December 2020- 14h00	ZOOM Special Focus Group Discussion	Range of stakeholders see attendance register in Annex C8.9.4	Presentation followed by Q&A session. A copy of the	• 47

Date	Engagement	Stakeholders	Activities	Number of attendees
			presentation can be found in Annex C8.6.3 Meeting recording is available on the project website www.erm.com/BGHES-ESIA	
11 December 2020-9h00	ZOOM Government Stakeholders Engagement	Range of stakeholders see attendance register in Annex C8.9.4	Presentation followed by Q&A session. A copy of the presentation can be found in Annex C8.6.4. Meeting recording is available on the project website www.erm.com/BGHES-ESIA	• 48
21 July 2021	Government and UNESCO Feedback Session	Government and UNESCO Officials see Annex C8.9.5	Presentation followed by discussion see Annex C8.6.5	• 22
03 September 2021	ZOOM with Focused Group Discussion with UNESCO Officials	UNESCO Officials see Annex C8.9.6	Presentation followed by discussion see Annex C8.6.6	• 17
Radio Broadcasts				
Date	**Radio Broadcast**	**Station Name and listenership**	**Outline of Project description and findings of the ESIA, followed by Q&A session**	**Listenership**
14 December 2020- 19h00		BYTA FM- Choma	Outline of Project description and findings of the ESIA, followed by Q&A session see Annex C8.7.7 for minutes of what was discussed	Approximately 300,00 people
15 December 2020-19h00		Namyianga FM-Kalomo	Outline of Project description and findings of the ESIA, followed by Q&A session see Annex C8.7.8 for minutes of what was discussed	Approximately 400,000 people
16 December 2020- 19h00		Zambezi FM- Livingstone	Outline of Project description and findings of the ESIA, followed by Q&A session see Annex C8.7.9 for minutes of what was discussed	Approximately 260,000 people
16 December 2020-13h00		Breeze FM- Victoria Falls	Outline of Project description and findings of the ESIA,	Approximately 180,000 people

Date	Engagement	Stakeholders	Activities	Number of attendees
			followed by Q&A session see Annex C8.7.10 for minutes of what was discussed	
17 December 2020-19h00		Breeze FM- Victoria Falls	Outline of Project description and findings of the ESIA, followed by Q&A session see Annex C8.7.11 for minutes of what was discussed	Approximately 180,000 people
18 December 2020-19h00		Star FM- Harare	Outline of Project description and findings of the ESIA, followed by Q&A session see Annex C8.7.12 for minutes of what was discussed	Approximately 100,000 people

B7 GRIEVANCE REDRESS AND FEEDBACK MECHANISM

Stakeholder engagement is a two way process. It is therefore important to ensure that there is a feedback mechanism to ensure stakeholders affected by or interested in the proposed Project can present their input (e.g. opinions, requests, suggestions and grievances) for consideration and, if required, seek redress. It should be noted that, even where not all feedback or grievances are deemed 'valid' or applicable to the context of the proposed Project, the feedback mechanism needs to function in a non-judgemental manner and record all feedback received.

In the case of this proposed Project, there is a need for both a grievance redress and feedback mechanism. The grievance redress mechanism is the responsibility of the proposed Project, and should be designed to identify and manage issues across the entire Project lifecycle. A grievance redress mechanism has been developed and stakeholders were informed of it during the Scoping Phase engagement meetings. The grievance redress mechanism has been included as *Annex E* of the main ESIA.

B8 MONITORING AND REPORTING

B8.1 MONITORING STAKEHOLDER ENGAGEMENT ACTIVITIES

It is important to monitor the on-going stakeholder engagement process to ensure that consultation and disclosure efforts are effective, and in particular that stakeholders have been meaningfully consulted throughout the process.

There are two key ways in which the stakeholder engagement process will be monitored. These are presented below.

B8.1.1 *Review of Engagement Activities in the Field*

During engagement with stakeholders the ESIA team will:

- Assess meetings using a feedback evaluation form or asking questions to participations, depending on the stakeholder group, to ensure that messages are being conveyed clearly.
- Conduct debriefing sessions with the engagement team while in the field. This assess whether the required outcomes of the stakeholder engagement process are being achieved, and provide the opportunity to amend the process where necessary.
- Use engagement tools developed through the ESIA engagement including:
  - stakeholder database;
  - Issue Log or Issues and Response table; and
  - Keep meeting records of all consultations.

Moreover the tool can be used to manage on-going Project issues, and for stakeholder identification and analysis processes.

B8.1.2 *Reporting on Stakeholder Engagement Activities*

Performance will be reviewed following the engagement sessions conducted in the field. In addition, there will be opportunity for the ESIA engagement team to review and assess performance in between the engagement sessions depending on the level of feedback received from stakeholders during these periods.

Evaluation of performance will assess the extent to which the engagement activities and outputs meet those outlined in this SEP. In assessing performance, the following will be considered:

- Materials disseminated: types, frequency, and location;

- Place and time of formal engagement events and level of participation including by specific stakeholder groups (e.g. women, youth, cultural leaders);

- Number of comments received assessing the topic, type of stakeholder and details of feedback provided;

- Numbers and type of stakeholders who come into contact with the Project team by mail, webpage and any other means of communication;

- Meeting minutes, attendance registers and photographic evidence;

- Comments received by government authorities, village leaders and other parties and passed to the Project;

- Numbers and types of feedback and / or grievances and the nature and timing of their resolution; and

- The extent to which feedback and comments have been addressed and have led to corrective actions being implemented.

Annex C Part 1

Scoping Phase Engagement (2014 - 2015)

Annex C1

Notification and Registration Materials

Batoka Gorge Hydro-Electric Scheme

Background Information Document

Introduction

The Zambezi River Authority (ZRA) is a statutory body and was established in 1987. It is jointly and equally owned by the governments of Zambia and Zimbabwe. It is responsible for overseeing the development of the Zambezi River, which runs between the two countries (and forms a common border). As part of this mandate, ZRA has been mandated by the Governments of Zambia and Zimbabwe to develop Batoka Hydro Electric Scheme (BHES)..

As part of the proposed project, the ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Consultants to undertake an Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydro-electric Scheme (HES). As part of the ESIA a Stakeholder Engagement Process is being followed with the following objectives:

- To provide information about the proposed project, project environment and ESIA process;
- To gather local information which can be used to inform project decisions and as input into the ESIA process;
- To assist in the identification of issues of concern regarding the proposed project and ESIA process;
- To gather suggestions regarding project alternatives;
- To confirm issues identified in the public domain and ensure that where relevant these are investigated further through technical studies;
- To report back on the results of the ESIA and management measures;
- To gather comments on results and proposed management and project design;
- To meet legislative requirements.

Purpose of this document

This document serves to provide you with a brief introduction to the proposed Batoka Gorge Hydro-electric Scheme and the means by which stakeholders can become involved in the Environmental and Social Impact Assessment (ESIA) process currently being undertaken. Additional documents will be available at various stages during the ESIA to provide stakeholders with information and further opportunities to raise issues of concern and suggestions for enhanced benefits. Your comments and suggestions on any aspect of the proposed project, including the technical and stakeholder engagement processes, will help to focus the technical studies and will ultimately assist the authorities in Zambia and Zimbabwe to make a decision.

Motivation for the Project

The key motivation for the project is to allow the governments of Zambia and Zimbabwe to meet the growing demands for power. Both countries suffer from national power deficits as their power generation capacity is too small to meet demands from industry and private house holdings. This demand for power is expected to become more acute as the economics of both countries grow. If the Batoka Gorge HES goes ahead, the generation capacity for power will be increased in both countries and reliance on electricity imports will be reduced. The Batoka Gorge HES will provide up to 1,600MW; 800MW to Zambia and 800MW to Zimbabwe.

The Project Team for the ESIA

The Zambezi River Authority (ZRA) is the Client and project proponent. The ZRA was established as a body corporate in 1987 by parallel legislation in the Parliaments of Zambia and Zimbabwe following the reconstitution of Central African Power Corporation - under the Zambezi River Authority Acts (Act No. 17 and 19 Zambia and Zimbabwe respectively) and is jointly owned by the governments of Zambia and Zimbabwe in equal proportions.

Environmental Resources Management (ERM) is the consultant undertaking the ESIA with Black Crystal and Kaizen Consulting International. ERM is an international environmental consultancy and has over 35 years of experience of working with development agencies, developers and governments to address the environmental and social impacts of economic development worldwide. ERM has worked extensively throughout Africa and has conducted projects in both Zambia and Zimbabwe.

Black Crystal is one of Zimbabwe's leading reputable consulting companies, offering a quality service in environmental, socio-economic and cultural heritage consultancy services. Black Crystal deliver technical consulting services to private industry, NGOs, architects, engineers and public sector clients. It is registered with the Environmental Management Agency of Zimbabwe to undertake environmental impact assessments (EIAs).

Kaizen Consulting International (Kaizen) is an environmental consultancy based in Zambia. It provides services including EIAs and environmental management plans, solid waste management master plans, sustainable rural livelihood and strategic urban development plans and ISO 14000 implementation. It is registered with the Zambian Environmental Management Agency (ZEMA), to undertake EIAs.

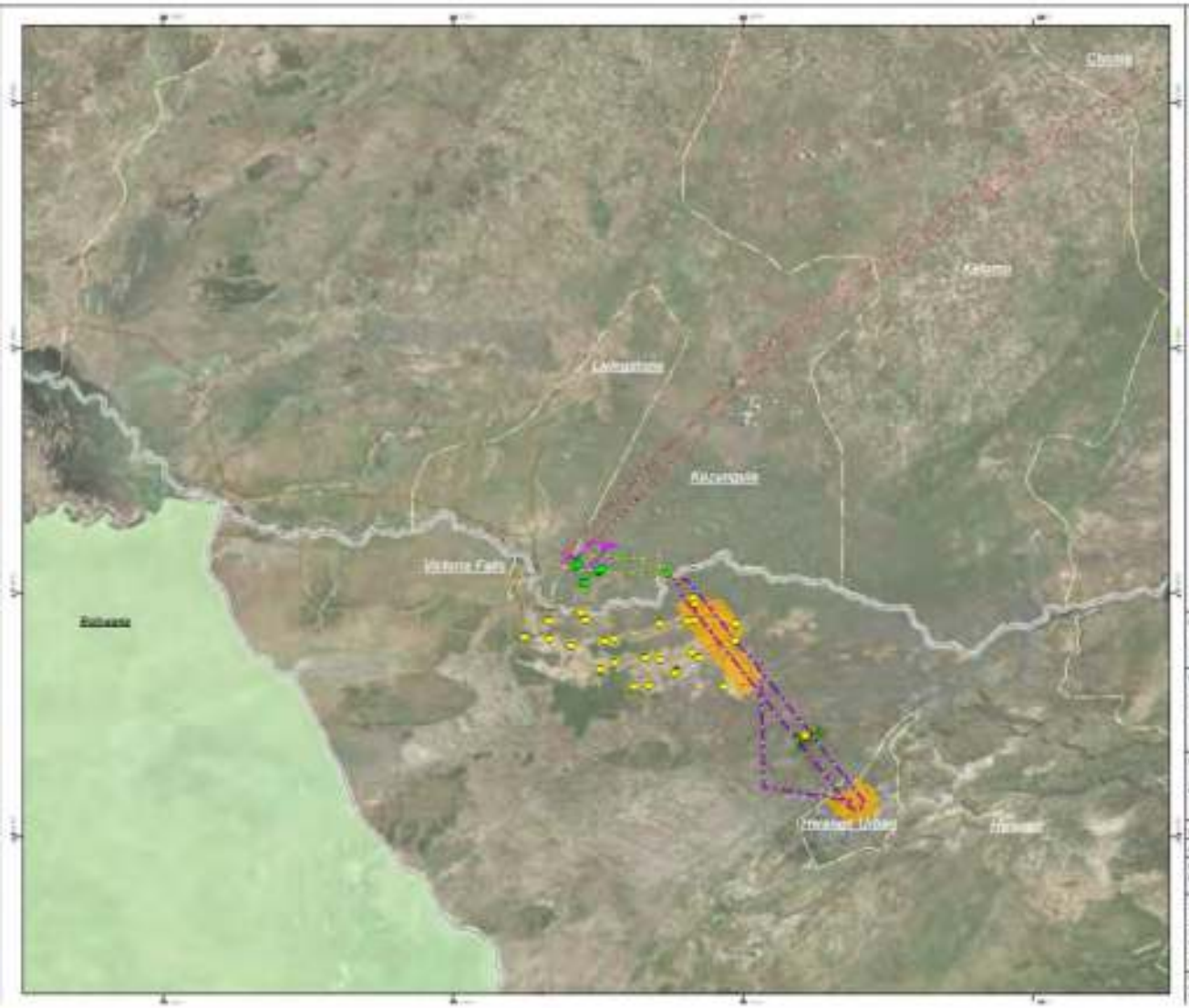
Batoka Gorge Hydro-Electric Scheme

Project Location

The proposed Batoka HES is to be located at 18º 1' S 26º 34' E, in the central portion of the Zambezi River Basin and will extend across the international boundary between Zambia and Zimbabwe. It will be situated upstream of the existing Kariba Dam hydroelectric scheme and approximately 47km downstream of the Victoria Falls.

In Zimbabwe, the proposed scheme falls within the province of Matabeleland North and in the Hwange Rural District. It includes the wards of Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sidinda, Mashala and Simangani. The traditional authorities in the area of impact include chief Shana, Bishop Matata Sibanda (who is Acting Chief for Mvutu who has recently deceased) and Chief Hwange .

In Zambia, the main area of direct impact falls under the Southern Province in the Kazungula District, most notably the wards of Mukuni and Katapazi, which fall under Chief Mukuni's jurisdiction. However, impacts will also be felt in Livingstone District, Zimba District and Choma District and if there are downstream impacts, these may be experienced in the District of Kalomo. The traditional authorities in these areas include Chief Musokotwane, Chief Simwatachela, Chief Sipatunyana , and Chief Singani.



Legend

- Zam Social Point
- Zim Social Points
- 'Social Roads / Tracks'
- Dam Infrastructure

Proposed Transmission Line Corridors

- NEW TL Bat-Hwa
- NEW TL Bat-Liv
- NEW TL Liv-Muz

- Agricultural Areas
- Social Areas
- Zambian Social Areas
- District Boundaries

District Boundaries and Social Points, Areas and Roads of Interest

Zambezi River Authority

ERM

A3

ERM

Kalom Consulting International

black crystal

Batoka Gorge Hydro-Electric Scheme

Project Infrastructure

The key infrastructure for the proposed Batoka HES project includes the following components:

Dam wall and Impoundment: The proposed high gravity arch dam wall will be 181m in height. The Full Supply Level (FSL) of the reservoir is tentatively set at 762 m above mean sea level. After impoundment to the FSL, the reservoir surface area will cover approximately 23 km2.

Power Houses: It is planned that two power houses, each with an installed capacity of 800MW, will be constructed on each river bank, with a total capacity of the scheme being approximately 1,600 MW. The powerhouses are likely to be located outdoor at the dam toe. Each powerhouse will accommodate four turbines. The spillway will be located in Zimbabwe, approximately 2km from the dam site.

Transmission lines: In Zimbabwe it is proposed that the transmission lines will comprise of 2 x 70km 330kV lines, running in parallel, and sharing a common right-of-way, to the existing Hwange 330 kV substation. In Zambia, the line will comprise of 2 x 330kV transmission lines measuring 21km running from Batoka and terminating at a new 330kV substation ZESCO will construct in Livingstone. A second line may also be developed which will run in parallel to the existing 220kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km.

Access Roads: Existing roads will be upgraded and new ones will be constructed to allow access to each river bank. In Zambia, it is proposed that the road originating in Palmgrove (near Livingstone) that connects to Mukuni village will be rehabilitated and a new road, measuring 20km in length will be constructed to connect Mukuni to the dam site. In Zimbabwe, the secondary road that starts from the Bulawayo-Victoria Falls main road and connects to Jabula will be upgraded and a new road, connecting Jabula to the dam site (measuring 14km long), will be constructed. The construction of a road downstream from the dam and a bridge that connects the two countries is also proposed, in order to minimise the passage of heavy loaded trucks on the dam crest.

Other Ancillary Infrastructure: Quarries, spoil areas, construction and batching camps, as well as construction camps and permanent staff villages will be required in Zambia and Zimbabwe.

Project alternatives are still under consideration so that sensitive areas such as sites of social/ecological and/or cultural significance can be avoided and environmental factors included in the design of the facility. This is particularly relevant for the proposed transmission line alignments where currently there is a corridor of a 3 km width under consideration which will be reduced significantly when a preferred alignment is selected

Proposed Project Programme

The ESIA is scheduled to be submitted to the Governments of Zambia and Zimbabwe in March 2015.

The construction phase is expected to last around nine years. It will be divided into two stages: the first stage will be when access roads and the first permanent camp will be built. It is expected that this will take one to two years. The second phase is when the dam and plants will be constructed; this will take six to seven years .

Project phase	Duration	Dates
ESIA process	11months	May 2014 – March 2015
Construction: phase 1	1–2 years	2015- 2017
Construction: phase 2	6–7 years	2017–2024
Operation phase	For life of dam	2024 onwards

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Batoka Gorge Hydro-Electric Scheme

What is an ESIA ?

In order to commence with the Project an Environmental and Social Impact Assessment (ESIA) must be completed. The ESIA will be undertaken in alignment with the relevant legislation, as well as international good practice guidelines such as the IFC's Performance Standards. In Zimbabwe, the key legislation is set out in Statutory Instrument No. 7 of 2007 the Environmental Management (Environmental Impact Assessments and Ecosystems Protection Regulations) and in Zambia, it is the Environmental Management Act, 2011 and Statutory Instrument 28 of the 1997 EIA Regulations. The objectives of the ESIA are:

- To understand how the proposed Project could impact the local environment and people living and working nearby
- To identify any measures that could be implemented to reduce negative impacts and enhance positive impacts
- The ESIA will advise whether the proposed Project can be developed in an environmentally and socially responsible way and if so, whether permission and funding should be given by the government to develop the Project.

Specialist Studies

To support the ESIA, specialist studies will be undertaken on the following areas:

- Biodiversity
- Social-economics including health impact assessment and an economic cost-benefit analysis
- Resettlement
- Cultural heritage and archaeology
- Water flow and water quality monitoring.

In parallel a Resettlement Action Plan (for the dam infrastructure) and Resettlement Policy Framework (for the transmission lines) is being prepared to assist and guide planning around any physical and economic displacement that may occur as a result of the project.

An ESIA aims to answer five key questions:

Baseline

1 What is the current environmental and social situation?

Prediction

2 What will the project's impacts be? How will conditions in the environment and society change as a consequence of the project?

Evaluation

3 Are the impacts significant? If so, how significant?

Mitigation

4 If an impact is significant, what can be done to avoid, reduce, remedy or compensate for the adverse effects of enhance the benefits?

Residual impact

5 What will the residual impact be after the mitigation? How significant will this be?

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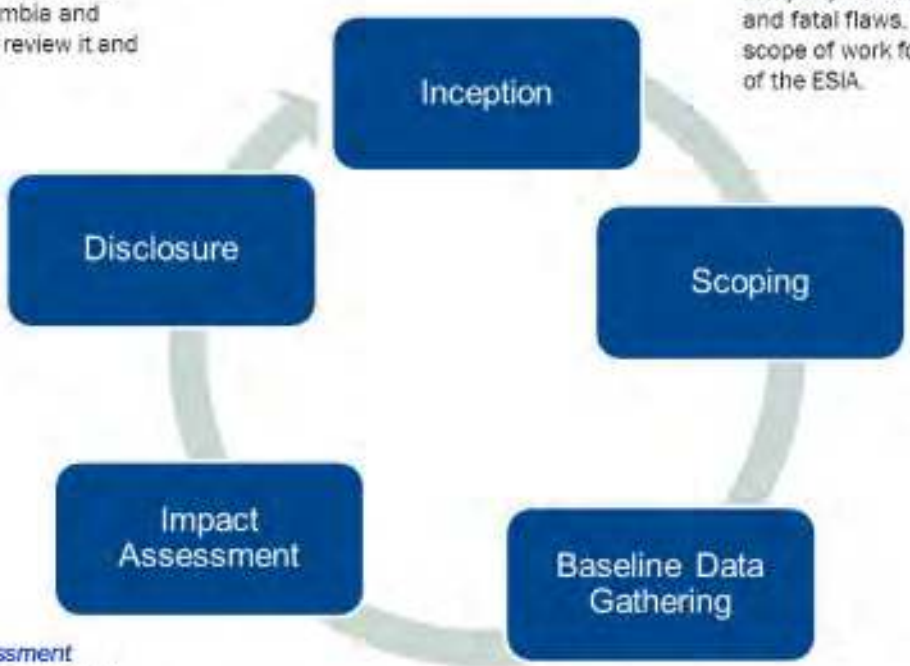
Batoka Gorge Hydro-Electric Scheme

The ESIA Process

The ESIA is divided into 5 stages:

During *Disclosure* the ESIA report will be submitted to the Governments of Zambia and Zimbabwe who will review it and issue a decision.

Inception or screening identifies likely key issues of concern, risks and fatal flaws. Defines the scope of work for the remainder of the ESIA.



Scoping identifies the likely changes (impacts) that will happen as a result of the proposed Project. Seeks to involved interested and affected parties.

The *Impact Assessment* assesses how significant the impacts are likely to be, as well as identifying ways to manage them.

Baseline Data Gathering will be undertaken to enhance understanding on the environment and people in the area and how the proposed Project is likely to affect them.

Potential Impacts

The ESIA studies will identify the likely impacts that will occur as a result of the Project. Some of the types of impacts that may occur are detailed below. This list will be expanded on, on the basis of comments and issues raised in the public domain. These impacts will be studied and understood in more detail through the Baseline Studies and Impact Assessment phases in the ESIA. During the Impact Assessment phase of the ESIA, mitigation and management measures will be developed so as to avoid and / or reduce any negative impacts. In addition recommendations will also be developed to enhance any positive impacts.

The potential environmental and social impacts include:

- Destruction/removal/loss of habitat for terrestrial and aquatic flora;
- Destruction/removal/loss of habitat for terrestrial fauna, including avifauna;
- Changes to river flows and associated impacts to downstream aquatic ecology and water users;
- Modification of the sediment regime as a result of the impoundment;
- Decrease in water quality and water temperature changes, both within the impoundment and downstream;
- Emissions of greenhouse gases as a result of the inundation of vegetation.
- Socio-economic impacts, including in particular the impacts to white water rafting and other tourism opportunities on the Zambezi River downstream of the Victoria Falls;
- Settlement and potential in-migration, during and after construction, and its potential effect on land-use, health and conservation;
- Economic and physical resettlement as a result of land take for the construction of Project infrastructure
- Impacts to cultural heritage, including the potential effects on the World Heritage status of the Victoria Falls (and Mana Pools).

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Batoka Gorge Hydro-Electric Scheme

Stakeholder Engagement

An important part of the ESIA process is to obtain feedback from people who may be affected by, or who are interested in the Project. Stakeholder consultations will therefore be undertaken throughout the ESIA process. The engagement process will be undertaken in order for stakeholders to:

- learn about the project
- raise issues that they are concerned about; and
- to make suggestions for enhanced project benefits.

ERM, Black Crystal and Kaizen Consulting International will run the engagement process. The team will try to make sure that engagement is open to all people, especially those who will be affected by the proposed Project.

The following engagement activities are proposed:

- Advertisements placed in national newspapers
- The placement of notices / flyers at public places including schools and public clinics.
- Circulation of this Background Information Document
- Meeting with national and provincial authorities in Bulawayo/Lusaka
- Meeting with local authorities and politicians (District Councils – Administrator/Chief Executive Officer/Chairman/Relevant Ward Councillors)
- Open day in Harare and Lusaka
- Open day in Victoria Falls and Livingstone
- Community meetings
- Community radio announcements
- Fielding of telephonic comment; and
- Receipt of written comment.

All comments and suggestions raised by stakeholders will be recorded. The technical specialists and project team will evaluate relevant issues and suggestions received and incorporate these into the ESIA studies.

Public meetings will be held in local languages so that the widest audience possible can understand the ESIA process and the proposed Batokoa Gorge HES.

Invitation to Comment and Register as an Interested and Affected Party

If you have any comments or concerns, and would like to register as a stakeholder you can get involved by:

- Attending public open days or information sharing meetings (by personal invitation) held during the ESIA process;
- Contacting Black Consulting or Kaizen Consulting International for further information (see contact details below); and
- Registering as an interested or affected stakeholder in the proposed Project. Registration will allow you to receive further communication about the ESIA process and the proposed Project. Please complete the attached Registration and Comment Sheet overleaf and return it to the contact specified by 27th October 2014.

Black Crystal

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Address: Suite 3, Floor 21st, Findeco House, Cairo Road, P.O. Box 33526, Lusaka, Zambia

Environmental Resources Management

Contact: Miana Capuano or Nadia Mol

Email: miana.capuano@erm.com; nadia.mol@erm.com

Phone: +44 (0) 20 3 206 5456, +27 (0) 21 681 5400

Batoka Gorge Hydro-Electric Scheme

Registration and Comment Sheet

Please complete and submit your comments to the relevant Stakeholder Engagement contact person by 27th October 2014.

ZIMBABAWE	ZAMBIA
Black Crystal	Kaizen Consulting International
Name: The Socio-economist	Name: Godfrey Chileshe
Email: queries@blackcrystal.co.zw	Email: Godfrey_chileshe@yahoo.com, kaizen0601@gmail.com,
Phone: +26377-287-6616	Phone: +269077-998-803
Address: 1 Fairbairn Drive, Mt Pleasant Harare , Zimbabwe	Address: Suite 3, Floor 21st, Findeco House, Cairo Road, P.O. Box 33526, Lusaka, Zambia

Please complete and submit your comments to the Stakeholder Engagement Contact Person by 27th October 2014.

TITLE		FIRST NAME	
INITIALS		SURNAME	
ORGANISATION			
POSTAL ADDRESS			
TELEPHONE NO		CELL NO	
FAX NO		EMAIL	

REGISTRATION AS AN INTERESTED AND AFFECTED PARTY (I&AP) (please mark applicable box with X)

Please formally register me as an interested and affected stakeholder so that I may receive further information and notifications during the ESIA process	YES	NO

I would like my notifications by:			
Letter (mail):	E-mail:	Fax:	Telephone:

I would like to receive documents for comment as follows:		
Paper copies:	By email:	

Comments:

THANK YOU FOR YOUR CONTRIBUTION

Batoka Gorge Hydro-Electric Scheme

COMMUNITY MEETING

The Zambezi River Authority, alongside the Governments of Zimbabwe and Zambia, is proposing to develop the Batoka Gorge hydro-electric scheme (BHES) on the Zambezi River. The proposed BHES will be situated approximately 47km downstream of the Victoria Falls. In Zimbabwe, it falls within the province of Matabeleland North and in the Hwange Rural District. In Zambia, it falls in the Southern Province, in the Kazungula, Livingstone, Zimba, Choma and Kalomo Districts.

The BHES will provide electricity for both Zambia and Zimbabwe. It will include the construction of a dam wall, as well as powerhouses, transmission lines, access roads, construction camps and permanent staff villages.

In line with Zambian and Zimbabwean legislation, an Environmental and Social Impact Assessment (ESIA) is required for the scheme. A resettlement Action Plan (RAP) is also being developed to address any physical and economic displacement that may result from the development. The ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) to undertake the ESIA.

Stakeholder Engagement is an important part of the ESIA process. ERM, Black Crystal and Kaizen Consulting will be holding community meetings to talk to you about the proposed HES. The meetings will:

- Provide information about the proposed Batoka Gorge HES;
- Give an overview of the ESIA process;
- Provide an opportunity for affected communities to raise comments, concerns and issues about the proposed HES.

Your views are very important to us.

Date	Affected Community	Venue	Time
2nd October 2014	Jambezi Ward	Chief Shana's homestead	10:00am

Please attend the community meeting.

Black Crystal

Name: Socio-economist

Email: queries@blackcrystal.co.zw

Phone: +26377-287-6616

Address: 1 Fairbaim Drive, Mt Pleasant, Harare

Kaizen Consulting International

Name: Godfrey Chileshe

Email: kaizen0601@gmail.com,

Phone +260977-998-803

Address: Suite 3, Floor 21st, Findeco House, Cairo Road, P.O. Box 33526, Lusaka, Zambia

Black Crystal Consulting Private Limited

1 Fairbairn Drive
Mount Pleasant, Harare
Office: +263 (0) 4 334 361/ 307 458
Mobile: +263 (0) 779 394 179

Box 9111, Harare
E-mail: infor@blackcrystal.co.zw
Fax: +263 (0) 4 307 466

19 September 2014

Dear

RE: Environmental and Social Impact Assessment Studies for the proposed Batoka Gorge Hydro-Electric Scheme

The Zambezi River Authority (ZRA) is a statutory organization jointly owned by the Governments of Zambia and Zimbabwe. It has been mandated by the two Governments to develop the Batoka Gorge Hydro Electric Scheme (HES). The proposed HES will be situated approximately 47km downstream of the Victoria Falls. In order to commence with the Project, an Environmental and Social Impact Assessment (ESIA) must be completed and environmental authorization granted for the project by both the Zambian and Zimbabwean regulatory authorities. The ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) to undertake the ESIA.

An important aspect of the ESIA process is the participation of people that may be interested in or affected by the proposed Batoka Gorge HES. This will allow the Consultants to identify issues of concern and relevance to stakeholders and ensure that they are investigated as part of the ESIA and considered in mitigation measures to be proposed. We would therefore like to hold meetings with Hwange Stakeholders as detailed below.

Meeting with Hwange Stakeholders

The proposed purpose of the meeting will be:

- To provide information about the proposed Batoka HES Project;
- To provide an overview of the ESIA Process;
- To provide information about the resettlement studies and next anticipated steps as part of this process; and
- To identify issues of concern.

Date: Friday 3rd October 2014
Time: 09:00 – 12:00
Location: District Administrators Office Boardroom, Hwange

For further details or if you have any queries about the meeting or the Batoka Gorge HES, please contact Black Crystal on +263772876616 or queries@blackcrystal.co.zw.

Thank you for your cooperation.

Yours sincerely,

Tasara Marondedze (Black Crystal) Zoe Daniel (ERM)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE DEVELOPMENT OF THE BATOKA GORGE HYDRO-ELECTRIC SCHEME

The Zambezi River Authority (ZRA) has been mandated by the Governments of Zambia and Zimbabwe to develop Batoka Hydro Electric Scheme (BHES). The proposed HES will be situated approximately 47km downstream of the Victoria Falls located in Hwange Rural District, Matabeleland North.

In line with Statutory Instrument No. 7 of 2007, the Environmental Management (Environmental Impact Assessments and Ecosystems Protection Regulations) and the Environmental Management Act, 2011, an Environmental and Social Impact Assessment (ESIA) is required. ZRA has commissioned Environmental Resources Management (ERM) and Black Crystal Environmental Consultants Zimbabwe to undertake the ESIA.

Stakeholders are invited to register as Interested and Affected Parties (I&APs) for the Batoka Gorge HES. I&APs may submit comments regarding the proposed scheme and will be notified of all stakeholder engagements and report availability in the future. The registration and comments period closes on **19th October, 2014**.

To obtain more information about the proposed HES and /or to register as an I&AP and submit comments, please contact the Black Crystal Socio-Economist on email queries@blackcrystal.co.zw, **landline +263-4-334361** or **mobile +263 772 876616, address 1 Fairbairn Drive, Mt Pleasant Harare, Zimbabwe.** A background information document is also available on the following website: http://www.erm.com/BatokaHESESIA.

Stakeholder consultation will take place in Harare on **30th September, 2014** at **Royal Harare Club between 15.00 and 19.00 hours** and in **Victoria Falls** on **4th October, 2014** at **Victoria Falls Municipal Chamber** between **15.00 and 19.00 hours**. All Interested and Affected Parties are invited.

ERM

black crystal

Please note that all information advertised below has been requested by the advertee to be distributed. Please note that "Vic Falls News" is not liable for anything pertaining to the below.

This is a community service and all donations are put towards our "Oldies" food boxes. All correspondence must be directed to the person advertising. Please don't add flyers, photos or logos when sending in your adverts. Adverts are sent out every Tuesday and Thursday evening, all correspondence must be directed through gover@voafrica.com. Please only send your adverts in an email or word format.

Please be honest and pay your donation as our "Oldies" rely on these donations that assist them each month.

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23rd September 2014

Treat everyone with politeness, even those who are rude to you — not because they are nice, but because you are. ~Author Unknown

PROPERTY REQUIRED \ AVAILABLE

- **INDUSTRIAL PROPERTY FOR LEASE -** Fatmans Sadza house premises is available for lease from this month onwards. It's a very clean and tidy premises offering a dust/sand free environment for $800 a month. We are also selling all our catering equipment, for more information please contact us within at 282 Holland Road, Victoria Falls.

SEEKING EMPLOYMENT

- **SEEKING EMPLOYMENT -** Hello Victoria Falls, I am applying to all the businesses, lodges and hotels in the hope that you have a vacancy, or that when you have a vacancy in the future you may consider me for a position. I am an internationally qualified beautician and am trained to be able to do treatments ranging from massages and basic treatments to advanced SPA treatments and more therapeutic treatments such as Aromatherapy and Reflexology. I would be willing to train staff to help improve the skill set of the local people and empower them. As a Somatologyst I have a lot of experience with sales, as our largest source of income is the sale of products to our clients. I also have experience with bookings and administration and have good client relation skills. I have a lot of experience with horses, their management, training and care. So I would be very willing and able to also manage a stable yard and conduct horse trails. Please email me should you want a copy of my CV. Hope to hear from you soon. Kind regards Monique Joubert mjoubs03@gmail.com

"Silent" and "listen" are spelled with the same letters.
~Author Unknown

We're seldom drawn to a character we admire;
only to a personality we like. ~Mignon McLaughlin

VACANCIES AVAILABLE

- **LODGE ADMINISTRATION ASSISTANT WANTED -** Applications are urgently invited for an Admin assistant job post for an up-market lodge close to Hwange National park.The suitable candidate should have the following :

  QUALIFICATIONS :

  -Formal qualifications in Office/Business Administration /Management from a recognised institution
  -Any Qualifications in various computer packages
  -At least 3 traceable references
  -A clean driving licence is an added advantage

  SKILLS: Strong analytical skills, Focused on attention to detail, Confident and comfortable to check on staff work and address issues when necessary, Ability to work independently without supervision, Dynamic – ability to adapt to change, Likes to learn and investigate and find solutions, Very high problem solving skills, High Microsoft Excel skills – Interlinked spreadsheets – Basic Macro's – Formatting Cell's etc.

  KNOWLEDGE AND EXPERIENCE :

  Knowledgeable in star ratings and standards of tourism, Experience in tourism industry (min 3 – 5 years), Administration experience, Some basic accounting experience would be an advantage, Experience in a developing enterprise (start of business and growth challenges) would be advantageous, HR knowledge and experience would be an advantage

  Please forward CVs to the following addresses : sulet@africanluxuryhideaways.com and thomas@africanluxuryhideaways.com
  Only shortlisted candidates will be contacted for interviews.

BUSINESS

- **MARANGE MOTORS -** Petrol reduced from $1.65 per litre and now $1.62 per litre
  Diesel reduced from $1.49 per litre and now $1 .48 per litre.
  We are open from 7am up to 22:00 hours Every day of the week. Visit us at Marange Motors Filling Station, Stand 430, Industrial Site, Victoria Falls OR Call 013-45954/41963

- **WIDENCY UPHOLSTERY CENTRE -** We give your old furniture new life, professionally done and custom made, for all your upholstery needs in camping equipment, boats, vehicle interior, couches, curtaining, carpeting, cushions in high density foam, contact us on 013 -43524, 07730008888/9 0712414188. email. hudmtomba@gmail.com or come to 82 pioneer road. We collect and deliver.

- **ACCOUNTING\TAX SERVICES -** Anastasis Financial Consultancy is a pioneer in the accounting and financial outsourcing industry. We are a growing and diverse Accounting & Consulting, whose primary offerings are accounting and financial outsourcing services at very reasonable rates. We have professionals at all stages of their professional careers, who have more than 10 years experience in the accounting and audit field.

  What We Do - Our focus is helping companies succeed by providing Executives with financial clarity by using our Accounting outsourcing Methodology .We put the financial systems in place that deliver timely, accurate and relevant information. Using this financial information, we provide guidance that allows our clients to grow their business and succeed.

  What we Offer - Our firm offers a wide range of services to our individual and company clients. Because our firm is relatively small, our clients benefit by getting personalized, and quality service that is beyond comparison. Below we have listed the services that we offer to our clients. As the list below is by no means all-inclusive, please feel free to inquire about a service if you do not see it listed. If it is not a service we provide, we would be more than happy to refer you to a qualified professional.

  - Accounting Services
  - Fraud Prevention & Detection
  - Tax Compliance Services
  - Tax Planning & Preparation
  - Accounting Software Selection & Implementation
  - Business Consulting
  - Loan applications, Business Plans, Cashflow projections

  Distance is no barrier, we can have one of our partners come to Victoria Falls or If you have any further inquiries please do not hesitate to contact Anastasis Financial Consultants on the following email address: anastasisafir@gmail.com or call on +263 775 939 713. Thank you Regards Anastasis Financial Consultancy.

BUSINESS - Continued

- **SAGRONE ENTERPRISES (PVT) LTD** - Elephants Walk Shopping Village, 273 Adam Stander, Victoria Falls
  Elegant Elephant-near Seven Eleven, Victoria Falls - Hwange Zoo and Aviaries, Hwange
  0777 048 472 boazmakiwa@gmail.com www.sagroneenterprises.co.zw
  Available in stock
  COMPUTER ACCESSORIES: -
  Keyboard, Mouse, Power cable, Web camera, HDMI to HDMI cables, cordless headphone SD/FM
  STORAGE:
  Flash drives from US$10
  4gb, 8gb,16, 32gb,128gb,256gb
  Micro SD cards
  2gb, 32gb,64gb
  Micro Memory Stick Duo
  2gb, 4gb, 8gb, 16gb
  POWER BANKS: from US$30 for Galaxy S11,HTC,BlackBerry, Huawei, Ipad 2,Iphone 3/4/5
  10800mAh, 5600mAh, 2600mAh,
  MOBILE PHONE ACCESSORIES:
  Iphone 5s/4s car charger, iphone 5s usb charger cable, iphone 5s card reader, 10 in 1 Universal Multi USB charger,
  CAR ACCESSORIES - Wireless Mp3car modulator @US$10
  MOVIES:@US$5 eac-original - Great vintage titles
  OTHERS - Deodorants:, polo, blue Givenchy,oganza,212 for men, irresistible etc Mineral water

Consultation Fee On All Hardware	$10.00
Documents Transefer To New Computer	$30.00
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Microsoft Office 2007,2010,	$40.00
Microsoft Kingsoft 2012	$35.00
Incredimail	$10.00
Download Manager	$10.00
Skype Premium	$10.00
Encarter 2010	$20.00
Computer Repairs Hourly Charge	$40.00
Mozilla Fire Fox	$10.00
Eset Nod 32 Antivirus	$35.00
Quick-Books Pro	$60.00
Quick-Books 2011	$150.00
Full Computer Service and Maintenance inc Virus Scan	$30.00
WORKSHOP HANDLING FEES	$10.00
Software Installation	$35.00
Antivirus Update -Monthly	$15.00
Printer Repairs per Hour	$40.00
Half Hour Printer Repairs	$20.00
Computer Repair Half Hour Standard	$20.00
Printer Service and Maintenance	$25.00
Repairs on Laptop chargers	$15.00
Operating System Installation Inc All Drivers	$65.00
Virus Removal	$25.00
USB Flash Stick Scan	$5.00
Documents Back Up	$35.00
Transfer of docs to new computer/laptop	$80.00

We Specialize in Computer Repairs, Sales, Service and Maintenance, Virus Removal, Networking, Internet and Email Setup, Upgrading, Typing, Scanning, Photocopying, Printing, Software Installations, Websites, Graphics Design and many more

BUSINESS - Continued

- **FORTWELL WHOLESALE -** Bulk groceries are now available at Fortwell Wholesale at 439 Miles Road, Victoria Falls Industrial sites and our prices are the best in town. Come to our wholesale and have a look at our wide range of grocery lines available, just a few of our money saving prices are as follows;
  Typek Bond - $4.00 a ream
  First Choice Milk 6x1lt - $6.60
  Coca Cola Longtoms 24x440ml - $15.50
  Bokomo Cornflakes 500g - $1.97
  C&B Mayo 3kg - $8.95
  Dark & Lovely Hair relaxer - $4.84
  Schweppes Tonic/Soda/Ginger Ale 24x200ml - $14.44
  Mazoe Orange 6x2ltr - $15.50
  Simba Chips 48x36g - $20.07
  Arenel Marie Biscuits 12x130g - $3.40
  Snowflake Cake flour 12.5kg - $11.06
  Koo Baked Beans 12x410g - $11.40
  Macaroni 3kg - $3.68
  Our landline numbers and email addresses are as follows : 013 44870/1 or 45165/8 neil@fortwell.co.zw / sipho@fortwell.co.zw

- **ePAP NOW AVAILABLE -** ePap Now Available in Vic Falls!!!! The Revolutionary ePap Cereal is now available in Vic Falls. ePap is a delicious, pre-cooked porridge made of nutritious wholegrain maize and soya, plus a special mix of powerful MICRO-Nutrients. Available in three delicious flavors: Vanilla, Banana and Original. For only $2.50 per 500g pack, feel the "10 Day ePap effect" for yourself and your family. For EXTRA Health, EXTRA Energy, EXTRA Brain-power, EXTRA Googness and EXTRA Lifeforce! Get yours from Seven/Eleven and Vic Falls Pharmacy. For bulk orders contact 0772462774/0712212581 or email epapvicfalls@gmail.com

- **PROCUREMENT FROM SOUTH AFRICA -** For all your business purchases in South Africa please contact us. We are able to source and supply any products you require. Transport from 1T to 34T can be arranged as well as Hazchem/Chemicals. Please contact us - Email info@faitum.co.za

- **FOR A GREAT START OF THE DAY & HAPPY GUESTS** use our top quality, frozen, oven ready croissants for a special breakfast! Ideal for HOTELS, LODGES, GUEST HOUSES, EVENTS CATERING or HOME use.
  Our current croissant range consist of:
  Small butter croissants
  Large butter croissants
  Chocolate croissants
  Country croissants (with brown flour & seed mix)
  Country / chocolate croissants
  Baking is easy & baking instructions are supplied. Croissants defrost overnight and are ready to bake in the morning. All our croissants are made from top quality ingredients and with 100% butter (no margarine, no pastry shortening). Croissants are sold in packs of 24/36 small and 12 large. We also make a superb 100% butter puff pastry ideal for pies, sausage rolls, vol au vents, Danish pastries etc.
  For enquiries and orders kindly call Rolf or Ali Steiner at 013-41590. We are open Monday to Friday 08:00 to 17:00 and Saturday 09:00 to 12:00

- **BERCOL®fly traps** - Simple, efficient and easily assembled, the BERCOL fly trap. Is designed for both Urban and Rural applications. Installed outdoors, it draws flies away from:
  KITCHENS, DUSTBINS, POOL AREAS, DOMESTIC AND FARM ANIMALS
  CONTACT - macla2003@gmail.com Leanne 071 2 231 391 - 077 2 771 885 or Mike 071 2 430 645 - 077 2 771 886

BUSINESS - Continued

- **COMPUPRO – HEART OF TECHNOLOGY –**

LENOVO SPECIAL

Lenovo IdeaPad G5030 Notebook $425.00 incl Vat
2GB RAM | 320GB HDD |Webcam |15.6" LED backlit display
Lenovo IdeaPad G5070 Black Notebook $665.00 incl Vat
Core i3 -4010U 1.7GHz | 4GB RAM | 500GB HDD |Webcam |15.6" LED backlit display
Lenovo ThinkPad Edge 531C Series Notebook $795.00 incl Vat
Core i3 sandy bridge D.Core 2.4GHz | 4GB RAM | 500GB HDD |Webcam |15.6" HD (1366x768) LED backlit display
Lenovo ThinkPad Edge 531C Series Notebook $895.00 incl Vat
Core i5 3320m 2.7GHz | 4GB RAM | 500GB HDD |Webcam |15.6" HD (1366x768) LED backlit display
Lenovo ThinkCentre Edge 62Z Series Notebook $975.00 incl Vat
Core i3 -3220 1.7GHz | 4GB DDR3 RAM | 500GB HDD |Webcam |18.5" All in One 1366x768 LED |
DVD+-RW DL | WIN 8 PRO 64bit

PROJECTORS

NEC VE281 $649 from $712
Brightness [ANSI Lumen] 2800, Contrast Ratio (up to)3000:1, Resolution: Native SVGA 800 x 600 Maximum UXGA 1600 x 1200
NEC VE280Xi $1639 from $1821
Brightness [ANSI Lumen] 2800, Contrast Ratio (up to)3000:1, Resolution: Resolution 1024 x 768
WiDi attachment (Does away with HDMI & VGA cables) $339
Installation P.O.E. T & C's Apply

DESKTOP GAMING PC

CoolerMaster Intel® Core i7-4790 3.6G hz Gaming PC USD1556
CoolerMaster K380 Chassis | Gigabyte 80Plus 650W PSU | Gigabyte B85M-HD3 Motherboard| Intel® B85 Express Chipset | iTE® I/O Controller Chip | Intel Generation 4 Core i7-4790 3.6Ghz CPU | Corsair 8GB 1600Mhz High Performance Memory | DVDRW | Seagate 1TB SATA-3 Hard Drive | VGA | DVD-D & HDMI Connector, 7.1ch Audio, Realtek® GbE LAN, 4 x USB 3.0, 4 x USB 2.0 | 4 x SATA 6Gbps | 2 x SATA 3Gbps nVidia GeForce GTX750ti 2GB GDDR5 Graphics Card | 120mm Front Fan with Red LED

Graphics Cards

nVidia Geforce 210 1GB DDR3 Graphics Card USD65
nVidia GeForce GT610 1GB GDDR3 PCIe Graphics Card USD85
nVidia GeForce GT730 2GB GDDR3 PCIe Graphics Card USD120
nVidia GeForce GTX750ti 2GB GDDR5 Graphics Card USD285
Price is valid whilst current stocks last. Offering Delivery Throughout Zimbabwe (terms & conditions apply)
Also Available: Laptops & Accessories | Desktops | Printers, Scanner & Projectors |UPS & Inverters | Sollatek Surge Protection | Networking | Accessories
Phone: (09) 889642/45 E-mail: info@compupro.co.zw Skye: info.compupro
Address: 130A S.parirenyatwa Street, Between 13th & 14th Avenue Bulawayo
OR VISIT OUR WEBSITE www.compupro.co.zw/CompuPro

ITEMS FOR SALE

- **40 FOOT CONTAINER FOR SALE -** 40 Foot Container for Sale neat condition, just arrived from Overseas and not been used locally. Price $4800- Call 0773 556 966 or 0715 961 256"

- **ITEMS FOR SALE –** I AM SELLING THE FOLLOWING VEHICLE: TOYOTA DUET MANUAL PETROL $1000 ONLY AND MIN BUS KOMBI ISUZU COMO AUTOMATIC PETROL $7000 INTERESTED PARTIES SHOULD CALL ON +263734777238 ALL OF THEM ARE IN GOOD CONDITION AND MOVING

- **FOR SALE -** CAPRI F2 10 8 CUBIC MULTI MODE FREEZER, CHILLER, COOLER. IN MINT CONDITION. PRICE $400.00 NEG CONTACT 0775 996 062

- **FOR SALE -**
  - Glass shop display counter
  - Free standing glass/metal display units
  - De Longhi coffee maker
  - Princess ice maker
  - 12 volt hot/cold Colman cool box
  - Lawn mower
  - Microlink complete set up incl modem, hub, UPS, receiver dish, etc, fully working.
  - Various household & kitchen items, furniture, linen, old tyres, golf clubs and bags, cooler bags, and LOTS of other small items. Sale at 60 Courtney Selous Crescent. Friday 19th September 10am to 2.30pm and Saturday 20th September 9am to 3pm only. Contact heleni0206@gmail.com

EVENTS HAPPENING

- **SIT DOWN DINNER AT THE BOAT CLUB -** 4th October 3 Course Sit Down Dinner. Book your tickets for a sit down dinner at Vic Falls Boat Club. In order to not miss out on this special evening early bookings are essential as tickets are limited. Tables will be set on the verandah overlooking the river. The menu as follows:

  Starter

  Fish Cocktail

  Mains

  Roast Beef and Roast Chicken, Crispy Potatoes, Rice and Seasonal Vegetables.

  Dessert

  Summer Cheesecake

  Bookings can be made on the following numbers: Liada 0774 894 690 / Hettie 0783 890 713 or glenuse@gmail.com

  Price: $15 per head

- **RE: ENVIROMENTAL AND SOCIAL IMPACT ASSESMENTS STUDIES FOR THE PROOPOSED BATOKA GORGE HYDRO-ELECTRIC SCHEME -** The Zambezi River Authority (ZRA), a statutory organization jointly owned by the Governments of Zambia and Zimbabwe, has been mandated by the two Governments to develop the Batoka Gorge Hydro Electric Scheme (HES). The proposed BHES will be situated approximately 47km downstream of the Victoria Falls. In order to commence with the Project, an Environmental and Social Impact Assessment (ESIA) must be completed and environmental authorization granted for the project by both the Zambian and Zimbabwean regulatory authorities. The ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) to undertake the ESIA. ERM and Black Crystal will be holding open days in Zimbabwe to provide further information about the proposed Batoka Gorge HES. The open days will provide information on the proposed project and the environmental and social impact studies. ERM and Black Crystal will also accept questions and comments from stakeholders. Representatives from ERM and Black Crystal will be present for the duration of the scheduled open day times. You have been identified as an Interested and Affected Party (I&AP) for this project and are invited to attend at any time during this open day timeframe at your convenience.

  Date: Saturday 4th October 2014

  Time: 15:00 – 19:00

  Location: Victoria Falls Municipal Chamber, Livingstoneway, Victoria Falls CBD, Victoria Falls

  For further details on the proposed project and for any queries about the open day or the Batoka Gorge HES, please contact Black Crystal on +263772876616 or queries@blackcrystal.co.zw Thank you for your cooperation. Yours sincerely, Tasara (Black Crystal) Zoe Daniel (ERM)

- **VICTORIA FALLS MUNICIPALITY - Indoor Residual Spray (IRS) Programme 2014**

Date	Activity	Area to be sprayed
15/09/2014 -19/09/2014	Training of spray operators	
	Warning	
	Indoor Residual spraying (IRS)	
22-29/09/2014	"	Ward 10 Chinotimba
30/09/14-06/10/2014	"	Ward9 "
07-10/10/2014	"	Ward8 "
13-16/10/2014	"	Ward7 "
17-22/10/2014	"	Ward6 "
23-29/10/2014	"	Ward5 "
30/10/2014-04/11/2014	"	Ward4 "
05/11/2014-24/11/2014	"	Ward 11 Mkhosana
25/11/2014-01/12/2014	"	Ward1 Low Density
02-05/12/2014	"	Ward 3 Medium Density
08-09/12/2014	"	Ward 2 Industrial Area

NB: from the 10th to the 15th of December 2014 they will be a mop up exercise. Targeted households, **7872**

We are on the **pre-elimination** phase of the disease **malaria**, it is very important that all stakeholders support this effort for us to succeed in eradicating this disease at its immature stage. Therefore stakeholders who receive this information are requested to cascade to all stakeholders at different levels in the community.

MISCELLANEOUS

- **LETS REACH OUT TO A LITTLE GIRL WITH CANCER -** Dear All, this is the moving story about 8 year old Cancer Patient Polite Theo Babonang and her Family. Please take 5 minutes to read it. Polite lives in Kasane on a threadbear sheet and thin mattress in the shade of their rented house. She is the second born and has 3 Sisters. Polite has a large tumour on the side of her head which distorts her little face and left eye. Her right leg has been amputated and she has another very large growth on her back, which is causing her a lot of pain. She is being treated in Gaborone where she will have radiation therapy on the 13" October. Members of the Leanne Britton Foundation went to visit her and she was overwhelmed by such a large gathering of visitors but smiled a very lovely, shy smile when Trish Williams read her The Cat In The Hat. Josh Britton (bless his cotton socks) had brought some of his favourite books as a gift. (he is his mother's son) and showed her how to find a hidden cricket on each page of a book about a giraffe. She liked that a lot. Trish will try and visit her fairly regularly to read to her and play some educational games with her since she can no longer go to school, she is in too much pain and has to rest frequently. **And here is how you can help**:
  -Children's clothes (They are all girls, ages are 2,5,8 and 12 years)
  -A proper bed (second hand would do) to comfort her in her pain.
  -Money donations for travel costs and any extra needs
  -Food Baskets (tins, cans, pap, rice,...)
  -Board Games, educational Games/ toys, Puzzles
  Anything will go a long way. Please feel free to contact us, if you would like to find out more about Polite or if you would like to make a donation. Toys/ Clothes Donations can be dropped at "The Cofee Buzz" or "Kasane Self Catering". Cash Donations, (please contact Duncan Britton under <duncan@chobesafarilodge.com>) Bettina Kelly (bettina.coffeebuzz@gmail.com) for the Leanne Britton Foundation -Reaching out with Love-

- **VFA WATER PROJECT -** Dear All, With regards the HAZ / Schweppes / CAAZ / ZIMRA & Immigration / ZTA customer service project at the Victoria Falls Airport (Arrivals) we kindly advise we are doing the following:
  - We have agreed that Schweppes Zimbabwe will be supplying the water at cost and delivering to VFA, payable either direct or via HAZ.
  - Schweppes will supply 2 coolers FOC
  - Wilderness / Wild Horizons / Shearwater / Safari Logistics (in no specific order) will be supplying the accredited support staff to assist with the distribution of 1 bottle of water per person, pens & immigration forms if needed.
  - These personnel will report to Michael from Wilderness This has been necessitated by the increase in the number of planes coming into Vic Falls, and the fact that this is our peak and hot season. The project is expected to run for 3 months while we wait for the completion of the new terminal building. Contributors are welcome from all business sectors in Victoria Falls and any amount will be welcome for the next three months, though a fixed fee of US$250 per month has been budgeted from 40 operators . Please get hold of one of the following should you need any further clarification:
  - HAZ Chair Jono Hudson jonathan@saflodge.co.zw
  - ZCT Rep Barbara Murasiranwa barbara@wildhorizons.co.zw

  Terms of reference for Airport Staff
  - Staff will wear a non-branded 'Welcome to Zimbabwe (ZTA T-shirt)
  - To receive all incoming guests and assist with providing pens and assistance with filling in relevant immigration forms, but will not physically fill in the forms
  - Issue one bottle of water to each guest
  - Assist with and direct any queries to immigration or customs accordingly
  - To offer a true Zimbabwe welcome
  - They are not to act as tour guides or booking agents, but will assist in directing guests to ground handlers in the arrival hall

- **TELECEL -** Enjoy new affordable tariffs with Telecash Send money across all local mobile networks.

AMOUNTS ($)			SEND TO ($)	CASH OUT ($)
FROM	TO	Registered	Non- Registered	For Registered
1.00	2.00	Free	0.10	0.10
2.01	5.00	Free	0.30	0.23
5.01	10.00	Free	0.50	0.45
10.01	20.00	Free	1.00	0.89
20.01	30.00	Free	1.20	1.05
30.01	40.00	Free	1.80	1.60
40.01	50.00	Free	2.10	1.95
50.01	75.00	Free	3.20	2.95
75.01	100.00	Free	3.90	3.55
100.01	150.00	Free	4.50	4.10
150.01	200.00	Free	4.50	4.10
200.01	300.00	Free	5.00	4.50
300.01	400.00	Free	5.40	4.90
400.01	500.00	free	5.40	4.90

Transaction limit is	$ 500.00	-	Cash in free
Daily limit is	$ 1 000.00	-	Sending money to registered is FREE
Monthly limit is	$ 5 000.00	-	Non – Registered cash-out is FREE

KAIZEN CONSULTING INTERNATIONAL
Addres Suite 3,
Floor 21st, Findeco House,
Cairo Road, P.O. Box 33526,
Lusaka
kaizen0601@gmail.com
+260-977-758591

Dear

RE: Environmental and Social Impact Assessment Studies for the proposed Batoka Gorge Hydro-Electric Scheme

Project Description

The Zambezi River Authority (ZRA) is a statutory organization equally owned by the Governments of Zambia and Zimbabwe. It has been mandated by the Governments of Zambia and Zimbabwe to develop Batoka Hydro Electric Scheme (BHES). The proposed HES will be situated approximately 47km downstream of the Victoria Falls. In Zimbabwe, it falls within the province of Matabeleland North and in the Hwange Rural District. In Zambia, it falls in the Southern Province, in the Kazungula, Livingstone, Zimba, Choma and Kalomo Districts.

The proposed scheme will generate a minimum of 1600 MW of electricity; 800MW for Zambia and 800MW for Zimbabwe. It will be used to address power shortages being faced by the countries and the region.

Environmental and Social Impact Assessment

As part of the statutory requirements, before development of the project commences, an Environmental and Social Impact Assessment (ESIA) must be completed and environmental authorization granted for the project by both the Zambian and Zimbabwean regulatory authorities. The ESIA will be undertaken in alignment with the legislation of both countries, as well as international good practice guidelines such as the IFC's Performance Standards. In Zimbabwe, the key legislation is set out in Statutory Instrument No. 7 of 2007 the Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations and in Zambia, it is the Environmental Management Act, 2011 and Statutory Instrument 28 of the 1997 EIA Regulations. The ESIA will determine and assess the social and environmental impacts that may result from the proposed scheme and will identify ways to manage these impacts through the development of appropriate mitigation strategies.

The ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Consultants to undertake the ESIA.

Resettlement Planning

In addition to the ESIA, the Consultants have been asked to identify and address the issue of physical and economic displacement that may result from this development in order to meet international good practice. This will require that a Resettlement Action Plan and/or Land

Acquisition and Compensation Plan is undertaken where there is a loss of economic/livelihood activities or the need to resettle people.

Public Participation
An important aspect of the ESIA and resettlement process is the participation of people that may be interested in or affected by the proposed Batoka Gorge HES. This will allow the Consultants to identify issues of concern and relevance to these stakeholders and ensure that they are investigated as part of the ESIA and considered in mitigation measures to be proposed. We would therefore like to hold meetings with Regulatory Authorities in Lusaka as detailed below.

Public Participation
An important aspect of the ESIA and resettlement process is the participation of people that may be interested in or affected by the proposed Batoka Gorge HES. This will allow the Consultant to identify issues of concern and relevance to these stakeholders and ensure that they are investigated as part of the ESIA and considered in resettlement planning. The Consultant will be holding a series of open days to provide further information about the proposed Batoka Gorge HES, the environmental and resettlement study process and accept questions and comments from stakeholders. Representatives from the Consultant will be present for the duration of the scheduled open day times. You have been identified as an Interested and Affected Party (I&AP) for this project and are invited to attend at **any** time during this open day timeframe at your convenience.

Date: Tuesday 7th October 2014
Time: 15:00 – 19:00
Location: Long Acres Lodge, Los Angeles Boulevard, P.O. Box 0100, Lusaka

If you would like any further details about the open day or the Batoka Gorge HES, please contact Godfrey Chileshe at Kaizen Consulting on 0977-998-803 or kaizen0601@gmail.com.

Thank you for your participation.

Yours sincerely,

Godfery Chileshe
Kazien Consulting International

Zoe Daniel
Environmental Resources Management

Annex C2

Stakeholder Database

Annex C2.1

Zambia Stakeholder Database

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
NATIONAL MINISTERIES					
Ministry of Communication and Transport	Fewdays Chanka	Director - Maritime and Inland Waterways Dept	P.O. Box 50065, Lusaka	2602112251740	fewdayschanka@gmail.com
Ministry of Communication and Transport	Nicholas Chikwenya	Director - Department of Transport	P.O. Box 50065, Lusaka	2602112251740	chikwenyan@gmail.com
Ministry of Communication and Transport	Steve Mbewe	Director - Planning and Monitoring Dept.	P.O. Box 50065, Lusaka	2602112251740	smmbewe@yahoo.com
Ministry of Commerce, Trade and Industry	Mr. Mwila Daka	Director - Planning and Information	P.O Box 31968, Lusaka	260211 226984	mwila.daka@mcti.gov.zm
Ministry of Lands and Natural Resources	Mr. Allan Danchi	Ag. Chief Natural Resources Officer, Land and Natural Resources Dept.	P.O.Box 50694, Lusaka	260 963 602 335	duchi45@yahoo.com
Ministry of National Planning and Development	Mr. Muketo Mulele	Director - Development Planning Dept.	P.O. Box 50062, Lusaka	260 211 250 712	maketo.mulele@mndp.gov.zm
Ministry of Works and Supply	Mr. Davies Chimfwembe	Director - Planning	P. O Box: 50236, Lusaka,	260 211 250 958, 260 211 252 366	jmukoloba2000@yahoo.com
Ministry of Water Development, Sanitation and Environmental Protection	Mr. Kenneth Nyundu	Director - Department of Water Resources Development (Former Dept. of Water Affairs		260 211248 304	kennethnyundu@gmail.com
Ministry of Community Development and Social Services	Changano Ngoi	Director- Community Development	Private Bag W252 , Sadzu Rd, Lusaka	260 977 700 244	changanongoi@yahoo.co.uk
Ministry of Agriculture	Mr.Moses Mwale	Director - Zambia Agriculture Research Institute	P. O. Box 50197, Lusaka	260 211 278 380	zaridirector@zari.gov.zm
Ministry of Agriculture	Mr. Peter K. Lungu	Director - Department of Agriculture	P. O. Box 50197, Lusaka	260 211 252 029	pklungu@gmail.com
Ministry of Agriculture	Mr Mwango	D/Director - Department of Fisheries	P. O. Box 50197, Lusaka	260 955 817 924	jmwango60@googlemail.com
Ministry of Agriculture	Julius Shawa	Permanent Secretary	P. O. Box 50197, Lusaka	+260-211-224648/257914/271093	
Ministry of Agriculture	Emmanuel M. Nyirenda	Principal Engineer	P. O. Box 50197, Lusaka	978954125	sweetkajipaike@yahoo.co.uk
Ministry of Fisheries and Livestock	Dr. Benson Mwenya	Director - Livestock Development		260 211 256 007	bensonmwenya@hotmail.com
Ministry of Infrastructure Development and Housing	Mr. Nkumbu Siame	Director - Department of Housing and Infrastructure Development		260 211 250 528, 260 977 482 335	nkumbusiame@yahoo.com
Ministry of Local Government	Mr.N. Banda	Director - Dept. of Physical Planning	Church road, Lusaka, Box 50027	260 211 250 996	
Ministry of Tourism and Arts	Mr. Zulu	Director - Dept. of Tourism	P.O Box 30055, Lusaka	260 977 784 114	
Ministry of Health	Dr. A. Silumesi	Director - Dept of Public Health	Ndeke House, Box 30202, Lusaka	260 211 253 040	
Ministry of Health	Dr. Kennedy Malama	Director - Health Promotion and Environment	Ndeke House, Box 30202, Lusaka	260 955 885 527	kennedymalama@yahoo.com
Ministry of General Education	Mr. Mwansa Lewis	Director - Planning and Information	P.O Box 50093, Lusaka	260 211 250 760	
Ministry of Energy	Mr. Arnold M. Simwaba	Director - Department of Energy	P. O. Box 36079, Lusaka	260 211 252011, 260 211 252 589	arnmils.simwaba806@gmail.com
Ministry of Energy	Mrs. Francesca Zyambo	Director - Department of Planning and Information	P. O. Box 36079, Lusaka	260 211 252011, 260 211 252 589	frachisangano@yahoo.com
Mnistry of Chiefs and Traditional Affairs	Mr. Joseph Mpishi	Director - Dept. of Chiefs and Traditional Affairs	P.O. Box 50506 Fairley Road: Lusaka	260 211 252713	jmpishi2001@yahoo.com
Ministry of Mines and Mineral Development	A. P. Dokowe	Acting Chief Geologist - Geological Survey Department	Govt Complex, Nasser Rd, P.O. Box 31969. Lusaka	260211250174	
Ministry of Mines and Mineral Development	Everisto Kasumba	Senior Geologist -Geological Survey Department	P.O. Box 31969, New Govt. Complex, Lusaka	0954207815, 0963670350	everistokasumba2@gmail.com
Ministry of Finance and National Planning (MFNP)	Mr. F. K. Yamba	Secretary to the Treasury	P. O. Box 50062, Chimanga Road, Lusaka	260211250501	
WARMA	Oscar Silembo	Act. Director - Water Resources Mgnt Info	Post.Net Box 681, P. Bag E891, Lusaka	0955/77-863089	oscarsilembo@yahoo.com
Energy Regulation Board (ERB)	Ms. Langiwe Lungu	Executive Director	P.O Box 37631, Lusaka	260211258844/ 9 or 260211258852	swilliams@erb.org.zm
Human Rights Commission	Florence Chibwesha	Director	Independence Avenue, P. O. Box 33812	260 211 251 327/251357	florence.chibwesha@hrc.org.zm
Ministry of Community Development, Mother and Child Health(MCDMCH)	Dr. D.M. Chikamata	Permanent Secretary	Private Bag W252 , Sadzu Rd, Lusaka		
Ministry of Community Development, Mother and Child Health(MCDMCH)	Mr. Cosmas Lukupulo	Director - Dept of Community Development	Private Bag W252 , Sadzu Rd, Lusaka	09775 451 360	lukupulo@gmail.com, lukpulo@yahoo.com
Ministry of Community Development, Mother and Child Health	Edmond Mwakalombe	HOD - Planning	Private Bag W252 , Sadzu Rd, Lusaka	+260-211-235339	
Ministry of Health(MoH)	Dr. K.Malama	Permanent Secretary - Administration	P. O.Box 30205, Longacres, Ndeke House, Lusaka	260211252989	

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Ministry of Gender		Director, Dept. of Gender in Development	Box 30719, Lusaka. Govt Complex	260 211 239924	
Ministry of Labour and Social Security(MLSS)	B. B. Mulenga	Permanent Secretary	Box 32186, Independence Avenue, New Government Complex, Lusaka	+260-211-229416	infor@hotmail.com
Water and Sanitation Association of Zambia (WASAZA)	Alexadra Couroy	Engineer	Plot 2130, Mwambeshi Rd, Northmead, Luusaka	966329972, 260 211 293 459	alexadra@wasaza.org.zm
Ministry of Livestock and Fisheries Development	Dr. D. Shamulenge	Permanent Secretary	3rd Floor, Mulungushi House, Room 310, Lusaka	260 211 254 546	
National Council for Construction (NCC)	Matthew Ngulube	Executive Director	P.O Box 39548, Sheki Sheki Rd, Lusaka	260211244004	matthew.ngulube@ncc.org.zm
National Road Fund Agency (NRFA)	Anthony Mwanumo	Chief Executive Officer	Ridgeway, Fairley Road, Lusaka, Box 50695	260 211 253 145	nrfa@zament.zm
The National Water Supply and Sanitation Council (NWASCO)	Curtis Muleya	Technical inspector	164 Mulombwa Close, Fairview, Bo 34358, Lusaka	260 211 226 941, 260 977 790 138	cmuleya@nwasco.org.zm
The National Water Supply and Sanitation Council (NWASCO)	Kelvin Chitumbo	Director	164 Mulombwa Close, Fairview, Bo 34358, Lusaka	260 211 226 941, 260 977 790 138	kchitumbo@nwasco.org.zm
Livingstone City Council	Ms. Mambwe Chisunka	Director - Planning	KabompoRd, P.O.Box 60029, Livingstone	260 213 324 043	
Road Development Agency (RDA)	Elias Mwape	Chief Executive Officer	P. O. Box 50003, Lusaka	260 211 253 088/253 801	MChisenga@roads.gov.zm, emwape@roads.gov.zm
Road Transport & Safety Agency (RTSA)	Lo Zindaba Soko	Chief Executive Officer	Box 32167, Dedan Kamathi Road, Kamwala, Lusaka	260 211 230 553	info@rtsa.org
Southern Water and Sewerage Company Limited	Charles Shindaile	Managing Director	P. O. Box 61113, Livingstone- Zambia	2603321796	southernwater@swasco.co.zm
Water and Sanitation Association of Zambia (WASAZA)		Engineer	Plot 2130Mwambeshi Rd, Northmead, Box 33493, Lusaka	260 211 293 477	alexadra@wasaza.org.zm
Zambia National Commission for UNESCO	Dr. C. Ndakala	Secretary General	P.O. Box 50619, Lusaka	260211254340	ndakalac@yahoo.com
Zambia National Commission for UNESCO	Hilda Sinywibulua	Senior Programme Offier - Culture	P.O. Box 50619, Lusaka	Tel:26021254340, Mobile: 26397438412	hmmilumbe@gmil.com
ZESCO Ltd.	Christopher Kaniki	Environmental Scientist	Box 33304, Lusaka	955996383	ckaniki@zesco.co.zm
ZESCO Limited	Victor Mundende	Managing Director	P. O.Box 33304, Stand No. 6949, Great East Road, Lusaka	260211362428	
PROVINCIAL AND LOCAL MINISTRIES					
National Heritage Conservation Commission (NHCC)	Francis K Shalwindi	Conservationist and Biologist, Retired Deputy Executive	P.O. Box 60124, Livingstone.	0977 849671, 260 213 320481	fkmshalwindi@gmail.com
Southern Province	M Liomba	Permanent Secretary _ Southern Province	Choma	097 742 9941	mwaliomba@gmail.com
Southern Province	Kennedy Mubanga	DPS	Choma		
National Heritage Conservation Commission (NHCC)	Kagosi Mwamulowe	Regional Director	Lusaka	260 211 221 221	mwamulowek@netscape.net, mwamsprog@mail.com
National Heritage Conservation Commission (NHCC)	Ndiyoi Muyumbwa	Chief Natural Heritage Officer	P. O. Box 60124, Livingstone	fice: 2603323662, Mobile: 260958832433	ndiyoi@yahoo.co.uk
National Heritage Conservation Commission (NHCC)	Issac Kanguya	Manager Information and Public Relations	P. O. Box 60124, Livingstone	26097499350, 2603322853	kanguyaisaac@yahoo.com
Ministry Of Tourism, Environment And Natural Resources	Serah Nyondo	Toursim Development Officer	P.O. Box 60563, Livingstone	2603321630 / 321297, 2609775634	s_nyondo@yahoo.com, serahnyondo@yahoo.com
Ministry of Tourism and Arts	Lucas Zulu	Principal Planner	Box 30575	977562278	lzulu@mota.gov.zm, lzullu@gmail.com
Ministry of Tourism and Arts	Brian Mwamba M	Tourism Development Research Officer	Box 30575	977807900	
Department of Energy - Min of Energy	Aggrey Siuluta	Energy Informatics officer	P.O Box 31968	977561830	aggrey.siuluta@moe.gov.zm, aggrey81@yahoo.com
Department of Social welfare	Modern Simabenga	District Officer	P.O Box 60487 L/stone	979886737	msimabenga@gmail.com
Energy Regulation Board	Steven Mwiinga	Senior Manager	P.O. Box 60292, livingstone	979451873	smwiinga@erb.org.zm
National Assembly of Zambia	Hon. D. Livine	Member of Parliament	Kazungula	260977803905	
Ministry of Tourism and Arts Zambia	Joseph Thole				jsphthole@gmail.com
National Assembly of Zambia	Hon. Edgar Sing'ombe, Membe	Member of Parliament	Dundumwezi, Kalomo	260950267567/ 977856772/ 978-668275	
National Assembly of Zambia	Hon. Harry Kamboni (MP)	Member of Parliament	Kalomo Central		
Zambian Wildlife Authority	Mwale Lusizi	Senior Wildlife Ecologist	Box 60086 livingstone	977238522	luzy.mwale@gmail.com
Zambian Wildlife Authority	Jones Masonde	Senior Wildlife Ecologist	P/B 1 Chilanga **or** P.O. Box 60086, Livingstone Zambia	or tel:2603321396, Mobile: 26097258901	kmasonde@yahoo.co.uk; jonesmasonde@zawa.org.zm
Zambian Wildlife Authority	Chilembo Robert	Research Technican	Box 60086, Livingstone	979930562	robertchilembo@gmail.com
ZESCO Ltd	Mr. Ntobani Ntobani	Technician	P.O. Box 60594,Livingstone	260977344238	
Ministry of Local Government	Eugene Mapuwo	His Worship The Mayor	P.O. Box 60029, Livingstone	978170436	
National Assembly of Zambia	Hon. Edify Hamukale	Provincial Minister - Southern Province	Southern Province		
ZEMA	Simon Tembo	Inspector	P.O. Box 60195, Livingstone	955596584	stembo@zema.org.zm, simon.tembo1@gmail.com
ZEMA	Lillian Kalenge	Principal Inspector	P.O. Box 60195, Livingstone		lkalenge@gmail.com
ZEMA	Lloyd Numdwe	Inspector	P.O. Box 60195, Livingstone	977332428	lnundwe@zema.org.zm, lloyd.numdwe@gmail.com
DISTRICT AUTHORITIES					
Livingstone Museum	Clare Mateke	Keeper of Mammalogy	P.O. Box 60498 Livingstone	977446080	cmateke@gmail.com

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Livingstone Museum	Choolwe Shalwindi	Keeper of Botany	P.O. Box 60498 Livingstone	979773963	oshalwindi@gmail.com
Minstry of Agriculture	Goliath Chooye	District Agricultural Coordinator	Choma	0967 -223898	
Ministry of Fisheries and Livestock	John Kaira	Aquaculturist	Choma	0979-483172	Kairajohn@ymail.com
Choma District Council	Jones Kalumbwa Mulomba	Senior Forestry Technician	Choma	967728845	mulombajk15@yahoo.com
Choma District Council	Sheena Muleya	District Commissioner	P. O. Box 630145, Choma	0977 881 265	
Ministry of Education	Samson D Sakala	District Education Board Secretary	P.O. Box 22, Kazungula	260977620252, 0965620252, 0955620252	amsonsakala@yahoo.com; samsondsakala@yahoo.com
Ministry of Local Government	Watson Mutoka	Director Of Works	Kazungula	0977 727 726	mutokawatson@gmail.com
Ministry of Local Government	Pamela Minyoyi	Secretary, Destrict Education Board	Kazungula	2600977726267	minyoyipamela@gmail.com
Department of Community Development / Kazungula District Council	Momex Habanji	Assistant Town Planner	P. O Box 61133 Kazungula	977176416	mhabanji@gmail.com
Department of Social welfare	Modern Simabenga	District Social Welfare Officer	P.O Box 60487 L/stone	979886737	msimabenga@gmail.com
Department of Community Development / Kazungula District Council	Getrude Muvwimi	Assistant Community Development Officer	P. O Box 60487 Kazungula	979527200	muvwimigetrude@yahoo.com
Department of Community Development	Gisford Muleya	Community Development Officer	P. O Box 61133 Kazungula	377624502	gisfordb@yahoo.com
Livingstone City Council	Bertha Nkhata	Assistant Director City Planning		097 983 6371	Bnkhata89@gmail.com
Livingstone City Council	Muyunda Muyambango	Assistant Director, Engineering	P O Box 60029, Livingstone Council	097 782 7746	mmuyambngo@yahoo.com
Livingstone City Council	Chilufya Chibiliti	Town Clerk	P O Box 60029,Livingstone Council	096 678 5778	livcity@gmail.com
Livingstone City Council	Harriet Kawina	District Comissioner	P.O. Box 60029, Livingstone		
Kalomo Town Council	Muzyani Franis		P O Box 620061, Kalomo Town Council	097 774 4477,0965244477	muzyanifranis@gmail.com
Kalomo Town Council	Trevor Mulenga	Chief Admin	P O Box 620061, Kalomo Town Council	0955552717, 0977605290	trevormulenga2@gmail.com
Kalomo Town Council	Future Chisenga	Civil Engineer	P O Box 620061, Kalomo Town Council	096 248 8048	sirfyu17@gmail.com
Kalomo Town Council	Kalumba Ethel	DACA	Kalomo	977488030	kalumbamwaandwe@gmail.com
Kazungula District	P. Musokotwane	District Commisioner	Kazungula	979960445	pasmuso@yahoo.com
Kazungula District Council	Kelyson Manuola	Physical Planner	P. O Box 61133 Kazungula	97700700	kelysonm@yahoo.co.uk
Kazungula District Council	Mutoka Watson			096 572 7726	
Kazungula District Council	Kelyson Manzioza	Planner	P O Box 65 Kazungula	097 770 0700	kelysonm@yahoo.co.uk
Kazungula District Council	Chrosebery Nchimunya	Planner		095 319 9672	chrozlyn@gmail.com
Kazungula District Council	Julius N. Simfukwe	District HIV/Aids Advisor / DACA	C/o Kazungula Town Council, Box KZ065, Kazungula	0955 800 623	juliussimfukwe@gmail.com
Kalomo District Council	Edwin Miyoba	Senior Agricultural Officer	Kalomo	0974-957259/ 0954-061527	edioyoba@yahoo.com
Kalomo District Council	Cosmas Chiiba	District Comissioner	P. O. Box 620061, Kalomo	0977 811 480	
Kalomo District Council	Joseph Mambwe Sakala	Environmental Health Officer	Kalomo	0977-835932	josephkalubila@yahoo.co.uk
Miistry of Agriculture - Zimba	Ronald Hamaimbo	Junior Technical Officer Irrigation	Zimba	0979 350 699	Ronaldhamaimbo@gmail.com
Miistry of Agriculture - Zimba	Mambo Lilanda	Assistant Technical Officer Land Husbandry	Zimba	0975 569 771	maambolilanda@gmail.com
Mnistry of Agriculture	Sepiso Mungandi	DACO	Zimba	0975-685895	sepiso.k@gmail.com
Ministry of Education (General)	Mr. Himoonde Nzila	District Education Board Secretary	C/o Zimba Town Council, Box 80, Zimba	0973 600 429	
Ministry of Fisheries and Livestock	Brian Fyacepa	Acting Fisheries Officer	Zimba	0978 777 863	bfyacepa@yahoo.com
Zimba District Council	Elizabeth Kalaluka	District Commissioner	C/o Zimba Town Council, Box 80, Zimba	0977 428 010	
Zimba District Council	Hibaajene Mainza Chavwanga	District Forest Officer	Zimba	0978-666440	mchvywanga@gmail.com
Zimba District Council	Katuta Mbewe	Deputy Director of Works	c/o Zimba Town, Council, P O Box 610100	097 412 7417	kutatambewe@gmail.com
Zimba District Council	Josephine Chiila	Planning Officer	c/o Zimba Town,Council, P O Box 610100	097 245 0206	chiilajosephine@gmail.com
Zimba District Council	Elizabeth L Moteto	Council Secretary	c/o Zimba Town,Council, P O Box 610100	096 668 4975	elizabethlondwe@yahoo.com
Ministry of Health	Musa Muyapekwa	District Health Planning Officer	Zimba	0955358520/ 0979568913	preciousmusa69@yahoo.com
LOCAL POLITICIANS					
Ministry of Local Government	Cheembo	Council Secretary	P. O Box 61133 Kazungula	0977 370 409	
Ministry of Local Government	Mr. Edmark Ilyamupu	Councilllor	Mwalibonena Ward, Livingstone	260977387002/ 0962380702	
Ministry of Local Government	Mr. Gift Malindi	Councillor	Mwata Ward, Kalomo		
Ministry of Local Government	Alfred Siampola	Councillor	Sipatunyana Ward, Kalomo		
Ministry of Local Government	Mr. Mantanyani	Councillor	Mayoba Ward, Kalomo		
Ministry of Local Government	Mr. Mutentwa	Councillor	Namuyanga Ward, Kalomo		
Ministry of Local Government	Liberty Chifuwe	Councillor	Choonga Ward, Kalomo		
Ministry of Local Government	Bugoga	Councillor	Siachitema Ward, Kalomo		
Ministry of Local Government	Denny Moono	Councillor	Kalonda Ward, Kalomo		
Ministry of Local Government	Kelvin Siakaja	Councillor	Nachibungu Ward, Kalomo		
Ministry of Local Government	Peter Chiile	Councillor	Kasukwe Ward, Dundumwezi, Kalomo		

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Ministry of Local Government	Mweemba	Councillor	Naluja Ward, Kalomo		
Ministry of Local Government	Germinator	Councillor	Bilili Ward, Kalomo		
Ministry of Local Government	Mr. Koi Magaya	Council Chairman	Kalomo	0977 67 08 16	
Ministry of Local Government	Vincent Hamugwala	Councilllor	Mikata Basic School, Chief Chikanta, Kalomo		
Ministry of Local Government	Mitulu Mabote	Councilllor	Mukuni Village, Kazungula	0972 064 247	
Ministry of Local Government	Mr. Josam Kanatela	Councilllor	Muleya Village, Nguba, Kazungula	260977692340	
Ministry of Local Government	Mr. Grave Muleya	Council Chairperson	Zimba		
Ministry of Local Government	Webby Kabamba	Councilllor	Zimba		
Ministry of Local Government	Mr. Clive Miyanda	Member of Parliament - Mapatizya	Zimba	260977693127	
National Assembly of Zambia	Mr. Albert Siachola	Councillr, Kanyanga Ward	Zimba	26054142409/ 97641254	
Ministry of Local Government	Mr. Davison Mudenda	Chief Simwatachela Representative	Zimba	260 979723148	
Ministry of Local Government	Mr. Victor Sindowe	Chief Sipatunyana's Advisor	Zimba	260977759096	
Ministry of Local Government	Mr. Josam Kanatela	Councilllor	Muleya Village, Nguba, Kazungula	260979961401	
TRADITIONAL AUTHORITIES					
Chief	Chief Mukuni	Chief Silowa Mukuni	Mukuni Ward, Kazungula	097 1013 664	kingmukuni@yahoo.com
	Stanley Syamapa (Syachulubwi)		Box 61133, Livingstone	097 949 3442	
Chief	Chief Musokotwane				
Chief	Senior Chief Mweemba	Chief Edson Shamu		097 563 5832	
Chief Mweemba	Chief Retainer	Alex Simunchembu		097 918 3297	
Chief	Chief Sipatunyana	Timonth Masaka	P O Box 620357, Kalomo	0977328492	
Chief Sipatunyana	Chief Retainer	Shabby Mudenda	Mutala Settlement	097 514 7877	
Chief Sipatunyana	Chairman of Reco Royal Establishment Committee	Tennyson S Sindowe	Mutala Settlement	095 353 9830	
Chief Sipatunyana	Vice Chairman Mutala Settlement	Wesley Simweena	Mutala Settlement	097 655 2565	
Chief	Chief Simwatachela	Chief Bothwell Staleka	P O Box 80, Zimba	0976320291	bstaleka96@gmail.com
INTERESTED PARTIES					
Tourism stakeholders					
Adventure logic	Mr. Ruaridh Stevenson	Owner	N/A	966946183	e@adventure-logic.com; ruaridh@adventure-logic.com
Bundu Adventures Ltd.	Johannas Stallman	Owner	Mosi-oa-Tunya Road Maramba River Lodge Livingstone, Southern Province Box 60773 Zambia	978203988	jo@bunduadventures.com
Bundu Adventures Ltd.	Christa Fromhert	Administration	Mosi-oa-Tunya Road Maramba River Lodge Livingstone, Southern Province Box 60773 Zambia	978911888	jo@bunduadventures.com
Euma Tours	Chief Executive		Room 122, Mosi o Tunya House, Mosi o Tunya Road, Livingstone, Zambia		eumatours@zamnet.zm
Dune Tours	Keith Martyn				keith@dunetours.co.za
Fawlty Towers	Eussa Davie	General manager	Livingstone	213323433	elissa@adventure-africa.com
Limbo lodge	Kingsley Lilamono	Owner	Box 608186 Livingstone	322096 / 0979311133	kingsley@limbolodge.com
Livingstone Tourism Association	Rodney Sikumba	Chairperson	Livingstone	260213322365	lta@microlink.zm
Maramba River Lodge	Theresa Lermer	Lodge Manager	P.O. Box 90575	0976 587 511, 260 213 324 189	manager@marambariverlodge.com
Munga Eco Lodge	John Sikaneta	Director	P.O. Box 60129 Livingstone	974109053	s.j.sikaneta@gmail.com
Mukwa Travel & Tours Zambia.	Hanida Malik	Chief Executive Officer	Villa 2, Millenium Village, Birdcage Walk, Longacres, Lusaka,Box RW 50710	0954 128 231	hamida@mukwatravel.co.zm
Taita Falcon Lodge	Anmarie Fourie				anmariefourie@gmail.com
Munga Eco Lodge	Dr Samuel Sikaneta	Director	P.O. Box 60129 Livingstone	965715442	s.j.sikaneta@gmail.com
Raft Extreme	Mack Gill	Director	Box 61105 livingstone	323929	
Safari Par Excellence	Graham Nel	Managing Director	The Waterfront, Sichango Road, Livingstone, Zambia, P.O.Box 60407	Tel: +260 21 3 320606, 0968 320 606	zaminfo@safpar.com
Safari Par Excellence	Gene Pecker	Manager	The Waterfront, Sichango Road, Livingstone, Zambia, P.O.Box 60407		spezam@safpar.com
Safari Par Excellence	Tony King	Operations	The Waterfront, Sichango Road, Livingstone, Zambia, P.O.Box 60408	Tel: +260 21 3 320607	zamops@safpar.com; zaminfo@safpar.com
Safari Trek international group	Dave Gyles	CEO	P.O Box M54 livingstone		dgyles@safaritrekafrica.com
Savannah Southern Safaris	Chilwza Saavanda	Guide	P.O. Box 60620	978169567	walks@savannah-southern-safaris.com
Stanley Exploration & Safari	Mr Reinout De Gruijter		P.O. Box 60439, Livingstone	0967848615, 0977848615	info@stanleysafaris.com
Tabonina Guesthouse	Lambert Mate Kalaluko	Director	Maina Soko St. P. O. Box 61284, Livingstone	213320274	tabonina@yahoo.com
Taita Falcon Lodge	Faan Fourie	Director	P.O. Box 60012 Livingstone	978225303	taita-falcon@microlink.zm
Taita Falcon Lodge	Ann Marie		P.O. Box 60012 Livingstone		anmariefourie@gmail.com
Wasawange Lodge & Tours	Kalinda Hamabwe	Operations Manager	P.O. Box 60278, Livingstone	324078, 0966323217	waslodge@zamnet.zm, waslodge@yahoo.com

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Zambezi Rafting Company	Kelom Muyatwa	River Guide	22 Mambo Way, Livingstone	974063980	
AOS - Sportagentur Strobl GmbH	Lukas Strobl		Friedau 1a, 8940 Liezen, Austria		office@rafting.at; strobl@rafting.at
International organisations					
UNESCO	Felicitas Chinanda	Secretary - General	P.O Box 50619, Lusaka	2601254340, 26097369075	msambachinanda@yahoo.co.uk, ncunesco@zamnet.zm
OWA	Catherine Loke	Safety Training Director	P.O Box 1370 white Salmon,WA 98672 USA		catherine.s.loke@gmail.com
WWF	Chanda Mwale	Project Officer	P.O Box 50551 RW Lusaka	T: +260 211 258759, M: +260 965 772 525	cmwale@wwfzam.org
WWF	Ms. Nachilala Nkombo	Country Director	WWF Zambian Country Office, Plot 4978, Los Angeles Boulevard, Longacres	(260211)250404	wwfzambia@wwfzam.org
International Rivers	Rudo A. Sanyanga	Africa Program Director	Office G12, Pro-Equity Court, 1250 Pretorius St, Hatfield 0028, Pretoria	27124302029	rudo@internationalrivers.org
SADC	Lubasi Mungandi	SADC National Contact Point	Ministry of Foreign Affairs, Lusaka, Zambia Independence Avenue; P O Box 50069 Lusaka, Zambia	(+260) 211 253508	lubasi_mungandi@yahoo.com
Oxfam GB		Country Director	Roma Township, Plot 250, Zambezi Rd.	260211291016 / 291085	infor@oxfam.org.uk, mtembo@oxfam.org.uk
World Vision	Sebastian E Kunda	Technical Advisor/Programme Manage	Plot No. 51/52, Great East Road, P.O. Box 31083 Lusaka	260 211 221 950/55/58	Sebastian_kunda@wvi.org
Other Interest Groups - Organisations					
Zambia Climate Change Network	Robert Chimambo	Board Member	P.O. Box 50699, Lusaka	260211257115, 260979988776	
Community Based Natural Resources Management Forum	Vincent Ziba	National Coordinator	P.O. Box 50551, RW, Los Angeles Boulevard, Lusaka	260966000000	om; melpezy88@gmail.com; richard.nawa@gmail.com
Jesuit Centre for Theological Reflection	Father Emmanuel Mumba SJ	Director	Martin Mwamba Road	260211290410/ 759	infor@jesuits.org.zm
Jesuit Centre for Theological Reflection	George S Makaha	Outreach Regional Officer	Mosi-o-Tunya House, Old wing, Room 607, 6th Floor	953699950	gchiwoneso@yahoo.co.uk
Southern Medical Centre			Mokambo Road, Livingstone	260 213 323 547	rhensonzam@gmail.com
Zambia Vulnerability Assessment Committee					cmateke@gmail.com
Zambia Community Based Natural Resource Management Forum	Mr. Chongo	Co-ordinator	C/o WWF Zambia, Plot 4978, Los Angeles Boulevard, Longacre, P. O. Box 50	0978 482 164	nchongo.zcbnrm@gmail.com,
Caritas Zambia	Steve Mulafulafu	Executive Director	Kabulonga, Plot BRT6, Kapingial House	260 211 260 980, 260 211 260 950	info@zec.org.zm, info@caritaszambia.org
Hearth Earth Art (Permaculture Fundi)	Carolyne (Carrie) Pretoriys			969648214	girl2river@yahoo.com
EAG and Environment Africa	Bernard Sinyangwe	Chairperson	Box 60066 livingstone	977333044, 0955915248	bernard.sinyangwe@yahoo.com
WESCZ	Margaret Whitehead	Member	P.O. Box 60648 Livingstone	955716341	mwhiteheadzam@gmail.com
The Livingstonian	Gill Staden	Director	Box 61070 livistone	977838512	gill@awindowonzambia.com
Zambezi Memories	Sean Edington		Linda Farm	0979626782, 986813782	productions@safpar.com
Zambezi Memories	Julius Nalishebo		3 Yeta Avenue	964664511	juliusnalishebo@gmail.com
Zambezi Nkuku Farm	Arthur Sonnusbreg	Director	P.O. Box 60604	977847406	arthur@bushbling.com
University of California	Grace Wu			16263885257	grace.cc.wu@gmail.com
University of California	Ranjit Deshmukh		2138 Mcgee Ave, Berkely, California, USA		ranjit.deshmukh@berkeley.edu
University of South Africa	Tracey Mckay	Senior Lecturer	Dept of Environmental Sciences, College of Agriculture and Environmental Sciences, Unisa, Florida Campus,Chair: CGA Road Commission	011-670-9461	mckaytjm@unisa.ac.za
Copperbelt University	Stanford Siachoono	Lecturer in Wildlife Management	Copperbelt university, Kitwe	0977 795909,	misomo@zamtel.zm
AZMEC, WECSZ, ZAMDEX	Narayana Money	Geologist	P.O.Box 50691, Lusaka	260211264432, 0976202964	
Private Sector Development Association(PSDA)	Chair Person, Yusuf. M. Dodia	Mulungushi International Conference Centre(MICC), Annex Buidling	P.O. Box 30819, Lusaka	+ 260-211-291018/24 or, 293914	psda@coppernet.zm
Livingstone Chamber	Malte Bvedelf	EO	P.O. Box FP65, Falls Park Mall, Livingstone	968238481	livcci@yahoo.com
Livingstone & Kazungula Farmers Association	Ruth Henson	Women's Representative	Box 60641 Livingstone	0955443711 / 327469	rhensonzam@gmail.com
Livingstone & Kazungula Farmers Association	Veronica Siachenga	Chairperson	Box 60641, Livingstone	0963 001 200	veronicasiachenga@gmail.com
Zambia Chamber of Small and Medium Business Associations(ZCSMBA)	Ms. Evelyn Puuka	Provincial Rep	Zambia Agriculture and Commercial Show(ZACS) Grounds	976 228736	evelynpuuka@yahoo.com
Non-Governmental Organisations					
Non Governmental Coordinating Council	Engwase B. Mwale	Executive Director	5168 Corner of Nchoncho and Chishango Road, P.O.Box 37879, Lusaka	0966 640 760, 260 211 224 727, 260 211 227 529	info@ngocc.org.zm
Wildlife and Environmental Conservation Society of Zambia	Patrick Shawa	National Coordinator	4434 Lubu Rd. P.O. Box 30255, Lusaka	260 211 251 630	wecsz@microlink.zm
The Butterfly Tree	Emma kennedy	Project manager	PO Box 61181, Mukuni Village, Livingstone	978357352	emma@thebutterflytree.org.uk
Birdlife Africa (Former Birdwatch Zambia	Mwape Sichilongo	Vice Chairperson	260 211 239 420, 966 442 540, 977 485 447		birdwatch.zambia@gmail.com

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Care International	Geraldine Zwack	Country Director	Lusaka	+(260) 211 267950-4	info@carezam.org
Environment Africa	Obert Mubiana	Director	Musi-O-tunya building, Old wing, 6th Fllor, room 6-10, Livingstone	979457539	mubianaobert@gmail.com
Environment Africa	Ackson Shala	Secretary	Musi-O-tunya building, Old wing, 6th Fllor, room 6-10, Livingstone	976404186	
Alliance for Sustainable Agriculture(ASA)	Executive Director, Brenda Han	Kabulonga, Plot No.39 A Kudu Road		260840591	hanampotab@yahoo.co.uk
Plan International	Mercy Chabu Ngoma	Interim Country Director, Plan International Zambia	87 A Kabulonga Road, Private Bag 518 RW 10101	+260 21 1260074	childprotection@plan-international.org
Save the Children			Postnet 487, Private Bag E891, Lusaka, 10101, Zambia	+260 (211) 250 139 / 252 084 / 95	zambia.info@savethechildren.org
Africa Impact			153 Main Rd, Surfers Corner, Muizenberg, Cape Town , 7950 (Head Quarte	+27 (0)21 065 0501	info@africanimpact.com
Corridors of Hope	Robert Chiegil	Country Director, Chief of Party	ZNFU Office Block, Off Nangwenya Road, Show Grounds Area Lusaka, Zambia	+260 211 368 190-9	rchiegil@fhi360.org
UNICEF	Precious M. Habeenzu	Communication officer	UNICEF Zambia,UN House, Alick Nkhata Road, PO Box 33610, Lusaka, Zambia	260 211 374 200	phabeenzu@unicef.org; lusaka@unicef.org
Response Network	Håkon Spigseth	Country Director	P.O. Box 60817, Livingstone, Zambia	260-977 873514	mail@responsenetwork.org
Land O'Lakes	Chuck Lippstreu		Ave N Arden Hills, MN 55126 U.S.A. P.O. Box 64101 St. Paul, MN 55164-0101	+1-651-375-5500	CLippstreu@landolakes.com
Other Interest Groups - Individuals					
N/A	Humphry C. Mhango	Conservationalist	Livingstone	0977 560410	hcmhango@zambia.co.zm
N/A	Mike Nawa	Renewable Energy Resources Researcher and Co	Livingstone	0955 047164	mikenawa2014@gmail.com
N/A	Cooper Freeman		California USA		cfreeman510@gmail.com
N/A	Helen Cave		Stewart Island, New Zealand		helencave@xtra.co.nz
N/A	Robert Le Brun	Freelance events organizer, assistant & logistics		0726022418	robert@lebrun.co.za
N/A	Scott Ramsay	Registered tour guide	Cape Town, South Africa		scottnramsay@gmail.com
N/A	Pam Bell				pam@searcherstraining.com
N/A	Fiona Buttrey				fiona@thebuttreys.com
N/A	Erin Carey		Atlanta, GA USA		erincarey@yahoo.com
N/A	Stone				stone1727@gmail.com
N/A	Matt Blue				mattblue1975@googlemail.com
N/A	Richard Addison				raddison37@gmail.com
N/A	Sam Helliwell				Sam.Helliwell@niras.com
Community Members					
Musokotwane	Kennyford Simakalanga				
Musokotwane	Alfred Katiti				
Musokotwane	Richard Mulibo				
Musokotwane	Elina Likukela				
Musokotwane	Jailosi Sikanzama				
Musokotwane	Donald Sitondo				
Musokotwane	Lydia Simuyandi				
Musokotwane	Siamabole Josephine				
Musokotwane	Mwiinga Donald				
Musokotwane	Kennedy Kameli				
Musokotwane	Sunday Siakasweka	Treasurer		969430338	
Musokotwane	Raphaelmuzala				
Musokotwane	Conerlius Mulikisa				
Musokotwane	Austin Sitali				
Musokotwane	Benson Malumanda				
Musokotwane	Daylight Chibbalo				
Musokotwane	Josua Ndambo				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Musokotwane	Lingwabo Robert				
Musokotwane	Chiyanika H. Grant				
Musokotwane	Edward				
Musokotwane	Boston Muzandu				
Musokotwane	Precious Kambulu				
Siandavu	Maureen Chikatala				
Sintabungu	Juju Mbamabele				
Sintabungu	Brown Santabangu				
	Sunday Munkombwe				
	Kenneth Siatebe				
Siasimambeba	Victor Mweemba				
Musokotwane	Patrick M. Sibofu				
Sheleni	Partson Kahemba				
Kapongo	Kenneth Muyama				
Mwiinga	Mweemba Royson				
Mwiinga	Situnga Godfrey				
Silelo	Siamunda George				
Mukemu	Kambole Ishmael				
Mwileli	Sando Kenneth				
Siamalambe	Mazunga Ishmael				
Mandandi	Thomas Simbotwe				
Mandandi	Alex Sililo				
Masunda	Maxon Mutema				
Pisami	Owen Manioponi				
Masuya	Aubrey Mbanachole				
Zambela Wasyamwalu	Benard Meduke				
Siamalange	Alfred Syamalange				
	Atson Kwimbe				
	Yona Kammando				
	Kenandi Mashachani				
Chilemfwe	Evans Chipango				
Mujala	Robert K. Mufalali				
Mujala	Winston Mumala				
Kpulanga	Henry Sitali				
Chilemfwe	Arnold Sionyungwe				
Nyagule	Geofrey Nyagule				
Nyagule	Bweenje Rogen				
Siasopo	Joshua Mbambo				
	Daylight Chibbalo				
Matengu	Benson Malumanda				
Sitahame	Austin Sitali				
Sitahame	Corneliuos Mwikisa				
Musoko	Raphaelmuzala				
Siakasipa	Kenush Siadudu				
Siasikambala	Lloyd S. Masamu				
Siasikambala	Katumba Moses				
Namatongo	Enock Siamasiku				
Zangala	Josephat Kandiana				
Zangala	Royd Sambo				
Siamatete	David Kesazi				
Chilizya	Emmanuel Kesho				
Siamatata	Anton Mukaye				
Chilizya	Kilian B. Siatontola				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Zangala	Lanny Mukumbuta				
Chilizya	Jim Siatontola				
Chilizya	Malumo Simasiku				
Siachuma	Steven Simubwele				
Siazibole	Dereck Sikanyama				
Sialulobe	Fwenco Ndelelwa				
Siachuma	Emmanule Moola				
Chibule	Gardina Malake				
Makalahani	Gift Nyambe				
Chbule	Andrew Chalinga				
Ngandu	Tichaona Ncube				
Ngandu	Makay Siyinda				
Makalahani	Peter Nyama				
Siakondo	Eliot Simasiku				
Siejoba	Boston Siachetola				
Chimbalani	Jacob Mufana				
Makalahani	Brian Silabi				
Munwana	Peter Simunomba				
Makalahani	Brandina Chembe				
Ngandu	Victoria Mutendwa				
Munwana	Marita Chekapa				
Ngandu	Getrude Solochi				
Siamatete	Layness Sibajene				
Siamatete	Anoya Muyangwa				
Munwana	Mary Sitali				
Chibule	Makanzala Malumo				
Chibule	Chathrine Siamantundi				
Chibule	Juliet Siansulinga				
Chibule	Ireen Simatele				
Muntu Muswana	Jerpha Gwelwauni				
Muntu Muswana	Angela Mumba				
Munwana	Mary Kasoka				
Ngandu	Lilian Sitwala				
Chibule	Modesta Mabunda				
Chibule	Mirriam Sikiti				
Ngandu	Patricia Simate				
Ngandu	Chathrine Siamukwele				
Muntu Muswana	Simasiku Justina				
Muntu Muswana	Banachibule Mwalasili				
Mukalahari	Pumulo Mary				
Mukalahari	Lownar Sizalia				
Ngandu	Jornar Nakalizya				
Munwana	Bweenda Siapuni				
Chibule	Rosarline Siamukwele				
Chibule	Iliun Siapongo				
Muntu Muswana	Idina Muhelo				
Ngandu	Loveness Simalongwa				
Chilizya	Philli Siatontola				
Siachoma	Mwaka Siachikuni				
Ngandu	Bult Nakakolizya				
Ngandu	Morren Mazanga				
Munwana	fIDELIS Mazanunga				
Munwana	Anna Siasayi				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Ngandu	Lray Siana				
Ngandu	Dorothy Kambole				
Ngandu	Cecilia Libetwa				
Ngandu	Josephine Sibenzu				
Ngandu	Anna Mundila				
Munwana	Gorrety Simutembo				
Waterusers					
DRC Fishing Camp	John Mwamsa	Madyongo Village, Mwense Leapula Province	Fishing	077 792 0167/ 097 666 3791	-
Bimbi Fishing Camo	Misheck Mwenya	Madyongo, Kafunambila, Chezya, Musuma, Muy	Fishing	0778722589	-
Mcdonald	Bridget (Care taker)	Madyongo	Tourism, recreational. Domestic, industrial and fishing	0977499559/ 0779154320/0967499559/ 0783226653	-

Annex C2.2

Zimbabwe Stakeholder Database

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
NATIONAL MINISTRIES					
Ministry of Local Government, Public Works and National Housing	George Magosvongwe	Permanent Secretary	P Bag 7706 Causeway, Harare, Zimbabwe	0242 708 493	kanyandurah@gmail.com,permsec@mlg.gov.zw
Ministry of Women Affairs, Community, Small and Medium Enterprises Developments	Ambassador Rudo M. Chitiga	Permanent Secretary	7 th Kaguvi Building 4th Central Avenue	263 4708389; 251559	rudo.chitiga@gmail.com; bnmush@gmail.com
Ministry of Health and Child Care	Dr. Gerald Gwinji	Permanent Secretary	Kaguvi Building, 4th Floor, Central Avenue, Harare	0242798555/60	
Ministry of Primary and Secondary Education	Mrs Tumisang Thabela	Permanent Secretary	14th Floor, Ambassador House, Union Avenue	0242- 734051, 705153, 705281	
Home Affairs and Cultural Heritage	Mr Melusi Matshiya	Permanent Secretary	Mukwati Building, Cnr 4th St/Selous, Harare		
Ministry of Youth ,Sports, Arts and Recreation	Dr Chitepo	Permanent Secretary		0242708373	gariranoni@gmail.com
Ministry of Finance and Economic Development	Mr Guvamatanga	Permanent Secretary	New Govt Complex, Cnr 4th Street/ Samora Machel Avenue, Harare	738603, 794572	kmudereri@gmail.com
Ministry of Transport and Infrastructural Development	Engineer Marawa	Permanent Secretary	Kaguvi Building, Selous Ave/4th St Harare	04-700991-9	amarawa@hotmail.com
Ministry of Energy and Power Development	Dr Gloria Magombo	Permanent Secretary	Chaminuka Building -Ground Floor. Cnr Fourth Street/Central Avenue	04-791760-9/733095-9 Or +263 4 799194	energy@energy.gov.zw, power@energy.gov.zw
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Ringson Chitsiko	Permanent Secretary	Block 2 Makombe Complex, H. Chitepo Ave	0242-797400-6, direct A73797425, 701310	chitsikorj@moa.gov.zw
Ministry of Environment, Tourism and Hospitality Industry	Mr M. Munodawafa	Permanent Secretary	11th Fl Kaguvi Bldg, Harare	04-780602/701681-3 /749421, 705948	mmunodawafa@environment.gov.zw
Ministry of Mines	Mr Onesmo Mazai Moyo	Permanent Secretary	8th Fl Old Mutual Centre, Jason Moyo/3rd St, Harare	242777043	ommoyo@my.gov.zw
EMA	Aaron Chigona	Director General	Makombe Complex	(04) 705671-3 / 705661-2, 305319	ema@ema.co.zw,
Zimbabwe Parks and Wildlife Management Authority	Mr F. U Mangwanya	Director General	P.O. Box CY 140 Causeway,	707624-8	fmangwanya@zimparks.go.zw
Department of District Development Fund	Mr JK Jonga	Director General:	Private Bag 7756,Causeway, Zimbabwe	799643/9 796120/9,706301/5	JongaJk@ddf.gov.zw,ddf@ddf.gov.zw
District Development Fund (DDF)	Mr T. Chiwera	Deputy Director Planning and Construction		799643/9 796120/9,706301/5	Chiwera@ddf.gov.zw
President's Office	Richard Moyo	Minister of State for Matableland North Province	Cnr Harare Street and Herbert Chitepo,	0778137527, 292889848	ministerofstatematnorth@gmail.com
Ministry of Energy and Power Development	Z.G Shumba		Cnr Fourth Street/Central Avenue	712884808	zgshumba@energy.gov.zw
Department of Physical Planning	Mrs Mutyambizi	Acting Principal Director	Harare	26347070667 / 700989, 263772266034	not given
Department of Physical Planning	Diana Chimhanda	Chief Planning Officer	5th Floor Makombe Building	26347070667 / 700989, 263772266034	dchimhanda@gmail.com
Zimbabwe Parks and Wildlife Management Authority	Mrs Rushesha	PA	P.O. Box CY 140 Causeway,	+263712 840 570	patodirectorgeneral@zimparks.gov.zw
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Hilary Madzikanda	Chief Ecologist	Corner Sandringham & Borrowdale Roads, Botanical Gardens, Harare	0772220330, 263912220330	hilarymadiri@yahoo.com; parksres@mweb.co.zw
Zimbabwe Tourism Authority	Karikoga Kaseke	Chief Executive Officer	55 Samora Machel Avenue, Harare	4 -758 712/ 758 714 or 0772185732	info@ztazim.co.zw; ce@ztazim.co.zw
Zimbabwe Council Of Tourism	Tichaona Hwingwiri	President	10th Fl Travel Centre, 93 J. Moyo St, Harare	+263-242-250 246	ceozct@gmail.com
City of Harare	Herbert Gomba	Mayor	Town House, Jason Moyo/Julius Nyerere Way, Harare	+263 (242) 752577 +263 (242) 7525781, 781810-19	
PROVINCIAL AUTHORITIES					
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Dumisani Nyoni	Chief Lands/Agritex Officer	Room 159, 4th Fl, Mhlahlandela Building, Box 1927	02912887928, 0775813338, 0292-884546, 0292276535, 0292273535	dumienyoni@yahoo.com
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Lungile Dhlomo	Dept of Livestock Product Development	Hwange	0779759387, 0281-22234	lungiledhlomo@yahoo.co.uk
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Raymond Nyandoro	Provincial Physical Planning officer	Mhlahlandlela Gvt. Complex BULAWAYO	0292-885944-50	
Provincial Mining Director	Mr F. Ngulube	PMD		09- 66381	pmdmatnorth@mines.gov.zw
Ministry of Local Government, Public Works and National Housing	Lathiso Dlamini	Provincial Administrator	Mhlahlandela Building Box 1496 Bulawayo	292269604	pamatnorth@gmail.com
Ministry of Transport and Infrastructure Development	Kamutema	Provincial Roads Engineer	Box 780, Bulawayo	02922-61312	kamutema@transcom.gov.zw
ZINARA	Eng Masocha	Planning and Monitoring Technician	90 Main Street, ZB Building First Floor, between 8th & 9th Ave	0292-882580, 0292888939	emasocha@zinara.co.zw
Ministry of Health	Dr Alfred Muchara	Provincial Medical Officer Matebeleland North	Box 441 Bulawayo	0292268976, 0292277919	atm4@gmail.com
Zimbabwe National Water Authority (ZINWA)	Engineer Manyeka	Operations Engineer	Mhlahlandlela Gvt. Complex BULAWAYO	0292269361-3	
ZINWA	B. Tagwirei	Quality Assurance Officer	Box 560 Bulawayo	0772981925, 0292269361-4	btagwirei@zinwa.co.zw
Surveyer General's Office		Deputy Surveyer General	2nd Fl Tredgold Bldg, Box 1580	0292262816, 0292264640	
LOCAL/DISTRICT AUTHORITIES					
Ministry of Health and Child Care	Ms Elizabeth Moyo	PrEHO	Box 39 Victoria Falls Hospital	772359783	emantoh@yahoo.com
Ministry of Youth	Mirriani Esther Chikwama	Youth Officer	215 Compensation House, Hwange	0775122643, 0712336884	
Ministry of Youth	Ndlovu Khethiwe	Youth Officer	215 Compensation House, Hwange	775122623	nkhcthwe84@yahoo.com
Civil Aviation Authority of Zimbabwe (CAAZ)	Mr Ronnie Masawi	Vic Falls Airport Manager	Victoria Falls	0712 411 704	masawir@caaz.co.zw
Civil Aviation Authority of Zimbabwe (CAAZ)	Sandra Nsamba	Secruit Officer	Box 9 Victoria Falls	712213072	sinsamba@caaz.co.zw
Department of Health	Winfrida Ngwenya	District Nursing Officer	Victoria Falls District Hospital+D192	0773621341	aaromuna@gmail.com
Zimbabawe Forestry Comission / Dept. Forestry Services	Bekithemba Ngwenya	District Manager	Fuller Forest, Victoria Falls	013-42195/43348, 0772226636	ngwenyabkt@gmail.com ; ngwenyabrt@gmail.com
Department of Immigration	Vincent Gombero Owen Mukombero	Principal Immigration Officer	P.Bag 5921 Victoria Falls	013-44237/ 431524/ 44235 0712321214	owenmukombero@yahoo.co.uk
Victoria Falls Municipality	Lot Mpande	Director: Housing & Community Services	Livingstone Way, Victoria Falls	0712217338; 013-44311/42298	
Victoria Falls Municipality	Ms Kholwani Mangena	Chamber Secretary	Livingstone Way, Victoria Falls	013-42369	tclerkvfm@comone.co.zw;info@vfm.co.zw
Victoria Falls Municipality	Ngoabutho Moyo	Public Relations and Economic Development Officer	Livingstone Way, Victoria Falls	772344093	nmoyo@vfm.co.zw
Victoria Falls Municipality	Tabani Mhlanga	Director of Housing and Community Servcies	Livingstone Way, Victoria Falls	2631344311, 26311217338, 912477800	
Zimbabwe Tourism Authority	Solphy Chimba	acting reg manager	Victoria Falls	013-44376; 0772972034	
Zimbabwe Parks and Wildlife Management Authority	Ticharamba Jura	Area Manager - Hwange Main Camp	Main Camp, Hwange National Park	013-44566; 0712875723, 07714011397	tsjura@yahoo.com

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Zimbabwe Parks and Wildlife Management Authority	Mr Edwin Makuwe	Ecologist	Main Camp, Hwange National Park	774135874	emakuwe@yahoo.com
Environmental Management Agency (EMA)	Day Mudyariwa; N. Khombe		Victoria Falls	263 77307300 or 0772468494 or 0775872857	
Zimbabwe Parks and Wildlife Management Authority	Edmore Ngosi	Area manager - Zambezi Nat Park	Zambezi National Park - Victoria Falls	263 13 42294 or 44566 or +263772482495	edmorengosi@yahoo.com
Metereological Services Department	Faith Chiramba	Met Officer - Vic Falls	56 Dale Crescent, Victoria Falls (or Box 11 Victoria Falls)	013-44285, 44695, 0712870883	faithchirambavf@gmail.com
Ministry of Home Affairs	Snr Ass Mbangwa	Officer commanding Province	Zimbabwe Republic Police Hwange	0281-30259	
EMA	N. Ndhlovu	District Officer Victoria Falls		777915900	
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Mr Marandu Misheck	District Lands Officer	Box 300 Hwange	0281-22234, 0772785503	mambom23@gmail.com
Department of Veterinary Services	Dr Dube	Prov Vet. Officer	Agritex Office Hwange	02812-24387 or 0785031548	
Agritex	Mangwiro Rurwakumire	Extension Officer	Victoria Falls, Opposite OK Shops	0712541272	kmangwiro37@gmail.com
Ministry of Primary and Secondary Education	Mr Lovemore Ncube	District Education Officer	Compensation House PO Box 230 Hwange	0281-22671; 32368; 0773 563 140	lovemorencube21@gmail.com
Ministry of Defence – Engineering Batillon	Musa Dhlawa	I.O. Officer		0772316168	
Ministry of Defence – Engineering Batillon	Munyoro Glabman	I.O. Officer		0773068174	0712594416 manzungu/ ask for d nyathi
Zimbabwe National Water Authority (ZINWA)	Mr Tom Rosen	Gwayi Catchment Area Manager	Mhlahlandlela Gvt. Complex BULAWAYO	02922-69361	trosen@zinwa.co.zw
Zimbabwe National Water Authority (ZINWA)	Taruvinga Bvambure	Operator in Charge	Victoria Falls Municipality Ofices	0774674027	bvamburetaruvinga@gmail.com
ZINWA (Zimbabwe national water authority)	Dumisani Nyathi	Watsan Superintendent	16 Acacia Lane Hwange	0773263222, 0712767311	dumienyathi@gmail.com
Zimbabwe Parks and Wildlife Management Authority	Edmore Ngosi Tcharamba Jura	Area Manager Hwange National National Parks	Hwange	0772482495,	edmorengosi@yahoo.com, engosi@zimparks.org.zw
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Mr Chiza	Parks Officer	NSSA House Hwange	0773457150	chizatm@gmail.com
Zimbabwe Parks and Wildlife Management Authority	C. Gurure	Area Manager Zambezi National Parks	Victoria Falls	0772572074, 0713098756	cgurure@zimparks.org.zw
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Tawanda Gotosa	Regional Manager	Box 2283 Bulawayo	0712871151	tngotosa@hotmail.com
Environmental Management Agency (EMA)		District Officer	DA's office Hwange	0281-22207	
Registrar General's Office	Alfred Jijah	Registrar General, Processing Officer	Box 170 Hwange	0281-22453; 0777712771	alfredojijah@gmail.com
Rural Electrification Agency			DA's Office	0281-21022/3	
Social Services Department	Ivy Mutandagai	District Officer	Compensation House, Hwange	0281-34398/24399/33526	
District Development Fund (DDF)	Jairos Mukuli	District Artisan	Jambezi	0779992772	
Civil Service Commission	Scholastica Mhlanga	District Inspector	CSC Box 138 Hwange	0712594106; 0281-20853	schomhlanga@gmail.com
District Development Fund	George Phiri	Roads Supervisor	Jambezi DDF Offices	0774008645	
District Development Fund	Jairos Mukuli	District Artisan	Box 275 Hwange	0779992772	
ZRP	Inspector Ncube Makeyi	Police Inspector	Hwange Police	0773924714	makeyincube@gmail.com
ZRP	Chief Superintendant Chiwona	SISPOL	ZRP Box 20, Victoria Falls	0712879953	mukomajai@yahoo.com
ZRP	Inspector Mkwebu	Police Officer	ZRP Box 20, Victoria Falls	0712763791	ndunamacebo@yahoo.com
Central Statistical Ofice			Hwange DA's Offices, Coronation Drive	0772779629	mhlanga.timothy314@gmail.com
Department of Local Government and National Housing	Previous Ncube	Intern	Hwange DA's Offices, Coronation Drive	0281-2225/6	ncubeprevious@gmail.com
Department of Local Government and National Housing	Mr Simon Muleya	DA's office	Hwange DA's Offices, Coronation Drive	0281-22245/6	dahwange@gmail.com
Department of Local Government and National Housing	Mrs Nyaradzo Magoja	Principal Administrative Officer	P O Box 121, Hangwe	0777866790	nyarandomagoja@gmail.com
National Museums and Monuments of Zimbabwe	Chrispen Chauke	Regional Director	Great Zimbabwe World Heritage Site, P.O. Box 1060, Masvingo	26339262080 / 265084, 26311875633	chrispenchauke@yahoo.com, natmus@utande.co.zw
Hwange Local Board	Nqobile mabhena	Environmental Health Technician	Hwange Local Board	0713099894, 263965394, 26311871151	nqobilemabhena@gmail.com
Hwange District Youth Development	Trymore Ndolo	Coordinator	4176 Chinotima Victoria Falls	077274789	trymorendolo@gmail.com
Hwange Rural District Council (HRDC)	Alic Mudenda	Engineer	Box 165, Hwange	0775044194	alicmudenda06@gmail.com
Hwange Rural District Council (HRDC)	Willard Paul Phiri		Box 165, Hwange	0771047558	paulwphiri@yahoo.com
Hwange Rural District Council (HRDC)	Sithokozile Kwidini		Box 165, Hwange	0773402408	thokokwids@gmail.com
Hwange Rural District Council (HRDC)	Sikhumbuzo Moyo		Box 165, Hwange	0771154468	smoyofeb@gmail.com
Civil Protection Unit	Mr Simon Muleya	Chairman	DA's office	0281-21022/3	
	Sansole Tose	Local MP	Hwange East	772249138	
	Daniel Molokela	Local MP	Hwange Central		
	Godfrey Dube	Local MP	Hwange West	772899763	
Hwange District Administrator	Mr Simon Muleya	DA	DA's Complex, Coronation Drive, Hwange	0281-22245/22246	dahwange@gmail.com
Hwange Rural District Council (HRDC)	Pendele Ncube	CEO	Box 165, Hwange	0772897842/0281-22541/24285	hwangeruraldc@gmail.com
Hwange Rural District Council (HRDC)	Sipiwe Mapfuwa	Chairperson	Box 165, Hwange	0772162945	
Mashala Ward (HRDC)	Mpofu Pastor	Ward Councillor		0776604375	
Simangani ward (HRDC)	Abigail Milazi	Ward Councillor		0779950097	
Sidinda ward (HRDC)	Sinikiwe Nyathi	Ward Councillor		0773 565 370	
Jambezi ward (HRDC)	Sino Moyo	Ward Councillor	Nejambezi Sec, Box 40 Victoria Falls	0773863768	
Nemananga ward (HRDC)	Christopher Sibanda	Ward Councillor		0771142043	
Mbizha (HRDC)	Gregory Zulu Dropa	Ward Councillor	Ward 6, Mbizha, P O Box 233, Hangwe	0778529185	
Mbizha ward	Benson Ncube	Makuni Village 2		0779351866, 0714433996	
Mbizha ward	Josias Mudenda	Makuni Village 3			
Mbizha ward	Clinos Dube	Makuni Village 1			
Matetsi Ward (HRDC)	Vulindhlela Mhlanga	Ward Councillor		0777835779	
Chidobe Ward	Mukoma Shakani	Ward Councillor	Chisuma, Box 56, Victoria Falls	0771950259	
Kachecheti Ward	Givemeagain Moyo	Ward Councillor	Box 104, Victoria Falls	0715470640	
Chikandakubi Ward	Tobia Moyo	Ward Councillor		0773695394	
TRADITIONAL AUTHORITIES					
Matetsi	Agatha Shoko	Headman		779722108	
Chidobe	Maratuza	Headman		0774342795	
Katchetcheti (Acting Chief Mvutu Mr Sibanda)	Sibanda	Headman		0774868620	
Mbizha/Milonga	Nzazi	Headman		0779950351	
Mbizha	Alois Ngozi	Headman			
Jambezi	Aaron Sibanda, Sifelani Ncube, Phillip Chuma	No Headman, Snr Village Heads			
Chikandakubi	Nedundwe	Headmen			
Nemanhanga	Chabwa	Headman			
Nemanhanga	Peter Ncube	Kasikili village head			
Nemanhanga	Noah Nkomo	Skumbi 134 village head			

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
	Tatani Nkomo	Skumbi 1 village head			
Sidinda	David Kufa Ncube	Headmen			
Mashala Ward 9	Patrick Nyoni	Headman		0712384952	
Mashala	Prosper Neshazi	Headman		c/o Chief Hwange	
Simangani	Raphael . Nyoni Chabwa	Headman		c/o Chief Hwange	
Acting Chief Mvutu	Acting Chief Mvutu	Acting Chief		0774868620/0771133453	
Chief Shana	Chief Shana	Chief		0779599675	
Chief Hwange	Chief Hwange	Chief		0712667506, 0779854571	
Jambezi ward (HRDC)	Anathasias Chitope	Village Head Zhulandangalilo Village 5		0778834597	
Jambezi ward (HRDC)	Godfrey Nyoni	Village Head Village D			
Jambezi ward (HRDC)	Aaron Sibanda	Village Head Zhulandangalilo Village 3			
Jambezi ward (HRDC)	Betty Nyathi	Village Head Village B		0771630583	
	Zansi Mathias Ncube	Village Head Village 3 Tamuka			
Mbizha ward	Richard Nyoni Mashake	Village head Kwalala Village 2			
INTERESTED PARTIES					
Tourism stakeholders					
CANSAF	Robin Brown	Managing Director	Cansaf	772274554	robin@cansaf.com
Zambezi River Society	Richard Maarsdorp	Strategic Director		0772 419897	racmaasdorp@gmail.com,zambezi@mweb.co.zw
Hotel Association for Matabeleland North	Jonathon Hudson	Chairman HAZ-VF	Vic Falls Safari Lodge	+263 712881589	jonathan@saflodge.co.za
Backpackers Lodge	Lodge	Lodge	357 Gibson Rd	+263 13 42209	
Shearwater Adventures	Cephas Moyo	Ops Manager	Box 125 Vic Falls	07773755471, 01344471	cephas@shearwatervf.com
Rafting Association & Wild Horizons	Skinner Ndlovu	Chairman	C/O Wild Horizons, Vic Falls	0775107253	skinner@wildhorizons.co.zw
Wild Horizons	Clive Bradford - Rafting or Barbra Murasiranwa or Gary Archer - MD	Directors	Holland Road Extention, Victoria Falls	mobile: +263 772 144777, landline: +263 13 44426/42313	clive@wildhorizons.co.zw
Wild Horizons	Barbra Murasiranwa	Director	1022 Holland Road, P.O. Box 159, Victoria Falls	+263 13 44426/42313	barbara@wildhorizons.co.zw
Wild Horizons	Gary Archer	CEO	1023 Holland Road, P.O. Box 159, Victoria Falls	+263 13 44426/42313	garya@wildhorizons.co.zw
Adventure Zone	Brent Williamson	Managing Director	Adventure Zone Lodge, Victoria Falls	+263 712205306	brent@adventurezonevicfalls.com
Adventure Zone	Edmore Sibanda	Manager	504 Accacia Cres, Victoria Falls	+263 712205307	riverops@adventurezonevicfalls.com
Shock Wave	Phillane Moyo	General Manager	Victoria Falls	+263 712337643	philani@shockrafting.com
Shock Wave	Marvel Nyathi	Communication and Information Officer	Shop 6, Bata Buildings, Victoria Falls	0772814545, 0779026669	nyathimarvel@gmail.com
Khanondo	Ben Tessa	General Manager	Victoria Falls	0772364595	ben@khanondotravil.com
Dingane Tours	Raz Dube	MD	273 Adam Stander St	013-4427/44554/40690 or 0772323027	raz@dinganetours.com
Lion Encounter Alert	Jonasi	Director	Box CT527 victoria Falls	0775729247, 071230665	stevej@lionencounter.com
African Predator Diving / Crco Cage Diving	Tendayi Mupanguri	Manager	273 Adam Standler, Victoria Falls	0772937704; 0774750661;	tendavies@yahoo.co.uk, croccagediving@gmail.com
Dabula Safaris	Mavis or Karen		Stand 280 Holland Rd, Box 210 Victoria Falls	013-44453, 44609	dabula@africaonline.co.zw
Zambezi Helicopter Company (Shearwater)	Mike Davis	Director	Victoria Falls	08328 44471, 0213 284 3569	mike@shearwatervf.com; mike@sheawaterct.co.za
Bonisair	Ioan David Gibbs	Director	Masuwe Heli Pad	0777059962	joan.gibbs@bonisair.com
Hotel Association for Matabeland North	Jonathan Hudson	Chairman HAZ - VF	Vic Falls Safari Lodge, Victoria Falls	0712881589	jonathan@saflodge.co.zw
Imvilo Gorges Lodge	Rob Waters	Project Manager	68 Townsend Rd, Box 767 Bulawayo	09-323312	rob@imvelosafarilodges.com
Imvilo Gorges Lodge	Mark Butcher	Director	Bulawayo	+263 772168189	imvelosafarilodges.com; imvelosafarilodges.com; rob@imvelosafarilodges.com; zondo@imvelosafarilodges.com; communities@imvelosafarilodges.com
Victoria Falls Hotel	Giulio Togni	General Manager	1 Mallet Dr Victoria Falls	023-44203/447514443	gm@victoriafallshotel.com
Victoria Falls Hotel	Farai Chimba	Deputy General Manager	1 Mallet Dr Victoria Falls	0712667690	dgm@victoriafallshotel.com
Victoria Falls Hotel	Graham Muzunze	Accountant	1 Mallet Dr Victoria Falls		hfc@victoriafallshotel.com
Kingdome Hotel	Derek Kung	General Manager	Kingdom Hotel, Victoria Falls	0712875095	dkung@legacyafricahotels.com
Ilala Lodge	Martin Vaughan	General Manager	Ilala Hotel	0832844737/8/9 or 077382638 or 263 (0) 772 336550	martin@ilalalodge.co.zw
Rainbow Hotel	Chris Svova	General Manager	Rainbow Hotel Victoria Falls	0772470478	gm.rainbowvfa@rtg.co.zw
Zambezi Hotel	Hilda Magaso	General Manager	Azambezi Hotel, Victoria Falls		hilda.magaso@rtg.co.zw
Heritage Expeditionsafrica	Fungai Mutseyekwa	General Manager	Harare	0782799059	fungai@heritageexpeditionsafrica.com
Elephant Hills Hotel	Mr Nkosinathi Moyo	General Manager	Box 300 Victoria Falls	0772-397-162, 213 2844793 -9 / (+263) 867 7004656	nmoyo@legacyafricahotels.com
Elephant Hills Hotel	M Sholw	Loss Control	Box 300 Victoria Falls	0772177440	kofficer@ehr.africansun.co.zw
Victoria Falls Safari Lodge	Jonathan Hudson	General Manager	Stand 471 Squire Cummings Road	01343211-20/ 0712881589	jonathan@saflodge.co.zw
Mputalo hunters	Zondo or Mark Butcher	Director	Bulawayo	+263 (0)712881680 or 077216189	zondo@matupula.co.zw; invelo@invilosafarilodges.com
Imvelo Safari Lodges (Gorges Lodge)	Rob Waters	Projects Manager		0292232312 / 02292232331	imvelo@imvelosafarilodges.com
Victoria Falls Publicity Association	Knowledge		Stnd 412 Parkway/Livingstone Rd	013-44202	
Regional Tourism Organisation of Southern Africa			Unit C39, Lone Creek, Waterfall Park, Midrand	(27 11) 315 2420/1 | (27 11) 315 9752/3	info@ztazim.co.zw; marketing@ztazim.co.zw; retosa@iafrica.com; info@retosa.co.za
Eco Elements	Peter Roberts		UK		retepstrebor@yahoo.co.uk
Cheziya Crocodile Ranch	Joshua N. Magaba	Director	Box 18 Victoria Falls	0712207368, 0777051865	joshggm@mweb.co.zw;Joshggm@mweb.co.zw cheziyacrocs1@gmail.com
Victoria Falls Wonders Online	Collin Wilbesi	Editor	778584951	4195 Vic Falls	editor@victoriafallswonders.com
Non-governmental organisations					
The Victoria Falls Wildlife Trust	Roger Parry or Jessica Dawson	Wildlife Manager	PO Box 159, Victoria Falls	Phone & Fax +263 13 42004 0712217171, 0712230845, 0782799006	roger@vicfallswildlifetrust.org ; jessica@vicfallswildlifetrust.org
Bird Life Zimbabwe	Darryl Teran	Regional Rep.		0712610222, 0779555260	ecolynx@zol.co.zw,
Environment Africa	Namo Chuma	Director	Victoria Falls	774788082,00 260 977 491 833	namo@environmentafrica.org
Environment Africa	Edith January	Field Officer	Box CT502 Victoria Falls	772384602	edith@environmentafrica.org; charlie@environmentafrica.com
Green Africa	Charlene Hewat	CEO	Victoria Falls	712408864	charlie@greenlineafrica.org

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Birdlife Zimbabwe	Julia Pierini	Director	Harare	(+263-4) 481496/490208	JuliaPierini@birdlifezimbabwe.org
Birdlife Zimbabwe		Member	Box 4 Victoria Falls	712610222	ecolynx@zol.co.zw
Green Fund	Yvonne Jandler			0712384924	yvonne@routesthrouafrica.com
KAZA (Kvango-Zambezi Transfrontier Conservation Area)	Alan Sparrow	Technical Advisor	Box 14 Victoria Falls	013/44477	sparrow.alan@gmail.com
Environment Africa	Oliver Wales Smith	PA		0774185930	oliver@environmentafrica.org
Zimbabwe Conservation Task Force	Johnny Rodrigues	Chairman		263 4 339065, 0712603213	galorand@mweb.co.zw
Victoria Falls Anti-Poaching Unit	Charles Brightman	Manager/Director	Victoria Falls	00	cat@yoafrica.com
Environment Africa	Namo Chuma	Director		+263 (4) 492143 or +263 (4) 492152 or 0712323116	info@environmentafrica.org; namo@environmentafrica.org
Zimbabwe Conservation Task Force	Jonny Rodrigues	Chairman		263 4 339065, 0712603213	galorand@mweb.co.zw
World Vision	Andrew Shamu	Communications and External Engagements Team Leader	P.O. Box 2420 / P.O. Box 3576 Harare Zimbabwe	+263 772 560 072	andrew_shamu@wvi.org
Painted Dog Conservation			PO Box 72, Dete, Zimbabwe	+263 (0)772 162 852	info@painteddog.org
Lubancho House,	Sr Sharon Ngwenya		Stand F35/36 Lwendulu Village, Hwange	0281-22760/ 0784258334	lubhouse@yoafrica.com
Integwe – Victoria Falls	Elizabeth (Liz) Marken			+263 712200455	elisabethm@intengwe.org
Dhibha Mombe	Mr Garikayi			0774752783; 0772384602; 0772155931; 0772135932	sgarikayi@achmonline.org
International organisations					
International Rivers	Rudo A. Sanyanga	Africa Program Director	Office G12, Pro-Equity Court, 1250 Pretorius St, Hatfield oo28, Pretoria	+27124302029	rudo@internationalrivers.org
University of California	Grace Wu			16263885257	grace.cc.wu@gmail.com
University of California	Ranjit Deshmukh		2138 Mcgee Ave, Berkely, California, USA		ranjit.deshmukh@berkely.edu
WWF	Mrs Charity Mvirimi		10 Lanark Rd, Belgravia, Harare	+263-4-252533/34	cmuvirimi@wwf.org
International Rafting Federation	Sue Liell-Cock	Secretary General			media@internationalrafting.com; info@internationalrafting.com
International Rafting Federation	Mr Andrew and Mrs Marie-Louise Kellett		20 Selous Road Claremont, Cape Town, South Africa		andrew@gravity.co.za
United Nations Development Programme	Resident Representative			263 4 338 836-44	communications.zw@undp.org
Other Interest Groups					
Jafuta Foundation	Godfrey S Maphosa	Trustee / Administrator	Box 291, Victoria Falls	0712231842, 0772477796	gsmaphosa@gmail.com
Matetsi ECS	Honye Herbert Sansole	Committee Member	528 Chibondo Hwange	0772903126, 0712958397	hhsansole@gmail.com
Tree Society of Zimbabwe	Mark Hyde		29, Harry Pichanick Drive, Alexandra Park, Harare 745263		mahyde@gmail.com;
The Falls Private Medical Centre - Health Bridge	Dr Manyise	Director		2631340529 0738950929	manyise@xceldent.com ; admin@thehealthbridge.com
Self	Trevor Lane			777057024	tlanezim@gmail.com
PSMI Medical Clinic (VF)	Dr Sinnity Finnity	Medical Doctor	5618 Mkhosana T/ship, Victoria Falls	013-40513	efinnity@psmi.co.zw
Victoria Falls Communications Bureau			69 Courtney Selous St	013-43505	
Elderman Indubiwa	Alderman Indubiwa	Ex Councilor		0779367948	
EMRAS Ambulance Services			Victoria Falls	013-46053	
Friends of Victoria Falls	Larry Norton	Chairman		+263 712604603, 263140076	fovf@yoafrica.com
Batoka Clan	N. Maphosa	Official	Monde village	778890894	ngomap@yahoo.com
Batoka Clan	B. Ncube	Coordinator	4411 Chinotimba T/ship	779832465	Frank_jordan_23@yahoo.com
Zimbabwe Power Company (ZPC)	Eng Andrew Ramani	Civil Engineer (Projects)	Hwange Power Station Box 257 Hwange		engramandi@gmail.com; aramandi@zpc.hps.co.zw
Zimbabwe Power Company (ZPC)	Modling Mberengwa	Civil Engineer (Projects)	Hwange Power Station Box 257 Hwange	776423856	mmberengwa@zpc.hps.co.zw
Zimbabwe Power Company (ZPC)	Theodore Ncube	Community Relations Officer	Hwange Power Station Box 257 Hwange	772857638	tncube@zpc.hps.co.zw
Hwange Power Station (HPS)	Chovivofa	Risk Manager	Hwange Power Station Box 257 Hwange	0772413047	tchovivofa@zpc.hps.co.zw
Champion Farmers	Langton Khumalo	Coordinator		0281-2261	langtonkhumalo59@gmail.com
Hwange Colliery	Anna Chuma	Environmental Officer	Box 123 Hwange	0782157151	achuma@hwangecolliery.co.zw
Hwange Show Society	Herbert Sansole		Hwange	0772903126	hhsansole@gmail.com
Hwange Colliery Company	Miss Netsai Munengami	Junior Environmental Officer	Hwange	0774145721, 0712594121	nmunengami@hwangecolliery.co.zw
Champion Farmers	Langton Khumalo	Coordinator	DA's Office Hwange	2261	langtonkhumalo59@gmail.com
Media: Finx	Tendai Sahondo	Reporter		0776372003	tsahondo@gmail.com
The Chronicle	Leonard Ncube	Senior Reporter		0773432655, (013)45203/4	ncubeleon@gmail.com
VFM	Mumpande Lot	Deputy Director	Box 41 Victoria Falls	0772127098	lmumpande@vfm.co.zw
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VFM	N. Ncube	TP		0772405091	nncube@vfm.co.zw
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Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
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Campfire Project, Zimbabwe	Charles		Glenara Ave/Hillside Rd, Harare	04-747422/747516	campfir@id.co.zw; campfire@internet.co.zw
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Community members					
Sacred Heart Mision	Mr Progress Ncube				
Sacred Heart Mision	Ms Gracious Tshuma				
Sacred Heart Mision	Ms Tumane				
Sacred Heart Mision	Mr Khayelihle Zulu				
Sacred Heart Mision	Mr Linny Zulu				
Sacred Heart Mision	Mr Lovemore Netha				
Sacred Heart Mision	Mr Talent Ndhlovu				
Sacred Heart Mision	Mr Mwikis Mathe				
Sacred Heart Mision	Mr Alexander Ncube				
Sacred Heart Mision	Mr Delroy Sakhala				
Sacred Heart Mision	Ms Kethiwe Nyoni				
Sacred Heart Mision	Ms Faresi Kumwenda				
Sacred Heart Mision	Ms Sina Nyoni				
Sacred Heart Mision	Ms Madelina Dube				
Sacred Heart Mision	Ms Belita Nyathi				
Sacred Heart Mision	Ms Blessed Tshuma				
Sacred Heart Mision	Ms Safira Nkomo				
Sacred Heart Mision	Ms Priscilla Sibanda				
Sacred Heart Mision	`				
Sacred Heart Mision	Ms Anna Moyo				
Sacred Heart Mision	Ms Agnes Nyoni				
Sacred Heart Mision	Ms Margaret Nyoni				
Sacred Heart Mision	Mr Orchad Ndhlovu				
Sacred Heart Mision	Mr Bekezela Ncube				
Sacred Heart Mision	Mr Phillip Banda				
Sacred Heart Mision	Ms Ottilia Chuma				
Sacred Heart Mision	Mr Lawrence Nyathi				
Silibinda	Mr Tadious Zulu				
Sikumbi	Mr Godwin Nyoni				
BH80	MrThembelihle Ncube				
BH86	Mr Patrick Neta				
BH124	Mr Judia Nyoni				
ZRP Jambezi	Mr Tafadzwa Mukaro				
ZRP Jambezi	Ms Letwin Chikohora				
Musani	Mr Jairos Ncube				
Musani	Mr Shephered Ndhlovu				
Musani	Mr Maxmillan Nyoni				
Musani	Ms Siphathisiwe Ndhlovu				
Musani	Ms Thembekile Dube				
Musani	Ms Jeska Mudzana				
Musani	Ms Loveness Sibanda				
Nemanhanga	Ms Rosa Kandimba				
Musani	Ms Margaret Nyoni				
Musani	Mr Fandison Ncube				
Jabula	Mr Kenias Mbewe				
Nemanhanga	Ms Rosina Nyoni				
Silibinda	Mr Themba Nyathi				
Silibinda	Mr Shephered Ngwenya				
Silbinda	Mr Kenneth Sibanda				
Siamwele	Mr Lifas Muleya				
Siamwele	Mr Linos Nkomo				
Siamwele	MrAlois Ncube				
Siamwele	Mr Herbet Ncube				
Jambezi	Mr Emmanuel Ncube				
Siamwele	Mr Richard Nyoni				
Siamwele	Mr Edward Ndhlovu				
Siamwele	Mr martin Dube				
Siamwele	Mr Mabuya Ndhlovu				
Siamwele	Mr Augustine Mlauzi				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Siamwele	Mr Leornad Nkomazana				
Jabula	Mr Cosmas Sithete				
Jabula	Mr Jee Mhlanga				
Jabula	Ms Sarudzai Dube				
Musena	Ms Bett Tshuma				
Silibinda	Ms Matilda Sibanda				
Silbinda	Ms Greedys Mpala				
Silbinda	Mr F Shoko				
Silbinda	Mr Sylvester Nyoni				
Silbinda	Mr Japhet Mathe				
Jabula	Mr Vela Mhlanga				
Jabula	Mr Mica Moyo				
Jabula	Mr F Chawira				
Jabula	Mr Ishmael Ncube				
Jabula	Mr Success Ncube				
Jabula	Mr Peter Ncube				
Jabula	Mr Victor Mupanduki				
Jabula	Mr Peter Kubi				
Sikumbi	Mr Noah Nkomo				
Siamwele	Mr M Zondo				
Siamwele	Mr Bheki				
Jabula	Mr Austin				
Jabula	Mr Makhosini				
Silibinda	Mr Doubt Ncube				
Silbinda	Mr Douglas Mathe				
Jabula	Ms Pretty Nkala				
Nemanhanga	Ms Sitabile Mlauzi				
Jabula	Ms Leah Mpofu				
Jabula	Ms Agadah Ndhlovu				
Jabula	Ms Mayi Chuma				
Musani	Ms Rosemarry Netha				
Musani	Ms Lydia Ntutu				
Musani	Mr Cherest Ncube				
Jabula	Mr Never Munsaku				
Jabula	Mr M. Muzamba				
Musani	Mr Chinene Ndhlovu				
Musani	Mr Kwenjani Ngwenya				
Musani	Mr Patrick Muketeyi				
ZP Jambezi	Mr B Nkatazo				
BH43	Mr Fetty Nyoni				
Jabula	Mr Nicholas Dube				
Jabula	Mr Patrick Ncube				
Jabula	Mr Notani Nkomo				
Jabula	Mr Philemon Nyathi				
Skhumbi	Mr Martin Sibanda				
Jabula	Mr Michael Mbewe				
Jabula	Mar Farai Moyo				
Jabula	Mr Masawuso Nyathi				
Jabula	Mr Konani Shoko				
Jabula	Mr Mongameli Khumalo				
Jabula	Mr Jivas Ndhlovu				
Jabula	Mr Andrew Ndebele				
Jabula	Mr Samsosn Nyathi				
Jabula	Mr Gilbert Ndhlovu				
Sikumbi	Mr Victor Nyathi				
Sikumbi	Mr N. Nkomazana				
Sikumbi	Mr Kenneth Zulu				
Jabula	Mr Mateya Ndhlovu				
Siamwele	Mr Darnsaw Siamwele				
Siamwele	Mr Alois Mathe				
Siamwele	Mr David Moyo				
Siamwele	Mr Victor Chiti Mutale				
Musani	Mr Christopher Sibanda				
Nemanhanga	Mr Vish Silibindi				
Musani	Mr Austin Nyathi				
Nemanhanga	Mr Abel Sibanda				
Sikumbi	Mr Lucky Sibanda				
Sikumbi	Mr G. Nkomazana				
Jabula	Mr Lenin Moyo				
Silbinda	Mr Y. Moyo				
Silibinda	Mr Dadani Ncube				
Silibinda	Ms Saliwe Ndhlovu				
Jabula	Mr Gungwe Sibanda				
Jambezi	Mr Daniel Rwendo				
Nemanhanga ward,	Headman Chabwa				
Jabula	Village head Amos Tolani				
Shantani Village 5	Mr Johane Shoko				
Nemanhanga Vill 1	Mr Peter Nyoni				
Musani	Ms Dorothy Ndhlovu				
Lukungani Mission	Headman Nkomo				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Silbinda	Kayelihle Ndhlovu				
Silibinda 3	Mr George Ncube				
Simwele 3	Village Head Ncube				
Simwele 3	Village Head Adolph Ndhlovu				
Nemanhanga	Village Head Daniel Dube				
Silibinda	Ms Josephine Ngwenya				
Musani	Mr Bongani Ncube				
Sacred Heart Mision	MrJabulani Mkwananzi				
Nemanhanga Vill 1	Mr innocent Viyazhante				
Nemanhanga	Nkosilathi nyoni				
Musani Village 4	Mr Patrick Nyoni				
Nemanhanga Village 4	Mr Phillip Chipaya				
Musani	Mr Davison Ncube				
Musani	Mr Bulowe Nyoni				
Nemanhanga	Mr Simon Muyambo				
Nemanhanga	Ms Nokuthula Sibindi				
Nemanhanga	Ms AliceMoyo				
Musani	Ms Elphina Ndhlovu				
Musani	Ms Ottilia Ncube				
Sikumbi	Mr Stephen Nyoni				
Jabula	Mr Chistopher Sibanda				
Silibinda	Ms Anastazia Sibanda				
Musani Village 4	Ms Conelia Ndhlovu				
Silbinda	Mr Newman Nyoni				
Silbinda	Mr Killion Mathe				
Silbinda	Mr Alexander Chuma				
Siamwele	Mr Khulani Ndhlovu				
Jabula 7	Mr Samson Muleya				
Jabula	Mr Darani Sibanda				
Sikumbi 1	Mr Mutambo Siachingongo				
Sikumbi	Mr Paipasi Tuturu				
Jabula 1	Mr Tawino Ngoni				
Nemanhanga	Ms Fimha Ndhlovu				
Nemanhanga	Mr Tapiwa Ganye				
Nemanhanga	Ms G. Chabwa				
Nemanhanga	Mr Richard Chatombota				
Nemanhanga	Mr morris Ngwenya				
Nemanhanga	Mr Mabuza Moyo				
Nemanhanga	Mr Richard Muleyi				
Vulindlela	Qhubekani Nkomazana				
Vulindlela	Talent Banda				
Vulindlela	Mcebisi Sifuya Sibanda				
Kachechete	Israel Moyo				
Kachechete	Obert Mpofu				
Vulindlela	Champion Ndlovu				
Ndlovu	Albert Ndlovu				
Vulindlela	Fred Ndlovu				
Mpumelelo	Raphael Dube				
Ndlovu	Chikuduri Elvis				
BH 129	Chikwa Sibanda				
BH 9	Everest Mpofu				
BH 25	Gladys Maphosa				
BH 127	Chiedza Sibanda				
BH 118 Lupinyu	Sibongile Sibindi				
BH 82	Deliwe Ncube				
BH 26	Jerita Ncube				
BH 37	Gladys Dube				
BH 38	Christine Moyo				
BH 24 Ndlovu Village	Nomusa Ncube				
BH 128	Nicholas Mpofu				
BH 59	Methia Mthupha				
BH 57	Precious Thebe				
BH 58	Ntabiso Thebe				
Ndlovu	Cllr Martin Ndlovu				
Ndlovu	Joshua Ngwenya				
Vulindlela	B Sibanda				
Vukuzenzele	First Dube				
Ndlovu	A Madhkwa				
Mpumelelo	Charles Moyo				
Kachechete	Ndabayabo Moyo				
Kachechete	Makitu Mpofu				
Mvutu	Andrew Moyo				
Vulindlela	Mtshayeli Msipa				
ZRP Victoria Falls	Sgt Chikweu				
Vulindlela	Moses Monhosa				
Village Head, Katshetsheti	Wonder Weza				
Vulindlela	Flonder Jabulani				
Vulindlela	Ngaiwi Moyo				
Vulindlela	Pilate Ndlovu				
Vulindlela	Wilson Moyo				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Vulindlela	Thayimoni Moyo				
Mnuthu	Lovemore Moyo				
Vulindlela	Jonathan Sibanda				
Vulindlela	Ngaqabutho Sibanda				
Vulindlela	Simon Sibanda				
Vulindlela	Nkosilathi Masipo				
ZRA	Elizabeth Karonga				
ZRA	Chrispin Namakando				
Chisuma	Lilani Chuma				
Chisuma	Sikhanyiso Moyo				
Chisuma	Patricia Mathe				
Chisuma	Bekithemba Mpofu				
Chisuma	John Zulu				
Jembwe	Sidaniso Mabhena				
Jembwe	Nthembiso Miyo				
Jembwe	Thomas P Ncube				
Jembwe	Pilate Ndlovu				
Jembwe	Albert Moyo				
Jembwe	Jameson Sibanda				
Chisuma	Qondani Ngwenya				
Chisuma	Phineas Tshuma				
	Milton Ncube				
Chisuma	Cleopas Moyo				
Chisuma	Felex Ncube				
Chisuma	Talent Mathe				
Chisuma	Godfrey Mudimba				
Chisuma	David Ndlovu				
Monde	Sebastian M Mathe				
Chisuma	Beatrice Nyoni				
Chisuma	Sara Ncube				
Dibu Dibu Chisuma	M Tshuma				
Chisuma	Charity Tona				
Chisuma	Maria Phiri				
Chisuma	Sekani Mudimba				
Chisuma	Cathrine Tshuma				
Chisuma	Limukani Tshuma				
Chisuma	Grace Jangiya				
Chisuma	Priscilla Ncube				
Chisuma	Gladys Shoko				
Chisuma	Benita Nethsa				
Chisuma	Otilia M Shoko				
Chisuma	Ficleia Ndlovu				
Chisuma	Sizilabuka Masuka				
Chisuma	Virginia Mathe				
Chisuma	Patricia Chuma				
Chisuma	Georgina Mzamba				
Chisuma	Dorcas Chuma				
Chisuma	Otilia Shoko				
Chisuma	Seria Nyoni				
Chisuma	Alice Lungu				
Chisuma	Agness Banda				
Chisuma	Jemila Mangomba				
Chisuma	Agnes Dube				
Chisuma	Tshambaja Chuma				
Sizinda	Dorcas Mabhena				
Chisuma Village Head	Tabona Ncube				
BH 34 Village Head	Yangi Vundla				
Chisuma	Safilo Muuma				
Chisuma	Jabulani Mjuma				
Chisuma	SM				
Chisuma	Jonathan Mabuthi				
Chisuma	Mbiyo Ncube				
Chisuma	J F				
Chisuma	Lucky				
Chisuma	Akwa				
Chisuma	Shakani				
Chisuma	Banda				
Chisuma	Lewis Mpala				
Chisuma	R M Ncube				
Chisuma	Matthew S Mathe				
Chisuma	Forget Mhlanga				
Chisuma	Stanley Mzamba				
Chisuma	Akin Bhebhe				
Chisuma	Amos G Ndlovu				
Chisuma	Itai Mkandla				
Chisuma	Ephraim Dube				
Chisuma	John Thebe				
Dibu Dibu	Nkosilathi Moyo				
Sizinda	Marupila A Ncube				
Chisuma	Andre Muzambani				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Chisuma	Joshua Bhebe				
Chisuma	Pidekelo Mathe				
Chief (A)	B Sibanda				
Headman	A Ndlovu				
Ass Headman	J Mkhawananza				
Monde Village Head	M M				
Jembwe No 5 village head	D Ndlovu				
Ass Headman	Thebe Stanford				
Monde Village Head	Mpala Paul M				
Chisuma	Cosmos Shoko				
Chisuma	Dorcus Masuku				
Chisuma	Sharon Mabhena				
Chisuma	Angela Ncube				
Chisuma	Ronka Dube				
Sizinda	Sifundo Ndlovu				
Chidobe Ward	Gama Siwela				
Monde	Dennis Tibu				
Ndimakule	Mokwala David				
Ndimakule	Abraham Nyathi				
Takazipila	albert Mathe				
Batanai	Edmond Zulu				
Takazipila	Enock Mpofu				
Takazipila	Dumisani Nyathi				
Takazipila	Patrick Dube				
Takazipila	Prince Sibanda				
Takazipila	Grant Moyo				
Takazipila	George Ncube				
Takazipila	kammor Ncube				
Takazipila	Christopher Mathe				
Takazipila	Mike Dube Dube				
Takazipila	Brighton E				
Milimitemba	I Ncube				
Ndimakule	H Kokosa				
Bhatanani	Lines Bwila				
Mitimithula	Richard Ngwenya				
Chishanga	Innocent Zimba				
Chishanga	Nchesi Ngwenya				
Chishanga	Cosmas Ncube				
Chishanga	Chetani Muleya				
Chishanga	Misheck Phiri				
Chishanga	Dennis Nyoni				
Ndimakule V 2	Janet Siband a				
Ndimakule V 3	Assa Nkomazana				
Ndimakule V 2	Beniter Mathe				
Ndimakule V 6	Loveness Tshuma				
Ndimakule V 6	Beniter Ncube				
Ndimakule V 6	Stella Ncube				
Ndimakule V 3	Zondiwe Moyo				
Ndimakule V 2	Tawana Moyo				
Ndimakule V 3	Blessing Moyo				
Ndimakule V 3	Perseverance Khumalo				
Ndimakule V 1	Masawenkosi Ncube				
Chishanga	Thuthukani Ndlovu				
Takazwi	Leonard Ndlovu				
	Samasani Sibanda				
Takazwipila	T Mathe				
Takazwipila	R Tshuma				
Ndimakule	Leornard Nyoni				
Ndimakule	Reign Moyo				
Takaziwi	Blessed Sibanda				
Takaziwi	A Sibanda				
Takazwipila	Michael Ncube				
Taka	Brighton Dube				
Ndimakule	David Khanye				
Chishanga	Morisen Moyo				
Takazwipila	Zenzo Mathe				
Ndimakule	Kadebona Bango Dube				
Mashange Sec School	Kabome Langton				
Government official	T Mvuti				
Agritex	I Liwonde				
Jambezi	D Renolo				
Jambezi Communal Lands	Chief Shana				
Takazwipila Chik Ward	Clement Moyo				
Chikandakubi Primary School	C R Ncube				
Agritex Chikandakubi	T Runhare				
Village Head, Chikandakubi	M Mungeletoni				
Village Head, Chikandakubi	Tobvasi Nyoni				
Village Head, Chikandakubi	Rasmus Nyoni				
Village Head, Chikandakubi	Jacob Ncube				
Village Head, Chikandakubi	Vinika Sibanda				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Village Head, Chikandakubi	Bulayani Ncube				
Village Head, Chikandakubi	Charles T Shoko				
Village Head, Chikandakubi	Chipango Nyatsi				
Takazwipila Chikandakubi	Grant Moyo				
Village C	T Moyo				
Village Chikandakubi	J L Palale				
Village Head Batanani	Raphael Muleya				
Village head Ndimakule Village 4	Selina Ncube				
Village head Chishanga Village 3	Lucia Ngwenya				
Village head BH 7	Mulindela Moyo				
Takazwipila Chikandakubi	Sibani Nkamazana				
Takazwipila Chikandakubi	Tangani Phiri				
Takazwipila	Cephas Ncube				
Chishanga	Bongani Mathe				
Chishanga	Irene Msaka				
Chishanga	Emeldah Nkomo				
Ndimakule	Esnat Ndlovu				
Ndimakule	Alice Tshabalala				
Chishanga	Elen Dube				
Takazwipila Chikandakubi	Evelyn Rwasarira				
Takazwipila	Precidias Chuma				
Takazwipila	Metade Tshuma				
Ndimakule	Selistina Makaza				
Chewumba	Mgotshwelwa Moyo				
Ndimakule	Sithembile Sibanda				
Ndimakule	Sitshengisiwe Muleya				
Chishanga	Nosizi Moyo				
Ndimakule	Alice Ncube				
Chishanga	Chuma Felistas				
Ndimakule	Mdimba Lydia				
Ndimakule	Sibanda Selina				
Takazwipila	Sibanda Veronica				
Ndikule	Muleya Esnath				
Ndimakule	Ndlovu Madoka				
Ndimakule	Kudakwashe Chibatamoto				
Chishanga	Brighton Nkomo				
Ndimakule	Kenneth Famela				
Ndimakule	Bret Ndlovu				
Ndimakule	Usumari Bhanda				
Takazipila	Eleza Chuma				
Takazwipila	Pauline Phiri				
Takazwipila	Christine Nyoni				
Takazwipila	Joyce Mpofu				
Takazwipila	Oliver A Sibanda				
Ndimakule	Nkululeko Khumalo				
Takazwipila	Christmate Chuma				
Takazwipila	Bright Nyoni				
Takazwipila	Mitchell Nyathi				
Ndimakule	Melody Nyoni				
Ndimakule	Naniwe Kafunga				
Takazupila	Regina Sibanda				
Takazupila	Mrs P Nkomanana				
Ndimakule	Sheila Chirwa				
Takazupila	Lambani Nyoni				
Takazupila	P Dube				
Takazwipila	Virginia Nyoni				
Talazipila	Phyllis Dube				
Ndimakule	Christine Ncube				
Ndimakule	Blessed Ncube				
Ndimakule	Precious Nyoni				
Chishanga	Yabani Nkunyawete				
Ndimakule	Simangaliso Ncube				
Ndimakule	Bridget Ngwenya				
Ndimakule	Nicoleen Dube				
Ndimakule	Siboniso Lugule				
Ndimakule	Margret Ncube				
Ndimakule	Mirian Khumalo				
Ndimakule	Matilda Sibanda				
Musenyika	Mishulisi Ndlovu				
Musenyika	Mthaisi Komazana				
Takazipila	B Pakhetikozana				
Takazipila	Paul Madimba				
Chishanga	Fabian Mumba				
Chishanga	Rabison Nyoni				
Chikandakubi	Reason Mukeya				
Chikandakubi	Gordin Mpala				
Chikandakubi	Ephraim Nyoni				
Ndimakule	Shelton Mathe				
Ndimakule	Petros Ngwenya				
Ndimakule	Malumani Moyo				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Ndimakule	Ronald Maseko				
Ndimakule	Hazvineyi Moyo				
Ndimakule	Hassen Mvundla				
Ndimakule	Lexlex K Dube				
Ndimakule	Harrow Moyo				
Ndimakule	Desire Ncube				
Ndimakule	Pilan Ncube				
Takazvipila	Ernest Mayabo				
Ndimakule	Mavuto Kfuiwa				
Ndimakule	Melusi Moyo				
Chenamisa	Lesuthu Mnkandla				
Chenamisa	Ozias Ncube				
Ndimakule	Thembani Maphosa				
Batanani	Lafion Moyo				
Batanani	Liveson Muleya				
Takazwipila	Lawrence Sibanda				
Chishanga	Joseph Ndlovu				
Chishanga	Ngwabi Nathaniel				
Chishanga	Alice Ncube				
Takazwipila	James M Sibanda				
Ndimakule	Joel Sibanda				
Sekebelo Farm Ward 1	Polite Shoko				
Dorn Roven Sekebelo ward 1	Given Nkomo				
Sekebelo Farm Ward 1	Fiddman Nyoni				
Sekebelo Farm Ward 1	Shelton Sibanda				
Masitili	Obert Sibanda				
Khayalethu	Navigator Dube				
Masilili	Isayab Ngwenya				
Khayalethu	Stradford Sibanda				
Sekebelo Farm Ward 1	Clever Ndlovu				
Sekebelo Farm Ward 1	Honest Ncube				
Sekebelo Farm Ward 1	Linos Ncube				
Mapanigomo	Chebeshos Sibanda				
Khayalethu	yabani Shoko				
Mapaningoma	Euberth Ngwenya				
Maskili	Bongani Dube				
Sekebelo Farm Ward 1	Michael Ncube				
Mapaningoma	Franscisco Nyoni				
Mapaningoma	Pelani Chuma				
Mapaningoma	Sharani Sibanda				
Khayalethu	Elias Chuma				
Farm 55	Amon Mudimbu				
Farm 55	Zebedia Dube				
Farm 55	J Marinami				
Maskili	Lindeline Ndlovu				
Matetsi	Sibanda P				
Matetsi	Nyathi D				
Isala	Aria Stephen				
Isala	Tallo Tshono				
Matetsi	Captain Z				
56 Farm	S C Shoko				
56 Farm	Dubani Shoko				
56 Farm	Willson Mudenda				
Farm Mapaningoma	Fulfilment Ngwenya				
Matetsi	Ronald Maths				
Isla Farm	Edmore Mudenda				
Sekebelo	Kennias Ndlovu				
Sekebelo	Josphit Moyo				
Maskili	Josphat Mhlanga				
Oliphent Farm	Ephrem Weza				
Maskili	Ncan Busumani				
Maskili	Joshua Nkomo				
Maskili	Ben Nyathi				
Sikabelo	Ursher Ncube				
Sikabelo	Jeffrey Mandla				
Kalethu	Zani Mudenda				
Maskili	Nyathi Sibongilizwe				
Maskili	Million Ndlovu				
Maskili	Ronald Ngwenya				
Maskili	Oswell Mathe				
Maskili	Richard Nyathi				
Village 5	J Manmani				
Farm 55	Gabriel Sibindi				
Farm 55	Zebedia Dube				
Farm 55	Amon Mudimbu				
Khayalethu	Elias Chuma				
Farm 56	N Bonomali				
Breakfast	Protty Ndlovu				
Mapaningoma	Edington Mpofu				
Farm 55	Gabriel Sibindi				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Farm 56	N Bonomali				
Farm 55	Phinia Mathe				
	Joram Nyathi				
Masikili					
Breakfast	Abel Nyoni				
Breakfast	Joram Phiri				
Masikili	Bruce Makarutse				
Shantani	Patricia Mafuko				
Shantani	Janet Ncube				
Shantani	Joice Nyoni				
Kwalala	Prisca Ncube				
Chenambi	Angela Shava				
Chenambi	Adela Namukowa				
Sisyathu	Sinazeni Shoko				
Chenambi	Sambina Nyathi				
Kwalala	Mukedzayi Sibanda				
Kwalala	Evangelista Sibanda				
Makuni	Kasheru Nyoni				
Makuni	Siphiwe Phiri				
Sisyathu	Khelesi Moyo				
	Memory Moyo				
Ntiba	Elizabth Moyo				
Ntiba	Fesina Sibanda				
Ntiba	Sibonginkosi Mahlanga				
Ntiba	Media Sibanda				
Makhuni	Jesita Phiri				
Makhuni	Zeria Ngozi				
Tishenambi	P Mathe				
chenambi	Jenata Zulu				
Sisyathi	Cynthia Kambole				
Sisyathi	Christina Ncube				
Sisyathi	Senzeni M Ncube				
Makhuni	Lethi Ngwenya				
Makhuni	Beatrice Nyoni				
Shantani	Cathrine Moyana				
Shantani	Priscillar Ngwenya				
Shantani	Ketty Shumba				
Shantani	Siphathelaphi Ndlovu				
Shantani	Simangaliso Mhlanga				
Sisyathi	Maria Moyo				
Village head	Orders Moyo				
Village head	J Dube				
Village head	M A Shava				
Village head	Stephen Sithole				
Village head	Joe Shoko				
Village head	Lenond Nkomo				
Village head	A Peter Ndlovu				
Village head	Ambrose Aloise Nyoni				
Village head	Benson Ncube				
	Florence Ngwenya				
	Dalesi Nyoni				
	Felix Sibanda				
	Rozina Ncube				
	Joyce Ncube				
	Joyce Dube				
	Jenper Mpala				
	Shilla Mwembe				
	Maria Ncube				
Care taker	Polina Shoko				
malaria Champion	Monica Ngwenya				
	Christine Mpofu				
	Wilani Tshuma				
	Matilda Shoko				
	Efan Ngwenya				
	Saviour Ngwenya				
Care taker	Trinity Ndlovu				
Mbizha Ward	Chr Farayi M Sholo				
Mbizha Ward	Village Head Sebastian Ngwenya				
Jambezi	Benelo				
Jambezi	Chief Shana				
Mbizha Ward	Alois Ndazi				
Mbizha Ward	Phineas Ncub				
Mbizha Ward	David Masuku				
Mbizha Ward	Shoko Conman				
Mbizha Ward	Herbert Ndlovu				
Mbizha Ward	Dominic Ncube				
Mbizha Ward	Jeqe Ncube				
Milonga Primary School	Nyoni B				
Mbizha Ward	Ambrose Aloise Nyoni				
Mbizha Ward	Benson Ncube				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Mbizha Ward	Theresa Mulale				
Mbizha Ward	Leornard Nkomo				
Mbizha Ward	Joe Shoko				
Mbizha Ward	Edward Mathe				
Mbizha Ward	Shobai Shoko				
Mbizha Ward	Jacob Sichoni				
Mbizha Ward	Thabhani Zulu				
Mbizha Ward	Nqobile Makufa				
Mbizha Ward	Peter Ndlovu				
Mbizha Ward	Shoko N				
Mbizha Ward	Patrick Sibu				
Mbizha Ward	Shoti Shoko				
Mbizha Ward	Ngalumi Ndlovu				
Mbizha Ward	Jivas Muleya				
Mbizha Ward	Lowani Befu				
Mbizha Ward	Dominic Shoko				
Mbizha Ward	Isaac Manjuzu				
Mbizha Ward	Isaac Mulenga				
Mbizha Ward	Sipho Ncube				
Mbizha Ward	Gift Ngwenya				
Mbizha Ward	Joel Ncube				
Munka	Bol S				
Chenambi	M Shoko				
Chenambi	T Mathe				
Kwalala	Christopher Dube				
Sisyatwi Mbizha	S Makulula Shoko				
Shantani Mbizha	S Mathe				
Sisyatwi	F Tshuma				
Kasalala	Michael Ncube				
Chenambi	Joseph Tshuma				
Ntiba	Simon Shoko				
Chenambi	Stephen Shoko				
Sisyatwi	Ken Shoko				
Kwalala	Joseph Ngwenya				
Sisyatwi	Kizito Nyoni				
Kwalala	Mandla Mpofu				
Chenambi	Stephen Moyo				
Kwalala	Simoloka				
Kwalala	Innocent Nyoni				
Sisyatwi	Jonathan Ncube				
Shantani	Mkhululi Masuku				
Sisyatwi	Gift Chidakwa				
Makuni	Lot Ngwenya				
Makuni	Ephraim Nyathi				
Ntiba	Malon Msaka				
Kwalala	Ernest Sibanda				
Ntiba	Venastius Nyoni				
Mununa	Washington Ngweny				
Sitwatwi	Enock Dube				
Gondwa	Croud Sibanda				
	Jimmy Ndlovu				
	Shelton Zulu				
Milonga	Joseph Mathe				
Ntiba	Ncube Christopher B				
Shantani	Ngezelwa Tshuma				
Chenambi	Lawrence Banda				
Chenambi	Godfrey Nyoni				
Kwalala	Gift David Tshuma				
Shantani	Ngwiza Ngwenya				
Shantani	Danisa Moyo				
Shantani	Felex Moyo				
Sisyatwi	Vincent Phiri				
Sisyatwi	Cleomore Sibanda				
Sisyatwi	Never Ndlovu				
Shantani	Admire Sithole				
Ntiba	Michael Ngwenya				
Sisyatwi	Fandoon Dube				
Sisyatwi	Lungisani Muleya				
	Ronald Neta				
Ntiba	Lawrence Sibanda				
Chenambi	S Nayo				
Ntiba	Isaac Sibanda				
Ntiba	Yeyani Ndlovu				
Ntiba	Ganzoni M				
Makala	Themba Ncube				
Lumbora	Kenneth Bhebhe				
Lumbora	Douglas Sibanda				
Makala	Jubelepi Ncube				
Sidinda	Gabriel Tshuma				
Dobolo	Philimon Nyilengo				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Ndoweni	Gibson Sibanda				
Ndoweni	Fabion Sibanda				
Bhombo	Lelani Mudimba				
Mbhombo	Dadani Madimba				
Mbhombo	Calton Nyoni				
Makala	Alexious Munkuli				
Makala	Tembo Simon				
Makala	Zebani Dube				
Makala	Driver Mudimba				
Makala	Shamiso Mathe				
Makala	M Ngwenya				
Dobolo	Danani Phiri				
Makala	Gidion Nyoni				
Lumbora	Owen Nyathi				
Lumbora	Wiziwell Nyoni				
Dobolo	Taitas Ncube				
Sidinda	Emmanuel Sibanda				
Sidinda	Innocent Ncube				
Sidinda	Chipiwa Ncube				
Chishoma	Bhebhe Ephraim				
Sidinda	Shephard Mbambo				
Sidinda	Emmanuel Mapeta				
Lumbola	Sophy Nkomazana				
Sidinda	Stanley Ncube				
Ndoweni	Vinsto Mhodi				
Lumbora	Pretty Masumu				
Lumbora	Lophias Mumpande				
Lumbora	Peter Mumpande				
Sidinda	Mendris Shoko				
Lumbora	Hurbert Moyo				
Lumbora	Lazarus Sibanda				
Ndoweni	Moffat Sibanda				
Lumbora	Peter Mumpande				
Ndoweni	Abraham Sithole				
Sidinda	Cosmas Mbambo				
Sidinda	Christopher Nyoni				
Sidinda	Paul Zulu				
Sidinda	Francis Shoko				
Sidinda	Dedick Sibanda				
Sidinda	Peter Munsaka				
Matetsi	Ceaser Munsaka				
Lumbora	Trust Bhebhe				
Makala	Peter Kayura				
Lumbora	Enock Moyana				
Ndoweni	Misheck Mathe				
Lumbora	Hillary Nkomo				
	Morris Ndlovu				
Lumbora	Ncedano Ncube				
	Peter Tembo				
Makala	Norman Change				
Makala	Dusani Muntanga				
Makala	Champion Mudimba				
Ndoweni	Peter Nyathi				
Sidinda	Emmanuel Ndlovu				
Makala	Admire Ngwenya				
Lumbora	Norman Mkhandla				
Makala	Hilbert Ncube				
Makal	Lawson Tshuma				
Ndoweni	Enock Nyathi				
Lumbora	Phumulani Ncube				
Lumbora	Innocent Bhebhe				
Lumbora	Raphael Nyathi				
Sidinda	Never Nyathi				
Sidinda	Japhet Sibanda				
Sidinda	Justin Ncube				
Sidinda	Leonard Dube				
Sidinda	Bonani Nyoni				
Sidinda	Anna Nyoni				
Sidinda	Derick Musaka				
Lumbora	Michael Nyoni				
Lumbora	Elisha Matekenya				
Lumbora	Siphelile Moyo				
Lumbora	Cynthia Chuma				
Lumbora	Letria Bhebhe				
Lumbora	Irene Chuma				
Lumbora	Jesta Shoko				
Lumbora	Yabani Shoko				
Lumbora	Swikani Mpala				
Lumbora	Lawrence Sibanda				
Kayamizi	Shantani Mutenda				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Lumbora	Kwezizakele Moyo				
Lumbora	Yenzini Sibanda				
Lumbora	Mtelisi Ndlovu				
Lumbora	Langton Mkanda				
Lumbora	Jechemisho Bhebhe				
Makala	Charson				
	Clatono Ncube				
Ndoweni	Nkalelo Sibanda				
Ndoweni	Agrippa Sibanda				
Ndoweni	Abraham Sibanda				
Lumbora	Moster Sibanda				
Lumbora	Welcome Nyathi				
Lumbora	Alice Mpala				
Lumbora	Tracy Tshuma				
Makala	Polite Munkula				
Sidinda	Emelda Sithole				
Matetsi	Tinos Mudenda				
Sidinda	Ausha Ndlovu				
Sidinda	Fiso Mudimba				
Sidinda	Inzoni Zulu				
Makala	Josphat Dube				
Sidinda	Lazarus Shoko				
Matetsi	Clement Ncube				
Makala	Shingiwe Nkomazana				
Makala	Sheila Ncube				
Makala	Lingiwe Ngwenya				
Ndoweni	Noreen Ncube				
Dobolo	Dafiya Ncube				
Dobolo	Lindiwe Lupahla				
Dobolo	Lombiwe Zimbo				
Makala	Alfred Mathe				
Lumola	Simon Sibanda				
Lumola	Mathias Mzamba				
Ndoweni	Sedias Nkonidzawa				
Ndoweni	Nomsa Vemani				
Ndoweni	Anastasia Ncube				
Ndoweni	Kadius Sibanda				
Ndoweni	Shakani Ngwenya				
Dobolo	Obert Njosi				
Matetsi	Bhubekani Bhebhe				
Matetsi	Nelson Tshuma				
Matetsi	Memory Munsaka				
Matetsi	Roy Sibanda				
Lumbora	Predance Mpofu				
Lumbora	Lydia Chuma				
Lumbora	Themba Ncube				
Makala	Shamiso Ncube				
Makala	Morgan Chanakira				
Makala	Aid Munsaka				
Mukonda	Gizo Sibanda				
Matetsi	Precious Tunaka				
Matetsi	Tichaona Thandla				
Lumbora	Leonard Chuma				
Makara	Allois Shoko				
Lumbora	Edith Sibanda				
Makara	Lameck Maths				
Ndoweni	Patson Sibanda				
Sidinda	Dubani Aleck				
Lumbora	Sinikiwe Zulu				
Lumbora	Siphathisiwe Moyo				
Lumbora	Chinamano Ncube				
Lumbora	Gracious N Sibanda				
Lumbora	Polite Sibanda				
Dobolo	Tshuma David				
Lumbora	Matthew Sibanda				
Sidinda	Tshuma Kevin				
Lumbora	Malunga Mackson				
Lumbora	Nyathi P C				
Lumbora	Gornelius M Bango				
Lumbora	Mdimba Darlington				
Dobolo	Mukaladi Ngwenya				
Makala	Million Ngwenya				
Makala	Crispen Ndazi				
Ndoweni	Oscar Ngwenya				
Makala	Charles Shoko				
Dobolo	Ehiya Ndlovu				
Lumbora	Bernard Sibanda				
Makonda	Jaison Chuma				
Lumbora	Patrick Mathe				
Lumbora	Sibanda Johannes				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Lumbora	Denny Sibanda				
Dobolo	Nkonekwi Mlilo				
Dobolo	Kelvin Mwalugale				
Lumbora	Mumpande Lyon				
Lumbora	Sehlulekile Makwasa				
Lumbora	Blessed Sibanda				
Lumbora	Loti Shaba				
Lumbora	T Mangena				
Lumbora	B Phiri				
Lumbora	P Ngwenya				
Lumbora	Moffat Ndlovu				
Lumbora	Herbert Nalbe				
Ndoweni	Prosper Ndlovu				
Lumbora	Monica Nyoni				
Ndoweni	Febi Mudenda				
Ndoweni	Lambile Nyoni				
Ndoweni	Irene Nyoni				
Ndoweni	Boniwe Nyoni				
Dobolo	Dafiya Ncube				
Makwa	Victor Chuma				
Mashala	Francis Shok				
Mashala	Paul B Munyandi				
Mashala Ward 9 Kasibo	Isaac L Tshuma				
Mashala	Charles Nyoni				
Mashala Ward 9 Kasibo	Zwela Mathe				
Siashashunge Ward 9	L P Tshuma				
Shashachunda Ward 9	Rosemary Shoko				
Chachachunda Ward 9	Joyce Ndlovu				
Chachachunda Ward 10	Bongani Chuma				
Mashala Down Ward 9	Linda Siachaba				
Mashala Down Ward 9	Virginia Mpofu				
Mashala Down Ward 9	Joyce Mathe				
Mashala Down Ward 9	Cecilia Ncube				
Mashala Down Ward 9	Hauka Muyambo				
Mashala Down Ward 9	Violet Ncube				
Mashala Down Ward 9	Gladys Myambo				
Chachachunda Ward 9	Sibonginkosi Nyathi				
Mashala Ward 9 Kasibo	Josifini Mahlanga				
Chachachunda Ward 9	Noria Mudeda				
Mashala	Sithembile Maluleka				
Kasibo	Cathrine Nkomo				
Kasibo	Jesi Nyoni				
Mashala	Enjeline Nphanzi				
Kasibo	Roseline Zulu				
Kasibo	Elizabeth Sibanda				
Mashala	Letiwe Maluleka				
Kasibo	Nyoni Cathrine				
Kasibo	Nyoni Sihle				
Kasibo	Chuma Chabani				
Shashachunda	Eveline Munsaka				
Mashala Down	Chiyano P Munsaka				
Mashala Down	Lashiwe Munsaka				
Mashala Down	Chatiwa Munsaka				
Mashala Down	Silibaziso Ncube				
Mashala Down	Judis Ngwenya				
Mashala Down	Lindani Ndlovu				
Zwabo	Gladys Muyambo				
Mashala Down	Maggie Chulu				
Chachachunda	Pauline Ndebele				
Chachachunda	Elina Muzamba				
Chachachunda	Rosina Dube				
Makuyu	Nokhutula Mpala				
Mashala Down	Joyce Mpofu				
Mashala Down	Shylet Sibanda				
Mashala Down	Sofi Mpofu				
Mashala Top	Kelvin Tshuma				
Mashala Down	Clement Moyo				
Mashala Down	Alexander Munsaka				
Mashala Down	Shadreck Dube				
Mashala Top	Andrew Tshuma				
Mashala Down	Shelton Nyathi				
Mashala Top	Mbuso Moyo				
Mashala Top	Shadreck Nyathi				
Nechishala Secondary School (teacher)	Ndlovu N				
Mashala Top	Vusani Ndlovu				
Mashala Top	Tinashe Shoko				
Mashala Top	Dumisani Ndlovu				
Mashala Top	Letiwe Maluleka				
Mashala Top	Shamiso Ncube				
Mashala Top	Eunice Tshuma				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Mashala Top	Sifiso Sibanda				
Mashala Top	Sophie Moyo				
Champepo	Pauline Nyoni				
Champepo	Jane Ncube				
Champepo	Saphira Phiri				
Mashala Top	Isaac Ncube				
Chachachunda	Alois Nyoni				
Makawa	Fesrestina Sibanda				
Zwabo/ Makuyu	Jameson Dube				
Mashala Down	M Ndlovu				
Kasibo	Stephen Sibanda				
Mashala Top	Julius Mpala				
Zwabo	Patrice Mkomon				
Zwabo	Ella Shoko				
Champepo	Mtshona Nyoni				
Makuyu	Green Dube				
Lubweludile	Mathias Ndlovu				
Makawa	Benedict Shoko				
Makawa	F Shoko				
Shachunda	M Nyathi				
Chezya	Gabriel Nyoni				
Madumabisa	A Chinunungu				
Mashala down	Oliver Ndlovu				
Mashala top	R Ncube				
Champepo	Lovemore Moyo				
Champepo	Clement Phiri				
Mashala Down	Shadreck Moyo				
Mashala Down	Bhuzani Ncube				
Makuyu	Tata Dube				
Kasibo	K Tshuma				
Shachanda	Stephemn Nyamusika				
	Eusanc Mbeena				
Shachachunda	Memory Nyathi				
Shashachunda	Melusi Sibanda				
Shashachunda	Lebani Nkomazana				
Shashachunda	Felistas Nyathi				
Mashala Top	Remind Masarakufa				
Mashala Top	David Sibanda				
Mashala Top	Marvellous Mhlanga				
Zwabo Makuyu	Kholisani Dube				
Makuyi/ Zwabo	Stella Dube				
Makuyi/ Zwabo	Joyce Dube				
Shachachunda	Clemenzia Mpala				
Shachachunda	Lebani Nyoni				
Mashala Down	Listina Ndlovu				
Mashanana	Enerst Sibanda				
Chezya	Dorris Moyo				
Makuyu	B Mudenda				
Makuyi/ Zwabo	Loius Moyo				
Shachachunda	Pauline Churu				
Zwabo/ Makuyu	Christina Mudimba				
Zwabo/ Makuyu	Berita Munsaka				
Zwabo	Brandina Nyoni				
Zwabo	Senzeni Zulu				
Zwabo	Lizzy Phiri				
Zwabo	Singu Shoklo				
Chachunda	Frolen Ndlovu				
Zwabo	Catrine Mundumba				
Zwabo	Berita Mundimba				
Mashala Down	J Mpofu				
Shachachunda	Jane Shoko				
Mashala	Mrs Zulu				
Shachachunda	Lucia Ndlovu				
Shachachunda	Somuleya Chuma				
Shachachunda	Donton Shava				
Shachachunda	S Choni Ndlovu				
Mashala down	Pascar Mpofu				
Makuyu	Tobias Mwembe				
Mashala Down	D Mudimbu				
Zwabo/ Makuyu	Matthew Mayambo				
Chezya	Charlie Muzanaba				
Zwabo/ Makuyu	Alvin Ncube				
Kasibo	Conious Chuma				
Mashala Down	Shephard Mudimba				
Mashala	Stephen Mubembwe				
Mashala Down	Elestina Nyoni				
Mashala Down	Ncube Zimbani				
Mashala Down	Banda Eunice				
Mashala Down	Mtombeni Kololo				
Mashala Down	Dube Christini				

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Mashala Down	Gutu Mavis				
Mashala Down	Maja Asura				
Mashala Down	Livett Nyathi				
Mashala Down	Mbonisi Ncube				
Mashala Down	Ndobile Mudimba				
Mashala Top	Precious Mhlanga				
Mashala Down	Vincent Mable				
Chief Hwange	Chief Hwange				
Mashala Ward 9	Cllr James Phiri				
Headman - Mashala Ward 9	P Nyoni				
Shachachunda Village head	W Sibanda				
Mashala top village head	E Tshuma				
Nechishala Secondary School	V Zimuto				
Mwemba hall	S Mpala				
prov ZANU PF	S Mlotshwa				
Village head ward 10	Christopher Shoko				
Chief coordinator	E Chopeni Sibanda				
mashala ward	Reeds Dube				
Simat	Makina Kunda				
Shachachunda	Roda Sakala				
Shachachunda	Cathrine Chuma				
Shachachunda	Agnes T Ngwenya				
Shachachunda	Thembeni Munsaka				
Shachachunda	Georgina Munsaka				
Shachachunda	Sithokozile Mhlanga				
Shachachunda	Loveness Nyathi				
Shachachunda	Peter Dube				
Shachachunda	Lazarus Munsaka				
Shachachunda	Alick Mathe				
VIDCO Chair Kasibo	Shadreck L Mpuza				
Pasta kasibo	Cowboy Ndlovu				
Kasibo Resident	Augustine Chipembere				
Namatongo	Enock Simasoku				
Zangala	Josephat Kandiana				
Zangala	Royd Sambo				
Siamatete	David Kesazi				
Chilizya	Emmanuel Kesho				
Siamatete	Anton Makaye				
Chilizya	Kilian B Siantontoia				
Zongala	Lanny Mukumbuta				
Chilizya	Jim Siantontola				
Chilizya	Makumo S				
Siachuma	Steven Simunkwere				
Siazibola	Dereck Sikanyama				
Sichilobe	Franco Ndebele				
Siachuma	Emmanuel Moola				
chibwe	Gardini Malaka				
Mukalahani	Gift Nyambe				
Chibule	Andrew Chalinga				
Ngandu	Tichaona Ncube				
Ngandu	Makayi Siyinja				
Makalahani	P Nyama				
Siakondo	Ehios Simasiku				
Siejoba	Boston Sichetola				
Chibalani	Jacob Mufana				
Mukalahani	Brian Silabi				
Munwana	Peter Simunomba				
Mukalahani	Brendina Chembe				
Ngandu	Victoria Mukendwa				
Munwana	Malita Chakapu				
Ngandu	Getrude Solochi				
Siamatete	Layness Sirajene				
Siamatete	Anoya Muyangwa				
Munwana	Mary Jitali				
Chibule	Makanzala Malumo				
Chibule	Cathrine Siamantundi				
Chibule	Juliet Siamsulinga				
Chibule	Irene Simatele				
Muntumuswana	Jerpha Gwemani				
Muntumuswana	Angela Mvuba				
Munwana	Mary Kasoka				
Ngandu	Lilian Swanala				
Chibule	Modester Mabunda				
Chibule	Mirriam Sikiti				
Nganzhu	Patricia Siamate				
Waterusers					
Imvelo Lodge	Imvilo Lodge, Sidinda ward	778538425		Fishing, Domestic	
Zambezi Fish Farm	Zambezi fish farm, Kanjeza, Hw	775150828		Crocodile Farm	mcdonalddaniel@gmail.com
Olive Beadle Fishing Club	Olive Beradle, Simangani Ward,	N/A	N/A	Fishing, Domestic	
Dream Land	Msuna Village< Simangani Ward	Mr Bwerinofa 0773256560		Tourism, Domestic	

Organisation/Stakeholder name	Contact Name	Position	Address	Phone	Email
Chezya Crocodile Farm	Chezya Village, Simangani ward	777051865		Agricultural, Domestic, Crocodile farming	josh@chezyacrocodiles.co.zw
Chezya Irrigation	Chezya Village, Simangani ward	779555448		Agricutural, Domestic	
Simangani Irrigation Scheme	Simangani primary	778673882		Agricultural, Domestic	
Imvelo Lodge		Tin Kok 0778538425		Tourism, Domestic, Fishing, Recreational	
Hwange Power Station	Hwange	Chivurayise GM 0779713587		Industrial, domestic	achivurayise@zpc.hps.co.zw
Hwange Local Board	Hwange	Eng Nguni 0772414186			ngunip@gmail.com
Hwange Colliery Company	Hwange			Industrial, domestic	cmunyamana@hwangecolliery.co.zw; fmapfuwa@hwangecolliery.co.zw

Annex C3

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RECORD OF STAKEHOLDER MET WITH DURING PROJECT INTRODUCTION IN KAZUNGULA, LIVINGSTONE, ZIMBA, KALOMO AND CHOMA DISTRICTS

1.0 Introduction

From 5-8th August, Kaizen Consulting International conducted a field visit in 5 Districts of Southern Province. The Districts were Kazungula, Livingstone, Zimba Kalomo and Choma. During this period the team met diverse stakeholders ranging from the District Commissioners (DCs), District Administration Officers(DAOs), Council Secretary's and Town Clerks, Chiefs representatives and NGO representatives. During the meetings the stakeholders were informed not only about the proposed BHES Project but were also briefed about the planned ESIA studies that would be conducted at a later stage to determine the social and environmental impacts that the proposed scheme may have in the project area and downstream effects.

1.1. Aim of the Project Introductory Visit

The aim of the visit was to introduce the proposed Batoka HES Project and ESIA to the stakeholders but also to obtain agreement with regard to holding major meetings with constituents and the affected communities at large; and also to gain an understanding of issues of concerns that the stakeholders may have and hear about in the coming meetings.

2.0. KAZUNGULA DISTRICT STAKEHOLDER DISCUSION

The meeting began at 10:00 am at the District Education Board Secretary' office who stood in for the District Commissioner who was out of town. Present at the meeting were the District Council Secretary, the Director Works, the District Education Board Secretary (DEBS) and the District Buildings Officer. After the formal introductions, the Consultants stated that the main objective of their visit was to introduce the proposed BHES project and the Environmental and Social Impact Study that would be undertaken. The consultants also mentioned that the Zambezi River Authority (ZRA) would soon initiate public consultative meetings with affected communities and other stakeholders in order to gain an understanding of their concerns. After giving the background to the project the participants were asked to identify the other key stakeholders and interest groups who should be engaged in the consultative process.

2.1 Stakeholder Identification

The following key interest groups were identified during the discussion:

The District Commissioner, Traditional Leaders (Chiefs, headmen), the Local Authority, Ministry Departments (Tourism, Lands, Health, Agriculture, Tourism, Water and Energy, and Community Development. Others mentioned were the District HIV/Aids Advisor (DACA), Ward Councilors, Care International, Nongovernmental Coordinating Committee (NGOCC) and the Water Rafters Association.

2.2. Stakeholder Concerns and Expectations

2.2.1. Stakeholder Concerns

A key concern raised was with the project's related risk associated with economic and physical displacement of people and whether the project would compensate the people that will be displaced along the route and the form of compensation. It was explained that the ESIA would determine the likely effect that the project would have on people and that should need for resettlement arise, appropriate mitigation measures would be put in place in line existing legal framework.

The Council Secretary for Kazungula intimated that the Zambian side would lose out White Water Rafting once the Project was completed. He observed that rafting was both an economic generating venture and a source of employment to many Zambians.

Further, the stakeholders expressed ignorance on the Transmission route and communities that would be affected along the route. They suggested that background information documents be availed to them so that they could make informed and meaningful contributions during Consultative meetings.

The Council Secretary further added that the proposed Batoka Gorge project will be situated at Gorge Number 23 along the Batoka Gorge system was located in a very steep area on the Zambian side. He indicated that they would be interested to see how Engineers would design the area to minimise flooding and maintain the existing beautiful scene.

2.2.2. Stakeholder Expectations

The stakeholders indicated that they expected that rural communities along where the transmission lines will pass will benefit from the electrical power and that local people will benefit from employment opportunities to be created during project construction. Stakeholders also advised that appropriate measures should be taken to assist house- affected families that may lose land, livelihood opportunities and businesses. They gave an example of how people in one part of Kazungula were supported by the Roads Development Agency (RDA) through constructing schools, health centers, houses and other social amenities after they were displaced.

2.3. Scheduling of Meetings and Notifications

2.3.1. Notification Period

It was suggested that the notification period to inform stakeholders about the meeting should be 3 weeks. The meeting suggested that the stakeholder meeting should take place during the first week of September 2014. The District Commissioner will be responsible for notifying other officers.

2.3.2. Type of Notification

A combination of notifications types were suggested; including Official Letters for District level Administrators, word of mouth and publicity materials.

At the District level, the District Commissioner will prepare official letters of invitation to individual Heads of Department and NGOs. It was suggested that attached to the invitation letters should be background information on the BHES.

At Community level, the Council Secretary will write to the Ward Councillors. At Village level the District Chief's Affairs Officer, working with the Chiefs Advisors will notify the Chief. The Chief will send word through his Induna to inform senior headmen and send headmen.

2.3.3. Need for Translation/Interpretation

The meeting were unanimous in confirming that while a translator would not be required during the District stakeholder meetings, considerations to acquire the services of a translator during meetings with people at the community level.

2.3.4. Notification Arrangement for Chiefs

It was the stakeholder's view that a separate meeting should be held with the Chiefs. The notification procedure was elaborated as follows:

The Chiefs Advisor will be notified by phone about the planned meeting once this is agreed and Courtesy call will then be made on the Chief at the palace.

It was the view of the stakeholders that the Chiefs would be met with their headmen Therefore the invitation would be coordinated by the District Commissioner in liaison with the District Chiefs Officer and Chiefs Advisor.

2.3.5. Need for Translation

The participants indicated that the District meetings would not need a translator. They however suggested that a translator at community meetings who can speak the local language was essential.

2.3.6. Meeting Venue

At District Level: It was proposed that the meeting venue will be the Council Chamber. In Villages that lie along the route or that will be affected by the Project, the Village headmen and their people will identify suitable places for community meetings for each affected area.

2.3.7. Meeting Day

The stakeholders indicated that meeting day can be held on any day during the week as long as concerned people have been informed except Saturdays and Sundays as most people attend church services.

2.3.8. Preferred Timing

The preferred meeting time was 09:00 hours but that invitations should indicate 8.30hrs.

3.0. LIVINGSTONE DISTRICT STAKEHOLDER MEETING

Three meetings were held in Livingstone. One was with the District Commissioner and the other with the local Authority staff. The Town Clerk, the Mayor and Deputy Mayor attended

the later. Others included the Director- City Planning and four (4) Ward Councilors while last meeting was attended by Chief Mukunis Advisor.

After introducing the project, the stakeholders were asked to identify possible interested individuals, organizations, CBOs and NGOs who should participate in the Consultative meetings.

3.1. Stakeholder Identification

The Chiefs Advisor indicated that all Senior Headmen for Namilangi Zone (13 Villages and Headmen) and respective Village Headmen for each including affected communities in Namilangi Zone where the proposed Dam and power station will be constructed. The others mentioned were the Local District Council Administration, Government Ministries (Tourism, Lands, Health, community Development), The District Commissioner, the Chiefs Affairs Officer and Ward Councilors. Others included the White Water Rafters Association, the District HIV/AIDS Advisor, Red Cross, including the ethnic Tonga who people were forcibly evicted to make way for the Kariba Dam in the 1950s.

3.2. Stakeholder Concerns and Expectations

3.2.1. Stakeholder Concerns

The District Commissioner observed that the project was not well publicised and requested for additional information on planned benefits to the people. Other participants noted that the project would pose loss to customary land, livelihood sources and household economic disruptions to people who rely on the Zambezi River for multiple uses. (drinking, fishing etc)

3.2.2. Stakeholder Expectations

A Ward Councillor contended that villagers through which the transmission lines will pass must be supported to improve their well-being by being connected to power grid once the project was complete. The majority of participants also indicated that they expected that employment opportunities should benefit the local people who live along the transmission line once the project began.

3.3. Scheduling of Meetings and Notifications

3.3.1. Notification Period

It was suggested that a two-week notification period was sufficient to inform all concerned parties. The proposed meeting day was 5th September, 2014.

3.3.2. Type of Notification

Letters and word of mouth would be used to notify all interested parties. There were also suggestions that local community radios (Mosi-o-tuya Radio), can carry the information. Government officials and Departments would be communicated to by the District Commissioners office while the Council Secretary working would notify the traditional leadership and Councillors. The chief through the headmen would inform the residents in the surrounding villages. It was further suggested that the DC and Chief's Affairs Officer would manage all publicity materials (posters).

3.3.3. Notification Arrangement and Meeting with Traditional Leadership.

It was the stakeholder's view that a separate meeting should be held with the Chiefs in each District. In this case, they suggested that the chief would be met with his Advisors, senior village headmen and headmen. The notification procedure to inform Senior Chief Mukuni is elaborated as follows:

The Royal Highness Chief Mukuni's Palace should be notified at least two weeks before the commencement of Consultative meetings. This will begin by a courtesy call on the Chief. The Chief will meet with his headmen and cannot attend a District meeting with other Government/NGO. The chief will then invite headmen in his area through his advisor. It was advised that the Chief was not particular about the time and could be available as early as 09.00hrs in the morning for the meeting; while word will be sent to headmen at 08.00hrs

3.3.4. Need for Translation/Interpretation

The meeting felt that there was need for a specialised translator at District level to ensure that the deaf can follow the proceedings of the meeting. At community level, an interpreter to translate information from English to the local Tonga language would be required.

3.3.5. Meeting Venue

At the District, the meeting venue would be the Government Hostel Lodge, while in the village, the Chiefs Advisors working together with Headmen would identify designated places for community meetings for each affected area.

3.3.6. Meeting Day

The proposed meeting day chosen was any working day between Monday and Friday.

3.3.7. Preferred Timing

The preferred meeting time was 0.9.00hours hours but that the time to be indicated on the invitation letters should indicate 8.30hours

4.0. ZIMBA DISTRICT STAKE HOLDER MEETING

The meeting began at 11:00hrs and was attended by the District Administration Officer who was representing the DC; the Council Secretary, the District Planning Officer and a representative from an NGO. The meeting was held in the District Commissioners Office who was not present at the time of the meeting.

4.1. Stakeholder Identification

The BHES Project was introduced to the meeting which was requested to identify stakeholders and interested parties that were key to the process of stakeholder engagement and also to share concerns if they had any. The following stakeholder groups were suggested but that many more would be identified:

District Commissioner, Council Administration, Government Ministries (Tourism, Lands, Health, Community Development); Ward Councilors. Others identified included Chiefs Simwatachela, Singani and Macha, Commercial FARMERS, Businessmen, the Ward Councillors and Members of Parliament.

4.2. Stakeholder Concerns and Expectations

4.2.1. Stakeholder Concerns

The District Planning officer wanted to know whether the project would compensate those that will be displaced by the transmission line and what sort of compensation would it be. An explanation to the question was that compensation plans and other forms of compensation will be managed once the ESIA establishes the number of people to be affected by the Project.

Stakeholders revealed that they were raising these concerns because some peasant farmers in Chief Sipatunyana's Chiefdom had lost their maize cultivation plots to a ZESCO Transmission line and were not given alternative cultivation plots.

They added that given the fact that the proposed Transmission Line may traverse through the chiefdom, the people would need assurance that alternative land should be found to those whose fields may be lost to the project. They also requested for project documentation to acquaint themselves with the project before stakeholder consultative meetings begin. The District Administration Officer observed that the line was likely to pass through areas where people that were historically displaced by the Kariba Dam and may resist to move. It was indicated that District staff must have adequate knowledge to respond to questions from community members.

The stakeholders also sought to know whether the Chiefs would be consulted. The meeting was informed that the Chiefs would be provided a platform and not left out of the process, as they oversee the villages likely to be affected by the project. Another key concern that was advanced by the Council Secretary (CS) was the absence of a defined route for the proposed transmission line right of way. The CS noted that stakeholders would appreciate that the route map and the other designs of the Dam wall and reservoir were made available before the stakeholder engagement meetings, as participants would then communicate from an informed position.

4.2.2. Stakeholder Expectations

A Councillor contended that villages through which the transmission lines will pass must be supported to improve their well being by being connected to power grid once the project was complete. Contributing to the discussion, the majority of participants indicated that they expected that employment would benefit the local people who live along the transmission line once the project began.

4.3. Scheduling of Meetings and Notifications

4.3.1. Notification Period

A notification period of between 3–4 weeks was suggested by the stakeholders as sufficient time to alert all interested parties. The proposed meeting day would then be set in September, 2014.

4.3.2. Type of Notification

Since the meeting would involve different interest groups they suggested the use of a combination of communication strategies which will include the following:

Government officials and Departments would be notified by the District Commissioners office. The Council Secretary will notify Ward Councillors and traditional leadership. The Chief will be notified through the Chiefs Advisor/ Chief Affairs Officer, while the headmen will be informed by word of mouth through the Chief Advisor. In turn, the headmen will inform residents in the surrounding villages. The District Commissioner working with the District Chiefs Affairs Officer (DCAO) will coordinate publicity materials in villages.

4.3.3. Need for Translation/Interpretation

At village level it was suggested that local Tonga or Leya translators would be required.

4.3.4. Meeting Venue

It was suggested that the Consultative meetings at the District will be held in the Council Chamber. In the village, the meeting will be convened in all those areas that lay along the designated transmission route.

4.3.5. Meeting Day

Working days were proposed as suitable rather than Weekends such as Saturday or Sunday or Holidays.

4.3.6. Preferred Timing

The preferred meeting time was 0.9.00hours.

5.0. KALOMO DISTRICT STAKE HOLDER MEETING

The consultants from Kaizen Consulting International met with Chief Sipatunyana at his town home (not Palace) on Thursday 7th August, 2014. The meeting was facilitated by the Chief's Advisor Mr. Victor Sindowe.

5.1. Stakeholder Identification

The consultants introduced the Batoka HES to the Chief. They stated that their mission was two-fold. The first was to identify key stakeholder who should be consulted at community level. The second was to plan and agree on the stakeholder consultation process, as well as to identify potential areas of concern which the Chief might have at this stage.

The following stakeholders were identified:

- Village headmen including ordinary people whose livelihoods might be negatively affected by either the electricity transmission line or flooding of rivers; and
- Villagers where people who were displaced by the construction of the Kariba dam have settled; and whose compensation was delayed for many years.

5.2. Stakeholder Concerns and Expectations

5.2.1. Stakeholder Concerns

- Flooding of rivers due to increased water flow from the dam;
- Displacement of people due to flooding;
- Lack of adequate information regarding the design of the dam and the extent to which it would impact negatively on the local communities.

5.2.2. Stakeholder Expectations

- Creation of employment opportunities for the local people during the construction phase;
- Increased access to electricity supply to the local community; and
- Resettlement of communities that would be displaced by the Batoka HES through construction of social facilities such as health centres, schools, etc.

5.2.3. Scheduling of Meetings and Notifications

In order to effectively engage stakeholders in his Chiefdom, Chief Sipatuyana made the following suggestions:

5.2.4. Notification Period

The preferred notification period was two (2) weeks. It was further suggested that consultations with the community in Sipatunyana's Chiefdom could take place on 9th September, 2014.

5.2.5. Type of Notification

Two (2) types of notification were suggested. The first was sending of Invitation Letters by the Chiefs and Traditional Affairs Officers (CTAO). Official letters would enable members of the community such as government workers to get permission from their working places. With regard to other members of the community, "word of mouth" would do. The Chief's Advisors and Retainers would inform members of the community about the purpose of the stakeholder engagement meetings as well the proposed dates and time of the meetings. The Chiefs Advisors and Retainers would inform the community through village headmen/headwomen.

5.2.5. Notification Arrangement and Meeting with Traditional Leader.

It was emphasised by the Chief that before any meaningful engagement of stakeholders in his community could take place, it was imperative that adequate information was made available not only to him, but his Advisors and village headmen. Notable in this regard were the following:

- The Plan for the proposed Batoka HES;
- The electricity transmission route including names of villages;
- Names of villages that might be affected with flooding;
- Impact on the Batoka Gorge Dam on the ecological system of the valley-downstream;
- Types of compensation for the affected villagers, etc

5.2.6. Need for Translation/Interpretation

Chief Sipatunyana is very well educated, and has served in senior government positions rising to the post of Permanent Secretary. However, some of the people in the community are not literate. Therefore, it would be necessary to have local interpreters.

5.2.7. Meeting Venue

The meeting would be held under the Mango trees at Chief Sipatunya's Palace. This is where traditional meetings are held.

5.2.8. Meeting Day

The meeting could be held on working days during the week, i.e. Monday to Friday. Saturdays and Sunday are reserved for Church services for the Seventh Day Adventist (SDA) Church and other Christian denominations, respectively.

5.2.9. Preferred Timing

The Chief preferred that the meeting should be held at his Palace starting at 10:00 hours. However, invitation letters should indicate that the meeting will start at 9:00 hours.

6.0 CHOMA DISTRICT STAKE HOLDER MEETING

On Thursday 7th August 2014 consultants from Kaizen Consulting International visited Choma with the view to introduce the Batoka HES to the Provincial and District Administrations including other stakeholders such as Chiefs and traditional leaders.

The consultants only managed to interview the District Administrative Office, the District Chiefs Affairs Officer and the Director of Planning at the Local Authority. Consultants were unable to meet senior government officials at provincial Level because there was By-Election in the area. The officials were attending to two (2) Cabinet Ministers who were in Choma for campaigns.

Highlights of interviews with the officials who were met are as follows:

- Chiefs in Choma have forbidden their Advisors from making appointments for them; except the Chiefs Affairs Officer. The Chiefs Affairs Officer promised that she would introduce us to the Chiefs by calling them first. The Chiefs do not like being given short notice for the meetings. They prefer at least one (1) week notification.

- The consultants require at least two (2) days to go back to Choma to introduce the Batoka HES project to the Provincial Administration and to visit Chief Singani whose subjects were victims of the Kariba Dam displacement. It is therefore important that an effort is made as soon as possible to visit Chief Singani.

- The consultants asked the Director of Planning for the Situation Analysis Report as well as the Strategic Plan. They were informed that Choma District has been operating without these key planning documents. The Local Authority has been using Council Resolutions to Plan and implement development programmes in the district. With the elevation of Choma to the Provincial Capital, the Administration had just started preparing the Planning documents that have been referred to.

6.1. Way Forward

(1). Adequate and detailed information about the project location and transmission route need to be made available at all levels; more so to the District staff who are in constant interaction with Ward Councilors, Chiefs and ordinary community members.

2. Consultations must begin at the National level and proceed to provincial District and Community. Consultations at Community level should be jointly facilitated by the Consultants, Traditional and Civic Leaders.

3. The Socio-economic Household survey should be informed by stakeholder engagement at community level.

Stakeholder meeting report

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3 August 2014

Prepared and compiled by Tasara F. Marondedze

Venue: Hwange District Administrator's Office, Hwange

Date: 29 July 2014. Time: 10.10 hours to 11.11 hours

In attendance:

1. Headmen Sikagune (representing Chief Shana) – 0774087358
2. B. Sibanda (representing Chief Mvutu) – 0774868620
3. Chief Hwange – 0712667506
4. Mapfuwa S (Hwange RDC Chairperson) – 0772162945
5. Ncube P. (Hwange RDC C.E.O) – 0772897842
6. Bongani Dhlodhlo (Translator/Driver) – 0774951908
7. T. Marondedze – Black Crystal Consulting

Introduction

The presentation was guided by a power-point presentation that was structured under the following agenda:

- Objectives of the discussion
- Introduction of team members
- Background to the Batoka Hydroelectric Scheme Project
- Background to the ESIA for this Project
- Requirements for stakeholder engagement
- Proposed engagement, comment and refinement of this

It was also structured under the following objectives, which were to

- Introduce the proposed Batoka HES Project and ESIA Process to key stakeholders;
- Develop a better understanding of the project affected area;
- Develop an understanding of likely issues of concern;
- Obtain your agreement with regard to holding further discussions with your constituents and the affected communities at large
- Develop an understanding as to how to best engage with stakeholders and develop a plan that will allow for this.

Findings

The meeting agreed that proposed stakeholder meetings would proceed as planned. The planned meetings are as follows:

- Meeting with national and provincial authorities in Harare/Lusaka
- Meeting with local authorities and politicians (District Councils – Administrator/Chief Executive Officer/Chairman/Relevant Ward Councillors)
- Open day in Harare/Lusaka
- Open day in Victoria Falls/Livingstone
- Community meetings for each affected traditional area
- Meeting with national and provincial authorities in Harare/Lusaka
- Meeting with local authorities and politicians (District Councils – Administrator/Chief Executive Officer/Chairman/Relevant Ward Councillors)
- Open day in Harare/Lusaka
- Open day in Victoria Falls/Livingstone
- Community meetings for each affected traditional area

Dates for the meetings was left to the stakeholder engagement consultants. Concerns were expressed about the need for meetings in Harare when the project is based in Matebeleland North where Harare-based Ministers and Permanent Secretaries of Government ministries can come. Fears were expressed that deliberations carried out in the absence of Hwange-based stakeholders could reach agreements or arrangements that are divorced from the ideals and aspirations of the actual stakeholders affected and impacted upon by the project. The concerns were assuaged by assuring the meeting that stakeholder engagement is broad and not restricted. Instead of Harare an open meeting could instead be held in Bulawayo that serves as the administrative capital of all Matebeleland Provinces. It was highlighted that views of different stakeholders are all valuable and balanced rationally and in accordance with domestic and international legislation as well as best practice.

Meeting deliberations on the engagement of local authorities and politicians as well as communities came up with suggestions that are as shown in Table 1:

Table 1: Proposed Engagement, Comment and Refinement

Engagement aspect	**Local authorities and politicians**	**Communities**	**Other considerations**
Notification period	7 working days	Less than 7 days	The DA, Chiefs, local councillors, village headmen and kraal heads to be informed about impending meetings in that order.
Type of notification – individual invitation letters (can details be provided/confirmed) and background information	Stakeholders to be notified/ invited by meeting convenor with the assistance and collaboration of the DA. The Chronicle newspapers that is largely distributed in Matebeleland provinces; – individual invitation letters distributed through a contact person such as the DA's office; invitations could flow through emails or phone calls cascading from the Consultants to key stakeholders and to their constituencies. Project	Through chiefs, village headmen and councillors with notification done through the DA. Project information required as maps and/or handouts	Stakeholders demanded a physical inspection of the power transmission route. They agreed to a road trip if an air trip could not be secured as earlier demanded.

	information required as maps and/or handouts		
Need for translation/interpretation	Meetings convened by non-locals can be held in English, although provision of Ndebele, Nambya and Tonga translations can also be helpful.	Required. Tonga, Nambya, Ndebele. Indicated local translators could be secured.	Translators have already been identified.
Meeting venue	Open days to be held in venues jointly identified between conveners and principal stakeholders. Hwange, Victoria Falls and Bulawayo. Meeting venues to be accessible and agreeable to stakeholders.	Community meeting points identified by chiefs, headmen and councillors.	Meeting places to be accessible to meeting participants
Meeting day	No specific days mentioned	No specific days mentioned	11 and 12 August (Heroes/Public holiday) was available for physical tour of powertransmission route.
Preferred timing	Open meetings ideal between morning and afternoon, 09.00 hours to 12.00 hours or 14.oo hours.	Nights to be avoided. Lunch time available if stakeholders have access to free refreshments	Community meetings flexible and can go up to 16.00 hours for local communities in consultation with villahge heads.
Venues for the	Determined by	Clinics, schools,	Venues are specific

placement of materials/reports	Consultants in consultation with the DA and community leaders. DA's office and community leaders can facilitate distribution of materials/reports	meeting points, community meeting points in communities affected by the project.	to each community depending on its availability of public places
Liaison requirements with the traditional authorities/council in advance	Chiefs already notified of the project intention as well as the consultationprocess through the meeting. Any follow-up meetings would refer to the present meeting.	Local gatekeepers to be informed separately, refernce being made to meeting with chiefs, HRDC CEO and office of the DA. and	

The stakeholders also made the following demands:

- Contracts for works associated with land clearance for power transmission routes;
- Empowerment of locals in employment associated with the project; and
- Compulsory corporate contributions to development of local area as opposed to voluntary Corporate Social Responsibility.

To this it was indicated that the stakeholder engagement process through stakeholder engagement meetings would entertain and document all stakeholder ideals that would also be buttressed by the baseline social and economic survey of affected communities. It was also indicated that issues of development of the local area would be considered under local legislation, particularly ZimAsset as well as regional and international best practice.

Observations

The meeting was productive and its objectives were met. An impression may have been created that the local authority may be the only significant stakeholder that holds the key to approval of the project at the expense of other regulatory stakeholders, hence the immediate relapse into demands. The Chiefs have indicated an inclination towards cooperation rather than opposition.

Annex C4

Attendance Registers

Meeting: Bulawayo Authorities

Date: 1st Oct '14

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR ROB WATERS	IMVELO SAFARI LODGES (GORGES LODGE)	PROJECTS MANAGER	09 232312 232331	—	BOX 768 BYO 68 TOWNSEND ROAD, BYO	rwaters747@gmail.com imvelo@imvelosafarilodges.com
MISS N. DUBE	LOCAL GOVT	ACTING P.A MAT NORTH	0712792855 0773275036	09-883790		dubenosizi@yahoo.com
Mrs B. Tagwirei	ZINWA	Q.A officer standing for C. Manager	0772981925	09-69361-4	BOX 560 BYO	btagwirei@zinwa.co.zw
Mr F. Ndhlovu	D.P.P. (Department of physical Planning). Ministry of Local Government.	P.P.O (Provincial Planning Officer).	0772 442 229	09-78487	P. BAG A5201 BULAWAYO	dppmatnorth@mlg.gov.zw frahndhlovu@gmail.com
MRS JEAN WHILEY	NONE	NONE	0772-168-136	09-285611	PO BOX 3327 BULAWAYO	whileyjean@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
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Mr CHRISSIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY	WATER RESOURCES ENGINEER	+260-977-807758		Box 30233 LUSAKA ZAMBIA	namakando@zarabo.org.zm namakandoc@yahoo.com

Meeting: Harare Public Open Day
Date: 30th Sep '14

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Richard Maasdorp	Zambezi Society	Strategic director	0772419897		9 Gramer Lane Borrowdale Harare	racmaasdorp@gmail.com
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Prof. ISLA GRUNDY	Dept Biological Sciences UZ	Head of Ecology	07795304-63 04 303211 x 14[redacted]321		PO Box MP167 Mt Pleasant Harare	isla.grundy@gmail.com
MR PARTSON I MBIRIRI	Min of Energy and Power Development	Secretary + ZRA Chairman	0712876540 0773004989	Box CY7758 Causeway HARARE		pimbiriri@energy.gov.zw
MR. SHUMBA Z.G	min of Energy and Power Development		0712884808		Box CY7758 Causeway Harare	zgshumba@energy.gov.zw

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Ms Elizabeth KARONGA	ZRA	PR & Communications Manager	+260 977 318735 +263773 002978		Box 30233 Lusaka Zambia	karonga@zaraho.org.zm
MR SIMON SIKOTA	Ministry of Youth, Indigenization and Economic Empowerment	S.A.O.	(04) 797239 0773 971296		Mkwati Building 17th floor. cnr Livingstone & Fifth Street	mrsikota@yahoo.com
Tendai Sahonda	FinX	Reporter	0776372 003			tasahonda @gmail.com.
Mr Oliver Wales-Smith	Environment Africa	PA	0774 185 930			oliver@ environmentafrica.org
Eng. CHRISPIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY	WATER RESOURCES ENGINEER	+260-977 807758		Box 30233 LUSAKA ZAMBIA	namakando@ zaraho.org.zm

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Mr John Chikeya	Nan Jian Southern Africa Pvt Ltd	Project Coordinator: Power Generation	077782690		22 Ferguson Ave, Greendale, Harare	jtchikeya@gmail.com
ENG. VICTOR SIBANDA	Nan Jiang Southern Africa P/L	Project Coordinator	0772408191		71 Orange Grove Highlands Harare	victorsibanda@gmail.com

Meeting: Hwange Rural District council

Date: 3rd Oct '14.

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR MILAZI A	DA's Office	Intern	0773 664477 0281-22245/6		P.O Box 121 DA's Complex Coronation Drive Hwange	milazianusa@yahoo.com
MR. H HERBERT SANSOLE	HWANGE SHOW SOCIETY	CHAIRMAN	0772903126		528 CHIBONDO HWANGE	hhsansole@gmail.com
MISS ANNAH CHUMA	HWANGE COLLIERY COMPANY	Environmental officer	0714 750 280		Business Dept Box 123 Hwange	achuma@hwangecolliery.co.zw
MR ~~LAWSTON~~ KHUMALO	CHAMPION FARMERS	CO-ODNATOR	22661		DA'S OFFICE	Langton khumalo59@gmail.com
~~Inspector~~ Mr. Neule Makeyi	ZRP	Inspector	0773 9124 714		Box 1 Hwange	makeyineule@gmail

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR LUNGILE JAMES DHLOMO	DEPARTMENT OF LIVESTOCK PRODUCTION AND DEVELOPMENT (DLPD)	LIVESTOCK SPECIALIST	0281-21927 0779759-387		P. O. BOX 117 VETERINARY SERVICES HWANGE	lungiledhlomo@yahoo.co.uk
MR NOISE MOJO	AGRITEX	AGRIC EXT. OFFICER	0281-22234 0777942245	0281-22234	P. O BOX 300 HWANGE	—
MR NQOBILE N. MABHENA	HWANGE LOCAL BOARD	ENVIRONMENTAL HEALTH TECHNICIAN	0713099894		PO BOX 140 HWANGE	nnqobilemabhena@gmail.com.
MRS NYARAI NJAMUSHAMBA	PRESIDENT'S OFFICE	ADMINISTRATOR	0774 944 055		COMPENSATION HOUSE	ropasabeka@gmail.com
MR JAIROS MUKULI	District Development Fund	Dist Artisan	0779992772		DDF Box 275 HWANGE	—

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR ALFRED JIJAH	REGISTRAR GENERAL	PROCESS ... OFFICE	0281 22453 0777712771	0281 23134	BOX 170 HWANGE	alfredojijah@gmail.com
MR JABULANI MOYO	HRDC	COUNCILLOR	0773007975		JABULA P. SCHOOL P.O. BOX CT 404 VICTORIA FALLS	
PREVIOUS NCUBE (MR.)	LOCAL GOVERNMENT	INTERN	0281 2225/6		Office of the District Administrator Coronation Drive P.O. BOX 128 HWANGE	ncubeprevie@gmail.com
Ms Elizabeth KARONGA	ZRA	PRCM	0773002978 +260977318735		Box 30233 LUSAKA Zambia	karonga@zarabo.org.zm lizkaronga@yahoo.com
MRS SCHOLASTICA MHLANDA	CIVIL SERVICE COMMISSION	DISTRICT INSPECTOR	0281-20853 0712 594 106		C.S.C. BOX 138 HWANGE DA'S COMPLEX	schomhlanda@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
DUMISANI NJATHI	ZINWA	W/S/SUPT	0773263222		Nº 16 ACACIA LANE HWANGE	dumienyathi@gmail.com
MUDENDA ALIC	HRDC	Engineer	0775044194		HWANGE RDC BOX 165 HWANGE	alicmudenda@gmail.com
ROSELYN MUGWECHETE	PRES DPTM	Officer	0772444271 0772441271		BOX 110 Hwange	mugwechete@gmail.com

Meeting: KAZUNGULA COUNCIL CHAMBER

Date: 10th October, 2014

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MUSAMPELE K BRIGHTON	~~AREA~~ K.D.C. COUNCILLOR	~~AREA~~ COUNCILLOR	0977 710998	—	BOX 61133 KAZUNGULA	—
GETRUDE MUNWIMI	Community Development	Ass. Com. Devpt Officer	0979527202	—	BOX 60487 KAZUNGULA	Munwimigetrude@yahoo.com
GISFORD MULEYA	KAZUNGULA DISTRICT COUNCIL	Com. Development Officer	0977604522	—	BOX 61133, KAZUNGULA	gisfordb@yahoo.com
MOMEX HABANTI	KAZUNGULA DISTRICT COUNCIL	ASSISTANT TOWN PLANNER	0977176414	—	BOX 61133 KAZUNGULA	mhabanti@gmail.com
RABECCA TEMBO	KAZUNGULA D. COUNCIL	WATER & SANITATION COORDINATOR	0979574175	—	BOX 61133	r.tembo@yahoo.com

Meeting: KAZUNGULA DISTRICT

Date: 10 – 10 – 14

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
ABBY CHUNGU	KAZUNGULA DISTRICT COUNCIL	HEALTH INSPECTOR	0966969994	–	BOX 61133 KAZUNGULA	abbychungu@gmail.com
NOOLE MASS	MOCTA	T.A.O	0977546662	–	BOX 19, KAZUNGULA	noremass@yahoo.com
KELYSON MANTULA	KAZUNGULA DISTRICT COUNCIL	PHYSICAL PLANNER	0977-700 700	–	BOX 61133 KAZUNGULA	kelysonm@yahoo.co.uk
NAMAKAU NALUMINO	KAZUNGULA DISTRICT COUNCIL	ADMINISTRATIVE OFFICER	0977 688 544	–	61133 L/STONE	kauthen@yahoo.com
WENDY MULENGA MUCHINDU	NATIONAL AID COUNCIL DATF	DACA	0977748 9116	–	61133 KAZUNGULA	wendymuchindu35@yahoo.com.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
GERTRUDE KAFUE COUNCILLOR	KAZUNGULA DISTRICT COUNCIL	COUNCILLOR	0978-93 6985		KAZUNGULA DISTRICT COUNCIL	
BIGGIE CHOONGO	"	COUNCIL TREASURER	0977271596		"	bchoongo@gmail.com.
Elizabeth KAROUGA	ZRA	PRCM	0977318 735		Box 30233 Lusaka Zambia	karonga@zaraho.org.zm
CHRISPIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY	WATER RESOURCES ENGINEER	0977-807758		BOX 30233 LUSAKA ZAMBIA	namakandoc@yahoo.com namakando@zarahe.org.zm

Meeting: LIVINGSTONE MUSEUM CONST. HALL

Date: 9.10.14

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Eng. NWANANJI SIKOMBE	Road Development Agency - Southern province.	Engineer. Contracts.	+260977 166285		P.O Box 60431 Nkumbi Road Livingstone.	irwasiko@yahoo.com.
Moses Mutambala	Zambia Environmental Management Agency (ZEMA)	Principal Inspector	+260977 819283	+260213 32129	P.O. Box 60195 Livingstone	chabatoto@gmail.com mmutambala@zemaorg.zm
Mrs Musawa Hamusonde	National Heritage Conservation Commission	Ecologist	+260 977 710923	+ 260 213 323653	Box 60124 Livingstone	musmus7703@yahoo.co
Joseph BUNDA	LCC	Evaluation officer	0978 405145	+260 213 321420	Box 60394 Livingstone	jb41@gmail.com
BANWELL MWILA	DBA	Chairperson	0977885959 0955993740		Box 60208 LIVINGSTONE	mwilabanwell@yahoo.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Mr. Simon Lembo	ZEMA	Inspector	0955596584	321297	P.O Box 60195	stembo@zema.org.z
Mr Lloyd Nundwe	ZEMA	Inspector	0977332428	321297	P.O BOX 60195	lnundwe@zema.org.zm
MR KAWANA MUNALULA	LIVINGSTONE MUSEUM	RESEARCHER (BOTANY)	0977-786460	–	Box 60498 LIVINGSTONE	munalulak@gmail.com
JACOB MAKONO	ENVIRONMENT AFRICA	ASSISTANT FIELD OFFICER	0964678444	–	MOSO-TUNYA BUILDING OLD WING 6th FLOOR ROOM 610 LIVINGSTONE.	yakobomakono@gmail.com
CLEMENT POTAID CHISANGWA	BUNDU RAFTING COMPANY	TRIP LEADER	09610 68249	–	DC116 DAMDWA CENTRA	clementchisangwa@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
P. Musokolwane D.C Kazungula	O.O.P.	District commissioner	0979960445			Pasmuso@Yahoo.com.
DIANA CHUNGA PUBLIC RELATIONS OFFICER.	LIVINGSTONE CITY COUNCIL.	Acting public Relations officer	0966507334		Livingstone city council P.O. box 60029	Chunga.diana@yMail.com
Vister Mugandu Zambezi ward member	Zambezi ward	Member	0978991400		Zambezi ward	
Trinah Jani Zambezi ward member	Zambezi ward	member	0971083504		Zambezi ward	

Meeting: BATOKA GORGE PROJECT
Date: 23/01/15

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MS Cardyme (Carrie) Pretorius	Hearth Earth Art (Permaculture Fundi)		096964 8214	/	/	girl2river@yahoo.com
JOHN Simonsen	HRC MUSOKOTWAN		097915 3010	/	/	—
Lamack Mushabati	Member Musokotwana		—	/	/	—
BERNARD SINYANGWE	ENVIRONMENTAL AFRICA DAMBISA	CHAIRPERSON	0977333044 0955915248	/	Box 60066 L/STONE	bernard.sinyangwe@yahoo.com
GILL STADEN	THE LIVINGSTONIAN	DR	0977838 512		61070 LIVINGSTONE	gill@lowdownontravel.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Tony King.	Safari Par Excursions	OPS MAN.				ZAMOPS@SAFPAR.COM.
Sunday Siakasweka	Musokotwane village	Treasurer	0969430338			
Melody Lubamba	Environmental Africa	Member	0961791117		P.O Box police camp central Livingstone.	
Mwiya Olien	Environmental Africa	Member	0972079688		Mukuni village P.O. Box 61133 Livingstone, Kazungula.	
KALUMBA ETHEL	LIVINGSTONE CITY COUNCIL	PLANNER	0977748030	03 32 3847	60029 LIVINGSTONE	ethkalu2@yahoo.com kalumbamuxandwe@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Miss Perrice NKOMBWE	Livingstone Museum	Keeper of Ethnography	0971 011724 0953 708700		BOX 60498 LIVINGSTONE MUSEUM	perricenkombwe@yahoo.com
REV. OSCAR MUYUNDA	ZAMBIA EVILMENTAL		0977 958 453.		Box 60755 L'stone	Omuyundah.@yahoo
MUKUNI NCHOBA	MUKUNI VILLAGE E.A.G.	MEMBER	0974666 410	✓	MUKUNI VILLAGE P.O BOX 61137 L/S	
GEORGE MAKAHA	JCTR	REGIONAL OFFICER	0977340241			show@jesuits.org.z
MUBIANA OBERT	ENVIRONMENT AFRICA	FIELD OFFICER	0979457539			mubianaobert@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
SAKALA SAMSON D	KAZUNGULA DISTRICT EDUCATION BOARD	DISTRICT EDUCATION BOARD SECRETARY (DEBS)	0977620252 0965620252 0955620252		P.O. BOX 22 KAZUNGULA	samsondsakala@yahoo.com
VICTOR MUCHIMBA	MUKUNI ~~AA~~ 9 MEMBER	MEMBER	0979415609		PO BOX 61133 KAZUNGULA	
CHILEMBO ROBERT	ZAMBIA WILDLIFE AUTHORITY	RESEARCH TECHNICIAN	0979930562		Head office Mosi-oa-Tunya Area management Livingstone	robertchilembo@gmail.com
Arthur Sonnenberg	Zambezi Nkuk	Director	0977847406		PO Box 60604.	arthur@bushbling.com

Meeting: BATOKA EIA / ERM / KAIZEN
Date: 23/1/15

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
ENOCK CHILOYA SECRETARY	EAG	SECRETARY	0973553628[illegible]	—	—	—
HAZEL MILIMO	EAG	MEMBER	0978648256	—	MUKUNI VILLAGE	—
KEPHY MAINZA	ZEMA	C' MEMBER.	0961912508		MUSOKOTWANE VILLAGE	
EVELY KAZOKA M.	CHESHIRE HOMES	MEMBER	0979307830		60758	enkazoka @ Yahoo. Com
FELIX BUNDA	EAG	SECRETARY	0966912449	—	BOX LIBUYU	—

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MISS CHANDA MWAKE	WWF	FRESHWATER	0965772525			cmwale@wwfzam.org
MALAWO SIMEON	E A G	MEMBER	–		MUKUNI VLGE 601133	–
MUBITA GODFREY	EAG	MEMBER	0972303896		MUKUNI VILAGE 61133	–
LIKUKELA ELINAH	EAG	V. Chair Lady	0966321995	–	MUSOKOTWANE	–
RICHARD MUNANAUTA	E A G.	C. MEMBER	0953553449	–	LIBUYU WARD A 5b.	–

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Laurent Marie-Kalaluka	Tabonina Guesthouse	Dr.	0213 320274			tabonina@yahoo.com
MRS MARGARET WHITEHEAD	WECSZ	MEMBER	0955 716341		P.O.BOX 60648 LIVINGSTONE	mwhiteheadzam@gmail.com
Fredrick NSamba Chumbula	Zambezi EAG.	member	0974-158932 096655-8932	—	60471 L/STONE	
GRACE MILUPI	Simoonga Ward EA9	Chair Person	0975832058		B7 Indeco Ext	
Julius male	SafPat	Guide	0964664511		3 Yeta	Nalishebajulius@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
EDMUND KEAST						
FAAN FOURIE	TAITA FALCON LODGE.	DIRECTOR	0978225303	321850	Box 60012 L/STONE.	taita-falcon @microlink.zm.
SÉAN EDINGTON	SELF	OWNER	0979626782			production@safpar.com
NEPHAT MUTEMA	Mukokotwane U/G	MEMBER	— —			
MOONGA CHIPO	ENVIRONMENT AFRICA	ASSISTANT FIELD OFFICER	0976683501			

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MAJUMBETO MUHONGO	ENVIROMENTAL ACTION GROUP	MEMBER	0977317648		61133 MUKUNI	
CATHRINE MUTEMA	ENVIROMENTAL AFRICA	CHAIRPERSON MUKUNI	096664171		61133 MUKUNI	
CHOOLWE SHALWINDI	LIVINGSTONE MUSEUM	KEEPER - BOTANY	0979773963			cshalwindi@gmail.com
CHIIWZA SIAVUMBA	SAVANNAH SOUTHERN SAFARIS	GUIDE	0978169561		60620	walks@savannah-southern-safaris.com
FRED SIKAZWE	LIVINGSTONE CITY COUNCIL	DEPUTY MAYOR	0977 368986		1565 KANINI CRES	Sikazmedh@yahoo

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
IMEEN NGANDU	ENVIRONMENT AFRICA	YOUTH	0978587006			ngandu@gmail.com.
Mary Chivunda	ENVIRONMENT Africa	YOUTH	0963553215			Lixy Divine
~~A/Lodge Manager~~ Ms. Kalinda Hamabwe	Wasawange Lodge & Tours	A/Lodge manager	324078 0966 323 217	324067	P.O. Box 60278	waslodge@zamnet.zm
JOHN KADYAMA	FISHERIES DEPT L/SIDE	DISTRICT FISHERIES OFFICER	0977427257		Box 60427 L/SIDE	
Dr Samuel Sikaneta	Nunga Eco-Lodge	Director	0965715442	—	Box 60129 L/stone	s.j.sikaneta@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
~~RLAN~~ MR KELYSON MANZOLA	KAZUNGULA DISTRICT COUNCIL	PHYSICAL PLANNER	0977-700 700 / 0955 800-700	—	P.O. BOX 61133 KAZUNGULA	kelysonmanzola@yahoo.co.uk
MR NYAMBE MUMBULA	ZAMBEZI WARD	V/CHAIRPERSON	0977673702		DISTRICT PLOT # 626 LISTONE	
GEORGE S. MAKATHA	JCTR	OUTREACH REGIONAL OFFICE	0955-699950	—	Mosi-tunya Hse old wing Room 607 6th floor	gchiwonesa@yahoo.co.uk shaw@jesuits.org.zm

Meeting: BATOKA EIA / ERM / KAIZEN
Date: 23/1/15

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
GOLDEN LIKOKOTO	EAG	COMMITTE MEMBER	0973258295		D SS 163	
DOMINIC KASANGA	—	COMMITTE LEADER	0977 686919	-	A S2 LIBUYU T/SHIP	-
ENOCK LABISI	Safpar	Guide	0977 229547	—	-	Kafekwa@yahoo.co.uk.
ACKSON SHAWA	ENVIROMENT AFRICA DAMBWA WARD	SECRETARY	097640 4186	—	BB185 D/CENTRAL L/STONE	N/A
BRAD KOASE	Maramba River lodge	lodge Manager	097724013		P.O. Box 90575	manager@maramba[illegible] - com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
DAVE Gyles	SAFARITREK	CEO			P.O Box M54 LIVINGSTONE	dgyles@safaritrekafrica.com.
ANDREW BOLTON	SAFARI PAR EXCHANGE	RAFTING / CANOE MANAGER			ZAMBEZI WORKS LVI	rafting@safpar.com
GENE PECKER	SAF PAR	MANAGER			P.O. Box LVI	SPEZAM@SAFPAR.com.
Joseph Kachingwe	Environment Africa	member	097818 9015			Kachingwe.joseph.kj@gmail.com
LUBASI MELODY	ENVIROMENT AFRICA	MEMBER	0977145452		MUKUNI VILLAGE P.O BOX 61133 LISTONE	

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Clare Mateke	Livingstone Museum	Keeper of Mammalogy	0977-446080		P.O. Box 60498 Livingstone	cmateke @gmail.com
BRAVE MUSITABATI	MUKUNI VILLAGE EAG	SECRETARY	0973677957 0961089360		Mukuni Village P.O Box 61133	bmushabati @ Ymail.com
ZUWANA CHIGWENEMBE	EAG MARAMBA WARD	V. CHAIR LADY	0977694254		R79 MARAMBA L/STONE	—
RUTH HENSON	LIVINGSTONE KAZUNGULA FARMERS ASSOCIATION	CHAIRPERSON	0955-443711		Box 60641 L/STONE	rhensonzam@ gmail.com
JOAN SIKANETA	MUNGA ECO-LODGE	OWNER/ DIRECTOR	0974109053		PO BOX 60129 L/Stone	s.j.sikaneta @ gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Ms VISTA MUNGANDY	ZAMBEZI WARD	MEMBER	0978991400	—	—	—
MWAMPOLE K. BRIGHTON	MANDA WARD COUNCILLOR	—	0977 71498	—	—	—

Meeting: Livingstone Open Day
Date: 6th Oct '14

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Mr Ruaridh Stevenson	Adventure Logic	Owner	+260 966946 183	—	—	ruaridh@adventure-logic.com
MR Scott Tiley	SAF PAR	Free lance Raft Guide	+260 978 177 580			Scotttiley@gmail.com
MR ENOCK CHILEYX	EAG	MEMBER	0976536251			
GOLDEN LIKOKOTO	EAG	MEMBER	0973258295			
NYAMBE MUMBULA	EAG	VICE CHAIRPERSON	0977673702			

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
CLEMENT CHISANGWA	BUNJU ADVENTURES	RAFT GUIDE	096 10 68 249	N/A	DC 116 DAMBWA CENTRAL	clement chisangwa @ gmail.com
OBERT MUBIANA	ENVIRONMENT AFRICA	FIELD OFFICER	0979-45-75-39	N/A	MUSI-O-TUNYA Building Room 6-10.	mubianaobert @ gmail.com
JOSEPHAT MULUTI CHINGUMBE	BUNDU ADVENTURES	1 RAFTING PORTER	097801 6563	N/A	I 3 KASHITU COMPOUND	N/I
STANELY MECK	BUNDU -	PAPNTIN GAA	~~[illegible]~~ 0965 35 65 65	N/A	I 3 KASHITU COMPOUND	N/I
ACKSON SHAWA	ENVIROMENT AFRICA	MEMBER	0976 404186	N/A	DB185 DAMBWA CENTRAL	N/A

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
PASTOR GEORGE SIAMUUWANGA	ENVIROMENT AFRICA	C/MEMBER	0977 692164	Z	BOX M21 MARAMBA LYSTONE	gsiamuuwanga@yahoo.com
GREGORY SIACHINGA			0966 845201			
EMMANUEL BANDA			097921 4818			
DOMINIC MABUNDA		RIVER GUIDE	0978-024415			Dominicmabunda@yahoo.com
GIFT PONISO			0977-371995	Z	—	—

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR SEAN EDINGTON	ZAMBEZI MEMORIES SELF	~~CHAIRMAN~~ ~~CHAIRMAN~~	0974626782		CINOM FARM	production@satpw.com
Zulu Kevias	Bundu adventure Rafting company		0968815112		Bundu	andre73@yahoo.com
Julius Nalisheba	Zambezi memories		0964666511		3 Yeta avenue	JuliusNalisheba@gmail.com
STANFORD ZULU	ZAMBEZI MEMORIES		0965618496		138 DSS LIVINGSTONE	
Kelvin Muyentwa	Zambezi Rafting Company		0974063980		bundu	

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Melvin Ndelewa	SAFARI		097331829		Melvin	✓
Jerico	Bundu	–	094206091		J. M	✓
July	Bundu		0972064230		July	✓
Lamus	Bundu		0974540645		L. S	✓

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Mafulo Kakoma Bundu adventure	Bundu Safari Company	0978702931		—	Bundu	—
Siloka Kakoma	Bundu adventer	0978702[illegible]		—	Bundu	✓
Chuma	Muncuna	0917502			Bundu	✓
Sepiso Mukele	BUNDU	09653146			Bundu	—
CLEMENT SIMALWEZ	Bundu Adventure	0961071762		—	Bundu	✓
Windos MUSWEU	Bundu Adventure	Kayaker	0976132654		Bundu	—

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
CLEMENT MANDALA	BUNDU ADVETURE	TRAINEE GUIDE	096192 1179		BUNDU	—
ANDREW KOZWANI	Bundu ADVETURE	manager	0977 14386		Bundu	—
MR STEPHEN CHIKATE	DEPT OF COMMUNITY DEVELOPMENT	DISTRICT COMMUNITY DEVELOPMENT OFFICER	0955771087	260213 320525	P.O. BOX 60487 Livingstone	schikate@yahoo.com
MODERN SIMABENGA	SOCIAL WELFARE	DISTRICT SOCIAL WELFARE OFFICER	0979886737		P.O. BOX 60487 LIVINGSTONE	msimabenga@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
SIANENE PETER	BUNDU SAFARI	KAYAKER (PHOTOGRAPHER)	0976-405273		BUNDU	—
NZALA NIYOBA	Bundu Adventure whitewater	TRAINEE GUIDE	0964-66 1105	—	BUNDU	—
SIANBUBU HENRY	Bundu Adventure	TRAINEE GUIDE	0962508460		Bundu	—
SIMUBALI CEASER	BUNDU RAFTING COMPANY	TRAINEE GUIDE	0976831864	—	BUNDU	—
INNOCENT SIAMAKUKANI	BUNDU ADVETURE	TRAINEE GUIDE	096540 3790	—	BUNDU	—

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR. BERNARD SINYANGWE	E A G.	CHAIRPERSON	0977333044		Box 60066 L/STONE	bernard.sinyangwe@yahoo.com.
MISS MAJUMBELO MUHONGO	EAG	MEMBER	0977317648		BOX 61133 MUKUNI	
MUSHABATI BRAVE	EAG SECRETARY	SECRETARY	0973 677 957		61133 Mukuni	bmushabati@yahoo.com
M/s Grace MILUPI	EAG Chairperson Simonga	C/person	097583 2058		B7 Indeco Est	—
DAVE GYLES	SAFARI TREK INTL. GROUP	CEO			P.O Box M54 Livingstone	dgyles@safaritrekafrica.com.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Catherine Loke	OWA	Safety Training Director			PO BOX 1370 White Salmon, WA 98672 USA	Catherine.s.loke@gmail.com
ELISSA DAVIE	FAWLTY TOWERS	GENERAL MANAGER	0213 323433			elissa@adventure-africa.com
Emma Kennedy	The Butterfly Tree	Project Manager	09783 57352			emma@thebutterflytree.org.uk
ANDREW BOLTON	SAFARI PAR EXCELLENCE	RAFTING/CANOE MANAGE	0955 838408		THE ZAMBEZI WATERFRONT SCHICANGO RD LVI Box 60407	rafting@safpar.com
Malte Bierdorff	Livingston Chamber	EO	096 8238481		Old civic centre Mot. Rd.	Livcci@yahoo.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MRS RUTH HENSON	LIVINGSTONE/ KAZUNGULA FARMERS ASSOCIATION	CHAIRPERSON	0955 443711 327469		BOX 60641 LIVINGSTONE	rhensonzam@gmail.com
Johannes Stallmann	Bundu Adventures	Owner	0979203988		Box 60773 Livingstone	jo@bundu adventures.com
DAVID CHOONGO	SAFARI PAR EXCELLENCE	RIVER GUIDE	097727-8352	—	BOX, 60407 L/STONE	
Christa Frankert	Bundu Adventures	Admin	0979911888		Box 60773 Livingstone	jo@bundu adventures.com
Mr. Cooper Freeman	Private	Tourist			California, USA	cfreeman510@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR KINGSLEY LILAMONO	LIMBO LODGE	OWNER	322096 0979311133	322096	BOX 60886 L/STONE	kingsley@limbolodge.com kingsley@limbolodge.com
CLARE MATEKE	WILDLIFE & ENVIRONMENTAL CONSERVATION SOCIETY OF ZAMBIA LIVINGSTONE MUSEUM	BRANCH SECRETARY KEEPER of MAMMALOGY	0977446080		P.O. BOX 60498 LIVINGSTONE	cmateke@gmail.com
DPO. ZIMBA CHRISTOPHER LUKUNESA	ZIMBA DISTRICT COUNCIL	DISTRICT PLANNER	0965-250182		BOX 610108 ZIMBA	clukunesa@yahoo.co.uk
MRS MARGARET WHITEHEAD	CONCERNED CITIZEN		323565 0955-716341		BOX 60648 LIVINGSTONE	mwhiteheadzam@gmail.com
STEVEN MWIINGA	E R B	SENIOR MANAGER	0979451873		BOX 60292, L/STONE	smwiinga@erb.org.zm

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
ENG. HUMPHREY NGWALE	E.R.B	ENGR - ELECTRICAL	0973491075		P.O BOX 60292	hngwale AT erb.org.zm
MUSONDA CHIBULU	ERB	Consumer Affairs Officer	097 — 759387		Box 60292	Cmusonda @ erb.org.zm
MWATLE LUS 121	ZAWA	Senior wildlife warden	0977238522		Box 60086 Livingstone.	luzy.mwale@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
RICHARD MINANAUTA	E.A.G. LIBUYU WARD.	MEMBER	0953 55 34 49.	NIL	A 56 LIBUYU	NIL
WINFRED SIFALE	E A G LIBUYU WARD	MEMBER	— —	NIL	A 151 LIBUYU	NIL
OSCAR M. MUYUNDA	E.A.G MARAMBA WARD	CHAIRMAN	097795845 3	—	171 MARAMBA LINDA RD	Omuyunda@yahoo.com
MARK GILL	RAFT EXTREME	DIRECTOR	323929	322370.	BOX 61105 L/STONE	—
GILL STADEN	THE LIVINGSTONIAN	DIRECTOR	323511	—	BOX 61070 LIVINGSTONE	gill@lowdown tvavel.com

Meeting: Lusaka authorities meeting

Date: 8th Oct '14

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Miss Chiluweza Musonda Muzongwe	Ministry of Community development Mother and Child Health	Planner - Development Cooperation	0967979149		Private Bag RW252	Chiluwezam@outlook.com
Ms Alexandra Conroy	WASAZA	Engineer	0966329972			alexandra@wasaza.org.zm
Mr. Evaristo Kasumba	Geological Survey Dept.	Acting Senior Geologist	0979687421		Box 50135 LUSAKA	evaristokasumba2@gmail.com
MUSHIMBEI MULIYA	Road Development Agency	Principal Environmentalist	0977 405784		Box 50303, LSK	mmuliya@rda.gov.zm
CHRISTOPHER KANIKI	ZESCO	ENVIRONMENTAL SCIENTIST	0955996383		Box 33304 LUSAKA	ckaniki@zesco.co.zm
Emmael M. Nyonde	MAL	Principal Irrigation Engineer	0978954135	—	Box 50291	Sweetkafopanke@yahoo.co.uk

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Agrey Smith	Department of Energy	Energy Information Officer	0977561830		P.O BOX 31969	asmlutaemewd.gov.zm aggrey81@yahoo.com
Misheck M. Mubuyaeta	Department of Energy	Energy Officer	0979002299		P.O BOX 31969	mmmubuyaeta@mewd.gov.zm mishmmubuyaeta@gmail.com
Curtis Muleya	NWASCO	TECHNICAL INSPECTOR	0977685997	226904	34358	cmuleya@nwasco.org.zm
OSCAR SILEMBO	DWA	SENIOR WATER QUALITY OFFICER	0955/77 863089	–	Box 30530 LUSAKA	oscarsilembo@yahoo.com
WILSON K. SAKALA	ZRA	SENIOR MANAGER (WREM)	0965511945	227498	P.O. box 30233 LSK	sakala@zaraho.org.zm

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Lucas Zulu	Min of Tourism & Arts	Principal Planner	0977562278		Box 30575	Lzulu@mota.gov.zm
MADALITSO JEMBO	MINISTRY OF TOURISM	TDRO	0966835004		BOX 30575	madalitsojembo@yahoo.com
Brian Nkwamba	Ministry of Tourism and Arts	TDRO	0977307448	—	"	Khondwanimwamba@gmail.com

Meeting: Lusaka Open Day
Date: 7th Oct '14, 15h00

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR JONES MASONDE	ZAMBIA WILDLIFE AUTHORITY	SENIOR WILDLIFE ECOLOGIST	0950205468		P/B 1 CHILANGA	JONES.MASONDE@ZAMA.ORG.ZM
MS CHANDA MWALE	WWF	FRESH WATER	0965772525		P.O.BOX 50551 RW LUSAKA.	cmwale@wwfzam.org
MR DANIEL PHIRI	WWF	INTERN	0965975504		P.O BOX 50551 RW LUSAKA	danielphiri@outlook.com.
David Ngwenyama	WWF	Policy	0962875790		"	dngwenyama@wwfzam.org
Pius LILANDA	CBNRM FORUM	FIELD OFFICER	0977646773 0968198350		P.O.BOX (Private adress) 31598 LSK/Box 50551 RW.LSK	piuslilanda@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
AKABINA MUKELABAI	CBNRM	PROJECT OFFICER	0977801744	—	LUSAKA	akabinam@yahoo.com
Elke Praagman MSc	WWF	Freshwater	0977202508		Lusaka	epraagman@wwfzam.org

Meeting: BATOKA ELA VIC FALLS
Date: 22/1/2015

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
LEONARD NCUBE	CHRONICLE	SENIOR REPORTER	0773432655 (013)45203/4			ncubeleon@gmail.com
N. Ndlovu	VFM	DTT	0712862767			nndlovu@vfm.co.zw
N Ncube	VFM	TP	0772405091			nncube@vfm.co.zw
S Sibanda	VFM	TE	0772411458			ssibanda@vfm.co.zw
P Mabhureni	VFM	HRO	0772265812			pmabhureni@vfm.co.zw

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MD SIBANDA	VFM	I.A	0772477807			Rmosesdanlington@yahoo.com
P. S. NDLOVU	V.F.M.	CS	0772411457	013-40253	BOX 41 V. Falls	psndlovu@vfm.co.zw
MIRRIAM ESTHER CHIKWAMA	MIN OF YOUTH	YOUTH OFFICER	0775122643 0712336884	—	215 Compensation House Hwange	—
MUKOMBERO VINCENT	IMMIGRATION	REGIONAL IMM. OFFICER	0712324214	(013)44238	1 Livingstone Way V/F	overmukombero@yahoo.co.uk
MATENDA G MIKE	DEF	LIASON offr	0712046382 0776025761	N/A	V. Falls	N/A

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
ROBIN BROWN	CANSAF	M.D.	0772274554			robin@cansaf.com
MUSA DHLAMA	MOD	I.O OFFICER	0772316168			
MUNYORO GLADMAN	MOD	I.O	0773 068 174			
Brent Williamson.	Adventure Zone.	MD	0712205306			brent@adventurezonevicfalls.com
MANGWIRO RURWAKUMIRE	AGRITEX	EXTENSION OFFICER	0712541272			kmangwiro37@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
ENG ANDREW RAMANDI	ZIMBABWE POWER COMPANY	CIVIL ENGINEER (PROJECTS)	+263 713 987886		HWANGE POWER STATION, HWANGE	engramandi@gmail.com aramandi@zpc.hps.co.zw
Miss Annah Chuma	Hwange Colliery Company	Environmental Officer	0782 157 151		HCCL	achuma@hwangecolliery.co.zw
Miss. Netsai Munengami	Hwange Colliery Company	Junior Environmental Officer	0774145721 0712594121		HCCL	nmunengami@hwangecolliery.co.zw
Honye Herbert Sansole	Matetsi ECS	Committee member	0772903126 0712958397		528 CHIBONDO HWANGE	hhsansole@gmail.com
R. NCUBE	HWANGE RDC	CEO	0772897842		Box 165 HWANGE	hwangerural d.c@gmail.com

Meeting: Batoka Gorge EIA
Date: 22/01/2015 - Vic Falls

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
~~PrEHO~~ Ms Elizabeth Moyo	Min of Health & Child Care	PrEHO	0772359783	–	Box 39 Vic falls hosp	emantoh@yahoo.com
COUNCILLOR BINWELL SIBANDA	HWANGE RURAL DISTRICT COUNCIL	COUNCILLOR	0779556018		BOX 40 VICTORIA FALLS	
Simon Moyo	Adventure zone	manager	0777289741	—	504 Accacia Cress Vic Falls	simon@arrive.co.za
COLLIN WILBESI	Victoria Falls Wonders Online	EDITOR	0778584951		4195 Vic Falls.	editor@victoriafallswonders.com.
ALAN SPARROW	KAZA TFCA.	TECHNICAL ADVISOR	013/44477		Box 14 Vic Falls	SPARROW.ALAN@GMAIL.COM.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Rafting ops Cephas MOYO	Shearwater Adventures	Ops Manager	0777375 5441 013-44471		Box 125 Vic FALLS	Cephas@shearwatervf.com
DENNIS Thebe HRDC Councillor	Chidobe Ward (2) Council	Councilor	0713343581 0774358549		Box 140 Vic FALLS	—
HRDC MARTIN NDHLOVU COUNCILLOR.	KACHECHETI WARD 3	COUNCILLOR	0778747619 0712951663		BOX 104 VIC FALLS	~~martinndhlovu~~
Marvel Nyathi Communication & Information	Shockwave Adventures	Communication & Information Officer	772 814 545 779 026 669		Shop 6. Beta Building Vic Falls.	nyathimarvel@gmail.com
TENDAYI MUPANGURI	CROC. CAGE DIVING	MANAGER	0772937704		273 ADAM STANDER VICTORIA FALLS	tendavies@yahoo.co.uk

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR. EDWIN MAKUWE	NATIONAL PARKS	Ecologist	0774135874	—	P. BAG 5778 VETE MAIN CAMP	emakuwe@yahoo.com
CHIEF SUPERINTENDENT RHIWONA J.W. Officer Commanding Police, Victoria Falls District.	ZRP.	DISPOL	0712879953	—	Z.R.P. VICTORIA FALLS	mukomajai @ yahoo.com
Ass/Insp Mkuebu	ZRP	Police Officer	0712763791	013-41898	ZRP BOX 20 Victoria Falls	ndumamacebo @ yahoo.com
NGOABUTHO MOYO	V.F.M	PUBLIC RELATIONS AND ECONOMIC DEVELOPMENT OFFICER	0772344093	013 40301	MUNICIPALITY OF VICTORIA FALLS P.O BOX 41 LIVINGSTONE WAY VIC. FALLS	nmoyo@vfm.co.zw
MR GODFREY S-MAPHOSA	JAFUTA FOUNDATION	TRUSTEE/ ADMINISTRATOR	0712231842 0772477796		BOX 291 VICTORIA FALLS	gsmaphosa@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR FELIX T. CHIBWE	THE VICTORIA FALLS HOTEL	PROCUREMENT MANAGER	(013) 44751 0712661090	(013) 44762	P.O. BOX 10 VICTORIA FALLS	procurement@victoriafallshotel.com
MRS Andrea Amend	privat	tourist	+263 77444 7404	Phone +260 963 446689		amend@aka-designde
MR LOVEMORE NCUBE	MINISTRY OF PRIMARY AND SECONDARY EDUCATION	DISTRICT EDUCATION OFFICER	0281-32368 0773563140 0713919916	0281-32368	P.O. BOX 230 HWANGE	lovemorencube21@gmail.com

Meeting: Batoka Gorge EIA
Date: 22/01/2015 Vic Falls

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
OFFICER IN CHARGE FAITH CHIRAMBA	METEOROLOGICAL SERVICES DEPT. ZIMBABWE	H.O.D	0712870883	N/A	BOX 11 VICTORIA FALLS	faith chirambavf@gmail.com
ACTIVITIES MANAGER WILD HORIZONS SKINNER NDLOVU	WILD HORIZONS	MANAGER	0775107253	N/A	1021 HOLLAND RD VIC. FALLS	skinner@wildhorizons.co.zw
NDLOVU KHETHIWE	MIN OF YOUTH	YOUTH OFFICER	0775122623	N/A	MINISTRY OF YOUTH BOX 215 HWANGE	nkhethwe84@yahoo.com
MUMPANDE LOT	VFM	DEPUTY DIRECTOR	0772127098		BOX 41 VIC-FALLS	lmumpande@vfm.co.zw
F.M. Shoko	H.RDC	Adm. Chairman Councillor	0772760432	N/A	Mbizhan ward (6)	N/A.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
JOSHUA N. MAGABA	CHEZIYA CROCODILE RANCH.	DIRECTOR	0712207368	01342494	Box 18 VICTORIA FALLS	joshggm@mweb.co.zw CheziyaCrocs1@gmail.com
EDITH JANUARY	ENVIRONMENT AFRICA	FIELD OFFICER	0772384602	N/A	Box CT502 Vic-FALLS	edith@environmentafrica.org charlie@environmentafrica.org
M SHELO	ELEPHANT HILLS	LOSS Control	0772 177440	N/A	Box 300 Vic Falls	lcofficer@ehr.africansun.co.zw
Sandra Nsamba	CAAZ	SECURITY OFFICER	0712213072	NA	Box 9 Vic Falls	snsamba@caaz.co.zw
B. NGWENYA	FORESTRY COMMISSION	DISTRICT CONSERVATOR	0772226636	N/A	—	ngwenyabkt@gmail.com

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
CHRISTOPHER DUBE	VICTORIA FALLS MUNICIPALITY	TOWN CLERK	+263 13 42217 +263 71 217336	—	BOX 41 VICTORIA FALLS	cdube@vfm.co.zw
MODLING MBERENGWA	ZPC HWANGE POWER STN	CIVIL ENG	0776 423858	—	Box 257 HWANGE	mmberengwa@zpc.hps.co.za
THEODORA NCUBE	ZPC HWANGE POWER STATION	COMMUNITY RELATIONS OFFICER	0772857638	—	Box 257 HWANGE	tncube@zpc.hps.co.zw
TRYMORE NDOLO	HWANGE DISTRICT YOUTH DEVELOPMENT	COORDINATOR	0772747489	—	4176 CHINOTIMBA VIC FALLS	trymorendolo@gmail.com
SIPIWE MAPFUWA	HWANGE RDC	COUNCIL CHAIR	0772162445		Box 165 Hwange	

Meeting: Victoria Falls Open Day
Date: 4th Oct '14, 15h00

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR CHRISTOPHER DUBE	VICTORIA FALLS MUN	TOWN CLERK	013-42217 +263 712 217 336		BOX 41 V/ALLS	chris5dba@yahoo.co.uk cdube@vfm.co.zw
MS S CHENAUX-REPOND	S. AFRICA	DIRECTOR	013-41757		BOX 131 VIC FALLS	schenaux-repond@bluewin.ch
J. Shumba	Government	Official	0771 [illegible]		98 pioneer Rd	joshuba@gmail.com
Mr N. MAPHOSA	BATOKA CLAN	OFFICIAL	0778 890 894		MONDE VILLAGE	ngomap@yahoo.com.
M B. Naube	Batoka clan	co-ordinator	0779 832 465		4411 Chinotimba T/Ship	frank_jordan_23@yahoo.com.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
Ms Elizabeth Karonga	ZRA	PR & Comms Manager	0773002978, +260977378735		Box 30233 Lusaka Zambia	karongaez@zarho.org.zm lizkaronga@yahoo.com
Philani Mayo	Slackwater	Manager	0772814569		UCC FPCL	philanim@yahoo.com
GRACE WU	University of California		~~07~~ +01 626 388 5257		2138 McGee Ave. Berkeley, CA	grace.cc.wu@gmail.com
~~GRACE WU~~ RANJIT DESHMUKH	University of California				2138 McGee Ave. Berkeley, CA	ranjit.deshmukh@berkeley.edu
TREVOR LANE	—	—	~~07705~~ 0777057024		P.O. Box 210 VF.	tlanezm@gmail.com.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
T Mwun	Government	Official	0773284 332			t.mwun@29gmail
R. MAKIWA	Government		0715633402 0~~[illegible]~~		Box 124 Vic Falls	adachimakiwa@yahoo.com
DR DREW CONYBEARE	SELF	—	0772-308915	—	Box 177 VF	drew@gmail.com
D. KUNG	THE KINGDOM AT VIC FALLS	GENERAL MANAGER	0712 875095		P.O. Box 90, Vic Falls	gm@kingdom.africasw.co.za
F CHIMBA	VICTORIA FALLS HOTEL	DGM	0712667690		1 Mallet Drive	dgm@victoriafallshotel.com.

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
MR. TENDAYI MUPANGURI	AFRICAN PREDATOR DIVING	MANAGER	0772937794 0774750661 0773890316	—	C/o ELEPHANTS WALK SHOPPING MALL VIC. FALLS.	tendavies@yahoo.co.uk crocceagediving@gmail.com
MR STEVE JONASI	LION ENCOUNTER ALERT	M. DIRECTOR	0775729247 071230665		Box CT527 VIC-FALLS	stevej@lionencounter.com
CHRISPIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY	WATER RESOURCES ENGINEER	+260-977-807758		Box 30233 LUSAKA	~~Namaka~~ namakandoc@yahoo.com namakando@zarahoo.zm
PETER ROBERTS	NONE SELF EMPLOYED	-	NA	-	NA	relepstrebor@yahoo.co.uk
Darryl TIRAN	Birdlife Zimbabwe	member	0712610222		PO Box 4 VICFALLS	ecolynx@zol.co.zw

Meeting: _____

Date: _____

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Postal Address	Email Address
NANAO CHUNRA	ENVIRONMENT AFRICA ZAMBIA	DIRECTOR.	00263 774788082 00260 975319734	—	BOX CT. 163 VIC FALLS	nanao@environmentafrica.org
Charlene Hewat.	Environment AFRICA Regional	CEO.	0712408864		Vicfalls 168.	Charlie@environmentafrica.org.

Community Meeting Register

Date: 11/10/14
Venue (including ward):

Name	Sex (M or F)	Community	SIGN
MR KENFORD SIMAKALANGA	M.	MUSOKOTWANE	[illegible]
MR. ALFRED KATITY	M	MUSOKOTWANE	[illegible]
MR. BERNARD MWEENE	M	MUSOKOTWANE	[illegible]
MR. RICHARD MULIBO	M.	MUSOKOTWANE	[illegible]
MRS ELINA LIKUKELA	F	MUSOKOTWANE	[illegible]
MR Jailodi Sfansamo	M	Musokotwane	[illegible]
MR DONALD SITONDO	M	MUSOKOTWANE	[illegible]
MRS Lydia Simuyandi	F	MUSOKOTWANE	[illegible]
SIAMABOLE JOSPHINE	F	MUSOKOTWANE	[illegible]
MWIINGA DONALD	M.	MUSOKOTWANE	[illegible]
KENNEDY KAMELI	M	MUSOKOTWANE	[illegible]
MR. SUNDAY SIAKASWEKA	M	MUSOKOTWANE	[illegible]
MR. Raphael Muzala	M	MUSOKOTWANE	[illegible]
Cornelius Mwilhisa	M	MUSOKOTWANE	[illegible]
Austin Sitali	M	Musokotwane	[illegible]
BENSON MALUMANI	M	MUSOKOTWANE	[illegible]
DAYLIGHT CHIBBAGO	M	MUSOKOTWANE	[illegible]
Joshua Ndambo	M	Musokotwane	[illegible]
LINSWABO ROBERT	M	MUSOKOTWANE	[illegible]
Chiyandika H. Grant	M	Musokotwane	[illegible]
Edward	M	MUSOKOTWANE	[illegible]
Boston Muzaudu	M	Musokotwane	[illegible]
Precious Kambulu	M	Musokotwane	[illegible]

Name	Sex (M or F)	Community	SIGN
maureen chikatala	F	sectary Siandavu	M.Chikatala
Juju Mbanachele	M	Sectary Sintubungu	[illegible]
Brown Sintubungu	M	headman Sintubungu	[illegible]
LIKONGE KENNEDY	M	SECRETREY	[illegible]
Sunday Mukombwe	M	SECRETREY	[illegible]
Kenneth Siantebe	M	HEADMAN SIBSIM	[illegible]
Boston Muzandu	M	Headman Situmbeko	
VICTOR MWEEMBA	M	COMMITEE MEMBER MUSOKOTWANE	[illegible]
PATRICK M. SIBOFU	M	Secretary	[illegible]
partson Kahemba	M	HEADMAN SHELENI	[illegible]
Kenneth Mujana	M	SS/Headman Kapongo	[illegible]

Community Meeting Register

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Date: 11/10/14
Venue (including ward):

Name	Sex (M or F)	Community	SIGN
SIMWEEMBA ROYSON	M	HEADMAN MWIINGA-MWIINGA	R. Simweemba
Situnya Godfrey	M	secretary mwiinga-mwiinga	G. Situnya
SIAMUNDA GEORGE	M	SECRITARY-SILELO VILLAGE	[illegible]
KAMBOLE ISHMAEL	M	SECRITARY-MUKEMU.V.	[illegible]
SANDO KENNETH	M	V. HEADMAN MWILELI	[illegible]
MAZUNGA ISHMAEL	M	SECRITARY-SIAMALANGE V	[illegible]
THOMAS Simbotwe	M	V. HEADMAN MANDANDI	[illegible]
ALEX Sililo	M	Secretary Mandandi	[illegible]
Maxon Mutema	M	V. headman Masunda	[illegible]
Owen Mani Mani	M	Secretary Pisani	[illegible]
Rubrey Mbanachele	M	Headman Masunga	[illegible]
Bernard Melukhe	M	Zambeta wa Syamwalu	B.M.
Alfred Syamalange	M	Head man Syamalange	[illegible]
Watson Kwimbe	M.	Secretary	[illegible]
Yona Kamando	M	Head man	[illegible]
Kenondi Mashalhani	M	Head man	[illegible]
Frans Chipango	M	Headman Chilefwe	[illegible]
Robert K. Mufaleli	M	S Headman Mujala	[illegible]
Winston Mumala	M	Secretary Mujala	[illegible]
HENRY SITALI	M	Kapulanga V/Secretary	[illegible]
ARNOLD Sionyungwe	M.	Chilefwe V/ secretary	[illegible]
Geofrey Nyagule	M	Nyagule V/S H/man	[illegible]
Bweenje Rogen	M	Secritary NYAGULE	[illegible]

Community Meeting Register

Date:
Venue (including ward):

Name	Sex (M or F)	Community	SIGN
JOSHUA NDAMBO	M	SECRETARY SIASOPO V/G	[illegible]
DAYLIGHT CHIBBARO	M	REPRESANTATIVE FOR HEADMAN	[illegible]
BENSON MALUMANG	M	HEAD MAN MATENGUV	[illegible]
Austin Sitali	M	Secretary Sitahane V.	[illegible]
Cornelius Mwikisa	M	Headman Sitahane V.	[illegible]
Raphael Muzala	M	MUSOKOTWANE	[illegible]
KENUSH SIADUDU	M	SIAKASIPA	Siadudu
LLOYD S. MASAMU	M	SIASIKAMBALA	[illegible]
Katupa Moses	M	Siasikambala	[illegible]

Community Meeting Register

Date: 13/10/14
Venue (including ward): NGANDU SCHOOL, MUKUNI WARD

Name	Sex (M or F)	Community / VILLAGE	SIGNATURE
Enock Simasiku	m	NAMATONGO	[illegible]
Josephat Kandiana	m	ZANGALA	[illegible]
ROYD SaMBO	M	Zangala	[illegible]
DAVID RESAZI	m	SIAMATETE	[illegible]
EMANUEL KESHO	M	CHILIZYA	[illegible]
ANTON MAKAYE	M	SIAMATATA	—
KILIAN B. SIATONTOLA	M	CHILIZYA	[illegible]
LANDY MUKUMBUTA	M	ZANGALA	[illegible]
Jim Siatontola	m	Chilizya	[illegible]
Makumo [illegible]	M	Chillizya	[illegible]
STEVEN Simunkwete	M	SIACHUMA	[illegible]
DEIECK SIKANYAMA	m	SIAZIBOLA	[illegible]
Franco [illegible]	m	Sichilobe	[illegible]
EMMANULE MOOLA	M	SIACHUMA	[illegible]
Gardina malake	m	Chibule	[illegible]
GIFT NYAMBE	m	MUKALAHANI	[illegible]
ANDREW CHALINGA	M	CHIBULE	[illegible]
Tichaona Ncube	M	NGANDU	[illegible]
MAKAY SIYNDA	M	NGANDU	[illegible]
Peter nyama	M	Mukalahani	P.
Elias SIMASIKU	M	SIAKONDO	[illegible]
BOSTON SIACHETOLA	M	Siejoba	[illegible]
JACOB MUFANA	M	CHIBALANI	[illegible]

Community Meeting Register

Date: 13/10/14
Venue (including ward): NGANDU

Name	Sex (M or F)	Community / VILLAGE	SIGN
Catherine Siamukwele	F	N'GANDU	C.S
SIMASIKU JUSTINA	F	MUNTUMUSWANA	J. S
Banadibule mwalasili	F	muntumuswana	C.M
Pumulo mary	F	mukalahani	P.M
Lownar Sizala	F	Mukalabani	L
Jornar Nakalizya	F	Ngundu	J.N
Bweenda Siapemo	F	Munwana	B.S
Rosarline Siamukwele	F	Chibule	R.S.
Ilim Siapongo	F	Chibule	I.S
Idra Muhelo	F	Muntumuswana	I.M
Loveness Simalongwa	F	Ngundu	L.S
Phillip Siatontola	m	Chelizya	PS
Mwaaka Siachikuni	F	Siathoma	M.S
Bult Nakakalizya	F	Ngundu	B.N
Marren Mazanga	F	Ngundu	M.M
FIDELIS MAZANGA	F	Munwana	F.M
Anna Siasayi	F	Ngandu	A.S
LEAH Sreiza	F	Ngandu	L.S
Dorothy Kambole	F	Ngandu	D.K
Cecilia Libetwa	F	Ngandu	L.C
Josephine Sibenzu	F	NGANDU	J.S
ANNA mundila	F	NGANDU	A.M
Gorrety Simutombo	F	Munwana	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
BRIAN SILABI	M	mukalahani village	Bsilabi
PETER Simunomba	M	MUNWANA VILLAGE	[illegible]
Brandina chembe	F	Mukalahani "	[illegible]
victoria mukendwa	F	NGANDU "	
Malita chekapu	F	MUNWANA "	M.C
Getrude Solochi	F	Ngandu	G.S
LAYNESS SIRATENE	F	BIAMATETE	L Sibate
Anaya muyangwa	F	SIAMATETE	A.M
MARY Sitali	F	Munwana	MS
MUKANZALA MALUMO	F	Chibule	M.M
CATHRINE - Siamantundi	F	Chibule	C - S
Juliet - Siansulinga	F	Chibule	J - S
Ireen Simatele	F	Chibule	I - S
JERPha gwemani	F	Muntu muswana	J.G
ANGELA mumba	F	muntu muswana	A.M.
Mary Kasoka	F	Munwana	M K.
LILIAN Siawala	F	Ngandu	L.S
Modester Mabunda	F	chibule	M.M
MIRIAM Sikiti	F	Chibule	MS
Patricia Siamate	F	Ngandu	Biamate

Community Meeting Register

Date: 4/10/14
Venue (including ward): SACRED HEART MISSION, NEMANGA WARD

Name	Sex (M or F)	Community	SIGNA
PROGRESS Ncube	M	Nemananga (Sacred Heart Mission)	[illegible]
GRACIOUS Tshuma	F		
TUMANE	F		
Khayelihle Zulu	M	NEMANGA SACRE MISSION	[illegible]
LYNNIY ZULU	M	NEMANGA SACRE MISSION	[illegible]
LOVEMORE NETHA	M	NEMANGA SACRE MISSION	[illegible]
NDLOVU TALENT	M	NEMANANGA (SACRED HEART MISSION)	[illegible]
MWIKIS Mathe	M	NEMANANGA (Sacred	[illegible]
ALEXANDER NCUBE	M	NEMANANGA SACRED H MISSION	[illegible]
DELROY SAKALA	M	NEMANANGA SACRED H MISSION	[illegible]
Kethiwe Nyoni	F	Nemananga (SHM)	[illegible]
Faresi Kumwenda	F	Nemananga (SHM)	[illegible]
Sina Nyoni	F	Nemananga (SHM)	[illegible]
Medelina Dube	F	Nemananga (SHM)	[illegible]
Belita Nyothi	F	Nemananga (SHM)	[illegible]
Blissard Tshuma	A	Nemananga (SHM)	[illegible]
Safira Ncomo	F	Nemananga (SHM)	[illegible]
Priscilar Sibooda	F	Nemananga (SHM)	[illegible]
Esnat Moyo	F	Nemananga (SHM)	[illegible]
Anna Moyo	F	Nemananga (SHM)	[illegible]
Esnes Nyon	F	Nemananga (SHM)	[illegible]
Magret Nyon	F	Namananga (SHM)	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
ORCHARD NOLOVU	M	S H MISSION	[illegible]
Bekezela Naube	M	SH mission	[illegible]
PHILLIP BANDA	M	SH mission	[illegible]
Ottilia Chuma	F	SH Mission	[illegible]
Tadiouse Zhuu	M	Silibinda	[illegible]
Lawrence Nyathi	M	S.H-Mission	[illegible]
NYONI GODWIN	M	Sikumbi	[illegible]
THEMBELIHLE NCUBE	M	BH 86	[illegible]
PATICK NE[illegible]	M	BH 86	[illegible]
JUPIA NYONI	M	BH 134	[illegible]
MUKARO TAFADZWA	M	ZRP JAMBEZI	[illegible]
CHIKOHORA LETWEEN .C	F	ZRP JAMBEZI	[illegible]
JAIROS Ncube	M	MUSANI	[illegible]
Shephard Ndlovu	M	musani	[illegible]
Maxmillan Nyoni	M	Musani	[illegible]
Siphathisiwe Ndlovu	F	Musani	[illegible]
THEMBERILE DUBE	F	MUSANI	[illegible]
JESKA Mudzana	F	Musani	[illegible]
LOVENESS SIBANDA	F	Musani	[illegible]
ROSINA NYONI	F	NEMANANGA	[illegible]
Rosa Kandimba	F	Namananga	[illegible]
Margret Nyoni	F	Musani	[illegible]
FANDISON NCUBE	M	Musani	[illegible]
Kenias Mbewe	M	Jabula [illegible]	[illegible]

Community Meeting Register

Date: 4/10/14.
Venue (including ward): SACRED HEART MISSION, NEMANAGA WARD

Name	Sex (M or F)	Community	SIGNAT
THEMBA NYATHI	M	SILIBINDI	[illegible]
SHEPERD NGWENYA	M	SILIBINDA	[illegible]
LITASI MULEYA	M	SIAMWELE	[illegible]
KENNETH SIBANDA	M	SILIBINDA	[illegible]
Linos Nkomo	M	Siamwele	[illegible]
ALOB NCUBE	M	~~NCUBE~~	[illegible]
Hubert NCUBE	M	~~NCUBE~~	[illegible]
EMMANUEL NCUBE	M	JA[illegible]	[illegible]
Richard Nyoni	M	Nyoni	S. [illegible]
Edward	M	Ndlovu	[illegible]
MARTIN	M	DUBE	
MABUVA	M	NDLOVU	M.N
AUGUSTINE	M	Mlauri	A.M
LEONARD	M	Nkomazana	L.N
ELIZABETH KARONGA	F	ZRA	[illegible]
CHRISPIN NAMAKANDO	M	ZAMBEZI RIVER AUTHORITY	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
Cosmas Sithole	M	Jabula	[illegible]
[illegible]	M	Jabula	[illegible]
SARUDJHI DUBE	F	Jabula	[illegible]
BETTY TSHUMA	F	Musena	[illegible]
MATILDAH Sibanda	F	SILIBinda	[illegible]
Greedys Mpala	F	Silibinda	[illegible]
FELIX M. SHOKO	M	SILIBINDA	[illegible]
Sylvester Nyani	M	Silibinda	[illegible]
Japhet Mathe	M	Silibinda	[illegible]
VELAKUDE MALANGA	M	JABULA	[illegible]
Micah Moyo	M	JABULA	[illegible]
FIDELIS K. CHAWIRA	M	JABULA	[illegible]
ISHUMAEL NCUBE	M	JABULA	[illegible]
SUCCESS NCUBE	M	JABULA	[illegible]
Peter Ncube	M	J "	[illegible]
VICTOR M'PANDUBI	M	Jabula	[illegible]
PETER KUSI	M	Jabula	[illegible]
NOAH NKOMO	M	SIKUMBI	[illegible]
NIZONDO	M	SIAMWELE S	[illegible]
Phekim	M	MOLI	[illegible]
Austin	M	Jabula	[illegible]
MAKHOSINI	M	JABULA	[illegible]
DOUBT NCUBE	M	SILIBINDA	[illegible]
DOUGLAS MATHE	M	SILIBINDA	[illegible]

Community Meeting Register

Date: 4/10/14
Venue (including ward): SACRED HEART MISSION. NEMANANGA WARD 4

Name	Sex (M or F)	Community	SIGNATURE
Pretty Nkala	F	JABULA	P Nkala
Sithobie Mlauzi	F	MANANG.	S Mla
Leah MPofu	F	JABULA	LMP
AGadah Ndlovu	F	JABULA	A Nd
Mayi Chuma	F	JABULA	Chum
Rosemary Netha	F	MUSANI	R Net
Lydia M Ntutu	F	MUSANI	Lnt
CHEREST Ncube	M		[illegible]
Never Munsaku	M	Jabula Village	N.Mu
MBwindi MZamba	M	Jabula Village	M M
Chinene NLYOVU	M	[illegible] Village	[illegible]
Kwejani Ngwenya	M	Musani Village	[illegible]
Patrick M Muketeyi	M	Musani Village	[illegible]
NKATAZO B	M	ZRP JAMBEZI	[illegible]
Fedy NDUNI	M	BH 23	So
Nicholas [illegible]	M	Jabula Village 8	[illegible]
Patrick Neube	M	Jabula Village 2	[illegible]
Notani Nkomo	M	Jabula Village 6	[illegible]
Phillemon Nyathi	M	Jabula Village 8	[illegible]
Martini Sibanda	M	Sikhumbi Village 1	[illegible]
Michael Mbewe	M	Jabula Village 1	[illegible]
FARAI MOYO	M	JABULA VILLAGE 5	[illegible]
MASAWUSO NYATHI	M	JABULA VILLAGE 6	[illegible]
KONANI Shoko	M	Jabula Village 7	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
MONGAMELI KHUMALO	M	JABULA VILLAGE 6	[illegible]
JIXAS NDLOVU	M	JABULA VILLAGE 8	[illegible]
ANDREW NDEBELE	M	JABULA VILLAGE 1	[illegible]
SAMSON NYATHI	M	JABULA VILLAGE 8	+
Gilbert ndlovu	m	JaBula village	1
Victor Nyathi	M	Sikumbi village	2
Noi'an Nkomazana	M	Sikumbi, VILLAGE	
KENNETH KULU	M	SIKUMBI VILLAGE	[illegible]
MATEJA NDLOVU	M	JABULA VILLAGE 7	MN.
DARNSAW SIAMWELE	M	SIAMWELE V 2	[illegible]
alois Mathe	M	S VilagE	[illegible]
David Moyo	M	Siamwele	[illegible]
VICTOR CHITI MUTALE	M	S VILLAGE 3	[illegible]
Christopher Sibanda	M	Musani	[illegible]
Vishi Sibindi	M	Remanan	[illegible]
Austin Nyathi	M	Musani villageA	[illegible]
ABEL SIBANDA	M	Remanan	[illegible]
Lucky SIBANDA	M	Sikumbi	[illegible]
[illegible] NKOMAZANA	M	Sikumbi	[illegible]
Lenin Moyo	M	JABULA village 8	[illegible]
Venzani Moyo	m	Silibinda 2	[illegible]
Dadani Dabe	M	Silibinda village 4	[illegible]
Sadiwe Ndlovu	F	Silibinda Village 5	[illegible]
SUNGWE E SIBANDA	M	JABULA 7	[illegible]

Community Meeting Register

Date: 4/10/14
Venue (including ward): SACRED HEART MISSION, NEMANGA WARD

Name	Sex (M or F)	Community	SIGNAT
CHIEF SHANA	M	JAMBEZI	
DANIEL RWENDO	M	JAMBEZI	[illegible]
COUNCILLOR JABULANI MOYO	M	NEMANANGA WARD 4	[illegible]
HEADMAN CHABINA	M	NEMANANGA WARD 4	[illegible]
V/HEAD AMOS TOLANI	M	JABULA VIL NEMANANGA WARD 4	[illegible]
JOHANNE SHOKO	M	SHANTANI V/5	J.SHO
Peter NYONI	M	NEMANANGA V/1	[illegible]
DOROTH NDHLOVU	F	NEMANANGA MUSANI C	[illegible]
NKOMO HEADMAN	M	LUKUNGUNI MISSION CLINIC	[illegible]
Khayel We ndlovu	F	Silibinda village	[illegible]
George Ncube	M	SILIBINDA 3 V. HEAD	[illegible]
ADOLPH NDLOVU	M	SIAMWELE 3 V. HEAD	[illegible]
DANIEL K DUBE	M	NEMANANGA 2 V/HEAD	[illegible]
JOSEPHINE NGWENYA	F	SILIBINDA	[illegible]
Bangani Ncube	M	Musani	[illegible]
JABULANI MKWANAWZI	M	SACRED HEART MISSION	[illegible]
Innocent Viyazhante	M	Nemananga village 1	[illegible]
Nkosilathi Nyoni	M	Nemananga Village	[illegible]
PATRICK NYONI	M	MUSANI Village 4	[illegible]
Phillip Chipaya	M	nemananga Village 4	[illegible]
FRAE	M		[illegible]
DAVISON NCUBE	M	MUSANI	[illegible]
Bulowe Nyoni	F	Musani / Nemananga	B.Ny

Name	Sex (M or F)	Community	SIGNATUR
SIMON MUYAMBO	M	NEMANANGA	[illegible]
AZAF MBEWE	B	H	
NOKUTHULA SIBINDI	F	NEMANANGA	[illegible]
Alice Moyo	F	Nemananga Jabula Village	AMO
Elphira Ndlovu	F	Nemanga Musani	[illegible]
Otilia Ncube	F	Nemanga Musani	[illegible]
STEPHEN NYONI	M	Nemananga Sikumbi	[illegible]
Christopher Sibanda	M	Nemananga Jabula	[illegible]
Conelia Ndhlovu	F	Nemananga Musaniu	[illegible]
Anastazia Sibanda	F	Nemananga Silibinda	A S.
NEHMAN NYONI	M	SILIBINDI	[illegible]
KILLION MATHE	M	NEMANANGA SILIBINDA	[illegible]
ALEXANDER CHUMA	M	NEMANANGA SILIBINDA	A CHUM
Khulani Ndlovu	M	Siamwele	[illegible]
Jnosoli Muleya	M	Jabula 7	[illegible]
Darani Sibanda	M	Jabula	[illegible]
Mutambo L SIACHINGONGO	M	Sikumbi 1	[illegible]
PASIPAS TUTURU	M	SIKUMBI	[illegible]
Tawina NGONI	M	Jabula 1	[illegible]
Fimbo Ndlovu	F	Nemananga 1	F Ndlo
Tapiwa Ganye	F	Nemananga 1	T Gany
Grace Chabwa	F	Nemananga	[illegible]
RICHARD KWAIOMBOTA	M	NEMANANGA	[illegible]
MORRIS Ngwenya	M	NEMANANGA	M Ngwenya
Mabuza Moyo	M	Nemananga	[illegible]
Richard Muleyi	M	Nemananga	[illegible]

5/10/14

Ndlovu Business Centre, Kachechete Ward

Name	Sex (M or F)	Community	SIGNA
Ohubekani Nkomazana	M	Vulindleta	[illegible]
Talent Banda	M	Vulindlela	[illegible]
Mcebisi Sifuya Sibanda	M	Vulindlela Village	Siba
Israel Moyo	M	Kachechete V	[illegible]
Obent Mporu	M	Kachechete	[illegible]
Champion Ndlovu	M	Vulindleta	Cnd
Albert Ndlovu	M	Ndlovu	[illegible]
Fred Ndlovu	M	Vulindleta	[illegible]
Raphael Dube	M	Mpumulo	[illegible]
Chiwdzuri Elvis	M	Ndlovu Camp	[illegible]
Chikwa Sibanda	M	BH12 [illegible]	[illegible]
Ernest Mpuru	M	BH9	[illegible]
Gladys Maphosa	F	BH 25	
Chiedza Sibanda	F	BH 127	[illegible]
Sibangile Sibindi	F	BH118 Lupinyu	[illegible]
Deliwe Ncube	F	B.H. 82	D.Nc
Jerita Ncube	F	B.H 26	J.Ncu
Gladys Dube	F	B.H 37	[illegible]
Christine Mayo	F	B.H. 38	C.M
Nomusa Ncube	F	BH24 Ndlovu Village	N.Nc
Nicholas Mpala	F	BH128	
Mathias Mthupha	F	BH59	[illegible]
Precious Thebe	M	BH57	[illegible]
Ntabiso Thebe	M	BH57	[illegible]

Community Meeting Register

Date: 5/10/14
Venue (including ward): Ndlovu, katchechete ward

Name	Sex (M or F)	Community	Signa
CLLR MARTIN NDLOVU	M	NDLOVU VILLAGE	
Joshua Ngwenya	M	Ndlovu Village	[illegible]
B Sibanda	M	Vulindlela	[illegible]
First Dube	M	Vukuzenzele	[illegible]
A. MADHKWA	M	NDLOVU VILLAGE	[illegible]
CHARLES Moyo	M	MPUMELELO VILLAGE	[illegible]
NDABAYABO MOYO	M	KACHECHETE VILLAGE	[illegible]
MAKITH MPOFU	M	KACHECHETE VILLAGE	M. M
ANDREW Moyo	M	Mvutu Village	[illegible]
Mtshayeli Msipa	M	Vulindlela Village	M Msi
Sgt Chikwen	M	ZRP V/Falls	[illegible]
MOSES MAAHOSA	M	VILINDLELA VILLAGE.	[illegible]
Wonder Weza	M	V head Katshetshi	
Gilando Sarbulani	M	Vulindlela Village	
Mgiuni Moyo	M	Vulindlela Village	
Pilate Ndlovu	M	Vulindlela Village	V He
Robson moyo	M	Vulindlela Village	Comm
THayimani moyo	M	Vulindlela Village	
Lawemore Moyo	M	Mvutu Vlege	mkayen
Jotham Sibanda	M	Vulindlela village	
Nggabutha Sibanda	M	Vulindlela village	[illegible]
SIMON SIBANDA	M	Vulindlela village	[illegible]
Nkosilathi Msipa	M	Vulindlela Village	Msipa

Name	Sex (M or F)	Community	SIGNATURE
ELIZABETH KAROWA	F	ZRA	
CHRISPIN NAMAKANDO	M	ZAMBEZI RIVER AUTHORITY	

Community Meeting Register

Date: 6/10/14
Venue (including ward): Chisuma (Mee), Chidobe Ward

Name	Sex (M or F)	Community	SIGNATURE
Lilani Chuma	F	Chisuma	L Ch
Sikhanyiso Moyo	F	Chisuma	S Moy
Patricia Mathe	F	Chisuma	P Ma
BEKI THEMBA MPOFU	M	Chisuma	[illegible]
John Zulu	M	Chisuma	[illegible]
Sicbaniso Mabhena	M	Jembwe No 1	[illegible]
MTHEMBISO MOYO	M	JEMBNE	[illegible]
THOMAS P. NCUBE	M	JEMBNE NO 5	NCU
PILATE NDLOVU	M	"	P. NDL
Albert Moyo	M	"	[illegible]
Jameson Silanda	M	Jembwe	JSil
Chondani Nawenya.	M	Chisuma.	[illegible]
PHINEAS TSHUMA	M	Chisuma	[illegible]
Cleophas Moyo	M	Chisuma	[illegible]
Phillip Tshuma	M	chisuma	[illegible]
Milton Ncube			
Felex Ncube	M	chisuma	
Talent Mathe	M	chisuma	[illegible]
Godfrey Mudimba	M	Chisuma	
DAVID NDLOVU	M	Monde	[illegible]
SEBASTIAN M. MATHE	M	CHISUMA	[illegible]
BEATRICE NYONI	F	CHISUMA	[illegible]
Sara NCUBE	F	Dibutibu Chisuma	[illegible]

M TSHUMA

Name	Sex (M or F)	Community	SIGNATURE
Charity Topa	F	Chisuma	C. TOPA
Maria Phiri	F	Chisuma	
Sekani Mudimba	F	Chisuma	
Cathrine Ncube	F	Chisuma	
Limukani Tshuma	F	Chisuma	Tshuma
Grace Jangiya	F	Chisuma	
Priscillar Ncube	F	Chisuma	T. Ncu
Gladys Shoko	F	Chisuma	A. Mo
Benita Netha	F	Chisuma	T. Ncu
Orilia M. Shoko	F	Chisuma	S. Mat
Fidelia Ndiaru	F	Chisuma	[illegible]
Sizalabuhle Masuku	F	Chisuma	[illegible]
Virginie Mathe	F	Chisuma	Megom
Patricia Chuma	F	Chisuma	Tapias
Georgina Mzamba	F	Chisuma	Tapias
Dorcas Chuma	F	Chisuma	Tapi
CTTila Shoko	F	Chisuma	Math
Seria Nyoni	F	Chisuma	Mgoni
Alice Lungu	F	Chisuma	[illegible]
Agness Banda	F	Chisuma	A Bana
Jenifa Mangomba	F	Chisuma	J Mang
Agnes DUBE	F	Chisuma	A. DUB
Tshambaja Chuma	F	Chisuma	
Dorcas Mabhena	F	Sizinda	D. Mabh

Community Meeting Register

Date: 06/10/14
Venue (including ward): Chisuma (tree), Chidobe ward

Name	Sex (M or F)	Community	SIGNATURE
TABONA NCUBE	M	CHISUMA V/HEAD	[illegible]
Yangi Vundla	M	BH 34 V/HEAD	[illegible]
Safilo MULMA	M	Chisuma	[illegible]
Jabulani MJUMI	M	Chisuma NO 1	[illegible]
SMZMJOM			
[illegible] Mubutho	M	Chisuma Vol 4	[illegible]
Mbijo Ncube	M	Chisuma V	[illegible]
[illegible]	M	[illegible]	
Lucky	M	Chisuma	[illegible]
Akwa	M	Chisuma	[illegible]
SHAKANI	M	CHISUMA	[illegible]
Bando	M	Chisuma	[illegible]
LEWIS MPALA	M	CHISUMA	[illegible]
R M Dube	M	Chisuma	[illegible]
MATTHEWS MATHE	M	CHISUMA	[illegible]
Forget MHLANGA	M	CHISUMA	[illegible]
Stanley Mzamba	M	Chisuma	[illegible]
Akim Bhebhe	M	Chisuma	AK/[illegible]
ANOS G NDLOVU		Chisuma	[illegible]
itai mokandla	M	Chisuma	[illegible]
EphRAim Dube	M	Chisuma	[illegible]
JOHN THEBE	M	CHISUMA	[illegible]
Nkosilathi Moyo	M	Dibutibu	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
MARUPILA A. NCUBE	M	SIZINDA VILLAGE V/HEAD	[illegible]
ANDREW Mulambe	M	Chisumma	[illegible]
Joshua Bhebe	M	Chisumma	JB
Pelekelo Mathe	M	Chisumma	[illegible]
B Sibanda	M	CHIEF (A)	[illegible]
A NAHOVU	M	Headman	[illegible]
J MKHWANANZI	M	ASS HEADMAN	[illegible]
M M [illegible]	M	mond ~~Sizinda~~ V/Head	[illegible]
D. NDLOVU	M	Jembwe No 5 V/Head	[illegible]
THEBE STANFORD	M	ASS HEAD MAN	[illegible]
MPALA Paul M.	M	MONDE VILLAGE HEAD	[illegible]

Community Meeting Register

Date: 6. 10. 2014
Venue (including ward): CHISUMA, CHIBOBE WARD

Name	Sex (M or F)	Community	SIGNATU
Cosmas Shoko	M	Chisuma	C. SU
Dorcus Masuku	f	Chisuma	D. M
Sharon Mabhena	f	Chisuma	S M
Angela Ncube	F	Chisuma	AN
RONKA DUBE	F	Chisuma	Ro D
SIFUNDO NDLOVU	F	SIZINDA	[illegible]
GAMA SIWELA	M	CHIBOBE	[illegible]
Denis [illegible]	m	Mondu	[illegible]

Community Meeting Register

Date: 6/10/14
Venue (including ward): MASHAKE SCHOOL, CHIKANDUKUBI WARD

Name	Sex (M or F)	Community	SIGNATU
Mukwada DAVID	MALE	NDIMAKULE Village	[illegible]
ABRAHAM NYATI	MALE	MITAKACIPILA Village	[illegible]
ALBERT MATHE	M	Takazwipila V	[illegible]
EDMOND ZULU	M	BATANANI V.	[illegible]
Enock Mpofu		Takazwipila V	[illegible]
Dumisani Nyoni	M	Takazwipila V	
PATRICK DUBE	MALE	TAKAZIPILA V	[illegible]
Prince Sibanda	M	Takazipila V	[illegible]
Grant Moyo	MALE	TAKAZIPILA V	[illegible]
GEORGE NCUBE	M	TAKAZWIPILA V	[illegible]
Kartmar Tshuma	M	Takazwipila	[illegible]
CHRISTOPHER MATHE	M	TAKAZWIPILA	[illegible]
MIKE DUBE DUBE	M	TAKAZWIPILA	[illegible]
BRIGHTON E	M	TAKAZWIPILA	[illegible]
[illegible]	M	MILIMILIEMA	[illegible]
HELTON KOLOSA	M	NDIMAKULE	[illegible]
[illegible]	M	Bhatanani	[illegible]
Richard Ngwenya	M	Mitimitema	[illegible]
INNOCENT Zimba	M	Chichanga	[illegible]
HONEST Ngwenya	M	Chichanga V	[illegible]
Camab Ncube	M	Chichanga	[illegible]
Chetani Mukenya	F	Chichanga	[illegible]
MISHECK PHIRI	M	Chichanga	[illegible]
Dennis Nyoni	M	Chichanga	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
Janet Sibanda	female	Ndimakule V. 2.	[illegible]
Assa Nkomazana	female	Ndimakule V. 3	[illegible]
Beniter Mathe	female	Ndimakule V 2.	[illegible]
Loveness Tshuma	female	Ndimakule V 6	Tshum
Beniter Ncube	female	Ndimakule V 6	B Ncub
Stella Ncube	female	Ndimakule V 6	S Ncub
Zondiwe Moyo	female	Ndimakule V 3	[illegible]
Tawana Moyo	F	Ndimakule 2	[illegible]
BLESSING MOYO	F	Ndimakule 3	[illegible]
Perseverance Khumalo	F	Ndimakule 3	[illegible]
Musawenkosi Ncube	M	Ndimakule 1	[illegible]
Thuthukani Ndlovu	M	Ndin Chishanga 4	Ndlov
LEONARD NDLOVU	M	TAKAZWI	
Samazani Sibanda	M		
T. Mathe	M	Takazwipila	1
R. Tshuma	M	"	3
LEONARD NYONI	M	NDIMAKULE	4
REISN MOYO	M	Ndimakule	5
Blessed Sibanda	M	Takazilwi	
[illegible] Sibanda	M	Takaziwi	
MICHAEL NCUBE	M	TAKAZWIPILA	[illegible]
BRIGHTON DUBE	M	TAKA 3	[illegible]
Daniel Khanye	M	Ndimakule 4	[illegible]
MORISENI MOYO	M	Chishanga 1	
ZENZO MATHE	M	TAKAZWIPILA V 5	[illegible]
KADEBONA BANGO DUBE	M	NDIMAKULE PRY	[illegible]

Community Meeting Register

Date: 6/10/14
Venue (including ward): MASHAKE SCHOOL, CHIKANDUKUBI WARD

Name	Sex (M or F)	Community	Signature
Mpofu Chipo	FEMALE	NDIMAKULE	C.Mp
Moyo Mayibongwe	FEMALE	CHISHANGA	[illegible]
Milika Sithole	FEMALE	"	M S
Elizabeth Mudimba	FEMALE	"	E.M
Rhoda Ncube	FEMALE	NDIMAKU	R N
Monica Nyoni	FEMALE	NDIMAKULE	M N
Senzeni Ndlovu	FEMALE	Ndimakule	S.Nd
Lilian Ncube	Female	Ndimakule 1	[illegible]
Beritha Ncube	Female	Chishanga	B.Nc
Emma Ngwe.ya	Female	Chishanga	K.E.Ng
E [illegible]	F	Ndimakule 5	[illegible]
Ncube Otrude	F	Ndimakule 2	[illegible]
Ndlovu Winfreeda	F	Ndimakule 2	Ndl
Sibanda Nomsa	F	Ndimakule 2	S.Nm
Phanuel Masuku	Male	Ndimakule 2	[illegible]
Chengani makwala	F	Takazwipila 6	[illegible]
Otilia Dube	F	Takazwipila 6	O.Du
Kayani ndlovu	[illegible]	Takazwipila 4	[illegible]
Melody Ncube	F	Chishanga 2	[illegible]
Patience Ncube	F	Chishanga 1	P.Ncub
Patricia Munkombwe	F	Chishanga 1	[illegible]
Tani Ncube	F	Chishanga 1	T.Ncub
Hebrew Khonye	M	Ndimakule 3	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
Ncube Balbina	Female	CHISHANGA	B. Ncube
MATHE LOVENESS	Female	CHISHANGA	[illegible]
NGWENYA ROSSMARY	Female	CHISHANGA	B. Ngwenya
NGWENYA JANE	Female	CHISHANGA	J. Ngwenya
Nessy Sibanda	Female	CHISHANGA	F.
Matilda Sibanda	Female	~~[illegible]~~ Takazwipila	M.S.
Meletina Ncube	Female	Ndimakule	M.M.
Sithembiso Ndlovu	F	Ndimakile	
Sylvia Ngwenya	F	Ndimakule	
Unice Ndiweni	F	Ndimakule.	
Zwelitsha Tshuma	M	Chikandakubi	
Nkosilathi Tshuma	M	Chikandakubi	
Alton Ndlovu	M	Chikandakubi	
DOLLAR NCUBE	M		
Johannes Phiri	M	Chikandakubi	
Johannes Mlefu	M	Chikandakubi	[illegible]
SELINA MTALI	F	CHIKANDAKUBI	[illegible]
Barbra Chuma	F	Chikandakubi	[illegible]
Rosa Sibanda	F	Ndimakule	Sibanda
Susan Gwenda	F	Ndimakule	S. Gwenda
Jennifer Sibanda	F	Ndimakule	
Angeline Moyo	F	Ndimakule	A. Moyo
Elizabeth Muuudla	F	Ndimakule	E. Muu
Pretty Yin Maphosa	F	Ndimakule	P. Maph

Community Meeting Register

Date: 6/10/14

Venue (including ward): MASHAKE SCHOOL, CHIKONDABI WARD

Name	Sex (M or F)	Community	Signature
KABOME LANGTON	m	MASHAKE SEC SCHOOL	[illegible]
T Mnuuti	m	Government official	[illegible]
I. Liwonde	F	Agritex	[illegible]
D Renolo	m	JAMBEZI	[illegible]
CHIEF SHANA	M	JAMBEZI Communal Lanzo	[illegible]
CLEMENT MOYO	M	TAKAZWIPILA. CHIK. WARD	[illegible]
C.R NCUBE	M	CHIKANDAKUBI PRY SCHOOL	[illegible]
T. RUNHARE	M	AGRITEX Chikandakubi	[illegible]
M. Mugeleponi	M	V. Head Chikandakubi	[illegible]
A NJONI	M	V/HEAD CHIKANDAKUBI WARD	[illegible]
Tobias Njoni	m	V/H Chikanda	[illegible]
RASMUS NJONI	M	V/Head Chikandakubi	[illegible]
JACOB NCUBE	m	V/H. CHIKANDAKUBI WARD	[illegible]
VINIKA SIBANDA	m	V/H CHIKANDAKUBI WARD.	[illegible]
BULAYANI NCUBE	M	V/H CHIKANDAKUBI WARD	[illegible]
CHARLES T SHOKO	M	V/H CHIKANDAKUBI WARD	C.Sh
CHIPANGO NYATHI	M	TAKAZWIPILA CHIKANDAKUBI	C.Nya
GRANT MOYO	M	TAKAZWIPIA CHIKANDAKUBI	G.M
FREDXMM MOYO	M	Vilege [illegible]	[illegible]
J L Palale	M	Villege Katazwipila	J.Pal
RAPHAEL MULEYA	M	V/H BHATANANI	[illegible]
Selina ncube	F	V/H ndimakule V-4	S.nc
Lucia nguenya	F	V/H Chishanga V3	[illegible]
Mulindeli Moyo	M	V/H BH7	

Name	Sex (M or F)	Community	SIGNATURE
SIBANI NKOMAZANA	F	TAKAZWIPILA CHIKANDAKUBI	S.Nkoma
TANGANI PHIRI	M	TAKAZWIPILA. CHIKANDAKUBI	
CEPHAS NCUBE	M	TAKAZWIPILA 4.	[illegible]
Bangani Mathe	F	Chishanga 4	[illegible]
Irene MSaka	F	Chishanga 3	[illegible]
Emeldah. Nkomo	F	Chishanga 5	ENkom
Esnat Ndlovu	F.	Ndimakule 3	ENdov
Alice Tshabalala	F	Ndimakule 5	A. Tsha
Ellen Dube	F	Chishanga 5	Ellen
Evelyn Rwasarira	F	Takazwipila chikandakubi	[illegible]
Precidias CHUMA	F	Takazwipila 5	P CHU
Metrude Tshumo	F	Takazwipila 3	M. Tsh
Selishina Makaza	F	Ndimakule 1	Makaza
Magitshefwa Moyo	M.	Chewumba 7	Mdoyo
Sithembile Sibanda	F	Ndimakule 4	S Siba
Sitshengisiwe muleya	F	Ndimakule 4	S Muleya
Nosizi moyo	F	Chishanga 5	N moyo
Alice Ncube	F	Ndimakule 5	A Ncube
Chuma Felistas	F	Chishanga 2	[illegible]
Mdimba Lydia	F	Ndimakule 3	L.M
Sibanda Selina	F	Ndimakule 5	Selina
Sibanda Veronica	F	Takazwipila 3	[illegible]
Muleya Esnart	F	ndikule 5	E My
NDLOVU MADOLA	M	NDIMAKULE VILLAGE 4	[illegible]
Kudakwashe Chibatamoto	M	NDIMAKULE. V. 6	[illegible]
BRIGHTON NKOMO	M	CHISHANGA V-5	

Name	Sex (M or F)	Community
Kenneth Jamela	m	Ndimakule
BRET Ndloru	m	Ndimakule.
Usumari bhanda	m	Ndimakule.
Eleza chuma	F	Takazipila
Pauline Phiri	F	Takazwipila
christine nyoni	F	Takazwipila
Joyce mpofu	F	Takazwipila
OLIVER A Sibanda	M	" "
Nkululeko KHUMALO	m	NDIMAKULE
Christmate chuma	m	TAKAZWIPILA
Bright Nyoni	M	TAKAZWIPILA
Mitchell Nyathi	M	Takazwipila
Melody Nyoni	F	Ndimakule 2
NANIWE KAFUNYA	F	Ndimakule 2

Community Meeting Register

Date: 6/10/14
Venue (including ward): MASHAKE SCHOOL, CHIKUNDABI WARD

Name	Sex (M or F)	Community	SIGNA
REGINA SIBANDA	F	TAKAZUPILA	[illegible]
MRS P Nkomazana	F	"	[illegible]
Shiella Chimua	F	Ndimakule	[illegible]
Lambani Nyoni	F	TAKAZUPILA	L N
P. Dube	F	"	
Virginia Nyoni	F	Takazwipila	[illegible]
Phyllis Dube	F	Takazipila	[illegible]
Christine Ncube	F	Ndimakule	[illegible]
Blessed Ncube	F	Ndimakule	[illegible]
Precious Nyoni	F	Ndimakule	[illegible]
Jabani Nkunyawule	F	Chishanga	[illegible]
Simangaliso Ncube	F	Ndimakule	[illegible]
Bridget Nguenya	F	Ndimakule	[illegible]
Nicoleen Dube	F	Ndimakule	N.D
Siboniso Logule	F	Ndimakule	[illegible]
Margret Ncube	F	Ndimakule	[illegible]
Miriam Khimalo	F	Ndimakule	M.Kh
Matilda Sibanda	F	Ndimakule	[illegible]
MISHULUI NDLOVU	M	MUSENYIKA	[illegible]
JAISON NDLOVU	M	Musenyika	JN
MTHALISI Komazana	M	Musenyika	M.K
B [illegible]	F	Takazipila	
Paul Mudimba	M	[illegible]	[illegible]
Fabian Mumba	M	Chishanga 2	[illegible]
Raboon Nyoni	M	Chishanga 1	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
Reason Muleya	M	Chikandakubi 2	[illegible]
Gordin Moyo	M	Chikandakubi 1	[illegible]
Ephriam Nyoni	M	Chikandakubi 2	[illegible]
Shelton Mathe	M	Ndimakule 2	[illegible]
PETROS NGWENYA	M	Ndimakule 1	[illegible]
Malumani Moyo	M	Ndimakule 1	[illegible]
Ronald Maseko	M	Ndimakule 2	[illegible]
Hazvineyi Moyo	M	Ndimakule 1	[illegible]
Hussen Mvundla	M	Ndimakule 1	[illegible]
LESLEY K DUBE	M	NDIMAKULE 1	[illegible]
Acron Moyo	M	NDIMAKULE 2	[illegible]
Desire Ncube	M	Ndimakule 1	[illegible]
PLAN Dube	M	NDIMAKULE 3	[illegible]
ERNEST MAYABO	M	TAKAZWIPILA 5	[illegible]
MAVUTO KEVINA	M	NDIMAKULE V 6	[illegible]
Mellisi Moyo	M	NDIMAKULE V6	[illegible]
LESUTHU MNKANDLA	M	Chenamisa V 4	[illegible]
OZIAS NCUBE	M	Chenamisa V 4	[illegible]
Thembani Maphas	M	Ndimakule	[illegible]
LAFION Moyo	M	BATANANI V 3	[illegible]
LIVEAN Muleya	M	BATANANI V 3	[illegible]
LAWRENCE SIBANDA	M	Takazwipila V6	[illegible]
Joseph Ndlovu	M	Chishanga V 4	[illegible]
Ngwabi Nathaniel	M.	Chishanga V 4	[illegible]
Alice Ncube	F	Chishanga V 5	A.N.
James M. Sibanda	M	Takazwipila V 5	[illegible]
JOEL SIBANDA	M	NDIMAKULE V 3	[illegible]
[illegible]	M	Ndimakule V 3	[illegible]

Community Meeting Register

Date: 07/10/14
Venue (including ward): MATETSI POLICE STATION, MATETSI WARD

Name	Sex (M or F)	Community	SIGNATURE
Polite Shoko	Male	Sekebelo farm WARD I	[illegible]
Given Nkomo	Male	Dorn Roven Sekebelo WARD I	[illegible]
Fieldman Nyoni	Male	Sekabelo farm Ward I	[illegible]
SHELTON SIBANDA	MALE	SEKABELO WARD I	[illegible]
Obert Sibanda	Male	Masikili	[illegible]
Navigator Dube	Male	Khayalethu	[illegible]
Isayab Ngwenga	Male	Masikili	[illegible]
Stratford Sibanda	Male	Khayalethu	[illegible]
CLEVER NDLOVU	MALE	SEKEBELO FARM WARD I	[illegible]
HONEST NCUBE	MALE	SEKEBELO FARM WARD I	[illegible]
LINOS Ncube	MALE	SEKABELO Farm WARD I	[illegible]
Chehestoo Sibanda	Male	Mapaningoma	[illegible]
yabani Shoko	Male	Khayalethu	[illegible]
EUBERTH NGWENYA	MALE	MAPANINGOMA	[illegible]
BUSANI DUBE	MALA	MASIKILI	[illegible]
MICHAEL NCUBE	MALE	SEKEBELO	[illegible]
FRANCISCO NYONI	MALE	MAPANINGOMA	[illegible]
PELANI CHUMA	MALE	MAPANINGOMA	[illegible]
SHARANI SIBANDA	MALE	MAPANINGOMA	[illegible]
ELIAS CHUMA	MALE	Khayalethu	[illegible]
AMON Mudimba	Male	FARM SS	[illegible]
ZEBEDIA Dube	Male	FARM SS	[illegible]
J Marumani	Male	V SS	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
Lindelwe Ndlovu	m	Masipuli	[illegible]

COMMUNITY MEETING REGISTER

MATETSI WARD.

DATE: 07/10/14

VENUE: MATETSI POLICE STATION, MATESTI WARD

NAME	SEX (M OR F)	COMMUNITY	SIGNATURE
SIBANDA - P	m	MATETSI	[signature]
NYATHI. D	M	MATETSI	[signature]
GAVA STEPHEN	M	ISALA	[signature]
Tallo ; Tshaner	M	ISNER	[signature]
Captain Z	m	MATETSI	Captain
C.S. SHOKO	m	56 Farm	cs Shoko
DUBANI SHOKO	M	FARM 56	DShoko
WILLSON MUDENDA	M	FARM 56	WSMudi
FULUMENDE NGWENYA	m	FARM MAPANI NGOMA	[signature]
RONALD Mathe	M	MATETSI	[signature]
Edmore mudenda	m	ISLA farm	[signature]
KENNIAS NOLONU	M	SEKABELO	K. Nollo
Jafikit mo-yo	m	Sekabelo	
Josphat mhlanga	M	Masikili	[signature]
EPHREM WEZA	m	Oliphant FARM	[signature]
Noah Busumani	m	MASIKILI	[signature]
Joshua Nkomo	M	MASIKILI	J. N.
Ben Nyathi	m	MASIKILI	[signature]

COMMUNITY MEETING REGISTER

MATETSI WARD

DATE: 07/10/14

VENUE MATETSI POLICE BASE, MATETSI WARD

NAME	SEX (M/F)	COMMUNITY	SIGNATURE
Ursher Ncube	Men	SIKABELO	[illegible]
Jeffery Mawandla	M	Sikabelo	[illegible]
ZANI Mudendai	m	KALETHU	[illegible]
NYATHI Sibongiliso	m	MASIKILI	[illegible]
million ndlovu	M	MASIKILI	[illegible]
RONALD Ngwenya	m	MASIKILI	[illegible]
OSWELL MATE	m	MASIKILI	[illegible]
Richard Nyathi	m	MASIKILI	[illegible]
Jr Manumani	m	[illegible]	[illegible]
GABRIEL SIBINDI	m	FARM 55	[illegible]
ZEBEDIA [illegible]	m	FARM 55	[illegible]
Amon Mudimba	m	FARM 55	[illegible]
ELIAS Chuma	M	Khayalethu	[illegible]
N. BONOMALI	m	FARM 56	[illegible]
PROTTY Ndlovu	m	BREAK-FAST	[illegible]

COMMUNITY MEETING REGISTER

MATETSI WARD

DATE: 07/10/14

VENUE: MATETSI POLICE BASE.

NAME	SEX (M/F)	COMMUNITY	SIGNATURE
Edington Hpake	MALE	Maparigoma	[illegible]
GABRIEL SIBINDI	MALE	FARM 55	[illegible]
N BONOMALI	MALE	FARM 56	[illegible]
Phinia MATHE	MALE	FARM 55	[illegible]
Jorum Nyathi			
	Male	Masikili	[illegible]
ABEL NYONI	MALE	Break-FAST	[illegible]
Jorum Phini	male	" "	[illegible]
BRUCE Makantse	Male	Masikiri	[illegible]

COMMUNITY MEETING REGISTER

DATE: 7/10/14
VENUE: MILONGA CLINIC

NAME	SEX (F/M)	COMMUNITY	SIGNATURE
PATRICIA MAFUKO	F	Shantani 3	P. mafuk
JANET NCUBE	F	Shantani 3	~~P.~~ J. Ncu
Joice NYONI	F	Shantani 4	~~J. Ncube~~ Nyoni
Prisca Ncube	F	Kwalala -	P. Ncube
ANGELA SHAVA	F	CHENAMBI 2	A. SHAVA.
ADELA NAMUKOWA	F	CHENAMBI 3	A. NAMUKO
SINAZENI SHOKO	F	SISYATHU 1	S. SHOKO
SAMBIWA NYATHI	F	CHENAMBI 3	S. NYATHI
Mukaldoyi Sibanda	F	Kwalala 3	M. Sibanda
Evangelista Sibanda	F	Kwalala 1	E. Sibanda
Kushani Nyoni	F	Makuni 4	K. Nyoni
Siphiwe phiri	F	Makuni 3	S. phiri
Kheles moyo	F	Sisyathu 4	K. moyo
Memory Moyo	F		
Elizabeth moyo	F	NTiba 1	S. moyo
Fesina sibanda	F	NTiba 2	F. sibanda
Sibonginkosi Mahlangu	F	Ntiba 2	S. Mahlangu
Media sibanda	F	NTiba 2	M. sibanda
Jesita phiri	F	Makhuni 2	J. phiri
Zeria NGozi	F	makhuni 1	Z. NGozi
P. mathe	F	Tshenambi 4	P. mathe
Jenara Zulu	F	Chenambi 4	J. Zulu
Cynthia Kambole	F	Sisyatwi "	[illegible]
Christina Ncube	F	sisyatwi 3	C. Ncube
Suzeni M. Ncube	F	sisyatwi 3	S. Ncube
Lethi Ngwenya	F	Makuni 2	L. Ngwenya

NAME	SEX(M/F)	COMMUNITY	SIGNATURE
Beatrice Nyoni	F	Makuni 2	B. Nyoni
Cathrine Moyana	F	Shantani 2	C. Moyana
Priscillar Ngwenya	F	Shantani 2	P. Ngwenya
Ketty Shumba	F	Shantani 2	K Shumba
Siphathelupi Ndlovu	F	Shantani 2	S Ndlovu
Simangaliso Mahlangu	F	Shantani 2	Shahlang
Maria Moyo	F	Sisiyatu 4	M moyo

COMMUNITY REGISTER

DATE: 7/10/14
VENUE: MILONGA CLINIC

NAME	Sex (M/F)	COMMUNITY	SIGNATURE
orders Moyo	M	V. Head	[illegible]
J. Dube	M	V. Head	[illegible]
M. A. Shava	M	V/Head	[illegible]
Stephen Sithole	M.	V/Head	[illegible]
Joe SHOKO	M	V/Head	Shoko
Lenard. Nkomo	M	V/Head	[illegible]
A/Peter Ndlovu	M	V/Head	[illegible]
AMBROSE ALOIS NYONI	M	V/HEAD	[illegible]
Benson Ncube	M.	V/Head	Ncube
FLORENCE NGWENYA	F		F. Ngwenya
DALESI NYONI	F		D. Nyoni
FELX SIBANDA	M		F Sibanda
ROZINA NCUBE	F		R Ncube
JOYCE NCUBE	F		J Ncube
Joyce Dube	F		J DUbe
JENNER mpala	F		J mpala
shilla mwembe	F		S mwembe
Maria Ncube	F		M. Ncube
Polina Shoko	F	Care-taker	P. Shoko
Monica Ngwenya	F	Malaria Champio	M. Ngwenya
Christine MpoFu	F		C. MpoFu
Wilani Tshuma	F		W Tshuma
Matilda Shoko	F		M. Shoko
Eja Ngwenya	F		E Ngwenya
Saviour Ngwenya	F		S Ngwenya
Trinity Ndlovu	F	Care-taker	T. Ndlovu

COMMUNITY REGISTER

DATE: 7/10/14
VENUE: MILONGA CLINIC

NAME	SEX (M/F)	COMMUNITY	SIGNATURE
CLLR FARAJI M. SHOKO	MALE	MBIZHA WARD	[illegible]
V/Head SEBASTIN NGWENYA	MALE	MBIZHA WARD	[illegible]
D Kenelo	male	Jambezi	D Kenelo
Chief Shana	M.	Jambezi Communal Lands	S T Shana
Alois Ndazi	M	MBIZHA WARD	[illegible]
Phanias Ncube	M	MBIZHA WARD	D Ncube
[illegible]	M	MBIZHA WARD	D Masuku
Shoko Cosmas	M.	Mbizha ward	[illegible]
HERBERT NDLOVU	M.	MBIZHA WARD	[illegible]
Dominic Ncube	M	MBizha Ward	D Ncube
JEQE NCUBE	M	MBIZHA WARD	JEQE
NYONI B	M	MILONGA PRY SCHOOL	[illegible]
AMBROSE ALOIS NYONI	M	MBIZHA WARD	[illegible]
Benson Ncube	M	Mbizha Ward	Ncube
Theresa Mulale	F	MBizha ward	T. Mulale
Lenard NKomo	M	MBizha ward	[illegible]
JOE SHOKO	M	MBizha ward	JShoko
EDWARD Mathe	M	MBizha ward	Mathe
Shobani Shoko	M	MBizha Ward	Shoko
JACOB Sh Sichoni	M	MBizha ward	[illegible]
THABANI ZULU	M	MBizha ward	T Zulu
NGOBILE Nwugufa	M	MBizha ward	[illegible]
Peter Ndlovu	M	" "	[illegible]
[illegible]	M	" "	[illegible]
PATRICK Sibi...	M	MBizha ward	

Community Meeting Register

Name	Sex (M/F)	Community	Signature
Shoti Shoko	M	Mbizha	Shoko
Ngalini Ndoenu	M	Mbizha	[illegible]
Lucas Muleya	M	Mbizha	[illegible]
Lowani Bafu	M	Mbizha	Bafu
Dominic Shoko	M	Mbizha	[illegible]
Isaac Manjuzu	M	Mbizha	Manjuzu
Isaac Mulenga	M	Mbizha	[illegible]
Sipho Ncube	M	Mbizha	[illegible]
Gift Ngweya	M	Mbazha	[illegible]
Joel Ncube	M	Mbizha	[illegible]
Bob S	M	Munka	
M Shoko	M	Chenambi	
T Mathe	M	Chenambi	
Christopher Dube	M	Kwalala	C Dube
S. Makulela Shoko	M	Sisyatwi 2 Mbizha	[illegible]
S. Mathe	M	Shantani 2 Mbizha	[illegible]
F. Tshuma	M	Sisyatwi (6)	[illegible]
Michael Ncube	M	Kwalala (6)	Mncube
Joseph Tshuma	M	Chenambi (4)	[illegible]
Simon Shoko	M	Ntiba (1)	[illegible]
Stephen Shoko	M	Chenambi (1)	
Ken Nyoni	M	Sisyatwi 6	Nyoni
Joseph Ngwenya	M	Shantani 2	J Ngwenya
Kizito Nyoni	M	Kwalala 5	Kizito Nyoni
Mandla Mpofu	M	Sisyatwi (4)	[illegible]
Stephen Moya	M	Kwalala 5	[illegible]
Simo Loka	M	Chenambi 2	S. Muden
Inocent Nyoni	M	Kwalala 5	I. Nyoni
Jonathan Ncube	M	Kwalala 5	Ncube
Mkhululi Masuku	M	Sisyatwi 2	[illegible]

NAME	SEX(M/F)	COMMUNITY	SIGNATURE
GIFT CHIDAKWA	M	SHANTAN 2	[illegible]
Lot Ngwenya	M	SiSyatu 1	[illegible]
Ephram Nyati	M	Makuni B	[illegible]
Malon Msaka	M	Makuni A	[illegible]
Enest Sbanda	M	NTIBa 2	[illegible]
VENASTIUS NYONI	M	Kwalala 5	[illegible]
JOSEPH NYATHI	M	NTIBA 2	[illegible]
Washington Ngwenya	M	MUNUNA C	[illegible]
ENOCK [illegible]	M	Sitwatwi N	[illegible]
Croud Sibanda	M	Gondwa 2	[illegible]
JIMMY NDLOVU	M	M	
Shelton ZULU	M		
JOSEPH MATHE	M	MILONGA	[illegible]
[illegible] CHRISTOPHER [illegible]	M	NTIBA I	[illegible]
NGEZELWA TSHUMA	M	SHANTANI 2	[illegible]
LAWRENCE BANDA	M	CHENAMBI 2	[illegible]
GODFREY NYONI	M	CHENAMBI 4	[illegible]
Gift David TSHUMA	M	KWALALA 4	[illegible]
NGWIZA NGWENYA	M	SHÃTANI 2	[illegible]
DANISA MOYO	M	" 2	[illegible]
FELEX MOYO	M	" 2	F Moyo
VINCENT PHIRI	M	SiSyatwi 4	[illegible]
CLEMENT SIBANDA	M	SISYATWI 3	[illegible]
Kever Ndlovu	M	SISYATHU 6	[illegible]
Admire Sithole	M	SHANTANI 4	[illegible]
Michael Ngwenya	M	NTIBA 3	[illegible]
Fandoon Dube	M	Sisyatwi 1	[illegible]
LUNGISANI Muleya	M	SIS 3	[illegible]
RONALD NEta	M	"	[illegible]
LAWRENCE Sibanda	M	NTIBA 3	[illegible]
[illegible]	M	Chenambi	[illegible]

COMMUNITY REGISTER

DATE: 7/10/14

VENUE: ~~EMUA~~ MLONGA CLINIC

NAME	SEX (M/F)	COMMUNITY	SIGNATURE
Isaac Sibandu	m	Ntiba	Isaac Sib.
JEYANI NDHLOVU	M	NTIBA 1	[illegible]
Gamzani M	M	Ntiba 2	[illegible]

SIDINDA WARD 8
LUMBURA SEC SCHOOL.

Community Meeting Register

Date: 8/10/14
Venue (including ward): LUMBURA SCHOOL, SINDINDA WARD

Name	Sex (M or F)	Community	SIGNATURE
Themba Ncube	M	makala village 2	[illegible]
KENNETH BHEBHE	M.	Lumbora I " 1	[illegible]
DOUGLAS SIBANDA	M	Lumbora 4	[illegible]
Jubek' Pi Ncube	M	MAKALA " 3	[illegible]
GABRIEL TSHUMA	M	SIDINDA 1	[illegible]
PHILLIMON N'ILONGO	M	DOBOLO	[illegible]
GIBSON SIBANDA N	M	NDOWENI 3	[illegible]
FABION SIBANDA	M	NDOWENI 2	[illegible]
Lelani mudimba	M	bhombo 1	[illegible]
Dadani Mudimba	M	Mbhombo 1	[illegible]
Calton Nyoni	M	Mbobho 1	[illegible]
Alexious munkuli	M	Makala V 5	[illegible]
TEMBO SIMON	M	MAKALA Vill 1	[illegible]
Zabani Dube	M	MAKALA Vill 1	[illegible]
DRIVER MUDIMBA	M	MAKALA V 3	[illegible]
SHAMISO MATHE	M	MAKALA V (1)	[illegible]
[illegible] Nowenya	M	MAKALA V (4)	[illegible]
DADANI PHIR.	M	DoBolo village	[illegible]
GIDION NYONI	M.	MAKALA VILLAGE 5	[illegible]
Oweni Nyoni	M.	[illegible] 1	[illegible]
WIZIWELL NYONI	M.	LUMBORA 4	[illegible]
TaiTas NeUBe	M	DoBoLo	[illegible]
EMMANUEL SIBANDA	M.	SIDINDA 2	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
INNOCENT NCUBE	M	SIDINDA Village 3	[illegible]
Chipiwo Ncube	M	Sidinda Villege 3	Ncube
Dhebre Ephraim	M	Lumbora village 3	[illegible]
SHEPHERD MBAMBO	M	Sidinda Village 1	[illegible]
EMMANUEL MAPETA	M	SIDINDA VILLAGE 1	[illegible]
Sophy Nkomazana	F	Lumbola Village 3	[illegible]
Stanley Ncube	M	Sidinda 3	[illegible]
Vinsto Mhodi	M	Ndoweni 4	[illegible]
PRETTY MASUMU	F	Lumbora village 3	[illegible]
Lophias Mumpande	M	Lumbora V 4	L.M.
Peter Mumpande	M	Lumbora V/4	[illegible]
MENDRIS SHOKO	M	Sidinda V/1	[illegible]
HUBERT Moyo	M	Lumbora V/2	[illegible]
Lazaros Sibanda	M	Lumbora V/3 4	[illegible]
Moffat Sibunda	M	Ndoweni V 3	[illegible]
PETER Mumpande	M	Lumbara V 2	
ABRAHAM SITHOLE	M	NDOWENI V 3	
COSMAS MBAMBO	M	SIDINDA V 1	
CHRISTOPHER NYONI	M	SIDINDA V5	[illegible]
Paul Zulu	M	Sidinda V5	[illegible]
Francis Shoko	M	Sidinda V5	[illegible]
DERICK SIBANDA	M	SIDINDA V5	[illegible]
Peter Munsaka	M	SIDINDA	[illegible]
CEASER MUNSAKA	M	St Matetsi V	[illegible]

SIDINDA WARD 8
LUMBORA SEC SCHOOL

Community Meeting Register

Date: 8/10/14
Venue (including ward): LUMBORA SECONDARY SCHOOL, SINDINDA WARD

Name	Sex (M or F)	Community	SIGNATURE
TRUST BHEBHE	M	LUMBORA	[illegible]
PETER KAJURA	M	MAKALA	[illegible]
ENOCK Moyana	M	LUMBORA	[illegible]
MISHECK MATHE	M	NDOWENI	[illegible]
Hillary Nkomo	M	Lumbora	[illegible]
MORRIS NDLOVU	M	Sid.	[illegible]
Neelano Neubu	M	Lumbora	[illegible]
Peter Tembo	M	[illegible]	[illegible]
NORMAN CHANGE	M	Makala	[illegible]
DUBANI MUNTANGA	M	makala	[illegible]
CHAMPION Mudimba	M	makala	[illegible]
PETER NYATHI	M	NDOWENI	[illegible]
EMMANULE NDLOVU	M	Sidinda	[illegible]
Admire Ngwenya	M	Makala	[illegible]
Norman Mkandla	M	Lumbora	[illegible]
Albert Ncube	M	Makala	[illegible]
Lawson Tshama	M	Makala	[illegible]
ENOCK NYATHI	M	NDOWENI	[illegible]
PHUMULANI NCUBE	M	LUMBORA	[illegible]
ENNOCENT BHEBHE	M	LUMBORA	[illegible]
Raphael Nyathi	M	Lumbora	[illegible]
NEVEA Nyathi	M	Sidinda	[illegible]
Japhet Siabana	M	Sidinda	[illegible]

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Name	Sex (M or F)	Community	Signature
Justin Nautse	m	Sidinda V. 8	[illegible]
Lenard Dutse	m	Sidinda V 2	L.Dutse
Bonani Nyoni	F	Sidinda V. 2	B.Nyoni
Anna Nyoni	F	Sidinda V 1	A.Nyoni
DERICK MUSAKA	m	Sidinda 1	[illegible]
MICHAEL NYONI	m	Lumbora 3	[illegible]
ELISHA MATEKENYA	M	LUMBORA V/ 4	[illegible]
SIPHELILE MOYO	F	LUMBORA V/4	S.M.
Cynthia Chuma	F	Lumbora V/4	Chuma
Letrin Bhebhe	F	Lumbora V/3	L.Bhebhe
IRENE CHUMA	F.	LUMBORA V./4	[illegible]
JESTA SHOKO	F.	LUMBORA V./2.	J.Sh
JABANI SHOKO	F.	LUMBORA V/2.	[illegible]
SWIKANI MPALA	M	LUMBORA V/3	[illegible]
[illegible] Sibanda	M	LUMBORA V/3	[illegible]
Shatani Mulenda	M	Kayamizi V/1	[illegible]
[illegible] Moyo	m	Lumbora V/2	[illegible]
Yenzani Sibanda	F	Lumbora V 3	Yez.
MTELISI NDLOVU	M	LUMBORA V 3	[illegible]
LANGTON MNKANDLA	m	Lumbora V 1	[illegible]
[illegible] Bhebe	m	Lumbora V3	[illegible]
Charson	M	Makala V 4	[illegible]
CLATNO NUM	M	[illegible] V	[illegible]
Mkulaleka Sibanda	M	SANDOLVEAN 3	Si

SIDINDA WARD 8
LUMBORA SEC SCHOOL

Community Meeting Register

Date: 8/10/14
Venue (including ward): LUMBORA SECONDARY SCHOOL, SINDINDA WARD

Name	Sex (M or F)	Community		SIGNATURE
AGRIPPA Sibanda	M	Ndoweni	3	
Abraham Sibanda	M	Ndoweni	4	
MOSTER SIBANDA	M	LUMBORA	2	
Welcome Nyathi	M	Lumbora	1	
Alice Mpala	F	Lumbora	4	
TRACY TSHUMA	F	Lumbora	1	
Polite Munkuli	M	Makala	5	
Emelda Sithole	F	Sidinda	1	
TINOS MUDENDA	M	MATETSI	1	
AUSMA Ndlovu	M	Sidinda	1	
Figo Mudenda	M	Sidinda	1	
Inzani Zulu	F	Sidinda	1	
Josphat Dube	M	Makala	1	
Lazarus Sholo	M	Sidinda	3	
Clement Ncube	M	Matetsi	1	
SHINGINE NKOMAZANA	F	Makala	4	
SHIELA NCUBE	F	MAKALA	5	
Lingiwe Ngwenya	F	Makala	4	
NOREEN NCUBE	F	NDOWENI	4	
DAFIYA NCUBE	F	DOBOLO	1	
LINDIWE LUPAHLA	F	DOBOLO	1	
Lambiwe Zimba	M	DOBOLO	1	
ALFRED MATHE.	M	MAKALA	2.	

Name	Sex (M or F)	Community	SIGNATURE
Simon Sibanda	M	Lumola 2	[illegible]
MATHIAS MZAMBA	M.	Lumbola 2	M.M
Sedias. NKOMIAZANA	M.	Ndoweni 4.	S.N.
NOMSA Vemani	F	L 1	N Vem
ANASTASIA NCUBE	F	Ndoweni 3	Anastas
REDIUS Sibanda	M	Ndoweni 3	[illegible]
SHAKANI NGWENYA	M	NDOWENI 1	[illegible]
OBERT NJOSI	M	Dobola [illegible]	[illegible]
Ohubelsani Bhebhe	M	Matetsi village	[illegible]
Nelson Tshuma	M	Matetsi V	N.T
Memory Munsaka	M	Matetsi V	M.M
Roy Sibanda	M	Matetsi Village	[illegible]
PRESIDENCE MPOFU	F	Lumbora 4	MPOFU
Lydia Chuma	F	Lumbora 1	[illegible]
Themba Ncube	M	Lumbora 1	[illegible]
SHAMISO Ncube	M	Makala 2	[illegible]
MORGAN CHANAKIRE	M	Makala 4	[illegible]
AID MUNSAKA	M	Makala 4	[illegible]
GIZO SIBANDA	M	Makonda 2	[illegible]
Precious Thwala	M	Matsti Village	[illegible]
Tichaona Thwala	M	Matesti Village	[illegible]
Leinard Shuma	M	Lumbora Village 1	[illegible]
Allois Shoko	M	Makara Village 2	Shoko
Lidith Sibanda	F	Lumbola 2	[illegible]

SIDINDA WARD 8
LUMBORA SEC SCHOOL

Community Meeting Register

Date: 8/10/14
Venue (including ward): LUMBORA SECONDARY SHOOL, SINDINDA WARD

Name	Sex (M or F)	Community	Signature
Lameck Maths	M	Makala	[illegible]
Paetson Sibanda	M	Ndowen. V/ 2	[illegible]
Dubani Aleck	M	Sidinda	[illegible]
SINIKIWE Zulu	F	Lumbora	[illegible]
Siphathiwe Moyo	F	Lumbora	[illegible]
CHINAMANO NCUBE	M	LUMBORA 2	[illegible]
GRACIOUS . N. SIBANDA	M	Lumbora 4	[illegible]
Pollte Sibanda	M	Lumbora	4
TSHUMA DAVID	M	DOBOLO	[illegible]
Matthew Sibanda	M	Lumbora 2	[illegible]
TSHUMA KEVIN	M	SIDINDA	[illegible]
MALUNGA MACKSON	M	LUMBORA	[illegible]
NYATI P.C	M	LUMBORA	[illegible]
CORNELIUS M. Bango	M	Lumbola	[illegible]
Mdumba Darlington	M	Lumbola 4	[illegible]
MUKALADI NGWENYA	M	DOBOLO VILLAGE	[illegible]
Million Ngwenya	M	Makala V 5	[illegible]
CRISPEN Ndazi	M	Makala V5	[illegible]
OSCAR NGWENYA	M	NDOWENI 2	[illegible]
Charles Shoko	M	MAKALA 2	[illegible]
Emiya Ndlovu	M	DOBOLO	[illegible]
Bernard Sibanda	M	Lumbora V 2	[illegible]
Jaison Chimez	M	Mukonda	

Name	Sex (M or F)	Community	SIGNATURE
PATRICK Mathe	M	Lumbora	P. Math
SIBANDA JOHANNES	M	LUMBORA V/2	[illegible]
DENNY SHABA	M	LUMBORA V/2	[illegible]
NKONEKNI MILO	M	DOBOL V	[illegible]
KELVIN Mwulungale	M	Dobolo V	[illegible]
MUNDANDE LYON	M	LUMBORA V	[illegible]
Sehlulekile Matwasa	F	Lumbora 1	[illegible]
Blessed Sibanda	F	Lumbora 1	Sibanda
LOTI SHABA	M	Lumbora V/2	L SHAB
T MANGENA	M	LUMBORA PRIMARY	[illegible]
B. PHIRI	M	LUMBORA SCHOOL	[illegible]
P Nyoni	M	Lumbora school	[illegible]
Moffat Ndlovu	M	Lumbora school	Mdlu
Herbert Ndlovu	M	Lumbora sch	Herb
Prosper Ndlovu	M	Ndowen V 2	[illegible]
Monica Nyoni	F	Lumbora V4	M. N
FEBI Mudenda	F	Ndone V1	F M
Lambiwe Nyoni	F	Ndowen V1	L Nyon
Irene Nyoni	F	Ndowen V1	I Nyon
Boniwe Nyoni	F	Ndowen V1	P Nyo
DAFIYA Ncube	F	Dobolo V	[illegible]

Community Meeting Register

Date: 8/10/14
Venue (including ward): MASHACA SCHOOL, MASHACA WARD.

Name	Sex (M or F)	Community	SIGN
D Victor Chuma	m	makwa	[illegible]
Francis Shoko	M	Mashala	[illegible]
Paul B Munyandi	M	Mashala	[illegible]
Isaac L Tshuma	M	MASHALA WARD 9 KASIBO	[illegible]
Charles Nyoni	m	MASHALA TOP	[illegible]
Zwela Mathi	m	mashala ward 9 Kasibo	[illegible]
K P Tshuma	M	Siasiashunda Ward 9.	[illegible]
Rosemary Shoko	F	Shashachunda ward 9	[illegible]
Joyce Ndlovu	F	Chachachund ward 9	Jndl
Bengani Chuma	F	Chachachund ward 9	B. Chu
Linda Siachiba	F	Mashala down ward 9	[illegible]
Virginia Mpofu	F	Mashala down ward 9	V mp
Joyce Mathe	F	Mashala down ward 9	J. Ma
cecilia Ncube	F	Mashala down ward 9	[illegible]
Hauka muyambo	F	Mashala down ward 9	[illegible]
Violet Ncube	F	Mashala down ward 9	[illegible]
Gladys Muyambo	F	Mashala down ward 9	[illegible]
Sibongankosi Nyathi	F	Chachachunda ward 9	S Myo
Josifini Mahlangu	F	Mashala down ward 9	J mah
Noria Mudeda	F	Chachunda ward 9	N mu
Sithembile maluleka	F	mashala	
cathrene nkomo	F	kasiba	
Jesi nyoni	F	kasibo	

Name	Sex (M or F)	Community	SIGNATURE
Enjelini nphuri	F	mashala	
Roseline Zulu	F	KASIBO	
Elizabeth Sibanda	F	KASIBO	
LETIWE MALULEKA	F	MASHALA	
Nyoni CATHRINE	F	KASIBO	
Nyoni SIHLE	F	KASIBO	
Chema chibani	F	Kasibo	
Evelina Munsaka	F	Shashachunda	
Chiyamo P Munsaka	F	Mashala down	
LASHIWE MUNSAKA	F	" " "	
CHATINA MUNSAKA	F	MASHALA DOWN	
SILIBAZISO NCUBE	F	MASHALA DOWN	
JUNIS NGWENYA	F	MASHALA DOWN	
Lindani NDIOVU	F	MASHALA DOWN	
Gladys Muyambo	F	Zwabo	
Maggie Chulu	F	Mashala down	
Pauline Ndebele	F	Shashachunda	
Elina Mzamba	F	ChachaChunda	
Rosina Dube	F	Chachachunda	
Nkhutshula Mpala	F	Makuyu	
Joyce Mpofu	F	Mashala down	
Skylet Sibanda	F	MASHALA DOWN	
Sofi MPofu	F	MASHALA down	

Community Meeting Register

Date: 8/10/14
Venue (including ward): MASHALA SCHOOL, MASHALA WARD

Name	Sex (M or F)	Community	Signa
KELVIN TSHUMA	M	MASHALA TOP	[illegible]
CLEMENT MOYO	M	MASHALA DOWN	[illegible]
Alexander Munsaka	M	Mashala Down	[illegible]
Shadreck Dube	M	mashala Down	[illegible]
ANDREW TSHUMA	M	MASHALA TOP	[illegible]
Shelton Ngathi	M	Mashala down	[illegible]
MBUSO MOYO	M	MASHALA TOP	[illegible]
SHADRECK NGWENYA	M	"	[illegible]
NDLOVU N. MR	M	NECHISHALA SEC (TEACHER)	[illegible]
Vusani Ndlovu	M	MASHALA TOP	[illegible]
Tinashe Sheko	M	"	[illegible]
Dumisani Ndlovu	M	MASHALA TOP	[illegible]
LETIVNE MALULEKA	F	Mashala Top	[illegible]
SHAMISO NCUBE	F	" "	[illegible]
EUNICE TSHUMA	F	" "	[illegible]
SIFISO SIBANDA	F	" "	[illegible]
SOPHIE MOYO	F	" "	[illegible]
PAULINE NYONI	F	CHAMPEPO	[illegible]
JANE Ncube	F	CHAMPEPO	[illegible]
SAPHIRA PHIRI	F	" "	[illegible]

Community Meeting Register

Date: 8/10/14

Venue (including ward): MASHALA SECONDARY SCHOOL, MASHALA ward 9

Name	Sex (M or F)	Community
Isaac Ncube	M	Mashala Top
Alois Nyoni	M	~~Sha~~ Shachunda
FERESTINA Sibanda	F	makwa
JAMESONI Dube	M.	ZWABO / MAKUYU
M Dafsen Ndlovu	M	Mashala Down
STEPHEN Sibanda	m	Kasibo
Julias mpala	m	mashala Top
PATRICE mkoman	F	Zwabo
Ella Shoko	F	Zwabo
MESHONA Nyoni	M	CHMapepo
GREEN Dube	m	MAKUYU
MATHIAS NDWVU	m	LUBWELUDIle
Benedict Shoko	M	Makwa
F. Shoko	m.	makwa
M NYAthi	m	ShaChUNDA
Gabriel Nyoni	M	Chezya
A. Chinanungu	F	Madumabisa
Oliver Ndlovu	M	Mashala down
R Ncube	M	Mashala Top
Lovemore	m	~~NYATI~~ CHAMPEPO
Clement Phiri	m	CHAMPEPO
Shadrek moyo	m	Mashala down
Bhuzani Ncube	M	Mashala down

Name	Sex (M or F)	Community	SIGN
TATA DUBE	M	MAKUYU	
K TSHUMA	K	KAGIBO	[illegible]
STEPHEN NYAMUSIKA	M	SHACHANDHA	
EUSANI WSEENE	M		
Memory Nyathi	F	SHACHACHUNDA	
MELUSI SIBANDA	SM	Shashachunda	
LEBANI NZOMAZANA	F	Shashachunda	
Felistas Nyathi	F	Shashachunda	
Remind Masarakata	M	Mashala Top R[illegible]	
David Sibanda	M	Mashala Top David	
Marvellous Mhlanga	F	Mashala Top	[illegible]
Kholisani Dube	M	Zwabo Makuyu	
Stella Dube	F	makuyu / Zwabo	
Joyce Dube	F	makuyu / Zwabo	
Clemenzia Mpala	F	Shachachunda	
Lebani Nyoni	F	Shachachunda	
Listina Ndlovu	F	mashala bown	
Ernest Sibanda	m	mashanana	
Dorris Nyo	F	Chezya	U.head
B[illegible]	m	Makuyu	
Louis Moyo	m	makuyu / Zwabo	
Pauline Churu	F	Shachachunda	
Christina Mudimba	F	Zwabo / makuyu	
Berita Munsaka	F	Zwabo / makuyu	

Community Meeting Register

Date: 8/10/19
Venue (including ward): MASHALA SCHOOL, MASHALA

Name	Sex (M or F)	Community	SIGNAT
BRANDINA NYONI	F	ZWABO	B Nyo
SENZENI Zulu	F	Zwabo	L.Rh
LIZZY PHIRI	F	Zwabo	S. Zu
SINGU SHOKO	F	Zwabo	S.Sh
Froker Ndlovu	F	CHACHUNDA	F.Ndl
Catrine Mundumba	F	Zwabo	C.Mu
Berita Mundimba	F	Zwabo	B.Mu
MRS J MPOFU	F	Mashala Down	J.M
Jane Shoko	F	Shashachunda	
MRS Zulu	F	Mashala	[illegible]
LUCIA NDLOVU	F	Shachunda	
Samuleya Chuma	M	Shachunda	
DENTON Shava	M	Shachunda	
Sychoni Ndlovu	M	Shachunda	
PASCAR MPOFU	M	MASHALA DOWN	[illegible]
TOBIAS MAWEMBE	M	MAKUYU	[illegible]
E. MUDIMBA	M	MASHALA DOWN	
Matthew Muyambo	M	Zwabo / Makuyu	M.
CHARLE MUZAMBA	M	CHEZUA /	[illegible]
ALVIN NCUBE	M	ZWABO / MAKUYU	[illegible]
Conis Chuma	M	Kasibo	[illegible]
SHEPHARD MUDIMBA	M	MASHALA DOWN	S.Mud
STEPHEN MUKEMBWE	M	MASHALA DOWN	[illegible]

Name	Sex (M or F)	Community	[illegible]
ELESITA NYONI	F	MASHALA DOWN	

Name		Sex (M or F)	Community		Sig
Ncube	Zumbani	F	Mashala	Down	Ncu
Banda	Eunice	F	Mashala	"	Ban
Mtombeni	Kalolo	F	"	"	K Mto
Dube	Christini	F	"	"	C Dub
Sutu	Mavis	F	"	"	m S
Maja	Asura	~~F~~ M	"	"	M As
LIVETT	NYATHI	~~F~~ M	"	"	L Ny
Mbonisi	Ncube	M	"	"	N N
Ndobile	Mudimba	F	Mashala	Down	N. m
Precious	mtlanga	F	mashala	TOP	P. mth
Vincent	Mable	M	Mashala	Down	V m

Community Meeting Register

Date: 8/10/14
Venue (including ward): MASHALA SCHOOL, MASHALA WARD 9

Name	Sex (M or F)	Community	Sign
Chief Wange	M	Chief Wange	
Cllr James Phiri	M	Mashala Ward 9	
P. Nyoni	M	Headman - Mashala ward 9	
W. Sibanda	M	Shashachunda Village Head	
E. Tshuma	F.	Mashala Top - Village Head	
UZIMUTU	M	NELOLSHALA SEC	
S. MPALA	M	MWEMBA HALL	
S. Mlotshwa	F	PROV ZANU PF	
CHRISTOPHER SHOKO	M	V/head ward 10	
E. CHOPENI SIBANDA	M	CHIEF CO-ORDINATOR	
Reeds Dube	M	~~Ward 9~~ Mashai ward	
MAKINA KUNDA	M	SMAT	
Rodo Sakala	~~M~~ F	Shashachunda	
CATHERINE Chuma	~~M~~ F	Shashachunda	
Agnes T Nguenya	F	Shashachunda	
Themberi Munsaka	F	Shashachunda	
Georgina Munsaka	F	Shashachunda	
Sithokozile Mhlanga	F	Shashachunda	
Loveness Nyathi	F	Shashachunda	
PETER Dube	M	"	
LAZARUS Munsaka	M	"	
ALICK MATHE	M	"	
HARRECK L. MPERO	M	VIDEO CHAIR KASIBO	

Name	Sex (M or F)	Community	Signature
COWBOY NDLOVU	M	PASTA KASIBO	
AUGUSTINE MAPEMBERE	M	KASIBO RESIDENT	

Community Meeting Register

Date: 13/10/14
Venue (including ward): NGANDU SCHOOL, MUKUNI WARD

Name	Sex (M or F)	Community / VILLAGE	SIGNATURE
Enock Simasiku	m	NAMATONGO	[illegible]
Josephat Kandiana	m	ZANGALA	[illegible]
ROYD SaMBO	M	Zangala	[illegible]
DAVID RESAZI	m	SIAMATETE	[illegible]
EMANUEL KESHO	M	CHILIZYA	[illegible]
ANTON MAKAYE	M	SIAMATATA	—
KILIAN B. SIATONTOLA	M	CHILIZYA	[illegible]
LANDY MUKUMBUTA	M	ZANGALA	[illegible]
Jim Siatontola	m	Chilizya	[illegible]
Makumo [illegible]	M	Chillizya	[illegible]
STEVEN Simunkwete	M	SIACHUMA	[illegible]
DEIECK SIKANYAMA	m	SIAZIBOLA	[illegible]
Franco [illegible]	m	Sichilobe	[illegible]
EMMANULE MOOLA	M	SIACHUMA	[illegible]
Gardina malake	m	Chibule	[illegible]
GIFT NYAMBE	m	MUKALAHANI	[illegible]
ANDREW CHALINGA	M	CHIBULE	[illegible]
Tichaona Ncube	M	NGANDU	[illegible]
MAKAY SIYNDA	M	NGANDU	[illegible]
Peter nyama	M	Mukalahani	P.
Elias SIMASIKU	M	SIAKONDO	[illegible]
BOSTON SIACHETOLA	M	Siejoba	[illegible]
JACOB MUFANA	M	CHIBALANI	[illegible]

Name	Sex (M or F)	Community	SIGNATURE
BRIAN SILABI	M	mukalahani village	Bsilabi
PETER Simunomba	M	MUNWANA VILLAGE	[illegible]
Brandina chembe	F	Mukalahani "	[illegible]
victoria mukendwa	F	NGANDU "	
Malita chekapu	F	MUNWANA "	M.C
Getrude Solochi	F	Ngandu	G.S
LAYNESS SIRATENE	F	BIAMATETE	L Sibate
Anaya muyangwa	F	SIAMATETE	A.M
MARY Sitali	F	Munwana	MS
MUKANZALA MALUMO	F	Chibule	M.M
CATHRINE - Siamantundi	F	Chibule	C - S
Juliet - Siansulinga	F	Chibule	J - S
Ireen Simatele	F	Chibule	I - S
JERPha gwemani	F	Muntu muswana	J.G
ANGELA mumba	F	muntu muswana	A.M.
Mary Kasoka	F	Munwana	M K.
LILIAN Siawala	F	Ngandu	L.S
Modester Mabunda	F	chibule	M.M
MIRIAM Sikiti	F	Chibule	MS
Patricia Siamate	F	Ngandu	Biamate

Annex C5

Comments and Response Report

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
This area is used extensively by bird watchers and there are tours associated with this. There are very specific species found in this Gorge that are endemic to Zambia and Zimbabwe. This is an isolated breeding area for the Black Eagles.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	As part of the ESIA Studies a biodiversity study is being undertaken which will assess the impact of inundation of the gorge on bird species, including those endemic to the area. The study will develop the project EMP which will include mitigation measures to ensure that bird populations are not adversely affected. The specific mitigation measures will be developed in consultation with specialised stakeholders. Inundation of the gorge to varying degrees from the dam wall upstream towards the falls is an unavoidable impact of the scheme. Rock Hyrax populations should, however survive as much of the cliff and upper rocky habitats won't be affected and the Verreaux's (Black) Eagles should remain. ZRA has, however been informed about a general decline in raptor populations, particularly the Taita Falcons. Their numbers, have already declined in the area due to excessive helicopter activity along the length of the Gorge.
The insect life and loss thereof also requires consideration. This is a unique environment.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	We are aware of unique butterflies in the Victoria Falls Rain Forest and the Limited knowledge of insect fauna of the gorge has been highlighted as a gap that which will be addressed as part of the studies. Inundation of the gorge to varying degrees from the dam wall upstream towards the falls is an unavoidable impact of the scheme. The loss of the rapids could have an impact on midges, caddisflies etc. that are a key component of the food chains for Rock Pratincoles, Swifts and other birds. As part of the ESIA study for the project, a biodiversity specialist study will be undertaken which will identify and assess potential impacts and propose mitigation measures. The ESIA studies include identification and assessment of project impacts on biodiversity(both positive and negative). A baseline study will be carried out as part of the ESIA studies and subsequently an impact management plan will be developed that will also address identified project negative impacts on biodiversity which includes mitigation of impacts on insect life.
Bats are also found in the Gorge and will be impacted on.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	We are aware of the seasonal bat migration. The impact of the project on bats like the impact on all species to be affected by the project are subject of a biodiversity study being undertaken to assess the impacts and development of mitigation measures.
I also represent the Aloe and Succulent Society. There are unique species found in this Gorge, many yet to be identified.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	Inundation of the gorge to varying degrees from the dam wall upstream towards the falls is an unavoidable impact of the scheme. We are aware of a rich succulent flora in the gorge, some will be lost but much of it on the scree slopes which will remain. The uniqueness of the species is subject of the studies. Where it is established that a species is not found elsewhere, the EMP will include replication of that species.
Birds do nest in the area of silent pools.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	The choice of the full supply level of the dam will be such that it minimises impacts on the Silent Pool. Riverine vegetation around the Silent Pool shall remain predominantly unaffected, thereby allowing for continued nesting of birds in the area.
Are we not likely to be attacked by wild animals since the biodiversity will be affected?	Community member, Nemanhanga Ward	N/A		Nemanhanga Ward Meeting	Your concern is noted. Studies on flora and fauna are on-going. The project EMP to be developed in consultation with stakeholders will include mitigation measures to address any potential human-animal conflicts that would have been identified from the fauna studies.
Here there is a serious human wildlife conflict such that it is almost impossible to do any agriculture. With the coming of the dam, a lot more animals will be attracted and our livelihoods disturbed further. How are you going to compensate us for the disturbance of our livelihoods?	David Chuma, Dobolo Village	N/A	08-Oct-14	Sidinda Ward Meeting	Your concern is noted. Studies on flora and fauna are on-going. The project EMP to be developed in consultation with stakeholders will include mitigation measures to address any potential human-animal conflicts that would have been identified from the fauna studies.
The potential ecological effects on riverine ecology, fauna, flora, hydrology etc. needs to be better understood.	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	The ESIA studies include biodiversity and water flow studies. These studies will assist in understanding the ecology of the area as well as identifying the potential impacts of the project on the ecology. The EMP will be developed which will include mitigation measures for identified impacts.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
National Park area is being lost as a result of this proposed dam. This should be offset and protected areas provided for elsewhere.	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	The ESIA Studies include an study to determine the balance between the height of the dam, power requirements and extent of habitat loss. A careful assessment of the situation will be done during the Impact Assessment Phase of the Project and management measures put in place for all identified impacts.
Will the crocodiles in the Gorge be relocated?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	The ESIA studies will include the assessment of the impact of the project on fauna including crocodiles. A decision to relocate the crocodiles will be subject to the results the studies.
Can you provide assurance that a search for rare and endangered species was done by properly qualified staff at the appropriate times of year for the species to be detected. In particular the "Taita Falcon".	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	The ESIA study for the project includes specific studies for the identification and assessment of endangered faunal species of the project area including bird species. During the studies, stakeholders will continuously be engaged. In particular the Zimbabwe Falconry Club, who have extensive knowledge of Taita Falcons in the Batoka Gorge, have been consulted and have been assisting in the assessment of the baseline ecology.
The Taita Falcon's and Black Eagles nest in the area. The Falcon's are only found in this Gorge and Wonder Gorge. They are difficult to locate and identification cannot be based on chance sightings.The African Finkfoot is also present in the area. A bird specialist needs to form part of the biodiversity team. The level of the dam will determine if they can continue nesting in the area.	Chanda Mwale and David Ngwenyama	WWF	06-Oct-14	Lusaka Open day	The ESIA study for the project includes specialised studies for the identification and assessment of impacts of the dam height on fauna species of the project area, with appropriate mitigation measures developed. In the development of the baseline and subsequent EMP for the project consultations have been carried out with the Zimbabwe Falconer's Club on the state of the Taita Falcon, Black Eagle, and other bird species of Batoka Gorge and how best to mitigate any potential negative impacts.
There is concern regarding the nesting of endangered birds in the Gorge.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	The ESIA study for the project includes specialised studies for the identification and assessment of endangered fauna species of the project area including bird species. In the development of the EMP for the project, specific mitigation measures will be developed, including for any identified endangered species.
What is the potential impact of the Batoka Dam on the fresh water bio-diversity (fish, reptiles, unique vegetation etc.)?	David Ngwenyama	WWF-Zambia Country Office	Registration and Comment sheet		The review of previous studies in the Project Area of Influence (AoI) provide an overview of the predicted changes to the fish species diversity. The studies indicated that some of the riverine fish species might not thrive in the dam, however none of these are threatened species of particular conservation concern, as they exist in abundance elsewhere. Tiger Fish are expected to increase in the dam if a pelagic fish species (e.g. Kapenta) is introduced to occupy a vacant niche. However, there is some upstream riverine habitat retained for the Tiger Fish to breed. This will be documented and assessed as part of the biodiversity impact assessment.
How will the Batoka Dam and the Powerline and new infrastructure affect bird life and large mammals?	David Ngwenyama	WWF-Zambia Country Office	Registration and Comment sheet		The ESIA studies will assess the impacts of Batoka Gorge Dam, the Powerline and new infrastructure on bird life and large mammals. The studies will assist in determining the balance between the height of the dam, power requirements and extent of habitat loss if any. A detailed assessment of the situation will be done during the Impact Assessment Phase
How will flooding affect nests and nesting for African Finfoot, Taita Falcon and other restricted range bird species?	David Ngwenyama	WWF-Zambia Country Office	Registration and Comment Sheet		Preliminary assessments show that , flooding will not disturb the nests of Taita Falcons up on the cliffs. The assessments also indicated that the African Finfoot are widely distributed in Africa and not considered to be range restricted. So far there are no indications of any other range restricted birds occurring in the gorge. However, the studies will still be looking into this and any possible impacts on birds as part of the biodiversity impact assessment.
Habitat fragmentation has been cited as one of the primary reasons for the loss of biodiversity across the world. Large dams such as the one proposed at Batoka lead to habitat fragmentation and loss of biodiversity. WWF would like to know if any fragmentation studies have been carried out in the Batoka Gorge, and if so what species and corresponding habitats and effects have been investigated. WWF would also like to highlight that habitat fragmentation should not only focus on aquatic diversity but on terrestrial biodiversity, as well. There are a number of tree species in the gorge such as the Entandrophragma caudatum (Mountain Mahogany) and the Gryocarpus americanus (Propeller Tree) that are rare and localized species. Fragmentation of their habitat will lead to severe impacts on their resilience to withstand environmental change. Avoidance of this impact needs to be seriously considered.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Batoka is a large dam in terms of dam height but not so much in terms of reservoir surface area considering that it is more than 200 times smaller than Kariba (Kariba is 5576.61km2 while Batoka is 25.6 km2), and therefore it is anticipated that fragmentation if any will be minimal. Though fragmentation could be one of the adverse impacts however it must be noted that the Batoka Gorge in its natural state represents a major barrier to the movement of terrestrial faunal species, and the studies will identify and assess the potential for loss in biodiversity as well as its fragmentation due to the project impacts.
The area that will be developed is used as a migratory corridor for several bird species that migrate in a north to south and north to easterly direction. The setup of BGHS transmission lines will disrupt this corridor. WWF would like to know what are the planned mitigation measures regarding this disturbance.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Specialists have been included within the ecological surveys and are advising on how best to mitigate the impacts of the project infrastructure on birds. The ESIA will include recommendations on best practice for the design of transmission lines to minimise the impacts to raptors and other birds.
It is known that several raptor species (birds of prey) tend to nest on power lines and associated infrastructure. This affects raptor birds both positively and negatively. WWF would like to know to what extent baseline data has been gathered to investigate raptor bird nesting impacts.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	The Baseline study will include establishing baseline data on raptors species. As part of the development of the Project EMP, this information will form part of the input required in the design of transmission lines to minimise the impacts to raptors and other birds.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Large dams such as the one proposed for Batoka Gorge have significant impact on fisheries. There are several species of migratory fish in the Zambezi which cover large distances. The current extent to which fish migrate through the Batoka Gorge and the importance of this on overall fish stocks downstream is not clearly known yet. However, it can be expected that this habitat makes significant contribution towards downstream fish stocks. Against this background, WWF would like to know what studies on fish diversity and downstream fisheries impacts are planned on being incorporated into the ESIA. Furthermore, WWF does not consider the remarks in section 6.3.4 under "Aquatic Ecology" as adequate to address the matter of aquatic biodiversity and fisheries. That section states that: "The aquatic ecology requirements will be addressed through the Environmental Flow Assessment". This is not considered sufficient due to the fact that there isn't enough information on aquatic diversity on which to base the flow models. Therefore, WWF would like to propose the engagement of a fish expert to carry out baseline studies within the gorge to investigate what fish species use the gorge for breeding, nursing, and migrating among other ecological functions. Those studies should also document the impact the proposed dam will have on fish species locally, as well as the cumulative impact on downstream fisheries.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Both Kariba Dam and the Victoria Falls present major barriers to the migratory movements of fish and construction of the Batoka Reservoir is not expected to make a large impact on fish migrations. The Batoka Gorge represents a very harsh environment for fish and in itself has presented a natural barrier to the movements of many species. Currently there is very little utilisation of fisheries in the Batoka Gorge due to its inaccessibility and we therefore consider the situation not to have changed much from the natural state. Review of previous studies in the project AoI provides a very good assessment of what the impact of the reservoir will be and how the fisheries there should be managed. Furthermore, the Environmental Flow studies will effectively assess the impacts downstream of the dam wall and how the different fish species will be affected.
It is mentioned in the Draft Inception Report in Section 6.3.1 that there will be no fieldwork to establish the status of wildlife within the area. Rather, there will be use of WWF aerial surveys and other secondary data for wildlife status in Zambia. This is of concern.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Notwithstanding the statement in the Inception Report, specialists have spent time in the field in Zambia, and direct observations of the habitats, their diversity and present ecological state as well as evidence on the presence of fauna in the area was recorded. This information will be used together with the available data from WWF and ZAWA.
Does the data collected by other institutions have particular focus on the Area of Interest (AoI) or is it simply studies of broader areas? This could raise concerns as the data might not be representative of the study area.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	A considerable effort has been made to visit as much of the ecological Area of Influence to directly assess the situation on the ground and relevant data collected.
The BHES will likely lead to resettlement of several communities and also the blocking off of a migratory corridor for large mammals. This in turn is likely to increase the human-wildlife conflict in the area. Is there any research being carried out to investigate the likely increase of human-wildlife conflict? If so, what mitigation or alternatives are being presented? It is also known that there is a direct relation between river bank erosion due to decreasing sediment in the river and people being attacked (often killed) by crocodiles. To what extent has this been investigated and what mitigation measures will be looked into?	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	ZRA is not aware of any important migratory movements of large mammals within the Zambian component of the AoI as this area is already quite populated with human settlements. We therefore don't expect much increase in human-wildlife conflict in the area. The Environmental Flow studies show that there will be a decrease in the movement of sediments as a result of the Batoka Reservoir with a possible decrease in availability of sandbanks and the habitat that presents for wading birds. It is anticipated that run-of-river flow regime will be adopted, to avoid adverse impact on crocodiles due to intermittent flooding of their breeding habitats towards the end of the Batoka Gorge and before Kariba.
In its current state, the Maramba tributary of the Zambezi River has high concentrations of Eichhornia crassipes (water hyacinth) but this is flushed out naturally during the rainy season. With the building of the BHES this will no longer happen. This is likely to lead to accumulation of water hyacinth in the dam lake and surrounding areas. WWF recommends looking into invasive species such as the water hyacinth (and others) as serious matters that negatively impact the operation of dams. The creation of a reservoir changes the chemical and biological composition of the water in the reservoir often leading to conditions where alien invasive species thrive. Currently, nature is taking care of the water hyacinth problem but the construction of the dam will most likely adversely affect this process.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Monitoring and Management measures will be included in the ESIA to assess and address the threat of Water Hyacinth and other exotic floating weeds. Initial inundation will result in the rapid release of nutrients that may lead to a boom in these plants, but recent advances in biological control have fortunately greatly reduced this risk. The surface area of the dam (~23km2) is small relative to other schemes, and this impact will need to be monitored and effectively mitigated through various forms of control.
Can you provide an assurance that a search for a rare and endangered species was done by properly qualified staff at the appropriate time of the year for the species to detected in particular "Taita falcon"?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Excellence International Rafting Federation	06/10/14 18/11/14	Written submission	The Zimbabwe Falconry Club, who have extensive knowledge of Taita Falcons in the Batoka Gorge, and have been part of the team for assessment of the baseline ecology.
How far will the Batoka Dam reach downstream? There are two islands downstream which are rich in wildlife and host a unique form of buffalo. These are the Secula and Chete islands.	Jones Masonda	Zambia Wild Life Authority(ZAWA)	06-Oct-14	Lusaka Open Day	There are no significant islands within the area proposed for the Batoka Dam, those islands are located downstream of the proposed Batoka Gorge HES and will not be affected.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
A search for rare and endangered species needs to be done by properly qualified staff at the appropriate times of year for the species to be detected.	Mr Cooper Freeman		07-Oct-14	Email	We are aware of rare plant species on the scree slopes of the Batoka Gorge but they have not been formerly classified with a threatened status. We expect that these plants occur above the full supply level of the reservoir and may not be affected, however a mitigation measure will be incorporated to involve a competent botanist to identify and locate threatened and unique species and to translocate these as best as is practically possible. It is notable that the baseline study will include identification and listing of all flora and fauna species of the project area including those classified as rare and/or endangered species and this will be used as input in the development of appropriate mitigation measures to ensure the preservation of such flora and fauna.(refer to purpose of the ESIA studies)
Is there a potential threat to animal life?	Mr. Kelyson Mangola	Kazungula District Council	10-Oct-14	Kazungula District Meeting	The impacts to these species are being investigated. Bird life, particularly large raptors that use the gorge may be affected by loss of nesting sites and displacement of their prey. These impacts are also being investigated. Fish in the river will be displaced by a different spectrum of fish in the reservoir. In the development of the EMP for the project, specific mitigation measures will be developed to address the potential impacts, including for any identified endangered species.
Batoka gorge is also used as nesting grounds for the Zambezian endemic Taita Falcon, Rock Pratincole and African fin foot. The Draft Inception Report notes that there will be no specialist avifauna studies, and birdlife will only be noted as and when in the field. WWF would like to suggest that there is need to have a credible avifauna specialist study included as part of the ESIA baseline data gathering.	Mr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	The ESIA studies include Baseline studies and input to the baseline studies has been obtained from the Zimbabwe Falconer's Club on the state of the Taita Falcon and Rock Pratincoles in the Batoka Gorge and how best to mitigate impacts. The Zimbabwe Falconer's Club stated that the numbers of Taita Falcons have already declined in the area due to an influx of Lanner Falcons and excessive helicopter activity along the length of the Gorge. Rock Hyrax populations should survive as much of the cliff and upper rocky habitats wont be affected and the Verreaux's (Black) Eagles should remain. The input from organisations such as the Zimbabwe Falconer's Club will be used in development of the Project EMP .
In the Draft Inception Report under section 6.3.1 reference is made to the use of 1) Only desktop studies to ascertain the protected areas and 2) Consultation with CAMPFIRE personnel and other ornithologists for faunal components. This section raises two concerns. The first is about how recent the data that will be used is. The second has to do with CAMPFIRE being a Zimbabwean based organization. As respectful and credible as the organization is, it will not be in a position to adequately provide information on the Zambian side of the gorge. Zambia has enough expertise of its own to provide that information and therefore we recommend the use of local experts on this matter. Lastly, very little reference is made to the need to engage with Zambian authorities (i.e. ZAWA, Department of Fisheries, etc.) and Community Based Natural Resource Management parties in Zambia.	Mr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Both ZAWA and the Livingstone Natural History Museum have been consulted, and have been asked for inputs on the current state of fauna in the area. The input from such organisations will be used in development of the Project EMP .
The Draft Inception Report makes reference to an aerial survey that will be carried out by WWF in 2014. WWF is unaware of commitments made to complete an aerial survey of the area in 2014 and has no record of previous surveys completed on this area, at a scale that is relevant for this ESIA. This begs the question as to how current the data planned to be used is. It also raises the question in terms of accuracy of impact assessments on wildlife populations.	Mr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	An aerial survey of elephants is being conducted by WWF within Zimbabwe, but results of that study have are yet to be accessed. This information will form part of the input into the baseline report of the project area. The baseline report will include information on flora and fauna surveyed in the area and mitigation measures will be proposed for the potential impact of the project on the species and populations of the area. The ESIA study will make all attempts to access the most current and additional data available, from all possible also sources including engagement of WWF and organisations responsible for wildlife and national park management in data capture in the project AoI.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Avifauna needs a specialist study and not just a desktop study.	Ms. Chandra Mwale	WWF-Zambia Country office	06-Oct-14	Registration and Comment Sheet	The specialist team have contracted the Zimbabwe Falconry Club who have a great deal of personal experience with the Taita Falcons and other species in the Gorge.
There are elephant corridors in the area and the ecologist needs to consult with the Zambian Wildlife Authority.	Mwale Lusizi	Zambian Wildlife Authority	06-Oct-14	Livingstone Open day	The baseline report will include information on flora and fauna surveyed in the area and mitigation measures will be proposed for the potential impact of the project on the species and populations of the area. The ESIA study will make all attempts to access the most current and additional data available, from all possible also sources including engagement of organisations responsible for wildlife and national park management in data capture in the project such as ZAWA.
What are the mitigation measures for the unique vegetation which is found in the area as a result of the micro-climate?	Pius Lilanda	Community Based Natural Resources Management (CBNRM) Forum	06-Oct-14	Lusaka Open day	The unique vegetation that occurs as a result of the microclimate is the rainforest associated with the Victoria Falls. This vegetation will not be affected by the construction of the Batoka Dam.
Water hyacinth might stop being flushed downstream with the development of the Batoka Dam. That might result in the Batoka Dam being fully-colonized by this species. What are the project's mitigation measures to stop the spread of this invasive species?	Pius Lilanda	Community Based Natural Resources Management (CBNRM) Forum	06-Oct-14	Lusaka Open day	Monitoring and Management measures will be included in the ESIA to assess and address the threat of Water Hyacinth and other exotic floating weeds. Initial inundation will result in the rapid release of nutrients that may lead to a boom in these plants, but recent advances in biological control have fortunately greatly reduced this risk.
The Batoka Dam will obstruct elephant crossings, thus endangering their lives and that of people in the surrounding communities. Is the project considering constructing "elephants' crossing points?"	Pius Lilanda	Community Based Natural Resources Management (CBNRM) Forum	06-Oct-14	Lusaka Open day	Elephants are more likely to cross the Zambezi River above the Victoria Falls where the water is shallow and no steep sides to the river exist. Furthermore, wildlife data shows that there has been a large decline in the elephant numbers in the area of the Batoka Gorge. However, the ESIA studies will include a socialist study of elephant populations and corridors so that mitigation measures are proposed under the EMP for the project for any identified potential impact on elephant populations and corridors .
The proposed Transmission line in Zambia is in the migration path for birds which migrate from DRC and Mozambique to the Okavango. A "Bird Specialist" should be part of the biodiversity study given the importance of this area in terms of bird migration. The nesting of raptors and vultures on the power lines requires mitigation.	Pius Lilanda	Community Based Natural Resources Management(CBNRM)	06-Oct-14	Lusaka Open day	The ESIA studies include ecological surveys and is advising on how best to avoid impacts to birds. The ESIA will include recommendations on best practice for the design of transmission lines to minimise the impacts to raptors and other birds.
The Dams being proposed and built now on the Zambezi River will be negatively affected by climatic changes, yet energy planning in the basin is not taking serious steps to address these huge hydrological uncertainties. Ensuring energy and water security in the Zambezi River basin for the future will require new ways of thinking about river basin development. We must avoid investing billions of dollars into projects that could become white elephants.(Dr Richard Beilfuss)	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	We are aware of the possible losses in basin yield in the next decades as a result of climate change which may be significant in design terms. The World Bank's Multisectoral Investment Opportunity Analysis that predicted a 16% fall in yield in the Upper Zambezi by 2030. We will be drawing upon these and other published data, in the impact assessment, i.e. recommending that the final design factors this in. The engineers will be assessing the impacts of climate change on dam design, and on the overall feasibility of the scheme.
Climate change needs to be considered in the design and impact assessment. Local and regional weather patterns require consideration.			06-Oct-14	Livingstone Open day	We are aware of the possible losses in basin yield in the next decade as a result of climate change which may be significant in design terms. The World Bank's Multisectoral Investment Opportunity Analysis that predicted a 16% fall in yield in the Upper Zambezi by 2030. We will be drawing upon these results in the impact assessment, i.e. recommending that the final design factors this in. The engineers will be assessing the impacts of climate change on dam design.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Will climate change impacts be considered as part of this study?			08-Oct-14	Lusaka authorities meeting	We are aware of the possible losses in basin yield in the next decade as a result of climate change which may be significant in design terms. The World Bank's Multisectoral Investment Opportunity Analysis that predicted a 16% fall in yield in the Upper Zambezi by 2030. We will be drawing upon these results in the impact assessment, i.e. recommending that the final design factors this in. The engineers will be assessing the impacts of climate change on dam design.
Communities need to benefit from employment.	Mr Jabulani Moyo	Councillor, Ward 4	03-Oct-14	Hwange District Council Meeting	The ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will endeavour to employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
What is proposed in terms of social benefits and investment? Water is the biggest need in the community.	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
The transmission line is impacting on people. Are they going to benefit at all? We do not want our people to live without power when there is a transmission line passing through their area.	Nqobile Mabhena	Hwange Local Board	03-Oct-14	Hwange District Council Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. The ESIA study will include appropriate sighting of power line routes so as to minimise any potential impacts on communities and reduce the potential for resettlement. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
The Ministry is concerned about the youth of the area and how their economic activities may be impacted on. What plans are there to support communities?	Mr Simon Sikota	Ministry of Youth, Indigenisation and Economic Empowerment	30-Sep-14	Harare Open Day	ZRA will develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
As compensation for use of the river for your projects, what will be provided? We want projects such as irrigation schemes, reticulated water for our schools and clinics and rural electrification.	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	One of the requirements for compensation according to the local and international performance standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. All affected people will be helped to ensure that their livelihoods are restored or, that they can access new income streams. In addition, ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. Early studies have pinpointed a number of potential benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want the project to consider companies that are in the community or owned by people from the project community in tenders as sub-contractors.	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	The governments of Zimbabwe and Zambia encourage this as long as the local people are compliant with the tender procedures and specifications.
Although we welcome the project our concern is that the district lacks tertiary education colleges, good hospitals, roads	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want the project to upgrade our roads, hospitals-especially mortuaries- and build us a college.	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want water and sanitation projects into the area.	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We also want sports facilities such as a stadium. There are many youths who are very good soccer players but there are no facilities	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	The ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. The ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
We need the project to assist in the upgrading of our science laboratory at the school	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	This has been noted. ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
How is the project going to compensate the whole community for allowing it to construct the project in our land? All of us one way or the other is affected. What does the project offer the community?	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Are we going to benefit directly from the project with such benefits as electricity	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	ZRA cannot make a promise now on the provision of electricity. However, ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Be transparent with what the project can offer the communities	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	ZRA is and will continue to be transparent and this ESIA is part of this commitment. ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
How will the project develop the present infrastructure such as clinics, school and so on	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Business opportunities and tenders for the supply of goods and services should be given to the local people	H.T Mobe, Madumabisa Farm	N/A	07-Oct-14	Matetsi Ward Meeting	The governments of Zimbabwe and Zambia encourage this as long as the local people are compliant with the tender procedures and specifications.
In the event that a local person is awarded a contract and then teams up with another from Harare or Bulawayo and this person is the one with all the equipment and money, how will the project ensure that there is fair play in the operation of business	Marumane J, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	Subcontractors will be required to be compliant with tender procedures and specifications.
Matabeleland is considered to be very poor and without development. How are the people of this community going to benefit from the project?	Mr Moyo, Masikili village	N/A	07-Oct-14	Matetsi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
The community needs electricity. Will the project provide electricity to the communities?	Marumane J, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Many schools and clinics are too far from the people. Will the project build more schools such that they are near to people?	Marumane J, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We would want electricity to be made available by the project in our community rather than for the electricity to go to Harare and Bulawayo.	Felix Moyo, Milonga Village	N/A	07-Oct-14	Mbhizi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
What development benefits will communities get from the project, such as clinics, schools roads and so on?	Farai Shoko, Gondwa Village	N/A	07-Oct-14	Mbhizi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Is there a possibility that existing structures such as the clinic or primary school are going to be upgraded as a result of the project coming to this area?	Cllr Farai Shoko, Gondwa Village	N/A	07-Oct-14	Mbhizi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What will the local populace get in terms of development projects?	Alois Ndazi, Mbizha Ward	N/A	07-Oct-14	Mbhizi Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
How will the project develop the present infrastructure such as clinics, school and so on?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want rural electrification. Can the project assist us to get our homes electrified?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
How can societies benefit from the dam water?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	The communities will benefit through the fishing and tourism industries that will develop as a result of the project.
We don't want contractors from outside the locality to do work here. There are companies in the community, the district and the province that can do contract work.	Gideons Nyoni, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	The governments of Zimbabwe and Zambia encourage this as long as the local people are compliant with the tender procedures and specifications.
Are our roads going to be upgraded?	Derek Sibanda-, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	Yes, some existing roads will be upgraded and some new ones will be constructed. Engineering studies are still ongoing to identify the exact locations of these. At the moment, it is proposed that in Zimbabwe, the secondary road that starts from the Bulawayo-Victoria Falls main road and connects to Jabula may be upgraded and a new road, connecting Jabula to the dam site (measuring 14km long), may be constructed. In Zambia, the road originating in Palmgrove (near Livingstone) that connects to Mukuni village may be rehabilitated and a new road, may be constructed to connect Mukuni to the dam site. The construction of a road downstream from the dam and a bridge that connects the two countries is also proposed, in order to minimise the passage of heavy loaded trucks on the dam crest.
How do we get direct benefit from the Batoka project? Will the project plough back into chief Shana's domain?	Ephraim Bhebhe, Lumbora school	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Is Batoka project going to improve community access to reticulated water and sanitation especially to schools, clinics, by providing the services direct to the institutions?	Raphael Nyathi, Lumbora Village1	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Are we going to benefit from the electricity from Batoka project?	Kelvin Chuma, Sidinda village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want electricity as a direct benefit and priority in employment	Dubani Muntanga, Mukala Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want a training centre and skill training college for our children	Phillip J Ncube, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We have no skills training centres in our community we want the project to help in constructing one as a way of appreciation of the land we have given to the project	Driver Mudimba, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
As a community how can we directly benefit from the project?	Ephraim Bhebhe, Teacher at Lumbora	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
We are asking the project to plough back into the area of Chief Shana in the form of projects such as irrigation schemes. We want direct benefit.	Peter Kayula, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
The project must provide water and sanitation projects in our schools, clinics and communities	Dubani Muntanga. Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
We want training centres in our village	Nkonekwa Mlilo, Sidinda Village 2	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
How will the project improve the lives of those affected if at all?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	All affected people will be helped to ensure that their livelihoods are restored or, that they can access new income streams. In addition, ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. Early studies have pinpointed a number of potential benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
What social corporate initiatives are to be put in place?	Agney Siuluta	Department of Energy	08-Oct-14	Lusaka authorities meeting	ZRA will develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities
Are you going to give us power once the project is completed	Bernard Mweene	Musokotwane	11-Oct-14	Musokotwane community meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
If the project takes place, do you have any plans for upgrading the school?	Godfrey Siavuka	Ngandu village	13-Oct-14	Ngandu, Community Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Will we be provided with free electricity?	Lloyd Masamu	Sekuba village	11-Oct-14	Musokotwane community meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Will the people of Mukuni be willing to let us to also benefit from the project seeing as though most of the activity is carried out in their area?	Lloyd Masamu	Sekuba village	11-Oct-14	Musokotwane community meeting	This Project will benefit Zambia. The chiefdom of Musokotwane should also benefit, as well as the chiefdom of Mukuni.
There is a Community Project being undertaken in Chief Mukuni's area, with the objective of conserving wildlife. A Community Development Trust has been established for this purpose. The access road and in-migration to the area may impact on this project. From a positive note however, there may be an increase in tourism due to improved access. One of the challenges of the project was always getting water from the Gorge for the purposes of the project. This will be easier now with the dam.	Mr Jones Masonde	Zambia Wildlife Authority	07-Oct-14	Lusaka Open Day	The implications of improved access to the area will be considered as part of the social impact assessment.
What will be the benefits for the local people?			11-Oct-14	Musokotwane community meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Are we going to be provided with electricity if the project goes ahead?			11-Oct-14	Musokotwane community meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
Local employment opportunities are required. Training and education is required to enable the local people to be employed during construction.			06-Oct-14	Livingstone Open day	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. This will include training and education and employment during construction.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Direct benefits need to accrue to the affected communities and should not pass through too many hands so that they are never realised.			06-Oct-14	Livingstone Open day	ZRA will ensure that the benefits accrue directly to the affected people in the project area of influence.
Once the power station is completed, it will just employ degreed people, leaving many youths in the surrounding area.			06-Oct-14	Livingstone Open day	This will be addressed and assessed as part of the social impact assessment.
Sustainability of skills training in the community requires consideration. Communities should be trained broader than dam construction to ensure sustainability.		Environmental Action Group	06-Oct-14	Livingstone Open day	This will be addressed and assessed as part of the social impact assessment.
In terms of Education, skills, training and development: the project should i) primary schooling: construct at ;least 2 blocks of 3 classrooms at the existing primary schools. The blocks to be electrified and fully equipped/furnished. ii) secondary schooling: provide 1 fully equipped boarding school for up to A-level inclusive of science laboratories. Existing secondary schools will require electrification, equipping / furnishing, library an books, science laboratories and equipment. iii) Skills Training & Development: training of local apprentices to be prioritised, plant operator training to prioritise locals and engineering cooperatives training (i.e. semi-skilled personnel) to cover at least 90% locals and the neighbouring districts of Hwange, Binga and Lupane.; iv) scholarships and bursaries: creation of a scholarship fund to cater for secondary, college and university education for local students. v) industrial attaches: prioritize industrial attachment for local college and university students - at least 60-70%	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. This will include training and education and employment during construction.
In terms of Health Services, the project should: i) hospital: upgrade Jambezi clinic into a fully-fledged hospital, inclusive of a mortuary or find a new hospital, at either Jambezi ward, Nemananga, Sindinda, or Mbizha. Ii) Existing clinics: work that needs to be done at the existing clinics includes electrification, where necessary, equipping and furnishing and supply of essential drugs and accessories. iii) Transportation of Patients: an ambulance should be provided for attending to emergencies and the ferrying of patients to the health services.	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
In terms of roads and infrastructure, the project should: i) Roads and infrastructure which serves the rural wards which fall under chief Shan's jurisdiction. These roads are susceptible to damage during the rainy season. The following roads will need to be prepared and upgraded annually: a) Border road from Makwa village to the Monde inter-section with the Victoria Falls - Bulawayo highway. b) Jambezi-Ndlovu Road. c) Milonga - Mununa Circular Road. d) Chidobe-Matata Road. e) Bingwa Loop Road (being the shortest link to Hwange town) and f)Access Roads to Chief's Place. ii) Tarring: consideration be given to work with the relevant Ministry to tar the following roads a) Makwa - Monde Border road; b) Bingwa Loop road to Jambezi	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
In terms of water and sanitation the project should i) water supply and sanitation: water is the lifeline for the survival of people and their livestock. The following issues concerning water and sanitation will need to be addressed a) provision of piped water to the immediate local communities or villages and b) sinking and equipping of boreholes for the schools and local communities sunder Chief Shana's Wards. ii) Dams: a)one or two dams to be constructed for the provision of water for the livestock NB: Lukunguni Dam site was long pegged by Government and only awaits construction. b) Some boreholes to be equipped with engines so as to provide water storage reservoirs for livestock water. iii) Small Scale Irrigation: facilitate and support small irrigation projects for the immediate local communities	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
In terms of Rural electrification, the project should i) village electrification: facilitate and set up infrastructure for rural electrification of rural homes through the provision of power lines and the provision of transformers at strategic points where the villagers can tap. ii) Solar Panel System: villages that are not accessible to be assisted with the utilisation of the solar panel electrification of homes.	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
In terms of Social Services, all displaced villagers to be compensated and built new homes; support for orphans, old aged and vulnerable persons' welfare; cater for standard monthly benefits for chief and Headmen i.e. fuel, accommodation and travelling allowances (Chief - air and Headmen - buses) and; revamp dipping tanks for livestock	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	One of the requirements for compensation according to the local and international performance standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. All affected people will be helped to ensure that their livelihoods are restored or, that they can access new income streams. In addition, ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. Early studies have pinpointed a number of potential benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of affected communities.
In terms of Sub-contracting; at least 75% of contract work should be sub-contracted to the indigenous local registered companies; companies to be closely supervised and monitored to employ at least 90% of local labour and other skills and where possible, local indigenous contracting companies to be supported to raise the required resources to carry out the required jobs or tasks.	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	The governments of Zimbabwe and Zambia encourage local companies to benefit from the project as long as the local people are compliant with the tender procedures and specifications. ZRA
Being cognisant that the Company/ project may end up with its own residential and business sites, the following considerations need to be implemented: a) that 90% of retail businesses be reserved and allocated to indigenous local companies (i.e. the surrounding wards under District 79 - i.e. Hwange District) and b) that the routine day jobs related to office cleaning, sanitation, street cleaning, catering etc. should be contracted to the indigenous local companies	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
What is the proposed project going to offer in terms of compensation?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Compensation still needs to be discussed and agreed to as part of the Resettlement Action Plan. A "Like for Like" replacement for assets is preferred in terms of international best practice.
What projects will be available for the less privileged in our community?	David Thsuma, Dobolo village	N/A	08-Oct-14	Sidinda Ward Meeting	International best practice requires the welfare of vulnerable people, such as the elderly, child headed households and orphans, to be considered as part of such projects. In the event that the project goes ahead, it will partner with existing organisations that are active in the affected areas to minimise negative impacts and enhance positive impacts on these people.
Will an ethnographic study be undertaken in conjunction with the Ministry of Arts and Culture on the cultural impact of such a project.	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	A cultural and heritage study is being undertaken as part of the ESIA and will meet legislative requirements. The participation of the Ministry of Sports, Arts and Culture in Zimbabwe and Zambia will be sought on this Project.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Will the project respect our cultural sites?	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Cultural, historical and archaeological sites will be respected. These will be identified through a heritage impact assessment. Should they be impacted, traditional and cultural authorities will be engaged to reach an agreed way forward and authorisations sought from the national authorities in both countries.
The contact person for cultural heritage and sites is Mambaitha and she stays in Milonga Village. You need to consult her before any decision to move any of the sites is made	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Noted.
The project sponsors need to be aware of the importance of our cultural heritage sites because they form a very important part of our tradition and our lives. You should ask us to guide you where they are and what to do for the project to proceed.	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	Cultural heritage studies are currently ongoing and consultation will be undertaken with community members. We will be guided by the advice of the community leaders in this regard.
What will happen to our cultural and historic and heritage sites? What about graves and cemeteries?	Gabriel Nkomazana, Milonga Village	N/A	07-Oct-14	Mbhizi Ward Meeting	Cultural, historical and heritage sites, including cemeteries and graves will be respected. Should they be impacted, traditional and cultural authorities will be engaged to reach an agreed way forward. Heritage impact studies are currently underway as part of the ESIA.
Will the project respect our cultural sites?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Cultural, historical and heritage sites will be respected. Should they be impacted, traditional and cultural authorities will be engaged to reach an agreed way forward. Heritage studies are currently underway and need to be undertaken to meet the requirements of the heritage authorities.
What will happen to our historical sites and graves in the event that a road passes through the area?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Cultural, historical and heritage sites will be respected. Should they be impacted, traditional and cultural authorities will be engaged to reach an agreed way forward. Heritage studies are currently underway and need to be undertaken to meet the requirements of the heritage authorities.
We need documented presentation on how cultural heritage will be managed.	Paul Costa Nyathi, Teacher at Lumbora Sec School	N/A	08-Oct-14	Sidinda Ward Meeting	Cultural heritage studies are currently ongoing. This will fed into the ESIA report that will be publically disclosed in 2015.
If the Projects passes through sacred /cultural sites will the sites be relocated elsewhere	Kenford Simalanga	Ngambela –Musokotwane Village	11-Oct-14	Musokotwane community meeting	A heritage impact assessment is being undertaken to identify archaeological, historical and cultural resources and assess the impact on these. This will be undertaken to support authorisations by the regulatory authorities. Should sites be impacted on, traditional and cultural authorities will be engaged to reach an agreed way forward.
What measures are being put in place to protect cultural sites and the "Boiling Pot"?	Mr. Noole Mass	Ministry of Chiefs and Traditional Affairs	10-Oct-14	Kazungula District Meeting	A heritage impact assessment is being undertaken to identify archaeological, historical and cultural resources and assess the impact on these. This will be undertaken to support authorisations by the regulatory authorities. Should sites be impacted on, traditional and cultural authorities will be engaged to reach an agreed way forward.
If heritage sites are likely to be affected, will these be moved to new locations?		Musokotwane village	11-Oct-14	Musokotwane community meeting	A heritage impact assessment is being undertaken to identify archaeological, historical and cultural resources and assess the impact on these. This will be undertaken to support authorisations by the regulatory authorities. Should sites be impacted on, traditional and cultural authorities will be engaged to reach an agreed way forward.
Will the ESIA also consider the impact of other projects in the area?	Abby Chungu	Kazungula District Council	10-Oct-14	Kazungula District Meeting	The ESIA will collaborate with the engineering feasibility consultants to establish conjunctive use of other dams on the Zambezi to ensure all dams are operated in a sustainable manner to minimize cumulative impacts as much as possible.
What will be the cumulative impact of constructing another dam on the Zambezi River?	Moses Tambala	ZEMA	09-Oct-14	Livingstone District Meeting	The ESIA will collaborate with the engineering feasibility consultants to establish conjunctive use of other dams on the Zambezi to ensure all dams are operated in a sustainable manner to minimize cumulative impacts as much as possible.
It is understood from the Open Day with ERM Consulting that the various specialist studies planned for the ESIA are happening concurrently with the design of the dam by engineers. It is a concern of WWF to understand to what extent the specialist studies will inform the design of the dam, if the latter is already being carried out.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	The Consultants undertaking the ESIA Studies (ERM) and the engineers are collaborating throughout the ESIA process. The process for collaboration is documented in the Proposed Study Plan for Coordination with Engineering Consultants. It must be noted that it is common for an ESIA to be undertaken in parallel with engineering feasibility studies, as both studies feed information or rely on information from each other. For example, the outputs from the Environmental Flow Assessment (EFA) is being fed into the engineering feasibility study so that the required EFAs can be incorporated into the project design.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What is the safety of residents downstream that may be impacted on if the dam collapses?			06-Oct-14	Livingstone Open day	The Engineering Feasibility Studies will address such concerns. The dam will be designed and built to the highest level of safety and to international standards such as those from the International Commission on Large Dams in order to assure the safety and reliability of the dam. The operation of the dam will also include protocols for annual inspection by independent assessors, as well as a weekly dam safety monitoring program by the ZRA. Intensive geotechnical investigations of the site have been undertaken over several years to investigate and reduce dam failure associated with geological risks. Hydrological records dating back to 1907 were used for flood routing to reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. Furthermore, another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin. This study will identify all potential impacts of dam breach and propose mitigation measures, as well as update existing emergency preparedness plans for dams along the Zambezi River so that the safety of the people is enhanced.
What is the risk assessment for the project? Could it take longer than necessary to construct and thus all project funds depleted before completion	Rob Waters		01-Oct-14	Bulawayo national and provincial authorities	The Feasibility Studies will detail all project risks and recommend risk mitigation measures for each significant risk identified. It is the intention of the governments of Zambia and Zimbabwe to commence construction works only when adequate funds have been secured to guarantee successful completion of the project.
Dam construction has been regretted in USA, Colorado where water abstraction is causing conflicts with Mexico. Once a dam is developed, it cannot be undone. Why destroy beautiful canyon? In addition the cliff texture is breakable and fragile and hence there is a high risk of mechanical weathering. Water and moisture cause gorge expansion. In Southern China, dam collapse caused the deaths of 26 000 people. The World Commission reports 40-80 million people are affected by dams every year. Uganda still suffers from the damming of the Nile River, with no benefits. Business in South Africa needs electricity, but they have no major rivers. Zimbabwe has no money for the project and foreign investors want this.	Ranjit Deshmlikh	University of California	04-Oct-14	Victoria Falls Open Day	The ESIA and the Engineering Feasibility Studies will address these concerns. The construction will be carried out using world class safety standards including factoring in guidelines from the International Commission on Large Dams and the Hydropower sustainability protocol factors so that the safety and reliability of the dam is assured. The operation of the dam will also include protocols for annual inspection by independent assessors as well as weekly dam safety monitoring program by the ZRA
Can you provide assurance that the risk of dam failure or other structural problems has been adequately assessed?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	The Engineering Feasibility Studies will address such concerns. The dam will be designed and built to the highest level of safety and to international standards such as those from the International Commission on Large Dams in order to assure the safety and reliability of the dam. The operation of the dam will also include protocols for annual inspection by independent assessors, as well as a weekly dam safety monitoring program by the ZRA. Intensive geotechnical investigations of the site have been undertaken over several years to investigate and reduce dam failure associated with geological risks. Hydrological records dating back to 1907 were used for flood routing to reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. Furthermore, another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin. This study will identify all potential impacts of dam breach and propose mitigation measures, as well as update existing emergency preparedness plans for dams along the Zambezi River so that the safety of the people is enhanced.
There needs to be assurance that the risk of dam failure or other structural problems have been adequately assessed.	Mr Cooper Freeman		07-Oct-14	Email	The Engineering Feasibility Studies will address such concerns. The dam will be designed and built to the highest level of safety and to international standards such as those from the International Commission on Large Dams in order to assure the safety and reliability of the dam. The operation of the dam will also include protocols for annual inspection by independent assessors, as well as a weekly dam safety monitoring program by the ZRA. Intensive geotechnical investigations of the site have been undertaken over several years to investigate and reduce dam failure associated with geological risks. Hydrological records dating back to 1907 were used for flood routing to reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. Furthermore, another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin. This study will identify all potential impacts of dam breach and propose mitigation measures, as well as update existing emergency preparedness plans for dams along the Zambezi River so that the safety of the people is enhanced.
Assurance is required that the safety impacts to people downstream of the reservoir are analysed.	Mr Cooper Freeman		07-Oct-14	Email	The Engineering Feasibility Studies will address such concerns. The dam will be designed and built to the highest level of safety and to international standards such as those from the International Commission on Large Dams in order to assure the safety and reliability of the dam. The operation of the dam will also include protocols for annual inspection by independent assessors, as well as a weekly dam safety monitoring program by the ZRA. Intensive geotechnical investigations of the site have been undertaken over several years to investigate and reduce dam failure associated with geological risks. Hydrological records dating back to 1907 were used for flood routing to reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. Furthermore, another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin. This study will identify all potential impacts of dam breach and propose mitigation measures, as well as update existing emergency preparedness plans for dams along the Zambezi River so that the safety of the people is enhanced.
If the dam overflows it will impact on a lot of people and animals.			06-Oct-14	Livingstone Open day	The dam will be designed and built to the highest level of safety. Additionally, the reservoir operation simulations will form part of the study and the spillway design and operation as well as provision of water quantities for power generation will be such that the risk of overflow is mitigated. A water balance calculation which takes into consideration the rainfall projections will be inclusive of the dam and spillway design processes,. Also another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Dam stability was a concern in the past. Is this still the case?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	The Engineering Feasibility Studies will address such concerns. The dam will be designed and built to the highest level of safety and to international standards such as those from the International Commission on Large Dams in order to assure the safety and reliability of the dam. The operation of the dam will also include protocols for annual inspection by independent assessors, as well as a weekly dam safety monitoring program by the ZRA. Intensive geotechnical investigations of the site have been undertaken over several years to investigate and reduce dam failure associated with geological risks. Hydrological records dating back to 1907 were used for flood routing to reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. Furthermore, another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin. This study will identify all potential impacts of dam breach and propose mitigation measures, as well as update existing emergency preparedness plans for dams along the Zambezi River so that the safety of the people is enhanced.
If there is dam failure what will happen downstream?	Victor Sibanda	Nan Jiang	30-Sep-14	Harare Open Day	A dam failure has to be avoided at all costs. The Engineering Feasibility Studies will ensure that the scheme will be able to cope with the probable maximum flood. Furthermore, intensive geotechnical investigations of the site were undertaken over several years which will reduce failure to geological risks and hydrological records dating back to 1907 were used for flood routing which reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. The Plan will be reviewed regularly with a view to ensure that the safety of downstream communities is enhanced.
Is the geology suitable to ensure the stability of the dam?			06-Oct-14	Livingstone Open day	Studies already undertaken confirm that the geology is suitable.
The risk of dam failure and structural problems requires assessment.			06-Oct-14	Livingstone Open day	The Engineering Feasibility Studies will address such concerns. The dam will be designed and built to the highest level of safety and to international standards such as those from the International Commission on Large Dams in order to assure the safety and reliability of the dam. The operation of the dam will also include protocols for annual inspection by independent assessors, as well as a weekly dam safety monitoring program by the ZRA. Intensive geotechnical investigations of the site have been undertaken over several years to investigate and reduce dam failure associated with geological risks. Hydrological records dating back to 1907 were used for flood routing to reduces failure due to overtopping of the dams. As is current practice an emergency preparedness plan will be put in place to deal with the unlikely event of dam breach. Furthermore, another study is being conducted to determine the impacts of dam failure on the Zambezi River Basin i.e. The Dam Break Analysis for the Zambezi River Basin. This study will identify all potential impacts of dam breach and propose mitigation measures, as well as update existing emergency preparedness plans for dams along the Zambezi River so that the safety of the people is enhanced.
Our roads are already in a bad shape and their use by construction vehicles will further damage them. Is the project going to improve our roads and the network?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	Yes. Some roads will be improved and some new roads will be constructed for access to the site.
What will the impact be on Victoria Falls and Kariba Dam?			06-Oct-14	Livingstone Open day	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. The environmental flow study will however examine the impacts of any potential 'peaking' operations that may vary the outflows during certain periods of the day. The effects on flow (and associated water level) conditions upstream of the dam will be examined as part of the study. The hydraulic studies will make recommendation and ensure that that these effects will not be felt upstream of the Silent Pool area.
Will there be a specialist study on environmental flows. Not a rapid assessment but a full comprehensive study?	Elke Pragman	WWF-Zambia Country Office	06-Oct-14	Registration and Comment Sheet	The Environmental Flow Assessment (EFA study) being conducted for the study applies the comprehensive DRIFT methodology, and includes an in-river biophysical survey component to supplement existing data sources. The methodology is generally considered to constitute best practice.
Environmental flows assessment will be carried out at the same time as design. How will this inform design of the dam effectively?	Ms. Chanda Mwale	WWF-Zambia Country office	06-Oct-14	Registration and Comment Sheet	The EFA and associated studies are being conducted in parallel with the engineering design, and the key results and outcomes will be shared with the design engineers at key stages in the design process.
What will the impact of silt downstream be during the construction phase?	Alexandra Conroy	WASAZA	08-Oct-14	Lusaka authorities meeting	Potential downstream effects on water quality and sediment will be examined for all stages of the project.
How will water be released from the river? What will the regularity of the releases be? Will there be seasonal variations?	Isla Grundy	Dept of Biological Sciences	30-Sep-14	Harare Open Day	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. The environmental flow study will however examine the impacts of any potential 'peaking' operations that may vary the outflows during certain periods of the day. The effects on flow (and associated water level) conditions upstream of the dam will be examined as part of the study.
There are two private conservancies that have been set up in the forested area downstream of the proposed Dam.	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	Noted. These will be considered as downstream water users and added to the stakeholder database .
There are also several irrigation schemes about 40 km downstream of the dam. These are government schemes. They are abstracting water from the Zambezi.	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	Noted. These will be considered as downstream water users and added to the stakeholder database
Will the water flow to Kariba be impacted on?	Nqobile Mabhena	Hwange Local Board	03-Oct-14	Hwange District Council Meeting	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. However, the environmental flow study will examine the impacts of any potential 'peaking' operations that could occur and that may vary the outflows during certain periods of the day or at certain times of year. Given the storage capacity of Kariba, however, there is likely to be very little impact to Kariba as a result of the scheme.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Will there be a resultant impact on surface and groundwater on land immediately adjacent to the dam as a result of the quantity of water stored in the dam.	Herbert Sansole	Hwange Show Society	03-Oct-14	Hwange District Council Meeting	The dam is actually small compared to other schemes, being deep with a relatively small surface area (~23 km2). As for all dams, fault lines and other zones connected to the dam may result in groundwater zones being affected adjacent to and downstream of the dam. A limnological study will be undertaken to assess the surface water quality impacts both within the dam, and downstream of the dam wall to Kariba.
What existing data is available with regard to water quality? Is there a monitoring record in place?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	Water quality data is available from a number of field campaigns that have been carried out in the Zambezi River in the project area in the past, including a 2-year detailed programme of hydrometric, water quality and sediment monitoring in 2004/05.
How will water flow and Kariba water levels be managed during the dam flooding process?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	An Environmental Flow study is being conducted and dam filling will be included as part of this study to cater for downstream impacts. It must be remembered, however that the dam size is small relative to the flow of the river, and dam filling will not have the same impact comparable to other larger schemes.
What will the impact downstream be? Binga is also an important tourism area.	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	The potential impacts on flow and water quality conditions downstream of the dam are being examined in detail as part of the study, and will be reported in the draft ESIA. The study will consider the effects on all sensitive and important receptors downstream, including tourist areas.
What will the construction phase impact be downstream?	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	The ESIA study will inform impacts from construction/. Downstream impacts will mainly relate to dam filling and minimum flows.
What will the downstream impact be on water quality and flow?	Richard Maasdorp	Zambezi Society	30-Sep-14	Harare Open Day	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. However, the environmental flow study will examine the impacts of any potential 'peaking' operations that could occur and that may vary the outflows during certain periods of the day or at certain times of year. The potential impacts on water quality downstream of the dam would relate to residence times and circulation patterns in the reservoir and resulting impacts on temperature, dissolved oxygen, sediment transport etc. The environmental flow study will examine these effects in some detail.
What will the philosophy of releases be so that there is no impact on Kariba Dam? What will happen in the case of flooding events?	Richard Maasdorp	Zambezi Society	30-Sep-14	Harare Open Day	The dam is being designed as a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. The study will also examine the impacts of any potential 'peaking' operations that may vary the outflows during certain periods of the day
Will the spillway be gated or not? If not gated the flood events will be less tempered and releases will have more of an impact.	Richard Maasdorp	Zambezi Society	30-Sep-14	Harare Open Day	The Engineering Feasibility study will inform on the design of the spillway gates.
The treatment of water prior to release requires consideration.	Alexandra Conroy	WASAZA	08-Oct-14	Lusaka authorities meeting	Potential water quality conditions in the reservoir and downstream (and associated mitigation measures if required) will be examined as part of the study, although given the very short water residence time it is unlikely that these effects will be significant.
Will the inflow of water to Kariba be managed?			06-Oct-14	Livingstone Open day	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. The environmental flow study being undertaken for the ESIA will also examine the impacts of any potential 'peaking' operations that may vary the outflows during certain periods of the day.
Assurance is required that the estimate for power projection takes into account adequate allowance for downstream water needs (in stream flow requirements).	Mr Cooper Freeman		07-Oct-14	Email	A comprehensive Environmental Flow Assessment (EFA) is being conducted for the study using the DRIFT methodology, the results of which will be provided to the design engineers in order to inform the design process.
Power lines will destroy the fields. Trucks will result in noise and air pollution.	Kevin Zuhn		06-Oct-14	Livingstone Open day	The impact on fields will be considered as part of the Resettlement Policy Framework and Resettlement Action Plan for the project. The Environmental and Social Management Plan (ESMP) will outline mitigation measures related to noise and air quality management during the construction and operation phases of the project.
Will an economic analysis be undertaken taking into account the potential for unsustainable "boom and bust" economic impact on local and regional economies?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	The economic impact assessment and social impact assessment will consider this as part of its scope.
Will the project result in any loss of tourism income to Zambia?	Jones Masonda	Zambia Wild Life Authority(ZAWA)		Registration and Comment Sheet	This will be assessed as part of the socio-economic impact assessment of the ESIA. It is anticipated that the Batoka HPP will disrupt white water rafting activities. This will be explored further in the impact assessment.
What will be the economic impacts of the project?	Mr. Noole Mass	Ministry of Chiefs and Traditional Affairs	10-Oct-14	Kazungula District Meeting	As part of the ESIA study, a social and economic impact assessment will be undertaken for the Project to identify and assess all the economic impacts of the project with a view to enhance positive impacts and minimise any negative impacts.
What will the social impact be post the construction phase when employment and economic opportunities are reduced?			06-Oct-14	Livingstone Open day	This issue will be considered as part of the socio-economic specialist study.
The socio-economic study needs to consider the number of people that will be employed for the project versus the number that will lose jobs as a result.			06-Oct-14	Livingstone Open day	This will be addressed as part of the ESIA.
The knock on tourism will be felt by all. We might not be physically or economically displaced, but will experience a loss of income. How will that be measured?			06-Oct-14	Livingstone Open day	A n economic impact assessment will be undertaken as part of the ESIA which will attempt to quantify this loss.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
WWF's overarching concern regarding the building of this hydroelectric facility, at this particular site, is that the dam will reduce the ability of the river to provide people along the Zambezi River with valuable ecosystem services. WWF acknowledges that the planned baseline studies will investigate different impacts and mitigation measures where possible. However, it is of concern that there is no mention of avoidance of impact as the first step.There are instances during Environmental and Social Impact Assessments when the proposed action is to go directly to compensation measures, without due consideration for avoidance and then mitigation of impacts. WWF would like to strongly recommend the consideration of Avoidance of Impact as a first option in the Impact Mitigation Hierarchy, before mitigation and, well before, compensation	Mr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	The mitigation hierarchy will be carefully considered, however there are limited options for avoidance as construction of a dam of this size cannot be readily shifted elsewhere. The key avoidance measure is the consideration of alternative means of generating power which will be thoroughly considered in the ESIA. Mitigation measures to minimise (such as management of flow releases) and rehabilitate (such as construction sites) will also be considered, but most importantly the residual impact following application of the mitigation hierarchy will be carefully assessed. Recommendations will then be made regarding offsetting based on the overall significance of the residual impact, however we are aware that offsetting may not be feasible as the Batoka Gorge is a unique feature. The primary Ecosystem service provided by the Batoka Gorge is fishing, but there are few people engaged in this activity as the area is generally very inaccessible. This service will not be displaced as the proposed reservoir will have a significant fisheries potential which will need to be managed by the fisheries depts. of both countries.
For how long will the EIA be valid? Baseline conditions may have changed before the dam has been developed and impacts will be different. This requires consideration.	Nqobile Mabhena	Hwange Local Board	03-Oct-14	Hwange District Council Meeting	The EIA will need to be valid to cover the feasibility study and the entire time period up to and including construction and operation of the scheme. It must be noted that further baseline studies may take place pre-construction as a recommendation of the ESIA.
If the project is not approved in Zambia, what will take place?	Nqobile Mabhena	Hwange Local Board	03-Oct-14	Hwange District Council Meeting	For the Batoka scheme to be realised, approvals will need to be obtained in both countries.
Mention is made of best international practise. What is this?	Herbert Sansole	Hwange Show Society	03-Oct-14	Hwange District Council Meeting	The ESIA and resettlement studies need to support a decision for amongst other things, financing. In order to secure funding, it is necessary to comply with the international best practices and standards such as the International Finance Corporation and World Bank Group standards. The project will be measured against these standards.
How long will the studies take?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	The ESIA is due to be submitted to the regulatory authorities in August 2015.
Who are the people collection baseline data?			03-Oct-14	Hwange District Council Meeting	A team of field researchers that are local to the project area have been appointed to undertake baseline data collection in collaboration with the project team.
We express concern that an ESIA is being undertaken for a structure that is not yet finalized as "scoping" is still being carried out.	Sue Liell-Cock	International Rafting Federation	18th Nov-14	Written submission	The objectives of the Scoping Phase of the Project are to gather issues of concern, identify project alternatives and scope the baseline and impact assessment studies. As such, the consideration of various design options is accommodated through the Scoping Process.
At what stage of the ESIA process are we at now?	Mrs. MusawaHamusonde	National Heritage Conservation Commission	09-Oct-14	Livingstone District Meeting	We are currently in the Scoping / data collection stage of the project. The primary aim at this stage is to identify issues of concern.
At what stage of the project will the impacts be communicated to stakeholders?	Mrs. MusawaHamusonde	National Heritage Conservation Commission	09-Oct-14	Livingstone District Meeting	We are providing high level information regarding Project impacts at open day meetings, regulatory meetings and community meetings. We are also distributing the Background Information Document which includes some of the anticipated impacts. However, our studies are at the early stages. We will communicate further with you about expected impacts in 2015.
May we have a copy of the ESIA process when it is complete	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	The ESIA will be a public document once it has been drafted.
What is the meaning of Scoping?			06-Oct-14	Livingstone Open day	Scoping is the first phase of an Environmental Impact Assessment during which it is intended that the issues and concerns of stakeholders are identified so that further specialist work addresses these concerns adequately.
Who is funding this report? We question the independence of the consultant.			06-Oct-14	Livingstone Open day	The Environmental and Social Impact Assessment is being funded by the World Bank Group under the and being undertaken to meet international good practice.
We feel that this project is a fait accompli.			06-Oct-14	Livingstone Open day	Comment noted. Authorisation and financing decisions are still to be made. The project will only go ahead after approval by the two governments (regulatory authorities).
Can we have priority in employment? We do not want the situation where the employment process is heavily politicised and people from other provinces are employed in place of the local people. The airport ended up employing only 20% of its labour force from locals and the rest from other provinces.	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. We are currently unable to specify quotas for employment.
Are our children going to benefit from employment when the project is under construction	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. We are currently unable to specify quotas for employment.
We are concerned that there will be corruption on employment of community members	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	Companies working for the Project will need to abide by national law which forbids corruption on employment.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
We want our own people to benefit especially on youth employment	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. We are currently unable to specify quotas for employment.
We want our children to be trained for the jobs such that when the project starts they will be ready to start on the jobs	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. We are currently unable to specify quotas for employment.
We ask the project authorities to consider us for possible employment. There is history of projects such as the airport project which promised 3000 jobs but only a handful of people are employed there	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	We cannot speak on behalf of other projects. However, the ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. ZRA/SP
This development is likely to cause poverty in the community like all development projects do. Will our children from the immediate community be guaranteed work during the construction period?	Mr Moyo, Masikili village	N/A	07-Oct-14	Matetsi Ward Meeting	The Project cannot guarantee work to specific communities. Individuals recruited will need to have the required skills to undertake the work. However, the ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined yet, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. We are unable to specify quotas for employment.
We do not want workers, especially unskilled, from Mashonaland to be employed in the project	Emelda Shoko, Lubangwe	N/A	07-Oct-14	Matetsi Ward Meeting	The Project cannot forbid people from Mashonaland from working on the Project. Employment will be bound by the employment laws of the two countries.
We want genuine companies to employ our children and not bogus ones that will fail to pay them on time.	Village head	N/A	07-Oct-14	Matetsi Ward Meeting	Companies working for the Project will need to abide by national law.
Will our children have priority in employment in the project area?	Councillor Farai Shoko, Gonwa Village	N/A	07-Oct-14	Mbhizi Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
We ask the project authorities to consider us for possible employment	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
What employment opportunities will be available to our children and what monitoring methods will the project use to avoid in migrants from taking their jobs?	Alleck Dubani, Sidindi Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
There is danger of corruption on employment such that the local end up not getting priority as the policy requires	Aleck Dubani, Sidinda village	N/A	08-Oct-14	Sidinda Ward Meeting	Companies working for the Project will need to abide by national law which forbids corruption related to employment.
On employment, unemployment is very high in the community but our concern is that at the time of employment, people from afar end up getting the jobs instead of us. There is corruption in the selection of those to be employed	Norman Mkandla, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. Employment opportunities will compromise of skilled , semi-skilled and unskilled jobs. The project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people. Companies working for the Project will need to abide by national law which forbids corruption related to employment.
We ask that employment should not be heavily politicised	Dadani Phiri, Dobolo village	N/A	08-Oct-14	Sidinda Ward Meeting	Companies working for the Project will need to abide by national law which forbids corruption related to employment.
Menial jobs should not be employed on the basis of 5 O levels	Levias Ncube, Sidinda ward	N/A	08-Oct-14	Sidinda Ward Meeting	The selection criteria for the jobs will be the prerogative of the employing company.
If someone is injured whilst working on the project, will they be compensated?	Chrishnan Siamkwele	Siachuma Village	13-Oct-14	Ngandu, Community Meeting	Yes. All companies will have to abide by employment laws of the two countries. This involves having appropriate insurance polices so that if anyone is injured at work they are compensated appropriately.
Considering this is a joint venture, what will be the ratio of people employed on the Zambian side compared to the Zimbabwean side? Quotes should be set for employment.	Councillor Mwapole K. Brighton	Kazungula District Council	10-Oct-14	Kazungula District Meeting	No quotas have been established and the number of positions that will be required has not yet been determined. The level of employment the project will offer will be assessed during the social -economic study phase of the ESIA for the project. The Project will provide employment opportunities for local people from both the Republic of Zambia and Zimbabwe
Will we be given priority for employment or will people be coming from outside to take the jobs?	Elena Likukela	Musokotwane village	11-Oct-14	Musokotwane community meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
Can we be given priority for employment? This will stop influx of people.	Ines Mulapi	MuntuMuswana village	13-Oct-14	Ngandu, Community Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
There should be a deliberate policy to prioritize the employment of locals, who fall mainly under the administrative district of Hwange. As a result, consideration should be given to achieve the following employment levels: i) 90% unskilled labour to be sourced from locals, ii) 60% - 70% of semi-skilled labour to be sourced from locals, iii) 409 - 50% of skilled labour to be sourced from the neighbouring districts of Hwange, Binga and Lupane; iv) 80% of professional / non-technical skills (e.g. clerks, bookkeepers, nurses, junior accountants, typists, secretaries, etc.) to be sourced from the neighbouring Districts of Hwange, Binga and Lupane	Document presented by Chief Shana and councillors for communities sunder his area of jurisdiction	N/A	04-Oct-14	Written submission	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
We welcome the project but we want our children to form 90% of the labour force especially unskilled and semi-skilled.	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	ZRA wants to make sure it has a positive impact in the communities in the project area of influence. The number of positions that will be required has not yet been determined. However, it is expected that this will be a limited number. The Project will try and employ local people provided that they have the relevant skills and experience to perform the work according to internationally accepted quality standards. However, the Project will have to recruit people from outside the local area when it is unable to find suitably qualified people.
Binga should be made part of the study area. Livelihoods of people in Binga district may be affected by the project.	Acting Provincial Administrator Matebeleland North	Ministry of Local Government	01-Oct-14	Bulawayo national and provincial authorities	This is noted. Further investigations and modelling is required by the engineers to understand the extent of project Area of Influence
We require a copy of the Prospectus Report in hard or soft copy		ZINWA	01-Oct-14	Bulawayo national and provincial authorities	This is noted. Prospectus will be availed
The project should pay a consultation fee to ZINWA to undertake an EIA for the proposed project. ZRA should also pay for transport for site inspection, accommodation and an administration fee of $200.		ZINWA	01-Oct-14	Bulawayo national and provincial authorities	This request is under consideration. However, it should be noted that this project involves two countries and hence regulatory requirements will need to be harmonised.
Zambians do not need the power generation project because they have enough and are even exporting. Why should we expect this project to be approved in Zambia?	Steve Jonasi, Lion Encounter Alert	Lion Encounter Alert	04-Oct-14	Victoria Falls Open Day	As of December 2012, total energy demand in Zambia exceeded internal generation capacity. This was as a result of the expansions in the mining and manufacturing sectors as well as overall expansions in the economy and population in Zambia. Power generation demand must also be seen for the SAPP region as a whole, not only for Zambia.
Are you authorized to carry out Socio-economic assessment? How do you go to the people to consult? Who will carry out the assessment?	Acting Provincial Administrator Matebeleland North	Ministry of Local Government	01-Oct-14	Bulawayo national and provincial authorities	The ZRA has recruited consulting firms from South Africa, Zimbabwe and Zambia to undertake the ESIA and social impact assessment. In addition, fieldworkers local to the project area will be employed. Consultations are being held at a district level and with traditional authorities before communities are engaged with.
When is disclosure going to be done and what does it incorporate?			30-Sep-14	Harare Open Day	The results of the ESIA will be feedback to stakeholders in 2015. Further meetings and the availability of the Draft ESIA Report will be allowed for in this process.
There is a lot of understanding that needs to be set. Is the project a done deal, is it going on irregardless?			04-Oct-14	Victoria Falls Open Day	Environmental authorisation and financing still need to be resolved for the project, so until those requirements are in place, the project cannot proceed.
Do you have external reviewers to ensure that international standards are met for the cost benefit analysis?			04-Oct-14	Victoria Falls Open Day	An external reviewer has been appointed by ZRA. The external reviewer will review ESIA against the Terms of Reference (ToR) to ensure that the report and ESIA process aligns to the ToR and conforms with international good practice.
Are independent consultants really objective to address scientific and stakeholder points of view.			04-Oct-14	Victoria Falls Open Day	An independent ESIA process is being undertaken to ensure the report and ESIA process conforms with international good practice. The independent consultant's are required to list all impacts and are to remain objective and non-biased. If impacts cannot be mitigated, then these need to be clearly identified, so the applicable regulators can make an informed opinion as to whether the scheme should go ahead or not. All stakeholder concerns also need to be clearly listed in the ESIA report.
Has there been an expression of interest released for the construction contractor?	Agney Siuluta	Department of Energy	08-Oct-14	Lusaka authorities meeting	No. This will only happen once the feasibility study for the scheme is finalised and the Environmental authorisation has been given.
If there are significant design changes from what has been presented today, there will be a need to repeat these scoping meetings.	Curtis Muleya	National Water and Sanitation Council	08-Oct-14	Lusaka authorities meeting	This is noted.
Throughout the document and in the relevant appendix, reference is made to IFC standards and which would be applicable to the BHES ESIA. WWF would like to find out how exactly these standards will be applied and to what extent. The concern arises from the fact that the report does not explicitly mention the rigorous application of IFC standards to all relevant components of this project.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	The ESIA and resettlement studies need to support a decision for amongst other things, financing. The ESIA and resettlement studies need to support a decision for amongst other things, financing. In order to secure funding, it is necessary to comply with the international best practices and standards such as the International Finance Corporation and World Bank Group standards. The project will be measured against these standards.
The Hydro Sustainability Assessment Protocol (HSAP) is holistic and covers many different sectors pertaining to the sustainability of a hydropower project. It should be applied at different phases of project development allowing for a cradle to grave approach in terms of project sustainability. WWF acknowledges that it is indeed an excellent tool that ensures the best possible development scenario for a dam. The HSAP is duly described in Annex E but there are no details as to how it will be applied to the current proposed project. For this reason, WWF would like to find out to what extent the HSAP is or will be applied to the Batoka Gorge Hydro-Electric Scheme project. WWF would like to further underline that if this Protocol is to be applied, it needs the use of an accredited assessor that has the required knowledge and skills.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	The ESIA will be guided by international standards such as the International Finance Corporation's (IFC) Performance Standards, as well as the HSAP and, the regulations of both countries.
It is understood from the Draft Inception Report that ERM and Kaizen International intend to apply good international practices in the execution of the ESIA. In this regard WWF would like to enquire if there is a specialized international impact assessment organization that has been engaged to oversee the ESIA process in both countries. If yes, WWF would like to know who that is. If no, WWF would like to suggest an organization such as the Netherlands Commission for Environmental Assessment (NCEA). NCEA is an international cooperation that works in several countries advising on issues such as Terms of Reference for reviews of environmental assessments, and capacity development of systems and institutions to improve the environmental assessment practices. Given the vast experience and expertise of NCEA, WWF believes it would be beneficial for the Zambezi River Authority, Kaizen Consulting International and ERM to take on board such an organization. This would go a long way to achieve international best practices during the Batoka Gorge Environmental and Social Impact Assessment.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	As part of the ESIA process, the Southern African Institute of Environmental Impact Assessment (SAIEA) will be reviewing the overall ESIA. ZRA have also independently appointed an external reviewer, who will have inputs into the draft deliverables produced by ERM.
What is included in the scope of the ESIA? Is it the dam or all infrastructure presented at this meeting?	Mushimei Muliya	Road Development Agency	08-Oct-14	Lusaka authorities meeting	The scope of the ESIA is for all of the infrastructure presented in the meeting and Background Information Document.
The National Park boundary is not denoted correctly on these maps.	Mwale Lusizi	Zambian Wildlife Authority	06-Oct-14	Livingstone Open day	Noted. We will ensure that the maps are updated to reflect the correct boundaries. Data from the most relevant sources will be obtained where possible.
While welcoming the project and wishing it to succeed the importance of the impact assessment and mitigation measures are key.	Nick Money	WECSZ		Registration and comment sheet	Comment noted
We want to know how our grievances will be managed and how promises and responses to our questions will be documented	Paul Costa Nyathi- Teacher at Lumbora Sec School	N/A	08-Oct-14	Sidinda Ward Meeting	A grievance reporting mechanism will form part of this study. Currently, we ask that if you have any grievances related to the Project, please tell the headman and chief, who will then forward them to the ZRA. A comments and response report has been prepared to record all comments raised through the stakeholder engagement process.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What is the anticipated impact on the water table likely to be? Will this impact on groundwater? Flora and fauna? Water quality impacts in the dam could have a resultant impact on adjacent water bodies.			06-Oct-14	Livingstone Open day	The dam is small compared to other schemes, but it will be deep with a relatively small surface area (~26km2). As for all dams, fault lines and other zones connected to the dam may result in groundwater zones being affected adjacent to and downstream of the dam. A limnological study will be undertaken to assess the surface water quality impacts both within the dam, and downstream of the dam wall to Kariba. The potential effects on water quality and flow conditions downstream of the dam, and consequent impacts on related flora and fauna, are being examined as part of an Environmental Flow Assessment study and the ESIA as a whole.
The following should be addressed: diseases brought by migration of workers, pollution, diseases caused by the changes in the river ecosystem, especially increases in water-borne diseases such as malaria and schistosomiasis	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	A health impact assessment is being undertaken as part of the ESIA study which will assess these potential impacts. The study will develop the project EMP which will include mitigation measures so that the health of the population is not affected.
Have the expected health effects of the project been considered in conjunction with the Honorable Minister of Health and Welfare been considered. The following should be addressed: diseases brought by migration of workers, pollution, diseases caused by the river ecosystem and increase in water borne diseases such as malaria and schistosomiasis.	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	A health impact assessment is being undertaken as part of the ESIA study which will assess these potential impacts. The study will develop the project EMP which will include mitigation measures so that the health of the population is not affected.
Will stagnant water as a result of the dam impact on the health of adjacent communities and thus have resultant displacement.			06-Oct-14	Livingstone Open day	A health impact study will be undertaken which will give consideration to this. The study will develop the project EMP which will include mitigation measures so that the health of the population is not affected.
HIV/Aids now requires consideration in all ESIAs. This has been a change in the legislation. Its prevalence in the area needs to be ascertained as well as determining what the drivers in the area are. Health workers in the area need to be consulted in this regard.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	This will be undertaken as part of the health impact assessment and to form part of an integrated Environmental, Social and Health Impact Assessment for the Project
The health impact assessment needs to advise what health authorities need and require preparation for. An interpretation of how current systems will cope is required. The Ministry of Community Development – Mother and Child Health and ZESCO would like to review the terms of reference for this study.	Miss Chilweza Musonda Muzongwe and Christopher Kaniki	Ministry of Community Development, Mother and Child Health and ZESCO	08-Oct-14	Lusaka authorities meeting	An integrated Environmental, Social and Health Impact Assessment is being undertaken for the Project. As part of this impacts to health of the local community will be identified and assessed. The ESIA will consider potential changes to the health profile of communities around the Project as a result of Project related activities and the capacity of health care facilities to cope with these changes. The ESIA will be a public document and therefore can be reviewed by all stakeholders to assist them in their future planning. The Terms of Reference for the health related aspects of the study have been sent to The Ministry of Community Development – Mother and Child Health and ZESCO.
HIV/AIDS is common in this area. Livingstone is a tourism destination and a border town. The project needs to consider the impacts on HIV/AIDS.	Abby Chungy	Kazungula District Council	10-Oct-14	Kazungula District Meeting	Noted. We will consider HIV/AIDS as part of the ESIA. A health impact study is being undertaken as part of the ESIA to address this impact.
Assurance is required that the expected health effects of the project are considered. The following should be addressed:diseases brought by migration of workers, pollution, diseases caused by the changes in the river ecosystem, especially increases in water-borne diseases such as malaria and schistosomiasis	Mr Cooper Freeman		07-Oct-14	Email	An integrated Environmental, Social and Health Impact Assessment will be undertaken for the Project which will give consideration to this.
If people from outside the area come here to look for jobs, we could be at risk of Ebola.	Obrim Maseah	Musokotwane village	11-Oct-14	Musokotwane community meeting	Your concern has been noted. A health impact assessment is also being undertaken as part of the project to identify what the likely health impacts will be and to develop measures that can be implemented to reduce any negative impacts.
Health impacts may result in displacement.			06-Oct-14	Livingstone Open day	A health impact study will be undertaken which will give consideration to this.
Health impacts are of concern. These will result from in-migration, pollution and river ecosystem changes.			06-Oct-14	Livingstone Open day	A health impact study will be undertaken which will give consideration to this.
Will an ethnographical study be undertaken in conjunction with the Ministry of Arts and Culture on the culture impact of such projects.	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	A cultural and heritage specialist study is being undertaken as part of the ESIA and will be undertaken to meet legislative requirements. The participation of the Ministry of Sports, Arts and Culture in Zimbabwe has been sought on this Project.
What comment has been made by the World Heritage Authorities?			06-Oct-14	Livingstone Open day	To date, the only comments received by the heritage authorities have been that received by the National heritage Commission in Livingstone, Zambia. They have requested that the geological and aesthetic value of Victoria Falls is taken into consideration in the planning of the Project.
The impact on white river rafting and the aesthetics of the Gorge requires consideration.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	This will be considered as part of the ESIA study.
The Batoka Gorge is an iconic paddling destination, known by almost anyone who is interested in whitewater – the destruction of this iconic gorge will result in the permanent loss of a wilderness asset. This will permanently remove any potential benefits to local communities from eco-tourism, specifically paddling or whitewater related tourism.	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	This comment is being assessed through the socio-economic impact assessment and biodiversity studies.
What is intimidating us is that our land and activities such as fishing are going to be affected	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	The ZRA will identify potential impacts that may occur to people's livelihoods as a result of Project activities. This will be explored further in the socio-economic baseline study and Resettlement Action Plan. The ZRA is committed to livelihood restoration of affected people.
Our livelihood depended on fishing on the Zambezi, what will happen when the dam wall has been constructed?	Derek Sibanda, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	The ESIA Studies are currently ongoing to determine the impacts on fishing. Any livelihoods, including fishing, that are disturbed will be compensated and people will be helped to restore their livelihoods.
What will the impact on the tiger fishing industry be? The breeding cycle is unknown and there may be implications.	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	Tiger Fish are expected to increase in the dam if a pelagic fish species (e.g. Kapenta) is introduced to occupy a vacant niche. There is some upstream riverine habitat retained for the Tiger Fish to breed.
Will the rafting industry in Victoria Falls be affected?	Mr Mudende	HRDC, Engineer	03-Oct-14	Hwange District Council Meeting	The impacts on the river rafting industry are being considered as part of the ESIA. An economic impact assessment is being undertaken so that an assessment can be made with regard to the impact on the river rafting industry and employment that it supports.
Can the project assist those that will lose employment as result of the project for example there are people involved with white water rafting who are going to lose their jobs. Will you also assist with terminal benefits?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	Potential impacts on livelihoods will be assessed further as part of the resettlement action plan, social impact assessment and economic impact assessment.
What form of compensation will we get if our livelihoods which depend on white water rafting are affected?	Itai Ngwenyama, Professional Rafting Guide	N/A	08-Oct-14	Sidinda Ward Meeting	An economic impact assessment is being undertaken as part of the ESIA so that an assessment can be made with regard to the impact on the river rafting industry and employment that it supports. This study will help to determine compensation provisions.
The impact on the multi day rafting and kayaking activities on the Zambezi will be significant and will lead to job losses across the board. The knock on economic and social effects of this need to be investigated and quantified and compensation calculated	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	An economic impact assessment is being undertaken to assess this impact.
The impact on the single day rafting and kayaking trips is unknown and may very well lead to job losses. The knock on economic and social effects of this need to be investigated and quantified and compensation calculated	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	An economic impact assessment is being undertaken to assess this impact. Alternatives are still under consideration in order to mitigate these impacts to some extent.
The water level can rise up to 20m at parts of the Gorge close to Victoria Falls and disrupt rafting. What is the anticipated impact of the project on rafting?	Phillane Moyo	Rafting company	04-Oct-14	Victoria Falls Open Day	Various design alternatives are still under consideration, but the current anticipated extent of the dam is back to Silent Pools. The impact on river rafting is being considered as part of a economic cost-benefit analysis which is being undertaken for the ESIA.
What will the impact be on the flow of the rapids?	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	On the basis of the current design, the area of inundation is expected to extend to just below Silent Pools on the Zambezi River. This will therefore affect all rapids between Silent Pools and the dam wall.
Whether the rafting companies and their staff will be compensated for loss of revenue?	Clive Bradford	Wild Horizons	26-Nov-14	email	An economic impact assessment is being undertaken as part of the ESIA so that an assessment can be made with regard to the impact on the river rafting industry and employment that it supports. This study will help to determine compensation provisions.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What will the impacts be on the river rafting industry? This is one of the attractions for people coming to Victoria Falls.	Richard Maasdorp	Zambezi Society	30-Sep-14	Harare Open Day	The impacts on the river rafting industry are being considered as part of the social specialist study and an economic impact assessment. On the basis of the current design, the area of inundation is expected to extend to just below Silent Pools on the Zambezi River.
What will be the costs of losing the white water rafting industry against the cost benefits of the Batoka Gorges Hydro-Electrical Power Scheme?	Moses Tambala	ZEMA	09-Oct-14	Livingstone District Meeting	This will be considered as part of the ESIA. An economic impact assessment is being undertaken as part of the ESIA so that an assessment can be made with regard to the impact on the river rafting industry and employment that it supports.
How will the loss of water rafting be valued?	Moses Tambala	ZEMA	09-Oct-14	Livingstone District Meeting	This will be considered as part of the ESIA. An economic impact assessment is being undertaken as part of the ESIA.
What will the impact be on the white river rafting industry?			06-Oct-14	Livingstone Open day	The impacts on the river rafting industry are being considered as part of the ESIA. On the basis of the current design, the area of inundation is expected to extend to just below Silent Pools on the Zambezi River.
There will be a loss of rapids.	Mr Jones Masonde	Zambia Wildlife Authority	07-Oct-14	Lusaka Open Day	On the basis of the 1993 proposed designs, all the rapids between the dam wall and Silent Pools could be lost.
The Batoka Gorge is one of the most beautiful gorges shared by Zambia and Zimbabwe. It is situated close to an international thriving tourism economy that relies on the uniqueness of a tourism product,impossible to replace with the construction of a dam – white water rafting. Furthermore, the gorge is intrinsically connected to the aesthetic, cultural and economic value of the Victoria Falls, as well as its World Heritage status. The pristine nature of this entire area provides for a local economy and jobs that affect a considerable number of people on both sides of the Zambezi River. The documentation presented at the open day does not give assurances that the lake created by the dam will not back flood the area where white water rafting takes place. Before a final decision is made, it is therefore critical to understand this matter and evaluate the direct economic impact of the dam on the tourism sector that depends on the gorge itself, as well as the indirect economic impact that it will have on the Victoria Falls as a tourism mega destination in Africa.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	An economic assessment of the impact on tourism will be undertaken as part of the social impact assessment.
What structures are there to evaualuate the uses of the revenue from business that rely on tourism? What if any compension plans are in place for those who will lose jobs and livelihoods?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	The economic impact associated with the impact on the tourism industry will be considered as part of the ESIA.
What will be the project's impact on tourism?	Acting Provincial Administrator Matebeleland North	Ministry of Local Government	01-Oct-14	Bulawayo national and provincial authorities	A Socio-economic assessment is currently being carried out to determine such impacts. The largest impacts to tourism will be on the white water rafting industry, and a socio-economic study on this impact specifically is to be undertaken.
Whitewater Rafting is an iconic activity for Vic falls and Livingstone and its role as the anchor adventure activity for the region needs to be understood. The loss of rafting will very likely have a much broader impact on the tourism industry of the area as a whole.	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	An economic impact assessment is being undertaken to assess this impact.
There is a potential impact on a World Heritage site and the basis of the economies of the regions around Vic Falls and Livingstone as a result.	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	An economic impact assessment is being undertaken as part of the ESIA to ascertain the extent of the loss of income to the tourism industry. Comment has been sought from the heritage authorities and UNESCO with regard to their views on the impact on the World Heritage Site.
We express deep concern that the opportunity costs of such an unnecessary, last minute energy project, among others, is that of a pre-existing, vibrant, rapidly growing tourism industry. Which directly and indirectly employs hundreds of thousands of people. As well as, among others, the destruction of a "UNESCO" world heritage site and the destruction of an Important Bird Area.	Sean Edington	Safari Par Excellence	27-Oct-14	email	An economic impact assessment is being undertaken as part of the ESIA to ascertain the extent of the loss of income to the tourism industry. Comment has been sought from the heritage authorities and UNESCO with regard to their views on the impact on the World Heritage Site.
What schematic structures are in place to evaluate the loss of revenue from businesses that rely on tourism? What if any compensation plans are in place for those who will lose jobs and livelihoods through the proposed project?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	An economic impact assessment is being undertaken as part of the ESIA to ascertain the extent of the loss of income to the tourism industry. The results of this as well as commitments for the mitigation thereof will be included in the ESIA.
Will studies be done to evaluate the effect of the proposed dam on perceptions of the tourism public - will they still visit the area in the same numbers as currently if whitewater rafting, the cornerstone of the local adventure tourism economy is affected?	Sue Liell-Cock	International Rafting Federation	18th Nov-14	Written submission	This will be assessed as part of the economic impact assessment.
One of the questions that we were desperate to get answered at the meeting was the Effect on the economy of closing the rafting. Do you have a schematic structure for measuring this and can we assist in providing any data? The industry here is notoriously exceptionally competitive and sharing info is not one of our strong points. Though I think it is vital that this information is taken into account? Primarily on the employment side of things, Safpar employs 61 people directly for rafting, the WB dependency ratio for 2014 is 19.6 for Zambia, yet this is purely age related and not necessarily a reflection of the actual support one employee generates. Additionally 72% of the urban population is employed in the "informal sector" with it being as high as 94% in rural areas, the people that carve curios, cook the food, transport, grow the relish, maintain the roads for the community for the vehicles, the ones that build the paths, the freelance porters etc etc. How is this quantified? In our opinion this community is tied so strongly to the river that we also need to accurately asses the impact of a complete destruction of a way of life for thousands of people and make sure these people have an option if the dam comes in. In my opinion this is not being factored in. Reading that "lion walking" is the major drawcard in the area is ludicrous. The revenue and tax base is another factor which we feel needs to be factored in, National Heritage themselves take USD 10 per person going rafting, as does the national park service in Zimbabwe. The Chief in our area gets USD 2 per person etc etc. Is all of this going to be taken into account and do you need any assistance?	Sean Edington	Safari Par Excellence	5th Dec 2014	Email	A questionnaire is being developed to administer information gathering as part of the economic impact assessment and this will consider impacts on the tourism industry as a whole.
It is our understanding that Zambia, through long term diligent and progressive management within ZESCO, will be able to meet the countries power requirement by the end of 2014 as planned. We express deep concern regarding the opportunity costs for the pre-existing vibrant rapidly growing tourists industry which directly and indirectly employs a hundred thousand people. Our other concerns are for the destruction of a UNESCO world heritage site and the destruction of an imporatnt bird area and habitat.	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	The economic impact associated with the impact on the tourism industry will be considered as part of the ESIA along with any impact on the World Heritage site and biodiversity studies.
Will the Victoria Falls be affected?	Colin Silowa	Chilbule village	09-Oct-14	Ngandu, Community Meeting	Studies are currently ongoing into the likely impacts to the Victoria Falls. However, the project is expected to have no effect on the Victoria Falls.
Has the geological and aesthetic value of Victoria falls been taken into consideration in the planning of the project? Victoria falls is of significant importance and has been designated as a World Heritage site.	Mrs. MusawaHamusonde	National Heritage Conservation Commission	09-Oct-14	Livingstone District Meeting	Studies are currently ongoing into the likely impacts to the Victoria Falls. However, the project is expected to have no effect on the Victoria Falls.
Is the water level in the river going to be lower because if it is there is a danger of increased cattle rustling from Zambia side	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Water studies are still ongoing. Once these studies have been finalised, further information about water levels will be available. However, any movement will be strictly monitored to avoid castle rustling from happening by the immigration and police.
The construction of the dam will cause the water levels to recede and give chance to the cattle rustlers from Zambia to cross and steal our livestock	Lazurus Shoko, Sidinda Village	N/A	08-Oct-14	Sidinda Ward Meeting	If the Project goes ahead, there will be staffed immigration and police posts to avoid this from happening.
With the development of the powerline, there will be increased access to the area. This may have social implications.	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	This will be considered as part of the socio-economic impact assessment.
Stakeholders would like access to the engineering and cost details of the project. Costs associated with environmental management must be details as a minimum.	Cooper Freeman	Private	06-Oct-14	Livingstone Open day	A draft bills of quantities for monitoring, mitigation and impact management for inclusion in tender documents for all works is a requirement of the ESIA.
The ESIA Report will need to assess the impact on existing communities of increased populations moving into the area.	Mr Cooper Freeman		07-Oct-14	Email	This will be assessed as part of the Social Impact Assessment.
Could we also see what legislation has been identified as relevant? This will include the Mines and Minerals Act for blasting and quarrying. Kaizen Consulting will be able to advise in this regard.			08-Oct-14	Lusaka authorities meeting	This will be included in the Draft Scoping Report which will be made available for public comment.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
The project will deprive local youths of employment since they rely on the Zambezi River for tourism and rafting.	Kevin Zuhn		06-Oct-14	Livingstone Open day	This will be considered and assessed further as part of the social impact assessment.
WWF would like to know what studies have been done to understand river morphology, potential changes to its local morphology as well as the extent to which morphological impacts will be examined downstream. Structures such as dams and reservoirs lead to sediment-poor rivers downstream thereby increasing incision of the river and lowering the riverbed. The effects further downstream need to be holistically investigated. WWF would also like to enquire about the effects of a reservoir on the operation of downstream existing dams. It is understood that for example the operation of Kariba dam is unlikely to be altered. However, to what extent are these scenarios being incorporated into the baseline data gathering for the BHES and the flows assessments?	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	A comprehensive Environmental Flow Assessment (EFA) examining the potential impacts on downstream conditions (including morphological processes) is being conducted for the study using the DRIFT methodology. The results of this study will be provided to the design engineers in order to inform the design process.
Is there a potential odour impact?			06-Oct-14	Livingstone Open day	Potential water quality conditions in the reservoir will be examined as part of the flow study, although given the very short water residence time it is very unlikely that these would give rise to any potential eutrophication issues and hence any odour related impacts.
Can you put your promises in black and white so that we will have a reference point in future. You are writing minutes but we are not sure whether this is genuine or not. We are not sure whether you will be the same people that will come back the second time around. This idea of signatures can be faked. What can you give us that satisfies us that you are genuine.	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	All minutes are being taken of meetings to record what is being noted. This will be published in the Scoping Report and ESIA and will act as a reference point for the public. The team will be returning during the Feedback Stage of the Project and reporting back on how issues have been identified.
We want evidence of ESIA or we won't sign the attendance register	Chief Muvutho	N/A	06-Oct-14	Chidobe Ward Meeting	There will be public disclosure of the draft ESIA. This is currently anticipated for early 2015. We would welcome your views on this. Signatures on the attendance are not necessary if not desired.
As a community we are happy for the dam development to be in our area. We must plan ahead so that we embrace the project.	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Thank you for the comment
When the project starts the sponsors sweet talk us and then all the promises vanish as the project is implemented.	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	All minutes are being taken of meetings to record what is being noted. This will be published in the ESIA and will act as a reference point for the public.
The community through their councillor accept the development of the dam and its facilities. The community is advised to look at the bigger picture and not small issues such as employment of non-skilled labour.	Councillor , Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Noted.
Are the promises of the project genuine or are they just for the communities to agree to the location of the project in their area. These communities have very bad memories of unfulfilled promises from similar projects, such as campfire, and the airport construction.	Mandla Mpofu, Milonga Village	N/A	07-Oct-14	Mbhizi Ward Meeting	All minutes are being taken of meetings to record what is being noted. This will be published in the ESIA and will act as a reference point for the public.
As a community we are happy for the dam development to be in our area. I urge my fellow community members to embrace the project. We must plan ahead so that we embrace the project.	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Thank you for the comment
The community should educate their children about the dam as a new development coming in the area.	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Noted
The councillor handed to the team a document of concerns and requests as attached.	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Noted. This has been included in this comments and response report.
The problem that we face with your projects is that when you come you entice us with the promises but as soon as we agree to the project going ahead the promises disappear and you disappear as well.	David Chuma, Dobolo Village	N/A	08-Oct-14	Sidinda Ward Meeting	All minutes are being taken of meetings to record what is being noted. This will be published in the ESIA and will act as a reference point for the public. In addition, the Project is being undertaken in line with international best practice. It will be monitored to ensure that any promises made are fulfilled.
My fear is that the project will not fulfil its promises or obligations before its implementation thereby getting away without doing what it promises to do.	Moster Sibanda, Lumbora Village 2	N/A	08-Oct-14	Sidinda Ward Meeting	All minutes are being taken of meetings to record what is being noted. This will be published in the ESIA and will act as a reference point for the public. In addition, the Project is being undertaken in line with international best practice. It will be monitored to ensure that any promises made are fulfilled.
Who owns what between the countries with regard to the dam infrastructure?	Agney Siuluta	Department of Energy	08-Oct-14	Lusaka authorities meeting	The dam infrastructure will be jointly owned by the two governments.
Why do you want to disturb the Zambezi River further? The Victoria Falls has already been disturbed and we already have the Kariba dam. Can we not use existing power sources?	Andrew Chalinga	Chibule village	13-Oct-14	Ngandu, Community Meeting	Existing power sources do not provide sufficient energy for the country's and the SAPP's needs. The Kariba dam has already been expanded and the number of generating units has recently been increased. If we put in an additional generator unit in the Victoria Falls Power Station, it will impact on the Victoria Falls.
If roads are built, will they be tarred? Will there be heavy duty vehicles using them? This will cause us problems if so.	Ernest	Ngandu village	13-Oct-14	Ngandu, Community Meeting	Some of the roads will be tarred and heavy duty vehicles will need to use them to transport project materials mostly during the construction phase of the project. Mitigation measures will be put in place to reduce negative impacts.
We are grateful for the project giving us improved roads. However, one of my chickens was killed by trucks using the road.	Frances Siasoko	MuntuMuswana village	13-Oct-14	Ngandu, Community Meeting	There will be adequate sensitisation to avoid such occurrences and to inform the public that when a road is constructed, livestock should be kept away from the road.
In Botswana other forms of energy are being used such as solar energy. Why can we not also look at these other forms of energy?	Gardner Malake	Chibule village	13-Oct-14	Ngandu, Community Meeting	Solar power is considered in the energy mix. For example, the total capacity of solar power in Zimbabwe is estimated at 300MW. The two countries require an upwards of 10000MW in the next five years, which cannot be secured through solar power alone. The Batoka HPP will deliver upwards of 1800MW, which is required to address part of the energy deficit in both countries.
What guarantees have been put in place to ensure that community members are protected?	GisfordMuleya	Kazungula District Council	10-Oct-14	Kazungula District Meeting	Extensive engagement is being undertaken with the local communities and district and traditional authorities to try and identify likely impacts and issues of concern, as well as to take suggestions on how to avoid and reduce any negative impacts. Once impacts have been identified, appropriate measures will be developed to ensure that no one is adversely affected.
This project should not be politicised. It should not be a competition between the chiefdoms, instead the whole district should benefit from it.	Kennedy Mufuna	Headman Kapongo village	11-Oct-14	Musokotwane community meeting	Noted.
We want to make a request to government to let the project be located in this area.	Lloyd Masamu	Sekuba village	11-Oct-14	Musokotwane community meeting	This has been noted.
The study should take into account the recent ESIA conducted for the construction of Kazungula Bridge	Mr. HivwananiSikombe	Roads Development Agency	09-Oct-14	Livingstone District Meeting	Noted.
On page 94 of the Inception report, it reads that the Director of Museum Mr. Katenekwa is under National Heritage Conservation Commission, Harare. This should be corrected so that it reads Zimbabwe.	Mrs. MusawaHamusonde	National Heritage Conservation Commission	09-Oct-14	Livingstone District Meeting	Noted. This will be corrected.
Will the project help to solve the problem of load shedding?	Susan Sikopo	Mebukose kampo village	11-Oct-14	Musokotwane community meeting	Yes. The project twill generate between 1600 MW and 3000MW for both Zambia and Zimbabwe. This should help with load shedding.
In terms of local participation, the project should: facilitate the appointment of locals onto company Board of Directors with at least 30% representation, appointment of Board members to be made in consultation with the Chief and the Chief to be an ex-officio member of the Board	Document presented by Chief Shana and councillors for communities under his area of jurisdiction	N/A	04-Oct-14	Written submission	The appointment of the Board of Directors is a preserve of the two governments.
Why do projects always start in Mukuni and Musokotwame is left out	Evans Mwiya	Musokotwane	11-Oct-14	Musokotwane community meeting	Mukuni chiefdom is located closer to the Zambezi River however Musokotwane village is likely to be benefit through employment opportunities since the project is within the district. It is likely to be affected especially if the transmission line from Livingstone to Choma is developed.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Will an economic analysis be undertaken taking into account the potential for unsustainable 'boon and bust' economic impact on local and regional economics?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	The economic impact assessment and social impact assessment will consider this as part of its scope.
Assurance is required that the potential for unsustainable "boom and bust" economic impact on local or regional economies are considered	Mr Cooper Freeman		07-Oct-14	Email	This will be assessed as part of the Social Impact Assessment.
The risks associated with this project need to be weighed up against the project alternatives.			06-Oct-14	Livingstone Open day	The Feasibility Studies will inform this outcome.
Solar power should be an alternative under consideration.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	Solar power is considered in the energy mix. For example, the total capacity of solar power in Zimbabwe is estimated at 300MW. The Batoka HPP will deliver upwards of 1800MW, which is required to address the energy deficit in the two countries.
The Batoka Gorge Dam is an outdated plan which requires reconsideration. What is the possibility of turbine generated power?	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	The current studies provide an update to the earlier studies and take into account latest developments.
Has the alternative of solar power been considered? This will entail a smaller footprint and could avoid the displacement of people.	Oliver Wales Smith	Environment Africa	30-Sep-14	Harare Open Day	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, power generation schemes, including thermal power, within the SADC region as a whole and solar power. The total capacity of solar power in Zimbabwe is estimated at 300MW. This is lower that the Batoka HPP, which will deliver upwards of 1800MW, which is required to address the energy deficit in the two countries.
What have been the project alternatives?	Ms Annah Chuma	Hwange Colliery Company	03-Oct-14	Hwange District Council Meeting	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. As per alterative operating scenarios for the Batoka scheme itself (such as run-of-river/peaking), these are currently being investigated as part of the overall engineering feasibility study .
Will the power be fed on to the national grid or are other alternatives been considered?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	Yes, the power will be fed into the national grids of both countries.
Any consideration of alternative sources of power? Should Zambezi River be destroyed and the environment permanently damaged? What will happen to rafting which is a major tourist attraction?	Phillane Moyo	Rafting company	04-Oct-14	Victoria Falls Open Day	Various design alternatives are still under consideration, but the current anticipated extent of the dam is back to Silent Pools. The impact on river rafting is being considered as part of a economic cost-benefit analysis which is being undertaken for the ESIA. The impact on the Gorges' biodiversity is also under investigation.
Has there been due diligence in exploring alternate electricity generation schemes if electricity is to be the primary objective of the project. Have alternate schemes such as run of the river turbines been considered that do not impact on the Mosi-oa-Tunya national park and the "UNESCO" world heritage sites.	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. As per alterative operating scenarios for the Batoka scheme itself (such as run-of-river/peaking), these are currently being investigated as part of the overall engineering feasibility study .
Can you provide assurance that conservation has been fully considered as an alternative to the project (including a full DSM conservation study).	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. As per alterative operating scenarios for the Batoka scheme itself (such as run-of-river/peaking), these are currently being investigated as part of the overall engineering feasibility study . The ESIA does not consider the Batoka HPP scheme and conservation as alternatives to one another. The HPP scheme is not expected to significantly impact terrestrial conservation, as the gorge supports minimal wildlife, presents a natural barrier to the movement of wildlife, and the loss of terrestrial habitat will be small. Conservation of the area remains the responsibility of the respective Zambian and Zimbabwean conservation authorities, and is not the responsibility of the HPP management authority. Promoting conservation of the greater area is however proposed within the mitigation measures. Development of the Batoka HPP scheme is expected to lead to improved management of the surrounding areas which will have positive spin offs for conservation.
Solar can produce 10 times more power than hydro. Reliable solar resources are available and abundant in Zimbabwe. Careful systems operations can address issues of inconsistent solar availability arising from weather causes. Hydro-electric power generation is also affected by drought seasons	Ranjit Deshmlikh	University of California	04-Oct-14	Victoria Falls Open Day	Solar power is considered in the energy mix. For example, the total capacity of solar power in Zimbabwe is estimated at 300MW. The Batoka HPP will deliver upwards of 1800MW, which is required to address the energy deficit in the SAPP. It is true hydropower is vulnerable to droughts. Engineering feasibility studies are considering the historical flow records (of ~100 years) as well as the impacts of climate change into their models, to assess the overall feasibility of the scheme.
Are there any project alternatives			03-Oct-14	Hwange District Council Meeting	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. As per alterative operating scenarios for the Batoka scheme itself (such as run-of-river/peaking), these are currently being investigated as part of the overall engineering feasibility study .
Have the engineers looked at alternate sites for the dam to be built			04-Oct-14	Victoria Falls Open Day	This site has been the subject of detailed studies as far back as 1993. The current engineering feasibility studies once again confirm that the present site is best suited for the construction of the scheme. The site has suitable geology for the construction of the dam wall, has a site suitable for the construction of a spillway, and the gorge at this point is narrower compared to sites downstream, thus reducing concrete volumes, and hence construction costs.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Can you provide an assurance that conservation has been fully considered as an alternative to the project (including a full DSM conservartion study)	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	The ESIA and Engineering feasibility studies will inform on this subject.
Has there been due diligence in exploring alternative electricity generation schemes if electricity is to be primary objective of the project? Have alternatives schemes such as run of the river turbines been considered that do not impact on the Mosi-oa-Tunya National park and the UNESCO world heritage sites?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. As per alterative operating scenarios for the Batoka scheme itself (such as run-of-river/peaking), these are currently being investigated as part of the overall engineering feasibility study .
There needs to be assurance that scaled-down, less-damaging project designs have been considered	Mr Cooper Freeman		07-Oct-14	Email	Different alternatives to the Batoka scheme are being considered and form part of the engineering feasibility studies.
Can solar power be considered as a project alternative?			06-Oct-14	Livingstone Open day	Solar power is considered in the energy mix. For example, the total capacity of solar power in Zimbabwe is estimated at 300MW. The two countries require an upwards of 10000MW in the next five years, which cannot be secured through solar power alone. The Batoka HPP will deliver upwards of 1800MW, which is required to address part of the energy deficit in both countries.
Could Zambia not develop the Kafue Dam Stage 2 as a project alternative?			06-Oct-14	Livingstone Open day	The two countries require an upwards of 10000MW in the next five years, which cannot be secured through the Batoka HPP alone, therefore Kafue Dam Stage 2 (Kafue Gorge Lower) is one of the projects to deliver that energy.
Technology is advancing. Could the use of fish friendly turbines be considered?			06-Oct-14	Livingstone Open day	The engineering feasibility studies will inform on this subject.
Why is the Hwange powerline alternative proposed?	Ms N Dube	Acting Provincial Administrator	01-Oct-14	Bulawayo national and provincial authorities	The alternative aligns with an existing road thus minimising the extent of disturbed area.
The percentage contribution of this power to the national grid needs to be better understood.	Darryl Tiran	Birdlife Zimbabwe	04-Oct-14	Victoria Falls Open Day	The engineering feasibility studies will inform on this subject.
What is the rationale for the location of the permanent camps? Will this lead to the development of a new urban centre?	Mr F Ndhlovu	Department of Physical Planning	01-Oct-14	Bulawayo national and provincial authorities	The rationale for the location of the camps will include, proximity to the project site among others. The development of new urban centres will stem from the need to have permanent townships for workers.
Please provide us with exact co-ordinates for the permanent camp in the west.	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	Note that at this stage, there a number of alternative locations for permanent camps proposed, both in Zimbabwe and Zambia. The ESIA will be making recommendations on the preferred alternative. At this stage, the coordinates for the proposed alterative camp in the west is 18° 0' 40.34" S; 26° 1' 6.14" E;
We would suggest that existing roads are utilised wherever possible. There should be no need to develop new roads.	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	The utilisation and hence upgrading of existing roads will be encouraged during the design of the scheme.
Can the permanent camp be developed to provide environmentally friendly services with regard to heating/lighting and waste management?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	The comment is noted and such measures will be included in the project ESMP.
What is the number of spillway gates?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	The engineering feasibility studies will inform on this subject.
How many people will be housed in the permanent camp?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	It is currently anticipated that 300 people will be housed in the permanent camp.
Will the access roads be tarred?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	Yes.
Where will the Dam be serviced from?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	The dam will be serviced from both Victoria Falls and Livingstone.
What will the power generation of Batoka be in comparison to Kariba?	S Chenaux	Environment Africa	04-Oct-14	Victoria Falls Open Day	Batoka will produce upwards of 1800MW. Kariba, together with the Kariba South and North bank extensions, will have a capacity of 2130MW.
How far is the new Ndlovhu housing project from the project location? Will it be affected?	S Chenaux	Environment Africa	04-Oct-14	Victoria Falls Open Day	The Ndlovu Housing project is 24km from the dam site. The ESIA studies will investigate whether it will be impacted; residents may experience greater traffic in the area if the proposed roads are built in this area.
Where are the game parks on your maps, they are not showing and that is one of the major concern, how the game parks will be affected by this project. Your maps need to be drastically improved if people are going to comment on this project. We also need to know where the dam will be and where the river will be.	S Chenaux	Environment Africa	04-Oct-14	Victoria Falls Open Day	Your comment has been noted and the maps will be updated accordingly.
What difference does 800 MW make to the Zimbabwean power requirements? What percentage does it add to the grid? Does it mean that we will no longer be subject to power cuts?	Ms Annah Chuma	Hwange Colliery Company	03-Oct-14	Hwange District Council Meeting	According to the Ministry of Energy and Power Development's National Energy Policy of 2012, there is a net deficit in the supply of electrical power in Zimbabwe. The country requires nearly 2 200MW in winter at peak, but generation locally can't meet the demand as only 1 300MW are being produced; energy imports currently cover for the deficit. Although the Batoka scheme will reduce this deficit, further power generation capability in Zimbabwe will still be required.
Who is funding this project?	Steve Jonasi, Lion Encounter Alert	Lion Encounter Alert	04-Oct-14	Victoria Falls Open Day	The World Bank is funding the ESIA but not the construction. Various funding institutions have expressed interest in funding the project after the feasibility studies are completed.
How does the water abstraction for the Chobe and Zambezi Matebeleland Water project interact with the Batoka Gorge Project?	Steve Jonasi, Lion Encounter Alert	Lion Encounter Alert	04-Oct-14	Victoria Falls Open Day	The feasibility Studies will inform on the exact impact this will have on the project.
How much water will be trapped by the dam?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	After impoundment to the full supply level, the reservoir surface area will cover approximately 23 km2.
You are not responding satisfactorily to our questions. There are some issues that you are leaving unanswered, for example the location of infrastructure, roads and road construction, the location of the power lines. If the water does not leave the gorge how are we affected	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	The engineering studies have not yet been concluded and so we are unable to provide you with specific details of where infrastructure will be located, at this stage of the project . Once we have these, we will communicate these to you. Although the water will not leave the gorge, households will still be impacted. For example, there is likely to be physical or economic resettlement associated with the powerlines, roads and construction camps.
How wide is the electricity transmission corridor?	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	In Zimbabwe, the transmission line corridor currently being explored is 3km wide and 70km long. It starts from the Batoka Gorge site to Hwange. However, engineering studies are still ongoing to confirm the exact locations; the community will be advised of the exact locations once these have been confirmed. Once the final routing to he Transmission line is known, the Transmission line corridors will be reduced to the normal servitude width.
How many Transmission lines will be erected?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	The engineering studies are still on-going. However, in Zimbabwe it is proposed that the transmission lines will comprise of 2 x 70km 400kV lines, running in parallel, and sharing a common right-of-way, to the existing Hwange 400 kV substation. In Zambia, the line will comprise of 2 x 330kV transmission lines measuring 21km running from Batoka and terminating at a new 330kV substation ZESCO will construct in Livingstone. A second line may also be developed which will run in parallel to the existing 220kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Can you explain the project site and the location of the transmission lines?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	The Project site will be located 47km from Victoria Falls. Engineering studies are still underway to exactly determine the location of the Project infrastructure, including the transmission lines. In Zimbabwe it is proposed that the powerlines will run from the Batoka Gorge site to the existing substation in Hwange. We will inform the community of the location of the infrastructure once the studies are completed.
Be clear on which areas are to be affected. Is it the whole of Jambezi area?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Engineering studies are still being undertaken to determine the exact locations of the infrastructure. It is only when these have been completed that we will be able to determine the actual project footprint. With regards to the transmission lines, in Zimbabwe the engineers are currently looking at a 3km wide corridor that runs from the Batoka Gorge site to Hwange. The line itself will fall within a much narrower servitude, but we are currently able to advise on areas to avoid. In terms of roads, in Zimbabwe, the secondary road that starts from the Bulawayo-Victoria Falls main road and connects to Jabula may be upgraded and a new road, connecting Jabula to the dam site (measuring 14km long), may be constructed. People living near these areas are likely to be affected. Three areas are also being looking at in terms of location of the permanent camps. Project alternatives are still under consideration as part of the engineering studies so that sensitive areas such as sites of social/ecological and/or cultural significance can be avoided and environmental factors included in the design of the facility.
Why don't you bring the people who send you to answer our questions?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	There are observers from Zambezi River Authority who are listening and recording your concerns. Unfortunately we are not able to answer all your questions as studies are still ongoing. This stage of consultation and capturing all your concerns is very important in the life cycle of the project because it will help capture and understand the community concerns and position and what needs to be done and corrected going forward. Measures to ensure the full project benefits are passed on the project area communities will be better developed, as well as those to mitigate all identified potentially negative impacts so that the project is sustainably implemented.
Who will be affected?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	In Zimbabwe, the proposed scheme falls within the province of Matabeleland North and in the Hwange Rural District. It includes the wards of Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sidinda, Mashala and Simangani. The traditional authorities in the area of impact include chief Shana, Bishop Matata Sibanda (who is Acting Chief for Mvutu who has recently deceased) and Chief Hwange. It is believed that all these wards will be affected in some way. The individual affected households have not yet been identified as servitudes have not been defined.
With the construction of the dam which roads will be upgraded or affected?	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	In Zimbabwe, the secondary road that starts from the Bulawayo-Victoria Falls main road and connects to Jabula may be upgraded and a new road, connecting Jabula to the dam site (measuring 14km long), may be constructed. The construction of a road downstream from the dam and a bridge that connects the two countries is also proposed, in order to minimise the passage of heavy loaded trucks on the dam crest. In Zambia, it is proposed that the road originating in Palmgrove (near Livingstone) that connects to Mukuni village may be rehabilitated and a new road, measuring 20km in length may be constructed to connect Mukuni to the dam site.
How wide is the transmission line corridor?	Mr Mkhwananzi, Kayalethu Village	N/A	07-Oct-14	Matetsi Ward Meeting	In Zimbabwe, the transmission line corridor currently being explored is 3km wide and 70km long. It starts from the Batoka Gorge site to Hwange. However, engineering studies are still ongoing to confirm the exact locations; the community will be advised of the exact locations once these have been confirmed.
How much land will the dam water take going backwards towards the Victoria Falls?	Lubasi, Kalala Village	N/A	07-Oct-14	Matetsi Ward Meeting	The dam will be solely within the gorge and is not expected to encroach on any land outside of the Gorge. The actual footprint of impact is still under consideration and assessment through the engineering and ESIA studies.
Where exactly will the transmission lines be as they enter Hwange town?	H.T Mobe, Madumabisa Farm	N/A	07-Oct-14	Matetsi Ward Meeting	The engineering work to determine the positions is still going on. As soon as that information is available it will be communicated to the community
Tell us the exact location of the infrastructure and the power lines	Councillor Farai Shoko , Gonwa Village	N/A	07-Oct-14	Mbhizi Ward Meeting	The engineering studies are still to be completed and the final routing is not available. Once these have been completed, we can feedback to you in regards to what communities are likely to be affected.
Can you tell us exactly where the project infrastructure will be erected?	Mandla Mpofu, Sisiyathu village 4	N/A	07-Oct-14	Mbhizi Ward Meeting	Engineering studies are still being undertaken to determine the exact locations of the infrastructure. It is only when these have been completed that we will be able to determine who exactly will be affected . We will communicate to you as soon as these have been undertaken.
Please tell us very clearly (Tiujeni kasa kasa) where the transmission lines and other infrastructure is going to be.	Farai Shoko, Gondwa Village	N/A	07-Oct-14	Mbhizi Ward Meeting	Engineering studies are still being undertaken to determine the exact locations of the infrastructure. It is only when these have been completed that we will be able to determine who exactly will be affected . We will communicate to you as soon as these have been undertaken. In regards to the transmission lines, in Zimbabwe the engineers are currently looking at a 3km wide corridor that runs from the Batoka Gorge site to Hwange. Those who fall in this corridor are likely to be affected. In terms of roads, in Zimbabwe, the secondary road that starts from the Bulawayo-Victoria Falls main road and connects to Jabula may be upgraded and a new road, connecting Jabula to the dam site (measuring 14km long), may be constructed. People living near these areas are likely to be affected. Three areas are also being looking at in terms of location of the permanent camps. Project alternatives are still under consideration as part of the engineering studies so that sensitive areas such as sites of social/ecological and/or cultural significance can be avoided and environmental factors included in the design of the facility.
Give us a time frame as to when resettlement will happen so that we prepare physically and psychologically	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	We are still unsure yet whether the project is going to go ahead. This will depend on the decision made by the environmental agencies and governments of both countries involved. Project financing also needs to be provided. The dam will only be operational in ten years' time, so resettlement is not immediate. Once we have further information, we will communicate this to you.
Is the dam water likely to spill over the gorge?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	The studies carried out so far show that there will be no dam footprint outside of the gorge.
Is the project going to develop a township?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Yes if the project goes ahead there will be constructed two townships one for the construction period and the other a permanent one to house employees during the operational phase of the project.
Tell us the exact location of the transmission lines from Batoka to Hwange	Derek Sibanda, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	Engineering studies are still being undertaken to determine the exact locations of the powerlines. It is only when these have been completed that we will be able to communicate these to you. However currently, in Zimbabwe, the engineers are currently looking at a 3km wide corridor that runs from the Batoka Gorge site to Hwange. This line would measure 70km long.
Will blasting be required? Will the gorge be widened to support the dam development?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	Blasting will be required for the development of the dam wall. There is no intention of widening the gorge.
Will there be a new customs post at the bridge over the dam?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	Yes.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Who is the contractor for the construction phase?	Peter Roberts	Private	04-Oct-14	Victoria Falls Open day	This will only be determined following the completion of the feasibility study.
Will the documents that disclose the cost and engineering sides of the dam project be made public?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	The ESIA studies report will be made public including the executive summary for the Engineering feasibility Studies.
Power supply to the country will increase which will be a benefit to us.	D. Kung	The Kingdom at Victoria Falls	04-Oct-14	Victoria Falls Open Day	Comment noted and will be considered as a benefit of the project in the economic impact assessment.
What is the reason that the Batoka Gorge site was selected?	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	This site has been the subject of detailed studies as far back as 1993. The most recent SP study once again reiterates that the present site is best suited for the construction of the scheme. The site has suitable geology for the construction of the dam wall, has a site suitable for the construction of a spillway, and the gorge at this point is narrower compared to sites downstream, thus reducing concrete volumes, and hence construction costs.
Will the bridge be creating an access point for the Zambian and Zimbabwean communities?	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	Yes.
What is the proposed area/size of the spillway? What is the commercial value for the loss of this land? Could water provision for local communities be provided through additional damming?	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	The ESIA and the Engineering Feasibility Studies will inform on these subjects.
What is the distance of the first permanent village from the Vic Falls/Hwange Rd?	C. Chimsa	Victoria Falls Hotel	04-Oct-14	Victoria Falls Open day	The first permanent village (furthest west) is approximately 15-20 km from the Victoria Falls/Hwange Road.
When construction will starts and the estimated time for completion?	Clive Bradford	Wild Horizons	26-Nov-14	email	If the proposed project goes ahead, it is likely that construction will commence in 2016. This will continue for a period of up to 9 years.
What will the height of the river be in the Gorge? How far will the tailwaters extend? We are concerned that this will impact on Victoria Falls.	Richard Maasdorp	Zambezi Society	30-Sep-14	Harare Open Day	The effects on flow and water level conditions upstream of the dam will be examined as part of the study. Based on earlier hydraulic studies it appears unlikely that these effects would extend beyond the Silent Pools area.
Who will be housed in the permanent villages?			03-Oct-14	Hwange District Council Meeting	Operational staff, to run the facilities if and when developed
What is the status regarding housing development			03-Oct-14	Hwange District Council Meeting	Currently three alternative sites for permanent camps have been identified. Approximately 300 people will be housed in the preferred alternative.
Do you have an anticipated level to which the water will rise			04-Oct-14	Victoria Falls Open Day	The engineers are still working on it but at the moment the current estimate is that this rise will be to the 757m contour in the Gorge.
Have the engineers considered designing at a static level?			04-Oct-14	Victoria Falls Open Day	The ESIA and the Engineering Feasibility Studies will inform on these subjects.
Will there be any diversion of water into penstocks			04-Oct-14	Victoria Falls Open Day	The ESIA and the Engineering Feasibility Studies will inform on this subject.
How does the Batoka Dam interact with expansion of the Kariba dam? Will the construction phase of this project interrupt water suplies to Kariba and Cabora Bassa?			04-Oct-14		The ESIA and the Engineering Feasibility Studies will inform on this subject. However, the project will not interrupt the supplies of water to Kariba and Cabora Bassa
What activities are planned for the Batoka Hydro-Electric (BHES) power plant in the various construction stages?	Abby Chungu	Kazungula District Council	10-Oct-14	Kazungula District Meeting	The construction phase is expected to last around nine years. It will be divided into two stages: the first stage will be when access roads and permanent camps will be built. It is expected that this will take one to two years. The second phase is when the dam and plants will be constructed; this will take six to seven years .
Has a pre-feasibility study been undertaken?	Agney Siuluta	Department of Energy	08-Oct-14	Lusaka authorities meeting	Yes and these studies are currently being updated by the feasibility studies being conducted .
Will the project details change if the power generation increases to 3000 MW i.e. in relation to what we have been presented with today?	Alexandra Conroy	WASAZA	08-Oct-14	Lusaka authorities meeting	There will be very little change to the design. This power generation capacity will be supported by the existing design for the wall height and area of inundation.
What is the reason for extending the high voltage power lines to Choma instead of Livingstone?	Councillor Mwampole K. Brighto	Kazungula District Council	10-Oct-14	Kazungula District Meeting	There will be a line to the New Livingstone substation from the Gorge site . It is also notable that taking power to Choma will also help reinforce the power supply in Southern Province through the existing high Voltage substations there.
There is a perception that there are a lot of activities being undertaken in Zimbabwe for the project, such as construction of access roads with very little work being done in Zambia. Why?	Councillor Mwampole K. Brighton	Kazungula District Council	10-Oct-14	Kazungula District Meeting	The proposed Batoka Gorge Project will have similar facilities on the both the Zimbabwean and Zambian side. Access roads will be constructed in as part of this scheme on the Zambian and Zimbabwean Side.
I am interested in the exact location of the new proposed Zambian power line and the proposed road on the Zambian side.	De Gruijter Reinout	Stanley exploration & safari Co. Ltd	27-Oct-14	Email	The location of this infrastructure is detailed in the Background Information Document that has been forwarded to all registered stakeholders. Both the exact alignment of the access roads and power lines has not been decided upon by the engineers or ZRA and will be disclosed in the future.
When will the dam be constructed?	Elena Likukela	Musokotwane village	11-Oct-14	Musokotwane community meeting	If the proposed project goes ahead, it is likely that construction will commence in 2015. This will continue for a period of up to 9 years.
What is the length of the power lines? Where exactly will they pass?	Kenenth Mufuna	Headman Kapongo Village	11-Oct-14	Musokotwane community meeting	In Zambia, the line will comprise of 2 x 330kV transmission lines measuring 21km running from Batoka and terminating at a new 330kV substation ZESCO will construct in Livingstone. A second line may also be developed which will run in parallel to the existing 220kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km. In Zimbabwe it is proposed that the transmission lines will comprise of 2 x 70km 400kV lines, running in parallel, and sharing a common right-of-way, to the existing Hwange 400 kV substation.
Where exactly are the projects affected areas?	Lloyd Masamu	Sekuba village	11-Oct-14	Musokotwane community meeting	In Zimbabwe, the proposed scheme falls within the province of Matabeleland North and in the Hwange Rural District. It includes the wards of Matetsi, Chidobe, Katchecheti, Nemananga, Mbizha, Jambezi, Sidinda and Mashala. The traditional authorities in the area of impact include chief Shana, Bishop Matata Sibanda (who is Acting Chief for Mvutu who has recently deceased) and Chief Hwange . In Zambia, the main area of direct impact falls under the Southern Province in the Kazungula District, most notably the wards of Mukuni and Kataazi, which fall under Chief Mukuni's jurisdiction. However, impacts will also be felt in Livingstone District, Zimba District and Choma District and if there are downstream impacts, these may be experienced in the District of Kalomo. The traditional authorities in these areas include Chief Musokotwane, Chief Simwatachela, Chief Sipatunyana, and Chief Singani. Engineering studies are still going on to determine the exact location of the project infrastructure. Once these have been completed, we can feedback to you in regards to what communities are likely to be affected.
Is this project owned by the Government of Zambia or is it being driven by private partnership deals?	Mang'olaKelyson	Kazungula District Council	10-Oct-14	Kazungula District Meeting	The project will be a joint partnership between the Government's of Zambia and Zimbabwe and will be led by the Zambezi River Authority (ZRA). The ZRA and is jointly owned by the governments of Zambia and Zimbabwe in equal proportions.
What is the time frame for the completion of the project?	Mang'olaKelyson	Kazungula District Council	10-Oct-14	Kazungula District Meeting	The ESIA is due to be submitted for review to the Governments of Zambia and Zimbabwe and the respective environmental agencies in March 2015. If they accept the Project, construction is likely to commence in 2015 with operation of the dam likely to begin in 2024.
There are falls which are in close proximity to the dam. Will they be affected by the dam?	Mr Jones Masonde	Zambia Wildlife Authority	07-Oct-14	Lusaka Open Day	On the basis of the current design, it appears likely that all the rapids/falls between the dam wall and Silent Pools could be lost.
Where will the project headquarters be based? What will be the governance structure for the project?	Mr. Noole Mass	Ministry of Chiefs and Traditional Affairs	10-Oct-14	Kazungula District Meeting	The headquarters of the ZRA are currently based in Lusaka, with local operations offices located in Kariba. Operations offices of the Batoka Project will likely be built closer to the project site in the future. The governance structure of the project will be decided by the two governments.
What is the expected output of the project and how long will it take to complete?	Mr.KelysonMangola	Kazungula District Council	10-Oct-14	Kazungula District Meeting	At the moment it is expected to generate 1600MW; 800MW will be provided to Zambia and 800MW to Zimbabwe. However, this is an output of the update of the detailed feasibility studies and the final power output will be communicated later once the studies are concluded. It is estimated that the facility will be operational in seven years time.
What is meant by permanent camp settlements?	Ms. Chanda Mwale	WWF- Zambia Country office	07-Oct-14	Lusaka Open Day	This will be the settlements within which the operational staff reside. It is currently anticipated that 300 people will need to be housed in the permanent camp.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
How much ecological costing is included in permanent camps?	Ms. Chanda Mwale	WWF-Zambia Country office	06-Oct-14	Registration and Comment Sheet	The ESIA studies being carried out will inform of this matter.
Which is the alternative siting for the dam?	Mwale Lusizi	Zambian Wildlife Authority	06-Oct-14	Livingstone Open day	For the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. These are currently being done as part of the overall engineering feasibility study .
What is meant by impoundment?			06-Oct-14	Livingstone Open day	The area within the dam footprint is referred to as the "impoundment".
Which side of Livingstone is the transmission line coming in on?			06-Oct-14	Livingstone Open day	The general direction will be from Batoka Gorge site to Livingstone. However, the specific route is to be defined during the studies.
Why is the spillway located in Zimbabwe?			06-Oct-14	Livingstone Open day	The layout presented showing the spillway on the Zimbabwean side, was only one of the options being considered for adoption. The final Layout will have the spillway on the dam crest.
Mention has been made that the dam will not hold sufficient capacity to produce the required power. There has been mention of a holding dam at Katambora. This was required for the Kafue Dam.			06-Oct-14	Livingstone Open day	No, this is not true, and a holding dam is not being considered in the engineering feasibility study.
My property is affected by the Katima-Munga line. I cannot be affected by another powerline. It will then not be possible to subdivide my property in the future.			06-Oct-14	Livingstone Open day	Comment noted.
We require information. There is a shortage of information at this meeting.			06-Oct-14	Livingstone Open day	A further meeting in Livingstone is proposed with the presence of the project engineers.
How far is Silent Pools from Victoria Falls?			06-Oct-14	Livingstone Open day	Silent Pool is located at the top of the 4th Gorge, immediately downstream of the outlets of the Victoria Falls Power station.
What is the size of the dam?			06-Oct-14	Livingstone Open day	It is intended that the inundation area will be 23 km2
Are there any roads that will link Batoka with Victoria Falls that will be constructed?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	Engineering studies are still in progress and the final road alignment has not been determined however, it is currently proposed that the secondary road that starts from the Bulawayo-Victoria Falls main road and connects to Jabula may be upgraded and a new road, connecting Jabula to the dam site (measuring 14km long), may be constructed. The construction of a road downstream from the dam and a bridge that connects the two countries is also proposed, in order to minimise the passage of heavy loaded trucks on the dam crest.
Does the project schedule reflect actual experience in the region particularly with regard to cost and timeline? A recent Oxford study found that large dams are uneconomical, run over budget, do not satisfy objectives and have construction time overruns, are there adequate contingencies included in project cost estimates for all of the following and other unforeseen problems: project delays due to strikes, adverse weather, unexpected construction conditions (i.e. re-evaluation of seismic risks), re-engineering, lawsuits, drought during operation, accidents, civil disobedience, or political unrest. What is the actual project cost and how is this to be re-paid? What is the debt burden on the people of Zambia? The Itaipu dam Brazil built in the 1970s suffered a 240 per cent cost over-run that impaired the country's finances for three decades. In the open meeting it was stipulated that the present timeline is "indicative" as opposed to "set in stone". If the project is to go ahead, what is the timeline and how will this be enforced. How long will it take for the project to begin to generate revenue and export electricity if this is the objective of the project?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	All these questions form part of the scope of the feasibility studies. Therefore, they will be answered at the end of the studies.
We express concern that the project will affect an already overburdened river system. Dr. Richard Beifuss postulates that the dams been proposed and built on the Zambezi River will be negatively affected with climate change, yet energy planning in the basin is not taking serious attention to this huge hydrological uncertainity. He further states that ' ensuring energy and water security in the Zambezi Basin in the future will require a new thinking about river basin development'. We must avoid investing billions of dollars into projects that could become white elephants." There is a growing groundswell of evidence that hydro projects are 'on the way out' so why is this type of project even being considered now?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	We are aware of the possible losses in basin yield in the next decades as a result of climate change which may be significant in design terms. The World Bank's Multisectoral Investment Opportunity Analysis that predicted a 16% fall in yield in the Upper Zambezi by 2030. We will be drawing upon these and other published data (Dr Belfuss's paper included) , in the impact assessment, i.e. recommending that the final design factors this in. The engineers will be assessing the impacts of climate change on dam design, and on the overall feasibility of the scheme.
Will the document that discloses the cost and engineering sides of the dam project be made public?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	The ESIA study report and the executive summary of the engineering feasibility report will be made public.
A realistic inflation of the project costs needs to be provided in the final cost estimate.	Mr Cooper Freeman		07-Oct-14	Email	Yes. This will be done.
There needs to be assurance that there are adequate contingencies included in project cost estimates for all of the following unforeseen problems: project delays due to strikes, adverse weather, unexpected construction conditions (i.e. re-evaluation of seismic risks), re-engineering, lawsuits, drought during operation, accidents, civil disobedience, or political unrest.	Mr Cooper Freeman		07-Oct-14	Email	Yes. This will be done.
There needs to be assurance that we will have access to the documents that disclose the cost and engineering sides of the dam project. I would like to be informed and it be made public when and how will we get the documents. If we cannot have full access to the cost and engineering sides of the project, I want assurance that we can at least have access to the aspects that touch on the environment and social impacts of the dam.	Mr Cooper Freeman		07-Oct-14	Email	The ESIA study report and the executive summary of the engineering feasibility report will be made public.
There needs to be assurance that conservation has been fully considered as an alternative to the project (including a full DSM conservation study).	Mr Cooper Freeman		07-Oct-14	Email	The ESIA studies will take this into account.
Assurance needs to be provided that the rate of reservoir siltation has been considered in the calculation of operations and maintenance costs, and in the calculation of the project's estimated lifespan.	Mr Cooper Freeman		07-Oct-14	Email	The ESIA studies and the Engineering Feasibility Studies will inform on this.
Does the project schedule reflect actual experience in the region particularly with regards to the cost and timeline? A recent Oxford study found that the lartge dams are uneconomical, run over- budget, do not satisfy objectives and have construction time overruns. Are there adequate contegiencies included in the project cost estimates of all the following and other unforseen problem projects to accommodate delays due to strikes, adverse weather, unexpected construction conditions (i.e re- evaluation of seismic risks), engineering, lawsuits, drought during operation, accidents, civil disobedience or political unrest? What is the actual project cost and how is this repaid? What is the anticipated debt and burden on the people of Zambia? The Itaipu dam in Brazil built in 1970s suffered a 240% cost overrun that impaired the country's finance for three decades. In the open day meeting it was stipulated the present timline is indicative as opposed to set in stone. If the project is to go ahead, what is the timeline and how will this be enforced?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	All these questions form part of the scope of the feasibility studies. Therefore, they will be answered at the end of the studies.
How long will it take for the project to begin to generate revenue and export electricity if this is the objective?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	Construction period for the project is estimated to be seven years.
Who is funding the project? Has any interest been shown? Have there been funding requests?			06-Oct-14	Livingstone Open day	Different institutions and organisations have shown interest in providing funding for the project. The decision on the funding and sources of funding is yet to be made.
What are the advantages because people can only think of the negative impacts at the moment			04-Oct-14	Victoria Falls Open Day	This is been assessed as part of the ESIA.
What types of impacts are anticipated from the project that is likely to extended to Choma and Kalomo Districts?	Mr. KelysonMangola	Kazungula District Council	10-Oct-14	Kazungula District Meeting	Both districts may experience displacement (physical and/or economic) if the transmission line is extended to Choma.
Can you show the railway on the map? This will help us to locate where we are.	Kennedy Mufuna	Headman -Kapongo village	11-Oct-14	Musokotwane community meeting	This will be included in the maps for future engagements.
Zimbabwe wants to take advantage of this project. They have killed their tourism and agricultural economies.	Clement Chisangwa	Bundu Adventures	06-Oct-14	Livingstone Open day	There is a power deficit in the two countries and the region. The Batoka Project is aim contributing to reducing this power deficit.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
An option assessment is required that looks at energy provision for the country.	Cooper Freeman	Private	06-Oct-14	Livingstone Open day	A number of project alternatives have been investigated. This includes both hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated.
The project's objectives need to properly describe the needs it is supposed to meet rather than just its structural features (i.e. a proper objective would be, "develop programmes to match energy needs with energy supply.")	Mr Cooper Freeman		07-Oct-14	Email	The Development of the Batoka is aimed at addressing the prevailing power supply shortages that the two countries are facing.
Which groups in society will realize benefits from the project - corporations or individuals?	Mr Cooper Freeman		07-Oct-14	Email	It is anticipated that the Project will benefit corporations and individuals. For example, some corporations will secure contracts in providing goods and services and some individuals will gain jobs.
We would like an assurance that scaled down versions of the project have been considered. Zambia is close to meetings its power requirements and therefore does not require that the project goes ahead.			06-Oct-14	Livingstone Open day	Different alternatives of the Batoka scheme are being considered as part of the ESIA and Feasibility studies. Zambia requires the project as the economy continues to grow.
The previous government had cancelled the project. Why is it now been reconsidered?			06-Oct-14	Livingstone Open day	The project has always formed part of the development plans for the two countries.
The project schedule needs to reflect actual experience in the region.	Mr Cooper Freeman		07-Oct-14	Email	The feasibility studies will inform on project schedule.
The analysis will need to indicate how long it will take the project to become a net-energy producer (including energy requirements used to build the dam: manufacturing project equipment and supplies, moving materials, tunneling, grading, disposing of soils, transporting workers to construction site and back and including: transmission line losses, operations and maintenance activities (replacing equipment, dredging accumulated silt), etc.)	Mr Cooper Freeman		07-Oct-14	Email	The feasibility studies will inform on all these issues.
There are infrastructural development plans for upstream sections of the Zambezi River. These are becoming more and more defined with increased likelihood that they will materialize sooner than later. WWF would like to know which upstream developments are being taken into consideration and what impact do these have on the economic feasibility of the proposed Batoka dam project?	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	It is noted that irrigation developments, increased water abstraction and climate change will all impact on the future flow conditions of the river, and hence the financial feasibility of the scheme. Although the engineering feasibility consultants have used over 100 years of flow data in their engineering feasibility studies at this stage, the impacts of flow reductions will be considered in the overall financial feasibility of the scheme.
Sanitation in permanent villages and areas where in-migration is experienced is of concern.	Alexandra Conroy	WASAZA	08-Oct-14	Lusaka authorities meeting	This will be assessed as part of the socio-economic impact assessment.
What will happen in the context that resettlement is required?	Ms N Dube	Acting Provincial Administrator	01-Oct-14	Bulawayo national and provincial authorities	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential.
People are worried about the project. There is a fear associated with the loss of property. How will communities benefit? When will this project happen? Where will resettled people be moved to?	Mr Jabulani Moyo	Councillor, Ward 4	03-Oct-14	Hwange District Council Meeting	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. The Resettlement studies have just commenced and so no resettlement sites have been identified. The dam will only be operational in ten years time, so resettlement is not immediate.
Issues like compensation need to be put in black and white.	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	All compensation agreements will be drawn up and signed for by the affected households before resettlement is undertaken.
We are going to lose a lot because the dam will affect our livelihoods negatively. Fishing and rafting were some activities we depended upon a lot. There are those who work on tourism projects that will be affected by the dam. How are you going to compensate for this lifetime loss?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	ZRA will try to avoid any livelihoods being negatively affected as a result of the Project. The ESIA will study what impacts to livelihoods are likely to occur. It will also develop measures to prevent and reduce the likelihood of these occurring. These studies will be communicated to you once they have been completed.
If a family loses farming land will the project assist in the clearing of virgin land?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	Potential compensation entitlements and land preparation will be considered as part of the resettlement planning process.
What will happen in the case that the land to which I am moved inferior and maybe less fertile or productive than where I was before?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. This will be addressed further through the resettlement process.
Where is the project to resettle the affected?	Community member, Chidobe Ward	N/A	06-Oct-14	Chidobe Ward Meeting	The Resettlement studies have just commenced and so no resettlement sites have been identified yet. The dam will only be operational in ten years' time, so resettlement is not immediate.
We are concerned that at the start like this you promise compensation but when the project comes no compensation will be given.	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	The project sponsors are bound by the laws of Zimbabwe and Zambia which require compensation to be paid. It will be against the law for them not to provide compensation. In addition, international good practice standards need to be adopted as part of the Resettlement Action Plan.
At what point in the project does compensation come?	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	Compensation will be provided prior to relocation.
What will happen in the event that the project fails to compensate the affected people?	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	The project sponsors are bound by the laws of Zimbabwe and Zambia which require compensation to be paid. It will be against the law for them not to provide compensation. There is a grievance procedure to be followed in the event of this unlikely event happening. This will require all cases to be investigated fully and appropriate re-dress provided.
If a person is only economically affected, will they be compensated?	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	Yes. Compensation or entitlement will be for both physical and economic displacement.
On relocation are people allowed to choose where they want to be relocated to?	Community member, Chikandakubi Ward	N/A	06-Oct-14	Chikandakubi Ward Meeting	The project will rely on traditional authorities and government to help determine the location of the resettlement sites. To avoid separation of communities and disruption to support networks, it will be more beneficial to have affected communities move in one group to a designated are However if a family feels strongly that they need to choose their own site in agreement with the land and traditional authorities, such a case will be considered during the resettlement negotiation process.
Are people to be separated from the Chief in the event of relocation?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	It is not the project intention to separate people from the chief. Much care will be taken to ensure that this does not happen.
How is the compensation to be evaluated?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Compensation will be evaluated on the basis of an asset inventory which will need to be undertaken closer to the time of actual resettlement.
Why do you not ask us what we want as compensation for the land that is lost?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Communities and affected households will be consulted with further once it is confirmed who will be resettled as a result of the project. Resettlement will be undertaken in line with international best practice, namely the IFC Performance Standards. These standards prioritise in-kind compensation as opposed to monetary compensation where this is feasible.
Is there a proposed resettlement site earmarked already?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	The Resettlement studies have just commenced and so no resettlement sites have been identified yet. The dam will only be operational in ten years' time, so resettlement is not immediate.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Do we halt what we are doing in anticipation of relocation? I have bought cement and it is going to expire before I use it.	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	The dam will only be operational in ten years' time, so resettlement is not immediate. The team is recommending that an asset inventory is not immediate and closer to the time of resettlement will be undertaken. Improvements to structures during this time cannot be halted.
Explain to us the two types of resettlement (economic and physical)	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Physical displacement involves the movement of households that currently reside within the project footprint. Economic displacement is the loss of access to livelihood and income generating activities as a result of the project footprint.
How much land will be acquired?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	This is still to be determined. Once the engineering studies have been finalised, we should have a better idea of how much land will be required for the project, which households will be impacted on and how much replacement land may be required.
We want resettlement schemes according to government models	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential.
What form of compensation does an affected homestead get? Please explain this compensation process to us.	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Compensation will be evaluated on the basis of an asset inventory which will need to be undertaken closer to the time of actual resettlement.
Are temporary structures going to be compensated for?	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	All structures, temporary and permanent, that are recorded at the time of the asset surveys will be compensated.
Explain the procedure of resettlement	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	The engineering studies will identify where project infrastructure will be located. This will determine who will be affected by resettlement and these people will be consulted with in greater detail. The area from which people will be moved from will be mapped in detail. Household and asset surveys will be undertaken with each affected household. As part of this, socioeconomic information will be collected on the household, including household population, livelihoods, health status etc. This information will be used to calculate compensation payments and/or replacement asset requirements. Suitable land for communities to be resettled on will be identified in cooperation with the traditional authorities and affected households and people living in these areas already will also be consulted in this regard.
Can you clarify on those who will be affected and those who will be compensated	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Engineering studies are still going on to determine the exact location of the project infrastructure. Once these have been completed, we can feedback to you in regards to what communities are likely to be affected.
Where are we likely to be resettled?	Community member, Katchecheti Ward	N/A	05-Oct-14	Katchecheti Ward Meeting	Until we know who is likely to be moved and land requirements associated with this, we cannot speculate where the communities will be moved to. The Resettlement studies have just commenced and so no resettlement sites have been identified yet. The dam will only be operational in ten years' time, so resettlement is not immediate.
To avoid psychological trauma caused by the movement/relocation, the project must build the affected 6 roomed houses, fence the homesteads, sink boreholes, and build schools health centres and so on.	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	The compensation for immovable assets will follow the guidelines of the International Finance Corporation and the World Bank as well as the Constitution of Zimbabwe where like for like replacement for assets is recommended. In other words, if a house of four rooms is lost to the project another four room house will be built as compensation. One of the requirements of the IFC standards is that no person should be any worse off after a resettlement process.
We want all resettlement agreements to be put in writing and signed	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	All agreements with the affected people will be in writing and signed by the project sponsors and the people affected.
Does the Batoka project have a place where the affected will be resettled?	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	The Resettlement studies have just commenced and so no resettlement sites have been identified yet. The dam will only be operational in ten years' time, so resettlement is not immediate.
When people are resettled, could you consider to resettle them on land that has all the essential facilities?	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. Your comment regarding essential services has been noted.
The project needs to be very clear on which homesteads will be affected so that resettlement committees can be formed in line with information that is there	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	Noted. When engineering studies have been completed, we will have a clearer idea on who will be affected by resettlement. This will be communicated to you.
There should be a conscious effort to reduce resettlement in hunting safari areas. If there is resettlement here, then how are the quotas handled?	Marumane J, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	The resettlement studies are still ongoing so we have not yet been able to identify affected areas and your concern is noted. In regards to hunting quotas, these are regulated by the Parks and Wildlife authority and the Project will not be able to interfere in this allocation.
If a person with a hunting quota is affected, how are they going to be compensated?	Marumane J, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	Should a quota be affected, the individual concerned would be compensated as per IFC/World Bank standards. Further consultation with affected individuals, as well as the Parks and Wild life Authority, will be undertaken to determine levels of impacts and appropriate compensation.
How is the compensation going to be effected?	Mr Moyo, Masikili village	N/A	07-Oct-14	Matetsi Ward Meeting	The engineering studies will identify where project infrastructure will be located. This will determine who will be affected by resettlement and these people will be consulted with in greater detail. The area from which people will be moved from will be mapped in detail. Household and asset surveys will be undertaken with each affected household. As part of this, socioeconomic information will be collected on the household, including household population, livelihoods, health status etc. This information will be used to calculate compensation payments and/or replacement asset requirements. Suitable land for communities to be resettled on will be identified in cooperation with the traditional authorities and affected households and people living in these areas already will also be consulted in this regard.
What criteria will be used to compensate those that are to be relocated?	Mr Mkhwananzi, Kayalethu Village	N/A	07-Oct-14	Matetsi Ward Meeting	International best practice / The IFC Performance Standards will be used to determine compensation that will be provided. Compensation will be provided in-kind where possible and at a minimum, will allow affected persons to retain his/her standard of life and livelihood potential. Asset surveys will be undertaken with all affected households to record all assets used and / or owned by affected households. Households will be compensated on the basis of this.
Is the level of compensation uniform to all people who will be relocated?	Mr Mkhwananzi, Kayalethu Village	N/A	07-Oct-14	Matetsi Ward Meeting	Compensation will be provided on a case by case basis in line with each households assets. Principles applied for resettlement and compensation rates will be consistent for all households.
Can you clarify on compensation for schools if for example the community loses a school will it be possible for a college or a school with boarding facilities will be built in its place or upgrading an existing one.	Saziso Nyath, Breakfast	N/A	07-Oct-14	Matetsi Ward Meeting	Social infrastructure if lost through displacement, will need to be provided at the resettlement site. Access for the affected households to this infrastructure needs to as a minimum remain as it currently is. This will be addressed in the resettlement studies.
Can the people choose a place where they want to be relocated to?	J Marumani, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	The project will rely on traditional authorities and government to help determine the location of the resettlement sites. To avoid separation of communities and disrupting to support networks, it will be more beneficial to have affected communities move in one group to a designated are However if a family feels strongly that they need to choose their own site in agreement with the land and traditional authorities, such a case will be considered at the time of relocation.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Is the resettlement going to be the same as the fast tract one?	Marumane J, Village 55	N/A	07-Oct-14	Matetsi Ward Meeting	No. Resettlement will be undertaken in line with the IFC Performance Standards.
Is land for resettlement available?	Dominic Ndazi, Mbizha Ward	N/A	07-Oct-14	Mbhizi Ward Meeting	Land requirements still need to be identified through the resettlement studies and then further discussions will be undertaken with the traditional authorities.
Is it not better to minimize compensation by avoiding such structures as Police Posts, DDF the Chief's Palace and so on. Will these be replaced?	Farai Shoko, Gondwa Village	N/A	07-Oct-14	Mbhizi Ward Meeting	Yes. The Project will aim to avoid and, where avoidance is not possible, minimise any resettlement. Resettlement will be carried out in line with international best practice. Any structures affected by resettlement e.g. police posts, DDF, the chief's palace, schools, clinics, etc. will be replaced by similar or improved structures.
Where will we be resettled in the event that it will be required?	Sheila Mwembe, Milonga Village	N/A	07-Oct-14	Mbhizi Ward Meeting	The Resettlement studies have just commenced and so no resettlement sites have been identified yet. The dam will only be operational in ten years' time, so resettlement is not immediate.
Can you explain to us the resettlement processes, as well as the compensation for losses that we incur if we are moved to a new place?	Godfrey Nyoni Lawrence Sibanda, and Zeria Ngonzi, Village 4, 3 Makuni Village	N/A	07-Oct-14	Mbhizi Ward Meeting	The engineering studies will identify where project infrastructure will be located. This will determine who will be affected by resettlement and these people will be consulted with in greater detail. The area from which people will be moved from will be mapped in detail. Household and asset surveys will be undertaken with each affected household. As part of this, socioeconomic information will be collected on the household, including household population, livelihoods, health status etc. This information will be used to calculate compensation payments and/or replacement asset requirements. Suitable land for communities to be resettled on will be identified in cooperation with the traditional authorities and affected households and people living in these areas already will also be consulted in this regard.
Which people will be affected in the wards and tell us exactly where we will go?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemananga Ward Meeting	Engineering work is still on going so that we cannot at this stage pin point who will be affected. Once this has been confirmed, we will communicate with you. The resettlement studies have just commenced and so no resettlement sites have been identified yet. The dam will only be operational in ten years' time, so resettlement is not immediate.
What form of compensation does an affected homestead get?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	This will be determined through the resettlement studies and will be dependent on the assets that each household currently has, opportunities for like for like asset replacement and negotiated compensation rates.
How will psychological compensation be calculated because the project is going to affect us psychologically, because of delays, uncertainties and just the fact that we are moving from one place to the next.	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	The impact of resettlement on the affected households will also be considered and assessed during the resettlement studies. It is the intention of these studies to minimise negative impacts and will suggest measures for this.
What will happen to villagers staying next to access roads that will be upgraded?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	Engineering studies are currently underway which will inform the road upgrades required. We will communicate further with you once these studies have been finalised to talk to you about the impacts and the compensation that will be undertaken.
Can I choose where I can be relocated to?	Community member, Nemanhanga Ward	N/A	04-Oct-14	Nemanhanga Ward Meeting	The project will rely on traditional authorities and government to help determine the location of the resettlement sites. To avoid separation of communities and disrupting to support networks, it will be more beneficial to have affected communities move in one group to a designated are However if a family feels strongly that they need to choose their own site in agreement with the land and traditional authorities, such a case will be considered at the time of relocation.
How will compensation be worked out on our lost biodiversity such as fish, wildlife, how are we to be compensated for the loss of these assets?	Derek Sibanda, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	As part of the resettlement study there will be a livelihood component that will ascertain the impact on the loss of ecosystem services. Biodiversity impacts are currently also being investigated. The Batoka Gorge does not support large numbers of fish, however the proposed reservoir is expected to have considerable fisheries potential. The Department of Fisheries for both Zimbabwe and Zambia will be responsible for management of that resource.
How is compensation to be calculated for immovable structures for cheap or expensive buildings?	Derek Sibanda, Makala Village	N/A	08-Oct-14	Sidinda Ward Meeting	This will be determined through the resettlement studies and will be dependent on the assets that each household currently has, opportunities for like for like asset replacement and negotiated compensation rates.
What are the plans for the resettlement of affected communities? Will there be public disclosure of compensation plans and available funds for this process	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	There will be economic displacement associated with the project and possibly physical displacement. A Resettlement Action Plan will be undertaken according to international good practice which will disclose compensation rates and budgets for any resettlement required.
Is it true that people will be resettled from the Batoka area and settled along the railway line?			27-Oct-14	Cell phone message received	It has not yet been determined whether there is a need for resettlement. No investigations or considerations have been given to the identification of a host site.
Resettlement of people will result in changes in land use. Will resettlement studies adequately include land use and land cover change studies?	Akabilwa Mukelabai	Community Based Natural Resources Management (CBNRM) Forum	06-Oct-14	Lusaka Open day	The resettlement studies will consider changes to land cover and land use in the area that is resettled as well as the potential for this in areas where people are resettled to. It is unlikely that host sites will be identified at this stage of the resettlement process, but further recommendations to address this issue will be mentioned and included in the Resettlement Action Plan.
Will people be displaced by the Batoka Gorge Hydro Electric Scheme(HES)	Akabilwa Mukelabai	Community Based Natural Resources Management(CBNRM)	06-Oct-14	Lusaka Open day	There is no displacement currently anticipated as a result of the dam inundation footprint. There may be physical displacement associated with access roads and permanent camps in both countries and economic displacement along the route of the power line. This can only be confirmed however when engineering decisions have been taken and the area has been ground-truthed.
If we are resettled, will we be built houses before we are asked to move?	Belemu Siantontola	Chibule village	13-Oct-14	Ngandu, Community Meeting	Houses will be built prior to you being moved.
If there is the need for resettlement, will people have to move by themselves or will the government help them?	Brighton Mulambo	Musokotwane village	11-Oct-14	Musokotwane community meeting	The Project will help people to move. Affected people will not be asked to move by themselves.
If we are relocated, will we move to places that have schools and clinics?	Charles Chalinga	Chilbule village	13-Oct-14	Ngandu, Community Meeting	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. Access to social infrastructure shall therefore as a minimum not change from the status quo.
What is causing the need for resettlement if it is not the dam?	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	Economic and physical displacement may result from the ancillary infrastructure including roads, power lines and permanent camps.
The history of Kariba needs to be considered to avoid a repeat of the same impacts. These impacts have been felt severely on the Zambian side.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	ZRA and the two governments are aware of the history of the Kariba Dam and its impact on peoples. This scheme is very much smaller than Kariba, nonetheless, the ESIA will investigate resettlement as part of the project.
Is displacement required on both the Zambian and Zimbabwean sides of the dam?	Cooper Freeman	Private	06-Oct-14	Livingstone Open day	There is no displacement currently anticipated as a result of the dam inundation footprint. There may be physical displacement associated with access roads and permanent camps in both countries and economic displacement along the route of the power line. This can only be confirmed however when engineering decisions have been taken and the area has been ground-truthed.
In the past, other villages have been resettled and the land they have been given for farming is not very good. People were also not given enough land for their livestock. We do not want this to happen to us.	Elena Likukela	Musokotwane village	11-Oct-14	Musokotwane community meeting	A Resettlement Action Plan and Resettlement Policy Framework is proposed in terms of international good practice and in accordance with the IFC Performance Standards. One of the requirements of these standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. Land needs and the suitability of replacement land still requires consideration.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
If we are resettled, will the land have the same access to water?	Elina Likukela	Headwoman	13-Oct-14	Ngandu, Community Meeting	Yes. One of the requirements of the IFC Standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. This means that the land will have the same (or improved) access to water.
If there is the need for resettlement, will the whole village be resettled or only parts of it?	George Ndambo	Siasoko village	11-Oct-14	Musokotwane community meeting	We are still unsure exactly who will need to be resettled. This will only become clear once engineering studies have been completed. The Project will need to consult further with affected parties once this information becomes available. The Project wants to avoid separation of communities and disruption of social and support networks. This will therefore be considered in any resettlement studies.
If we are resettled, will we be moved onto the same lands of chief Mukuni?	Grace Siamapepa	Ngandu village	13-Oct-14	Ngandu, Community Meeting	It is not the project intention to separate people from the chief. Much care will be taken to ensure that this does not happen.
What are the plans for the resettlement of the affected community? Will there be a public disclosure of compensation plans and available funds for this process?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	There will be economic displacement associated with the project and possibly physical displacement. A Resettlement Action Plan will be undertaken according to international good practice which will disclose compensation rates and budgets for any resettlement required.
Will the stakeholers have an input into the proposed compensation policy.	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	International best practices for involuntary relocation that are being employed prescribe stakeholder participation and input into decision-making around entitlements and compensation. Compensation agreements will need to be signed by the affected households before resettlement and/or compensation takes place.
Will government attend to all needs associated with compensation and resettlement? Will grazing lands be given to us if we lose them?	Ishmael Masunga	Siamalenge village	11-Oct-14	Musokotwane community meeting	Yes. All losses will be compensated for or replaced.
If we are resettled, will the land I lose be compensated?	Lawrence		13-Oct-14	Ngandu, Community Meeting	Yes, all losses, including land will be compensated and/or replaced. The Project is being undertaken in line with international best practice, i.e. IFC Performance Standards.
We appreciate the idea of bringing the project to this area. If the roads pass through the chiefdom, we would like to be resettled.	Lloyd Masamu	Sebula village	11-Oct-14	Musokotwane community meeting	Noted. However, the Project will try and avoid resettlement as much as possible to reduce any disruption on peoples' lives. Project engineering is still underway and when the affected area is defined we will notify you thereof.
There needs to be assurance that adequate funds and full plans (that include: access to clean water, power, jobs, etc) are included for the relocation and resettlement of people to be displaced.	Mr Cooper Freeman		07-Oct-14	Email	A Resettlement Action Plan will be prepared to address and show that these details are adequately addressed.
There needs to be assurance that affected people have had input into the proposed compensation policy	Mr Cooper Freeman		07-Oct-14	Email	A Resettlement Action Plan will be undertaken which will meet International Good Practice and ensure that local community input into the resettlement process is sought and negotiated.
Will people be displaced? What will the plans be for resettlement?	Mr. KelysonMangola	Kazungula District Council	10-Oct-14	Kazungula District Meeting	It is likely that people will have to be displaced as a result of land taken for the Project, for example for roads, construction camps or transmission lines. Once the engineering studies have been completed, ZRA will have a clearer idea of who will be affected by resettlement and will communicate further with the communities. Detailed asset surveys will then be undertaken with all affected households, business enterprises and communities in order to determine all the losses that will be experienced. The survey will account for land acquisition and loss of physical assets as well as loss of income.
Why is a RAP being undertaken for the dam and an RPF for the transmission lines?	Mushimbei Mutiya	Road Development Agency	08-Oct-14	Lusaka authorities meeting	The alignment of the transmission lines is currently not fixed and could take place anywhere within a 3 km corridor. It is therefore not known who the affected households will be which is why the study has been kept at a desktop level.
What measures are going to be put in place to protect the locals that will be displaced by the project?	Stephen Chitak		06-Oct-14	Livingstone Open day	A Resettlement Action Plan and Resettlement Policy Framework will be compiled to address impacts associated with physical and economic displacement and ensure that this is undertaken in accordance with International Good Practice.
Will the engineering design consider releases required when there are periods of drought?	Victor (Nan Jiang)		30-Sep-14	Harare Open Day	Seasonal water level changes are being studied as a minimum water flow is essential for power generation. In addition, environmental flow releases are also being studies, and will need to be released downstream for river maintenance, also in times of drought.
Rockfall into the gorge is common as a result of climatic factors. What will be done to avoid this taking place during the life of the project?			06-Oct-14	Livingstone Open day	The Project Engineers will produce a seismic report providing information on this.
What safety measures will be in place to protect labour during the construction phase?			06-Oct-14	Livingstone Open day	All necessary safety measures will be put in place to protect the workers.
How long will the project improve the lives of those affected if at all.	Jones Masonda Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/2014 18/11/14	Written submission	Positive benefits associated with the proposed development in terms of community development, electricity provision, improvement of roads in the area, etc. will be considered as part of the social impact assessment.
The impacts on the socio-economic conditions in the community as a whole requires consideration; not only that of the people affected by displacement.			08-Oct-14	Lusaka authorities meeting	This will be undertaken as part of the social impact assessment.
Is the general public to be fully engaged in the decision making process and are there mechanisms in place to reach out to the public. We express concern that there is currently no structure in place to address grievances from the general public in particular those from underprivileged areas who will be directly affected by the project.	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	A Grievance Handling Mechanism is being worked on and the document or its contents will be shared with relevant stakeholders. This will be put into effect before the work on the Resettlement Action Plan commences.
Will stakeholders have an input into the proposed compensation policy?	Sean Edington and Sue Liell-Cock	Safari Par Excellence and International Rafting Federation	2014/10/27 and 18th Nov 2014	email and written submission	International best practices for involuntary relocation that are being employed prescribe stakeholder participation and input into decision-making around entitlements and compensation. Compensation agreements will need to be signed by the affected households before resettlement and/or compensation takes place.
Are you communicating project impacts to stakeholders?	Provincial Physical Planning Officer	Department of Physical Planning	01-Oct-14	Bulawayo national and provincial authorities	We are not making firm commitments about what the impacts will be. This will be done at the Feedback Stage of the Project.
We as the local authority are being left out of the planning process. We require involvement on the technical team.	Mr Mudende	HRDC, Engineer	03-Oct-14	Hwange District Council Meeting	The ESIA process involved engagement with local authorities. We have already held meetings with some of the authorities that will be impacted and further meetings are due to take place. If the project goes ahead, it will be incorporated and form part of the local authorities' development plans.
How is the implementation of stakeholder issues monitored?	Ms Annah Chuma	Hwange Colliery Company	03-Oct-14	Hwange District Council Meeting	During the ESIA, the process ensures accountability and the opportunity to continually provide input and comment on deliverables. During the implementation of the project, ZRA and its contractors will be responsible for ensuring ongoing communication. A grievance mechanism will be put in place to provide stakeholders with the opportunity to raise concerns and issues and ensure that these are addressed.
Is there a platform for people to say how they would like things to be done?	Nqobile Mabhena	Hwange Local Board	03-Oct-14	Hwange District Council Meeting	The stakeholder engagement process is the platform for that input. Once of the final deliverables will be an Environmental and Social Management Plan which will include commitments to be adhered to should the project be authorised. Stakeholders will be requested to review and comment and these commitments.
A Provincial Development Committee (PDC) Meeting will take place in Lupane on 3 October at 10.00 hour to 13.00 hours. The consultants should come and meet the PDC	Acting Provincial Administrator Matebeleland North	Ministry of Local Government	01-Oct-14	Bulawayo national and provincial authorities	A meeting is already slotted for that date and time in Hwange. Attempts will be made for some representation by consultants at the Lupane meeting and if this is not possible, during the Feedback Stage of the Project, a meeting with this Committee will be scheduled.
Why are you consulting with so many wards when it is mainly only Jambezi ward that will be affected?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	Many wards will be affected by the proposed Project. Whilst it looks as though Jambezi may be affected by the transmission line, other wards are likely to be affected by roads, permanent camps and other project infrastructure. It is therefore important that we consult with a wide as group as possible.
The project should consult people before anything is done or any agreements are entered into.	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	Noted. This meeting is for the project to engage the communities and discuss their concerns. We will also come back at a later date to consult with you further. Stakeholder engagement is a key part of the ESIA process. In addition a comprehensive consultation process will be followed for the resettlement studies.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
There is an element of lack of respect to the traditional leadership as they were not consulted before the project started.	Community member, Mashala Ward	N/A	08-Oct-14	Mashala Ward Meeting	We have held meetings with the chiefs prior to this public meeting. The project has no intention to disrespect the traditional leadership; they are a very important part of this consultation process.
The notice period given for the Open days in Vic Fall, Livingstone and Lusaka are completely inadequate. This project is of international significance and impact and a minimum of three weeks is reasonable to allow as many stakeholders as possible to attend the meetings.	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	02-Oct-14	email	This has been recognised and all future notice periods will take cognisance of this.
Why is there consultation of district stakeholders without meeting Provincial stakeholders first		ZINWA	01-Oct-14	Bulawayo national and provincial authorities	The project is located in the district and an identification of key issues could only be done at local level and to ascertain how best to engage with communities. The Provincial authorities are relevant and are being consulted now.
Was there adequate communication about this project? Communications between the project and stakeholders should consider various languages in use in the Zone of Influence			03-Oct-14	Hwange District Council Meeting	Open Days for Harare and Victoria Falls were advertised for in the Herald and the Chronicle. There are notices in communities about current and on-going community engagement meetings. Tonga, Nambya and Ndebele will be used in communications.
How do stakeholders continually engage with the process? Any website for information?			04-Oct-14	Victoria Falls Open Day	After registering as a stakeholder we will keep you informed throughout the ESIA Process of all documentation that is available for review and all meetings being held. The ERM website does currently and will in future host project information. The link is http://www.erm.com/batokaHESESIA
What information has been given to stakeholders to date? Have they had access to the Final Inception Report?	Chanda Mwale	WWF	06-Oct-14	Lusaka Open day	The Final Inception report was an internal ZRA document and not released to the public. To date stakeholders have received notification material in the form of letters and invitations and background information documents.
How are comments been processed?	Chanda Mwale	WWF	06-Oct-14	Lusaka Open day	Recorded comments are being included in this, the Comments and Response Document which will be made available for confirmation with all registered stakeholders. These will then be considered further in detailed specialist studies.
Will the concerns raised in both Zambia and Zimbabwe be shared. It is important that we see concerns raised in other countries.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	A common Scoping Report and Comments and Response Report is being prepared so all concerns, whether in Zambia or Zimbabwe will be made available to all.
Could we have a look at the stakeholder list so that we can see if any important stakeholders have not been included.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	The stakeholder database will be included in the Draft Scoping Report and comment on this is encouraged.
Three week's notice of meetings is required.	Cooper Freeman	Private	06-Oct-14	Livingstone Open day	This will be accommodated in the future.
Translators and dictators must be used to disseminate information to the public.	Cooper Freeman	Private	06-Oct-14	Livingstone Open day	To date, this is the process that has been followed where the need for interpretation and translation has been indicated.
Are all the chiefs in Kazungula district being engaged /consulted?	Councillor Mwampole K. Brighton	Kazungula District Council	10-Oct-14	Kazungula District Meeting	Consultations with all the chiefs in the district have been initiated and are on going
WWF looks forward to further engagement and correspondant from Kaizen Consultation and ERM. We are grateful for the opportunity and we stand committed to find the best future for the Batoka Gorge.	Dr. Nyambe Nyambe	WWF	29-Oct-14	Written submission	Comment noted
Is the general public to be fully engaged in the decision making process and are there mechanisms in place to reach out to the public. We express concern that there is currently no structure in place address grievances from the general public in particular those from those underpriviledged areas who will be directly affected by the project.	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	A Grievance Handling Mechanism is being worked on and the document or its contents will be shared with relevant stakeholders. This will be put into effect before the work on the Resettlement Action Plan commences.
The consultation process to date has not, in our opinion, been adequate or fair. Stakeholders and interested and Affected Parties are located across the world. We would therefore like to request a much longer consultative framework to ensure that all stakeholders have time to be informed and to submit comments. We would like to requests a minimum of a 3-week notice period before any meetings regarding the social and environmental impact assessments. We would also appreciate receiving documents via email. The realities of today's world also need to be considered and public consultation must include the use of international media as well as social media in order to be considered adequate. We would also appreciate a formal sit-down question and answer session with the Zambezi River Authority and all interested stakeholders, as we are of the opinion the open meeting did not allow this to happen.	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	A three week notice period will be honoured for all future meetings. Documents and invites will be sent via email where we have these on record. An additional stakeholder meeting will be held in Livingstone in January 2015. This will have a formal presentation and meeting format with the presence of the relevant technical expertise.
I would also like to submit a request for a scoping meeting in Livingstone that includes a formal sit-down talk about the project followed by an open question and comment period. If a scoping meeting is not possible, I would like to request a second open meeting be scheduled in Livingstone.	Mr Cooper Freeman		07-Oct-14	Email	A further meeting in Livingstone is proposed with the presence of the project engineers.
Will solutions identified during the ESIA be included in the final report?	Mr. Kelyson Mangola	Kazungula District Council	10-Oct-14	Kazungula District Meeting	Yes. All information will be provided in the ESIA report. Mitigation measures will be detailed in the management plans.
The local offices of Museums, Wildlife and Tourism need to be invited directly to participate.	Mwale Lusizi	Zambian Wildlife Authority	06-Oct-14	Livingstone Open day	These stakeholders have been added to the stakeholder database and invited to participate in the ESIA Process.
There is a flaw in today's meeting in that people's names have not been recorded. ZEMA will not accept the comments raised unless we know who raised them.		ZEMA	06-Oct-14	Livingstone Open day	This will be addressed through an additional meeting in Livingstone.
Formal invitations are required to critical stakeholders.		ZEMA	06-Oct-14	Livingstone Open day	Formal invitations were sent to critical stakeholders who were identified during the Scoping Phase. As a result of Scoping engagement, further stakeholders have been identified who have been invited to participate in the ESIA Process.
Attendance registers should be handwritten		ZEMA	06-Oct-14	Livingstone Open day	This has been undertaken and will be included in the Scoping Report.
The notice period for this open day has been extremely poor. We request a further meeting during the Scoping Phase of the Project			06-Oct-14	Livingstone Open day	This request has been noted and it is intended that it will be honoured. A three week notice period for the next meeting in Livingstone will be allowed for.
Has International Rivers commented?			06-Oct-14	Livingstone Open day	International Rivers have not yet made any comment on the project to the ESIA team. They are on the stakeholder database and they will be asked for their comments on the Draft Scoping Report.
An engineer needs to be present to answer the stakeholder concerns.			06-Oct-14	Livingstone Open day	Comment noted. It will be requested that an engineer is present for the next Livingstone Meeting.
The notice period given for this meeting was very poor. Another meeting is required during the Scoping Phase of the Project so that answers can be given.			06-Oct-14	Livingstone Open day	This request has been noted and it is intended that it will be honoured. A three week notice period for the next meeting in Livingstone will be allowed for.
The co-ordinates in the background information document are incorrect.			06-Oct-14	Livingstone Open day	This has been updated to reflect the correct information.
The Districts marked on the map in the BID are incorrect.			06-Oct-14	Livingstone Open day	The Districts identified on the maps utilised at the public meetings seem to be consistent with current available information.
We are concerned that our questions are not been answered. We would prefer a meeting format with a single presentation.			06-Oct-14	Livingstone Open day	This request has been noted and it is intended that it will be honoured. A three week notice period for the next meeting in Livingstone will be allowed for.
We need another meeting before February 2015. We require this before the Terms of Reference is generated so that everyone's concerns can be identified.			06-Oct-14	Livingstone Open day	This request has been noted and it is intended that it will be honoured. A three week notice period for the next meeting in Livingstone will be allowed for.
What has been undertaken to engage with the local communities? What is proposed? What is the response received?			06-Oct-14	Livingstone Open day	There has been extensive engagement with the local communities as part of this consultation stage with prior communication with the District Authorities and traditional authorities preceding this. Approximately 11 communities meetings are been held during the stakeholder engagement process.
What is being undertaken to embrace the concerns of the river rafters?			06-Oct-14	Livingstone Open day	Concerns raised at this meeting are been recorded in a comments and response document and Scoping Report. This will be made available for review so that stakeholders can confirm that their issues have been identified. These issues will then be investigated further in detailed specialist studies.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What will happen next in terms of the stakeholder engagement process?			06-Oct-14	Livingstone Open day	The Draft Scoping Report and Comments and Response Report will be made available for comment before being finalised. Following detailed specialist studies, the results of the impact assessment will be presented to stakeholders through similar forums as per present. This should be in the first quarter of 2015. Requests at the Livingstone Open day have, however, also highlighted to need for an additional stakeholder meeting in a presentation and meeting format with the presence of the relevant technical expertise.
Why is it that in Zambia you address the Chiefs and here in Zimbabwe you prefer to deal with communities instead of the Chief?	Community member, Jambezi Ward	N/A	02-Oct-14	Jambezi Ward Meeting	In both countries we have held meetings with the chiefs, before the communities. In Zimbabwe, as the Project covers a larger area, it has been easier to hold meetings at the ward level, after seeking permission from the Chief.
What provision has been made for maintenance costs?	Charlene Hewat	Environment Africa	04-Oct-14	Victoria Falls Open Day	All such aspects are currently being investigated as part of the overall feasibility study of the scheme. Maintenance costs (which are typically low for hydropower schemes) are to be included into the overall financial feasibility study for the scheme.
Will a financial provision for maintenance during the operational phase be allowed for?	Jean Whiley	Private	01-Oct-14	Bulawayo national and provincial authorities	Maintenance costs are being included in the overall financial feasibility model for the scheme as a whole.
For how long into the future will the proposed Batoka Dam meet electricity requirements i.e. is it a long term solution?	Richard Maasdorp	Zambezi Society	30-Sep-14	Harare Open Day	The project is proposed to be designed with a life of thirty years.
Environmental flows need to be maintained.	Christopher Kaniki	ZESCO	08-Oct-14	Lusaka authorities meeting	A full Environmental Flow Assessment (EFA) is being conducted for the study, the results of which will be provided to the design engineers in order to inform the design process.
Water flows beyond the project area require consideration. Any area that is impacted on requires consideration.	Oscar Silembo	Department of Water Affairs	08-Oct-14	Lusaka authorities meeting	The ESIA study will consider the full potential area of influence of the project, rather than just the immediate project area.
Upstream and downstream effects are affected by dam operations. During implementation will stakeholders have a say in how the dam is operationalised? Will look out for this concern in your report.	Ranjit Deshmlikh	University of California	04-Oct-14	Victoria Falls Open Day	An Environmental Flow Assessment is being conducted to assess impacts downstream of the project and to advise on environmental flow releases. The environmental flow assessment also considers the impacts as a result of the operation of the scheme and as such, recommendations made to minimise impacts downstream of the scheme are to be made as part of the EFA study.
How far back upstream the dam head waters will reach?	Clive Bradford	Wild Horizons	26-Nov-14	email	The dam head will be designed such that the headwaters, at their peak, will reach a point just downstream of the Silent Pool.
Victoria Falls may be impacted on as a result of sediment build up all the way to the falls from the dam development.			06-Oct-14	Livingstone Open day	The effects on flow and sediment conditions upstream of the dam will be examined as part of the flow study forming part of the ESIA. Based on earlier hydraulic studies it appears unlikely that these effects would be significant or that would extend upstream of the Silent Pools area.
When there is flooding in the Zambezi, the water in the river rises and flood backwards. There was flooding of the Victoria Falls power station in 1958. This could happen again.			06-Oct-14	Livingstone Open day	The effects in flows and water level conditions upstream of the dam will be examined and assessed as part of the hydrological flow studies of the ESIA. Based on earlier hydraulic studies it appears unlikely that these effects would be felt upstream of the Silent Pools area. However, the ESIA studies will also identify and assess such identified potential impacts so that the Victoria Falls and power station are minimised through incorporation of appropriate mitigation measures in the EMP for the project
What is the plan for solid waste management during the implementation of this project?	Gisford Muleya	Kazungula District Council	10-Oct-14	Kazungula District Meeting	Waste management will be according to the requirements of the regulations in the two countries.
We would like to know what the anticipated water fluctuations are likely to be?			06-Oct-14	Livingstone Open day	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. The flow study will also examine the impacts of any potential 'peaking' operations that may vary the outflows during certain periods of the day.
What is the anticipated impact on water quality and hence on aquatic species?			06-Oct-14	Livingstone Open day	The potential effects on water quality in the reservoir and downstream of the dam are being examined as part of both the limnological study and the environmental flow study.
We would like assurance that the project's objectives properly describe the needs the project is supposed to meet, rather than just its structural features. We express concern that an SEIA is being undertaken for a structure that is not yet finalized as "scoping" is still being carried out. What are the objectives of the "Batoka Dam" project in the present socio-economic landscape?	Graham Nel / Tony King Sue Liell-Cock	Safari Par Exellence International Rafting Federation	06/10/14 18/11/14	Written submission	The objectives of the project will be detailed in the Environmental and Social Impact Assessment; a chapter is being developed which will specifically address this. The key objective is to increase power generation capacity in both Zambia and Zimbabwe, reduce power outages and reduce reliance on coal fired power stations. If the project goes ahead, it will contribute significantly to the electricity supply of both countries, and also serve to distribute power to southern African countries.
Many project have been implemented in Mukuni Area but very few have been honoured by project proponents. What makes this project different?	Mr.KelysonMangola	Kazungula District Council	10-Oct-14	Kazungula District Meeting	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. ZRA will also develop a Corporate Social Responsibility (CSR) programme for the project that will outline how a portion of the funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
My concern is on the effects on the fishes and other wild animals that may be displaced. The whole project will affect tourism in Livingstone and Victoria Falls towns since the rising waters of the dam may affect the levels of the falls which is a major attraction for tourists.	Ackson Shawa	Environment Africa	23rd Jan 2015	Written submission	Tourism impacts on Livingstone and Victoria Falls are being assessed as part of an economic impact assessment. The impact on biodiversity will be assessed as part of the biodiversity specialist assessment.
What does the project foresee on: 1. Settlement displacements? 2. Tourism impact? 3. Inmigration? 4. Social, heritage and biodiversity impacts? 5. Impact on the up and downstream environments? 6. Economic activities? 7. Climatic change? 8. If minimal water is to be impounded don't you foresee the dam getting usually dried and rendered useless.	Bernard Sinyangwe	Environment Africa	23rd Jan 2015	Written submission	These impacts are all being assessed as part of the ESIA and Resettlement Action Plan. Regarding the question about storage, whilst the reservoir volume will be relatively small, once filled and operational there should be no risk of drying out since the run-of-river design will mean that outflows will balance inflows over the daily operational cycle. The operational scenarios under consideration will be presented in the final ESIA report.
Is it not cheaper to expand Hwange Power Station?	Brent Williamson	Adventure Zone	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Currently there is a mix of power generation options under consideration by the two Governments. With climate change risks, there is a need to consider and retain a mix of options. The Hwange Power Station is currently under expansion.
Not sure that the transmission line has been explained throughly to the affected communities?	Sipiwe Mapfuwa	Hwange Rural District Council	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Discussions have been held with communities potentially affected by the powerlines in Zimbabwe. This has taken place at a village level and as part of this consultation, the current corridor under consideration has been presented.
`Will the spillway releases impact on Kariba as well?	Sipiwe Mapfuwa	Hwange Rural District Council	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The spillway will become operational during large flood events that exceed the storage capacity of the Batoka dam. Given the planned run-of-river operation of the dam (with inflows balancing outflows on a daily cycle) these large flood hydrographs should therefore be relatively unmodified by the Batoka dam such that flood inflow conditions at Kariba will be similar to those present.
Will there be access between the two countries as part of the development?	Sipiwe Mapfuwa	Hwange Rural District Council	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Yes there will be a border crossing between the two countries.
Will the dam expan in the future?		Zimbabwe Power Company	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Expansions will not be possible in future as any expansions would impact on the Falls and the Victoria Falls Power Station.
Will there be provision in the project budget for the compensation of businesses associated with tourism for the economic loss expected as a result of the dam development?	Skinner Ndlovu	Wild Horisons	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The impact on tourism firstly needs to be understood through the economic study. Best practice guidelines advocate for the consideration of economic displacement.
How will compensation for the affected villages be calculated?	Martin Ndhlovu	Hwange Rural District Council	22nd Jan 2015	Victoria Falls Information Sharing Meeting	International good practice advocates for a minimum of "like for like" compensation with a preference for replacement assets/livelihoods/access rather than cash compensation. This will be addressed as part of the Resettlement Action Plan which will commence when the project footprints are better understood. Before compensation is negotiated, environmental authorisation, feasibility and financing needs to be secured.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
I have a crocodile farm 40 km downstream of the dam wall. What will the impact be on the river 40 km downstream?	Joshua N Magaba	Cheziya Crocodile Ranch	22nd Jan 2015	Victoria Falls Information Sharing Meeting	This farm is close to one of the sites where environmental flows were monitored. Decisions with regard to the operational regime will be taken into consideration during the study as well as under the engineering design feasibility phases, but given work undertaken to date, it is not anticipated that there will be significant flow impacts in this area.
Reference needs to be made to Kariba and lessons learnt from that project. Mitigation must be implemented. Compensation is only a short term solution. A comprehensive impact assessment must be undertaken.	N Ndlovu	Victoria Falls Municipality	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The Resettlement Action Plan will be undertaken according to international good practice. Reflection will be given to the experience of Kariba. It is also important to note that the responsibility of the environmental impact assessment practitioner ends with the environmental authorisation decision hereafter it becomes the proponent, local authority and Environmental Agency's responsibility for implementation.
Will the project add value to the lives of children growing up in terms of nutrition, social services, bursaries and education?	Lovemore Ncube	Ministry of Primary and Secondary Education	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Development opportunities will be identified through the social impact assessment and baseline data collection process. This will inform the proposed CSR initiatives.
Will noise as a result of the dam impact on schools in the area? Will vibrations result in collapsing structures?	Lovemore Ncube	Ministry of Primary and Secondary Education	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The ESIA will advise on the avoidance of noise sensitive areas and those sensitive to vibrational impacts for the routing of access roads and other supporting infrastructure. The management plan forming part of the ESIA will elaborate with regard to the mitigation of these impacts.
The development of a national park around the dam development is a requirement of the legislation. Is there potential for this?	Edwin Makuwe	National Parks	22nd Jan 2015	Victoria Falls Information Sharing Meeting	This is acknowledged as a requirement. Discussions are currently underway with the local authorities in this regard.
Is there any hope for the future of the Taita Falcon?	Edwin Makuwe	National Parks	22nd Jan 2015	Victoria Falls Information Sharing Meeting	As part of the baselines specialist studies, advice has been obtained from the Zimbabwe Falconer's Club on the state of the Taita Falcon and Rock Pratincoles in the Batoka Gorge and how best to mitigate impacts. The impact on Taita Falcons is of concern as their numbers have already declined in the area due to excessive helicopter activity along the length of the Gorge and an influx of Lanner Falcons which is attributed to changing land use practices in the surrounding areas. The specialist studies will include identification and assessment of impacts on the Taita falcon with the projects EMP including measures to mitigate the identified impacts on the Taita Falcon and other Fauna species of the project area.
What will the effect of water level fluctuations be on the environment?	Robin Brown	Lansaf	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The aforementioned environmental flow study will include a detailed assessment of the potential impacts of downstream water level effects from dam operation on aquatic and riparian habitats. The results will be presented in the final ESIA report.
There will be a perceptive effect on the tourism market as a result of this project. Victoria Falls is a unique	Robin Brown	Lansaf	22nd Jan 2015	Victoria Falls Information Sharing Meeting	An economic study is being undertaken as part of the ESIA in order to consider the impact on the tourism industry on Vic Falls and Livingstone.
Reassurance of downstream impacts is required in the public domain.			22nd Jan 2015	Victoria Falls Information Sharing Meeting	The results of the ESIA will provide this information.
Has a projection been done of long term climate change and the effects this may have in terms of dam capacity and feasibility?	Faith Chiramba	Meteorological Services Dept, Zimbabwe	22nd Jan 2015	Victoria Falls Information Sharing Meeting	There have been several recent studies on the potential effects of future climate change on the water resources in the Zambezi River basin. The results of these studies will be taken into consideration during the feasibility study including with respect to their potential impacts on power generation capacity at the dam.
What impact will the project have on the Hwange Colliery water abstraction?	Annah Chuma	Hwange Colliery Company	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The assessment of downstream flow impacts from the scheme is currently underway, although we do not anticipate that there will be any significant impacts on the existing water abstractors (including Hwange Colliery) that lie downstream of the dam site. The water losses associated with the dam will be relatively insignificant compared to flow volumes given the narrow and deep dimensions of the reservoir, and the run-of-river design being considered means that for the most part flow conditions will be relatively unaffected by the impoundment. A minimum environmental flow condition will also be incorporated within the design to ensure that downstream flow requirements are met at all times, including during initial reservoir filling or any potential 'hydro-peaking' operation of the dam. Details of the downstream flow assessment and related mitigation measures will be presented in the final ESIA report.
If the project is impacting on Rapid No 5 which is only 2-3 km from Vic Falls, how can there be assurance that there will not be an impact on Victoria Falls?	Philani Moyo& Sipiwe Mapfuwa	Shockwave & Hwange Rural District Cou	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The reservoir inundation area has been determined based upon a recent and accurate LIDAR survey of the gorge carried out for the feasibility study. The hydraulic 'backwater' effect on river levels upstream of the reservoir cannot be determined with the same degree of accuracy since it depends on precise flow conditions and river channel dimensions and characteristics throughout the gorge. However, the hydraulic calculations carried out accord well with river levels measured recently at the Victoria Falls power station such that there is a reasonably high degree of confidence in the results. These results indicate that there should be no discernible impact on river levels upstream of the 3rd Gorge over the full range of flow conditions in the river, and that the effects will be relatively insignificant upstream of the 4th Gorge for all but the lowest flow conditions in the river. However, the ESIA studies will also identify and assess such identified potential impacts so that the Victoria Falls and power station are minimised through incorporation of appropriate mitigation measures in the EMP for the project
Once the dam is built it will be permanent and the damage will have been done.The canyon will be destroyed for future generations. Who is going to be benefitting from this project? South Africa?	Philani Moyo	Shockwave	22nd Jan 2015	Victoria Falls Information Sharing Meeting	The benefits from the project will accrue to Zambia and Zimbabwe, including the region.
People in the tourism industry need to be consulted with.	Philani Moyo	Shockwave	22nd Jan 2015	Victoria Falls Information Sharing Meeting	An economic study is being undertaken as part of the ESIA in order to consider the impact on the tourism industry on Vic Falls and Livingstone.
Will there be security issues associated with easier access between the two countries?	Philani Moyo	Shockwave	22nd Jan 2015	Victoria Falls Information Sharing Meeting	There will be police and immigration increased presence to enhance security.
There need to be benefits to the local communities in terms of employment and business opportunities. A	Sipiwe Mapfuwa	Hwange Rural District Council	22nd Jan 2015	Victoria Falls Information	This will be addressed in the social impact assessment
When water levels rise will there be more game attracted to the area?	Felix Chibwe	The Victoria Falls Hotel	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Most of the reservoir will be within the steep sided gorge and the water's edge will not be accessible. Game in the greater area generally has artificial water sources provided and there is already sufficient naturally occurring water in the area. Long gone are the days of unexpected wildlife migrations and we do not expect an influx of wildlife in response to filling of the reservoir. More likely an influx of people and an increased exodus of wildlife.
Will fishing and agricultural activities still be permitted in the Muzuma/Sidinda area?	Felix Chibwe	The Victoria Falls Hotel	22nd Jan 2015	Victoria Falls Information Sharing Meeting	Yes, they will be permitted in this area.
With the establishment of a national park around the dam area, it is likely that human wildlife conflict issues may escalate.			22nd Jan 2015	Victoria Falls Information Sharing Meeting	We do not expect any escalation of conflicts with wildlife as a result of the Batoka Reservoir. There may be an influx of people and increased encroachment of settlement and cultivation into areas occupied by wildlife leading to interactions, but those are not as a result of the Batoka Reservoir.
Zimbabweans and Zambians to carry out cultural rituals associated with the river. It is important that there is a sense of what these rituals are and where they take place.			22nd Jan 2015	Victoria Falls Information Sharing Meeting	These sites will be addressed through the social impact assessment, heritage study and resettlement action plan.
If minimal water is impounded in the dam, during the dry season this will be rendered useless.		Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	Whilst the reservoir volume will be relatively small, once filled and operational there should be no risk of drying out since the run-of-river design will mean that outflows (and associated power generation capacity) will balance inflows over the daily operational cycle. The operational scenarios under consideration will be presented in the final ESIA report.
What could impact on the start date for the project?	Irene Ngandu	Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	The start of the project is dependent on environmental authorisation, feasibility and financing. The role of the ESIA is to define the impacts and make suggestions for mitigation. It then becomes a decision of government and the financiers as to whether the project can proceed or not.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Has the option of run of river power generation without the development of a dam ever been considered?	Ruth Hanson	Livingstone Kazangula Farmers Association	23rd Jan 2015	Livingstone Information Sharing Meeting	Run of river power generation without a dam is a recent concept that still requires refinement. This has been tested with little success to date.
The impacts of the impoundment will affect people's livelihoods. Information presented for the social data collected to date does not reflect the wider picture on agriculture, fishing and tourism activities.	Ruth Hanson	Livingstone Kazangula Farmers Association	23rd Jan 2015	Livingstone Information Sharing Meeting	Primary data collected to date has focused on the communities residing in the footprint of the project infrastructure. A further understanding of the economic impacts associated with the impact on the Livingstone and Vic Falls communities will be developed through the economic study which will be commencing later.
There is more pressure from Zimbabwe for this dam development due to their power shortages. There are also fewer suitable dam sites available. Would it not be possible for Zambia to develop this dam elsewhere and then export power to Zimbabwe?	Ruth Hanson	Livingstone Kazangula Farmers Association	23rd Jan 2015	Livingstone Information Sharing Meeting	The Zambian Government is also looking at alternative sites in Zambia, like the Kafue Gorge Lower. The key objective of the project is to increase power generation capacity in both Zambia and Zimbabwe, reduce power outages and reduce reliance on coal fired power stations. If the project goes ahead, it will contribute significantly to the electricity supply of both countries, and also serve to distribute power to southern African countries. The demand for power in Zambia is expected to increase to meet the growing economy. T
What will be the impact of the project on Heritage Sites	Enock Chiloya	Environmental Action Group	23rd Jan 2015	Livingstone Information Sharing Meeting	This will be assessed as part of the heritage impact assessment. The ESIA studies will identify and assess any impacts on identified heritage sites and ZRA will work with national and local authorities to ensure that such sites are well preserved.
What will happen to people that will be displaced	Enock Chiloya	Environmental Action Group	23rd Jan 2015	Livingstone Information Sharing Meeting	A Resettlement Action Plan is being developed in order to assess and manage these impacts. This Plan will be undertaken and prepared in accordance with international good practice according to the principles of the International Finance Corporation.
The Scoping studies undertaken in 1998 have never been disclosed to stakeholders. Who has access to these reports?	Tony King	Safari Par Excellence	23rd Jan 2015	Livingstone Information Sharing Meeting	Requirements for disclosure and engagement have become far more stringent over time and were not so enforced in 1998. This is a new study and input into decision making is desired. The results of this study will be made public. The 1998 report can be accessed through the Ministries responsible for energy and environment from the two countries.
No mitigation measures have been presented in this meeting.	Kelyson Mangola	Kazangulu District Council	23rd Jan 2015	Livingstone Information Sharing Meeting	The impact assessment is still to be undertaken as part of the ESIA. Mitigation measures will be proposed during the next phase of work.
Zambia has sufficient power supply? Should we be concerned about the power needs of Zimbabwe and South Africa? What is the motivation for this project? What is Zambia getting out of selling this heritage site?	Sean Edington		23rd Jan 2015	Livingstone Information Sharing Meeting	Zambia's economy is growing and continues to grow. It is currently anticipated that in 2027, Zambia will not be able to meet its power requirements and therefore there is a need to look at a mix of power generation options.
Could we get comment on the 1997 CAPCO assets?	Sean Edington		23rd Jan 2015	Livingstone Information Sharing Meeting	The issues relating to CAPCO Assets are being dealt with between the Ministries of Finance and Ministries of Energy of the two countries.
There was a workshop on water flow issues with regard to the proposed BHES held in Cape Town, South Africa. Who attended the workshop? Can the findings be disclosed? Can this information be used?	Chanda Mwale	WWF	23rd Jan 2015	Livingstone Information Sharing Meeting	This was an internal water flow specialist workshop that was attended by 5-6 of ERM's specialists to aid in the assessment of impacts. The results of the workshop will be documented in the ESIA which will be released for public comment.
ZESCO is on record that there are sufficient sources of power supply in the Country without input from Batoka. Why is Zambia pushing the Batoka project.	Samuel Sikaneta	Nunga Eco Lodge	23rd Jan 2015	Livingstone Information Sharing Meeting	ZESCO has the mandate to look after power provision in Zambia and has participated in the decision-making and implementation of all power projects in the country. It may be that the report from ZESCO was for short term projections as currently available figures indicate a deficit of 6000 MW by 2045.
The EIA Process has yet to provide answers to many of the issues and there are only two months remaining in the project schedule. By when could we expect answers?	Brave Musharati	Environmental Action Group	23rd Jan 2015	Livingstone Information Sharing Meeting	Significant time has been spent collecting baseline data in order to facilitate the process of impact identification and assessment. Answers will be provided in the impact assessment and disclosed to the public by both the ZRA and the environmental regulators of the two countries.
There is no representative from the ZRA present. We would also like to ensure that key stakeholders are consulted with by the ZRA before the EIA meetings are held.	Fred Sikazwe	Livingstone City Council	23rd Jan 2015	Livingstone Information Sharing Meeting	The Project Manager (Eng. E. Kasaro) from the ZRA was present at the information sharing meeting. All local authorities were consulted with by the ZRA prior to the commencement of the ESIA. In the ESIA, the ZRA has allowed the consultant to take the lead as is required in terms of stakeholder consultations.
There are many other communities impacted on by the project and yet consultation seems to be focussed on Livingstone and Victoria Falls.	Joseph Kachingwe	Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	There have been 11 community information sharing meetings that were held in Zambia and Zimbabwe during October 2014. At these meetings information about the project was presented and stakeholder issues and concerns were gathered.
Zambia has 40% of the water in Africa. Another hydroelectric scheme could be developed elsewhere in Zambia.	Joseph Kachingwe	Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	The Zambian Government is also looking at alternative sites in Zambia, like the Kafue Gorge Lower. Increased power generation is required to meet the growing economy.
What will happen to people when they are resettled? Will they be taken even further away from amenities?	Joseph Kachingwe	Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	One of the requirements of the International best practice Performance Standards is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. This includes access to social amenities and this will be considered and detailed in the Resettlement Action Plan.
Hydropower is not the only option for energy creation. Should we be sacrificing a world heritage site for this project?		Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	A number of project alternatives have been investigated. This includes hydropower schemes in the Zambezi basin as a whole, and for power generation schemes, including thermal and solar power, within the SADC region as a whole. The Southern African Power Pool (SAPP) presents a Regional Generation and Transmission Expansion Study for the entire SAPP region. In addition, for the Batoka HPP scheme specifically, alternative locations for the scheme have been investigated and a number of options for the power houses, full supply levels etc. are currently being investigated. As per alterative operating scenarios for the Batoka scheme itself (such as run-of-river/peaking), these are currently being investigated as part of the overall engineering feasibility study .
The co-ordinates have now been provided, but the District map is incorrect.	Margaret Whitehead	WECSZ	23rd Jan 2015	Livingstone Information Sharing Meeting	Information has been forwarded to the team by Ms Whitehead as information sourced from the internet was incorrect. The maps will be updated accordingly.
I am concerned about climate change effects on the project. Is data collected over the past 80 years sufficient to guide the project and the impacts of climarte change. The 740 m contour option would instill greater confidence that there would not be an impact on Victoria Falls.	Margaret Whitehead	WECSZ	23rd Jan 2015	Livingstone Information Sharing Meeting	There have been several recent studies on the potential effects of future climate change on the water resources in the Zambezi River basin. The results of these studies will be taken into consideration during the feasibility study including with respect to their potential impacts on power generation capacity at the dam.
There were earth tremours when Kariba filled. This can also therefore be expected with Batoka.	Ruth Hanson	Livingstone Kazangula Farmers Association	23rd Jan 2015	Livingstone Information Sharing Meeting	The project engineers are considering the risk of seismic activity as part of their scope of work.
Livingstone should benefit if this project goes ahead, by lower electricity tariffs or electrification.	Ruth Hanson	Livingstone Kazangula Farmers Association	23rd Jan 2015	Livingstone Information Sharing Meeting	Livingstone will benefit through electrification. The electricity tariffs will be set and regulated by the Energy Regulation Board country wide.
What will the impact of Katambora barrage be? This will affect 100 km of the river.	Andrew Bolton	Safari Par Excellence	23rd Jan 2015	Livingstone Information Sharing Meeting	This project was previously under consideration, but it is understood that's its viability may have some considerable challenges. The ESIA will still review the information regarding the Barrage and assess any identified identify impacts in relation to the Batoka Project.
There is also the Pandamatenga River Scheme to consider. This is a Chinese initiative proposed at the mouth of the Chobe for rice cultivation. It is currently under construction.	Dave Gyles	Safari Trek	23rd Jan 2015	Livingstone Information Sharing Meeting	The assessment will aim to identify and take account of existing and likely planned (or under construction) agricultural or potable water supply abstractions in the Zambezi basin above Victoria Falls, including the Chobe-Zambezi Water Transfer Scheme (which includes the Pandamatenga irrigation project). The potential effects of this accumulated demand will be taken into consideration during the feasibility study with respect to estimating power generation capacity at the dam.
How is the population for the permanent camps derived if there are only 1500 employees?	Irene Ngandu	Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	The population size has been derived by assuming that families will also live with the workforce. It should be noted that information presented at the information sharing meetings was not accurate. The current thinking is that the construction force will be 1500 people. During the operational phase there will be 750 people with their families residing in the permanent camps.
There will definitely be rock falls with the filling of the dam. There is dam stability already every rainy season. What will the impact be on the slopes below our lodge?	Faan Fourie	Talton Falcon Lodge	23rd Jan 2015	Livingstone Information Sharing Meeting	The Project Engineers will produce a seismic report providing information on this.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
To what extent has the Heritage Department being engaged	Perrice Nkombwe	Livingstone Museum	23rd Jan 2015	Livingstone Information Sharing Meeting	The Heritage Commission has been invited to participate in all engagements to date. The Zambian fieldwork has not yet commenced, but the team is in the process of collecting information about the heritage sites identified through previous studies through the Commission.
When will the document and comments and response report be presented?	Irene Ngandu	Environment Africa	23rd Jan 2015	Livingstone Information Sharing Meeting	The Scoping Report and comments and response report will be made available in February 2015. The ESIA Report should be available in the 2nd quarter of 2015.
During the impoundment there is a need to monitor and translocate affected species - animal and plant eg. Endangered species such as the Taita Falcon. Implementation will require active liaison and engagement between stakeholders - government and private.	T.H Madiri	Zimbabwe Parks and Wildlife Management Authority	7th Jan 2015	Written submission	A Mitigation measure has been included for preparations to be put in place for translocation of wildlife and threatened plants species in collaboration with the relevant wildlife authorities as a result of the rising water levels as well as construction and other activities of the project.
The river continuum and flow needs to be sustained to maintain ecological processes.	T.H Madiri	Zimbabwe Parks and Wildlife Management Authority	7th Jan 2015	Written submission	The dam is being designed on the basis of a 'run-of-river' scheme, in that under normal operation there should be minimal impact on the flow regime in the river downstream to Kariba. However, the environmental flow study will examine the impacts of any potential 'peaking' operations that could occur and that may vary the outflows during certain periods of the day or at certain times of year.
The relocation of communities should promote conservation as it is the mainstream activity in the area, while mitigating the potential risk of human wildlife conflict. The impoundment will attract big game thus the settlement of communities into new areas should take into account animal corridors and routes. It is also important to note the potential conflict between humans and crocodiles.	T.H Madiri	Zimbabwe Parks and Wildlife Management Authority	7th Jan 2015	Written submission	Communities will only be resettled where their existence is greatly affected by construction activities or transmission line routes. Any resettlement of communities will be carried out through institutions of approved Resettlement Action Plans and in consultation with and approval from the affected communities and local authorities. It is not expected that the reservoir will attract large populations of big game as the A601 edge will not be accessible due to the steep side of the gorge and the ready access of water sources elsewhere. A significant increase in the numbers of crocodiles is not expected due to the steep gorge sides not providing suitable resting habitat, and therefore do not predict an increase in conflict with people. However, the ESIA study will identify and assess any such potential impacts and appropriate mitigation measures included in the project EMP.
The potential risk of malaria due to the creation of an impoundment will need to be considered for displaced and settled communities.	T.H Madiri	Zimbabwe Parks and Wildlife Management Authority	7th Jan 2015	Written submission	This will be considered as part of the health impact assessment for the ESIA.
The construction of the dam should have the potential to improve the livelihoods of the local populance promoting activities such as fish farming and ecotourism. Recreational or aesthetic value could support economic benefits for the communities.	T.H Madiri	Zimbabwe Parks and Wildlife Management Authority	7th Jan 2015	Written submission	ZRA wants to make sure it has a positive impact on the environment and the communities in the project area of influence. The ESIA will be key in this intention, helping to identify the potential benefits that may result from the Project and to develop measures that can be put in place to help enhance such benefits. Opportunities for community development/social investment and improved livelihood activities will be commented on in the social impact assessment and resettlement action plan.
We propose active monitoring on environmental attributes so as to provide a case study to guide policy and decisions for future projects of a similar nature.	T.H Madiri	Zimbabwe Parks and Wildlife Management Authority	7th Jan 2015	Written submission	The management plan produced by the ESIA will certainly include future environmental monitoring activities.
This dam is of international importance. It is not sufficient to advertise in local newspapers only. ERM has a responsibility to conduct a meaningful public participation process and this includes making an effort to get the word out to all potential I&APs using all reasonable means.	Marie-Louise Kellett	PaddleZone, African Paddling Association, International Rafting Federation	19th Dec 2014	Written submission	Local newspapers have been used for the notification of Zambian and Zimbabwean stakeholders. All registered stakeholders were also forwarded invitations and background information documents directly. Local networks such as Livingstone Weekly, Friends of Victoria Falls, the Hospitality Association of Zimbabwe and the Bejhani Trust were also utilised for the notification of information sharing meetings. Further documentation such as the comments and response report, Scoping Report and ESIA Report will be made available on ERM's website.
Has UNESCO been informed and, if so, what are their comments?	Gill Staden	The Livingstonian	23rd Jan 2015	Written submission	UNESCO has been informed of the project. More specifically, the following individuals from the Zambian National Commission for UNESCO (all based in Lusaka) have been contacted – • Dr. C. Ndakala (Secretary General) • Felicitas Chinanda (Secretary General) • Hilda Sinywibulua (Senior Programme Officer – Culture) Moreover, UNESCO has been invited to attend engagements and we have followed up with them for comment. To date, no comment has been received.
Namibia has just started to extract water from the Zambezi River which is being sent to Ngoma to supply homes and farms – this is recent. The project is only half-way through its planned extraction. Botswana, as was pointed out, is about to extract water from the Chobe (feeds into the Zambezi) for Pandamatenga Farms and for Francistown. There is also a future plan to take the water onwards from Francistown to South Africa. Botswana is very dry and already Gaborone is supplied water from the Tuli Block area. South Africa is also in need of clean water, so for them to plan to have our Zambezi water sent to them is not a surprise. Zimbabwe has plans to extract water from the Zambezi to take to Bulawayo which has a serious water shortage. The dams have not been maintained and the underground aquifer is not providing as much water as it did. This extracted water, we are told, will be pumped to Gwaai where there will be a dam. It will then be pumped on to Bulawayo. The plan is that the water can also be used at Gwaai to irrigate farms. There has also been talk of a large sugar plantation at Kasaya (after Kazungula) in Zambia. Put all these extractions together and think of a few more (there are bound to be more) ... add them to climate change and see what amount of water is left for the hydroelectric scheme. (And our beautiful Victoria Falls). I think the 90 years of water-flow figures down the Zambezi River will be of little value now ... things are changing fast. Clean, potable water for our rising populations will be much more socially important than a bit of electricity. Can we have some figures on this extraction and population increases along the river above the Falls?	Gill Staden	The Livingstonian	23rd Jan 2015	Written submission	The assessment will aim to identify and take account of existing and likely planned (or under construction) agricultural or potable water supply abstractions in the Zambezi basin above Victoria Falls. Details of catchment abstractions taken into consideration (existing and potential future) will be provided in the ESIA report.
It was pointed out that the water below a certain level in the dam will be 'dead' water, containing no nutrients. The dam will be deep and dark. It was noted that the fish which like fast-flowing water would die out and that new species would take over and mentioned kapenta. Kapenta were, of course, introduced into Lake Kariba from Lake Tanganyika. Will kapenta survive in the lake? What fish will survive? I was told by one of the geologists who worked on the feasibility study in 1991 that it would be a 'dead dam' and that very little could survive in its water. Maybe you can let us know what lives now in Kafue Gorge dam – the scenario should be much the same.	Gill Staden	The Livingstonian	23rd Jan 2015	Written submission	The impact of the dam and associated reservoir will be identified and assessed as part of the ESIA studies. It is notable that Lake Kariba is one of the popular fishing areas on the Zambezi River showing that the waters arising from a dam project such as Kariba and Batoka do allow for existence and increase of fish populations and fishing activity. The positive impact on fisheries will be an aspect that the specialist ESIA studies will assess and propose enhancement measures for
At Bujagali Falls in Uganda, they drowned their whitewater in a dam and promised the local people that the new lake would be a haven for water sports. The whitewater went and so did the rafters. There has been no development of water sports, boating and new lodges on the lake firstly, because the transmission lines are ugly and secondly the lake now has bilharzia snails. Their economy has died.	Gill Staden	The Livingstonian	23rd Jan 2015	Written submission	As part of the ESIA study, environmental, social and economic studies will be undertaken for the Project to identify and assess all the potential impacts with a view to enhance positive impacts and minimise any negative impacts.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What will happen to this township and all its infrastructure when the dam construction is over? Surely there should be a plan to use it for some useful purpose afterwards. I can imagine 9,000 people on the edge of a dam with no jobs or livelihoods – a recipe for rampant crime in Livingstone and our surroundings. I would suggest that that there are plans to make this township into, maybe, a sports village.	Gill Staden	The Livingstonian	23rd Jan 2015	Written submission	The intention is that the construction camp of 9000 people will be utilised for the permanent camp, so there will be no destruction of infrastructure developed during the construction phase.
We have seen the problems at Kariba. Someone said to me that now, when a new large dam is to be built, the calculations of cost have to include the de-commissioning of the dam when the time comes. Is this true? And is anyone considering this?	Gill Staden	The Livingstonian	23rd Jan 2015	Written submission	The Batoka dam development is meant to be permanent. The costs to be considered and will be reflected in the feasibility studies are those associated with the maintenance of the facility.
What will the impact be to Lake Kariba in the short and long term due to the proposed Batoka Dam Project?	Tundu Kaonga	Ministry of Agriculture and Livestock	16th Jan 2015	Written submission	Given the relative storage volumes of the two reservoirs (approximately 185 km3 for Kariba, and <2 km3 for Batoka) and the proposal to operate Batoka as run-of-river, it is extremely unlikely that the Batoka scheme would have any noticeable regulating effect on storage volumes/water levels in Lake Kariba (assuming that that operating conditions for Kariba remain unchanged) and thus on water abstractions from the lake. The downstream environmental flow studies will however examine the potential impacts on Lake Kariba fisheries from the Batoka Dam.
What will the impact be on energy generation at Lake Kariba for both Zambia and Zimbabwe expecially in the face of uprating both plants in Zambia and Zimbabwe recently?	Tundu Kaonga	Ministry of Agriculture and Livestock	16th Jan 2015	Written submission	The Engineering Feasibility Studies with inform of this .
What is the effect of seasonal water fluctuations along Lake Kariba on irrigation schemes managed by small scale farmers as a result of this project?	Tundu Kaonga	Ministry of Agriculture and Livestock	16th Jan 2015	Written submission	Given the relative storage volumes of the two reservoirs (approximately 185 km3 for Kariba, and <2 km3 for Batoka) and the proposal to operate Batoka as run-of-river, it is unlikely that the Batoka scheme would have any noticeable regulating effect on storage volumes/water levels in Lake Kariba and thus on water abstractions from the lake.
Does your remit include considering other possible sites for the dam? It seems to me that many of the objections to Batoka Gorge would fall away if the dam were moved downstream for example to Devil's Gorge, and the EIA should give the relative merits and demerits of different sites. so that if the development is rejected there is an alternative.	Magaret Whitehead	WECSZ	6th Feb 2015	Written submission	As part of the ESIA, other locations for the dam, including Devil's Gorge have been explored. As a result of these studies, Batoka Gorge is considered as the preferred site. This is largely due to the geology of the site being ideal for dam construction and the gorge at Batoka being more narrow than the other sites, thereby significantly reducing concrete volumes required, and also hence costs.
I would like to say thank you for brining this development to our village.	Mr. Johane Peterson	Jabula village, Nemanhanga Ward	7th May 2015	Written submission	Your comment has been noted.
My son was drowned at Lower Moemba in 2004. I am naturally interested in (and saddened by) changes in this area. Can you please let me know what is happening with your project at present - I would like to visit the rapids again before they are changed	Helen Cave	Stewart Island. New Zealand.	6th Aug 2015	Written submission	an Environmental and Social Impact Assessment (ESIA) is being undertaken for the Project to identify and assess the significance of any impacts that may be brought about by the Project, should it go ahead. The ESIA will also identify measures that can be implemented to avoid / reduce any negative impacts and enhance any positive effects. The ESIA is currently in the Scoping Phase: the Zambezi River Authority is finalising its review of the Scoping and Comments and Response Report, which details all the comments received by stakeholders. This will be released into the public domain for comment and submitted to the regulatory authorities once finalised. Baseline studies have been completed and the Project team is in the process of compiling an Impact Assessment Report. Feedback meetings will be scheduled with the release of this document. We will be sending out dates of the engagement meetings once these have been confirmed. I will add you to the stakeholder database and send you an email once dates for future meetings or new Project information is confirmed. I have also attached a background information document which provides some further information.
I understand you did an EIA for Batoka Gorge Dam in Zimbabwe. How is the project going to mitigate against habitat changes and destruction for cliff nesting Eagles and Storks and especially the threatened Taita Falcons. Where can I get a full EIA for this project?	Innocent		3rd Sept	Written submission	Project to identify and assess the significance of any impacts that may be brought about by the Project, should it go ahead. The ESIA is currently in the Scoping Phase: the Zambezi River Authority is finalising its review of the Scoping and Comments and Response Report, which details all the comments received by stakeholders. This will be released into the public domain for comment and submitted to the regulatory authorities once finalised. Baseline studies have been completed and the Project team is in the process of compiling an Impact Assessment Report. A biodiversity study is being undertaken as part of the ESIA. This has included engagement with key stakeholders such as the Zimbabwe Falconry Club, who have extensive knowledge of Taita Falcons, Black Eagles and other bird species in the Batoka Gorge. As part of the ESIA, an Environmental Management Plan is being developed which will include measures to mitigate the identified impacts on the Taita Falcon and other fauna species of the Project area. Feedback meetings will be scheduled with the release of the Scoping Report. We will be sending out dates of the engagement meetings once these have been confirmed. I will add you to the stakeholder database and send you an email once dates for future meetings or new Project information is confirmed. I have also attached a background information document which provides some further information.
The Proposed Full Supply Level (FSL) of 957m of the Batoka Gorge H.E.S. would mean the water would stretch back just below silent pool and mean white water rafting would close. Viable adventure companies would close down, 100's of staff from the communities would be unemployed. Tourism numbers visiting the area would be affected. The Zambezi River is rated as the best white water rafting in the world. Customers come specifically to raft this might river. 'But' if the average operating level could be 710 or below one day rafting trips could still operate. We would therefore only lose the multi-day section of the river.	C. Bradford	Wild Horizons	09/12/2015	Email	This issue will be the subject of a Tourism Study and Cost Benefit Analysis and Macroeconomic Study that will be undertaken as part of the ESIA.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
You said "in your vic falls open day" the site has suitable geology for construction of the dam wall and the Gorge is narrow at this point compared to sites downstream thus reducting construction cost" . In saying this you are admitting there are other sites downstream but this site is cheaper to develop to the detrement of the rafting industry.	C. Bradford	Wild Horizons	09/12/2015	Email	In total 17 project alternatives were assessed, including alternatives relating to dam type and full supply water level among others in the 70s and 80s. The proposed location of the Batoka HES was first selected in 1971 and further studies in 1981. The engineering team working on the site selection in 1981 also found the site to be the most favourable as none of the other alternatives had strong advantages in terms of geological, topographical, dam volumes and hydrological conditions (theoretical maximum production at the river section) as the current location. Considerations made in selecting this site were: Moving the dam downstream would reduce the capacity of any future development at Devil's Gorge; All the sites downstream, especially after chainage +55 km, are characterised by a widening of the valley which would require approximately 60% to 200% more concrete; moreover six of the seven downstream sites would require a saddle dam (another albeit smaller dam wall in a further location); and Moving the dam upstream would result in a loss of total head, unless any future development at Devil's Gorge had its full supply level (FSL) raised. The Batoka HES site showing advantages in terms of energy production, this site also benefits from: A favourable river shape, having a "Z" turn upstream, which makes it favourable for the waterways intake and tunnel river diversion; Previous detailed geological studies have already been carried out for this location; and the location guarantees an overall good quality of rock foundations for the envisaged rigid concrete dam.
The proposed full supply level of 757 of the Batoka Gorge would close down the rafting industry which will lead to lose of employment for hundreds of people in the community. Companies would have to be compensated for the lose of revenue. If the average operating level is reduced to around 700m below sea level the one day rafting trips will still carry on. A lot of people that visit Vic falls they do so because they also want to raft the best river on planet earth. If rafting closes down the country and Vic falls town will loose a lot of business due to tourism decline. Tourist will go some where there is better rafting.	Skinner Ndlovu	Rafting Association of Zimbabwe	09/12/2015	Email	This issue is the subject of a Tourism Study and Cost Benefit Analysis and Macroeconomic Study that has been undertaken as part of the ESIA.
I sent you a copy of the map of the new district boundaries in Zambia (copy attached here) but some of the maps are still incorrect, in particular Fig 0.4 on page xxiv Fig. 7.1 on page 7-3. The change to Livingstone District happened many years ago but the creation of Zimba District is fairly recent. But it means that Kalomo district is no longer in the picture for this project, and the following references in the text need to be amended: Mentions of Kalomo on pages v, xv, xxii, 3-1, 4-16, 4-18, 6-13. I have ignored historical references to Kalomo District as they are probably still valid, but for consideration of the impact of the project, Kalomo should be replaced with Zimba.	Margaret Whitehead		22.01.2016	Email	Thank you for the map. ERM will amend the identified errors accordingly.
We appreciate the opportunity to respond to the initial scoping report. Unfortunately, we were somewhat surprised and disappointed by the lack of details and misrepresentation of information in the baseline study report. As a baseline study that forms a basis for comparison of future developments it should therefore fully reflect the situation on the ground with adequate detail and analysis.	Mr Graham Nel and Mr Sean Edington	Safari-Par-Excellence	22.01.2016	Email	The baseline details contained in the scoping report comprised of high level secondary data from various sources. The baselines contained in the ESIA will comprise of secondary and primary data collected by the respective specialists. Baseline data collection followed on the Scoping Report generation so will be more robust in order to better inform the impact assessment.
There are areas of the upcoming ESIA that we see as vital but which appear to be vaguely represented and in some instances ignored. These areas include but are not restricted to: a) Tourism statistics and figures, GDP contribution of tourism and potential tourism contribution for future generations. b) Grievance procedure for compensation from loss of income for individuals and companies. c) Flooding a national park and World Heritage Area. d) Reliance on hearsay becoming public record. e) Public input/ideas on potential revenue schemes spun off the dam. We discuss these issues, it is our hope that these areas will be fully assessed and considered in the final study.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	A tourism impact study will be undertaken as part of the ESIA which identifies the likely monetary impact on the tourism industry. The grievance procedure currently available in the public domain is one that can be utilised for all purposes, but will be refined to be a RAP specific mechanism as soon as this work commences. Impacts on the National Park and World Heritage area will also be recognised and considered further in the ESIA. Further consultation during the ESIA will be undertaken and ongoing life of project communication will be committed to by the project component as part of the ESMP.
There is no doubt and it is also reiterated within the documents that were provided in the report that the tourism sector and specifically the whitewater rafting and supporting service industry will be the one most negatively impacted by the development of the Batoka Gorge dam. This sector contributes permit fees to the government through taxes and permits issued every year, it directly and indirectly employs a significant proportion of people in both Livingstone and Victoria Falls. Many families residing in and around Victoria Falls and the Gorge derive their livelihoods from this sector.We therefore feel that the importance of the industry was deliberately or otherwise minimized. In particular, we are concerned and surprised at the absence of data regarding tourism figures and the contribution of tourism to the Zambian economy, in the baseline study report. There arc no international arrival figures for Zambia, or mention of the contribution of tourism to Zambia's GDP. Nor does the report contain hard information regarding the potential for growth in this industry and the area earmarked for the potential HES. The Batoka Gorge area already sustains a vibrant expanding community and tourism economy. The area has huge potential for future generations, as a world heritage site and expanding tourism destination and perhaps more importantly as a source of national heritage and pride. These are areas that need to be reflected on, researched and impartially represented in pros versus cons manner.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016		The Scoping Report sought to identify impacts of concern for further investigation in the ESIA. A tourism/cost benefit analysis and macro-economic study will be prepared to assess the impact on the river rafting industry and tourism further.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Furthermore, there appear to be no figures reflecting the employment statistics for the tourism industry in Zambia. A noticeable exception, given that the short-term figure of three thousand jobs created, on the building of the dam is reflected. This figure needs to be realistically portrayed . Zambezi River Authority assures us that the modem dam would be operated by a "handful of employees". This needs to be clarified against the long-term affect of jobs lost in the tourism industry. It is our opinion that White Water Rafting is a vital component in the livelihood of many thousands of people. The consultants should have done a much better job in analyzing the industry and how it will be affected, giving numbers and monetary value lost by the government, companies and households that rely on the industry.	Mr Graham Nel/Mr Sean Edington	Safari-Par-Excellence	22.01.2026	Email	Economic losses and benefits and employment losses and gains will be detailed in the ESIA following the completion of the Tourism Study and Economic cost Benefit Analysis.
We are deeply concerned about the contention "It was claimed that lion walking may now be one of the key tourist attractions in the area" in the baseline study report 4-23. As a booking agent as well as an activity provider we categorically dispute this statement. In addition, we would like to respectfully point out that we have availed ourselves, sister organizations and the Livingstone Tourism Association to the ESIA staff. To have such an un-substantiated claim become public record is extremely worrying. In addition, we would like to ensure that all due diligence is taken to substantiate the claim stakeholders "hinted that white water rafting has not met with the projected income streams noted in the previous EIA studies" 4-22. Such statements need to be supported by figures showing projected trends and current trends. We acknowledge that this area is to be further investigated . Though we must protest that these unsubstantiated statements were included as a matter of public record.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	The baseline details contained in the scoping report comprised of high level secondary data from various sources. The baselines contained in the ESIA will comprise of secondary and primary data collected by the respective specialists. Baseline data collection followed on the Scoping Report generation so will be more robust in order to better inform the impact assessment.
In addition, there is no mention of compensation to individuals or companies who will lose revenue and livelihood should the dam go ahead. This is standard procedure according to the World bank guidelines? Safari-Par-Excellence has been operating in the area since 1990, employing hundreds of people and contributing to the tax base in an area earmarked for future tourism development.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	The Draft Scoping Report had not entailed an impact assessment or management plan as required at this stage of the study. This will be addressed in the Draft ESIA.
We would like to respectfully contend that the Batoka Gorge is a vital component in the livelihood and culture of the community in which the Batoka HES is to be situated. We contend that White Water Rafting is a signature activity and has directly influenced the growth of the tourism industry here in Livingstone, more than any other factor. We are gravely concerned that the consequences of the absolute loss of this industry have not been fully identified and addressed in the baseline study report.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	The ESIA Report will address this impact. The Draft Scoping Report recognised the need for this further level of consideration.
Furthermore, we are concerned that there is little mention of the Batoka Gorge area, known as Rapids 1-10 being inside the Mosi-Oa-tunya national park. While exhibited on the map FIG- 4.7, this area is under the protection of Zambian National Parks and is to be held for future generations. We contend that should the dam be created the entire fabric of the Victoria Falls area, a World Heritage site, will be jeopardized for future generations. The baseline information does indicate the existence of the park, but does not offer any information regarding the loss of this habitat in respect to Zambian National Parks and the heritage of the Zambian people.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	This will be addressed further in the biodiversity specialist study forming part of the Draft EIA Report.
In addition, we would like to suggest that the public be given the opportunity to suggest potential schemes to mitigate the negative employment and heritage losses of the dam. In the various meetings we were shown countless charts and diagrams. All outlining subsistence agriculture as the main income of the surrounding communities. As the baseline report indicates the dam will further exacerbate poor rainfall to the area. For the past two years we have seen crops fail due to poor rainfall. We would respectfully like to suggest a pump scheme to be considered in providing a steady water supply to the local communities should the dam be built?in the low season	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	Water provision has been identified as a community need and will be suggested as one of the community development initiatives in the ESIA and ESMP.
Additionally, in the baseline report it is contended that fish catches are higher during river high flows. This statement needs to be investigated and further explored. It is our observations that fishing catches increase. Furthermore, we would like to investigate the issue of new business, if the dam is to go ahead will affected businesses and individuals be given first preference for licenses for fishing or tourism? We feel this area has been poorly explored. Given the long deep oxygen deprived nature of the dam as shown in the baseline report.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	Email	This will be addressed further in the biodiversity specialist study forming part of the Draft EIA Report.
The dam is unlikely to harbor large fish stocks and with such an unaesthetic narrow space will it necessarily attract tourists?	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	email	This will be addressed further in the biodiversity specialist study forming part of the Draft EIA Report.
In addition, the animal/human conflict dilemma could be expected to rise dramatically . With the presence of crocodiles and hippos within the water base. The presence of such animals and reptiles would make it further unlikely that the water space could be used for other water based tourism. We contest the assumption that activities such as canoeing and windsurfing would replace rafting and adventure tourism . These factors absolutely need to be investigated further.We look forward to hearing from you and once again thank you for the opportunity for us to comment on the Initial Scoping Report before the ESIA begins.	Mr Graham Nel	Safari-Par-Excellence	22.01.2016	email	We do not expect any escalation of conflicts with wildlife as a result of the Batoka Reservoir. There may be an influx of people and increased encroachment of settlement and cultivation into areas occupied by wildlife leading to interactions, but those will not as a result of the Batoka Reservoir.
Importance of white water rafting and supporting industry minimised deliberately.	Graham Nel/ Sean Edington: Managing Director/	Safari Par Excellence, Zambia			The ESIA Report will address this impact. The Draft Scoping Report recognised the need for this further level of consideration.
Compliance with all legislative and constructive industry statutory obligations are met	Mr Muchapiwa Mazarura;	Zim Construction, Zimbabwe			Thank you for your comment.
Batoka Gorge Dam will have significant social and economic impacts due to loss of livelihoods, debt accrual for the nations and possible climate change impacts.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			Social and economic costs and benefits associated with the project will be assessed in the ESIA as part of the Tourism Study, Cost benefit analysis and macro-economic study.
Communities do not bear the costs of the development and that economically both countries stand to benefit in the short and long term	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			Thank you for your comment.
The ToRs were prepared 2 years ago. The ESIA should have commenced in 2014. The Scoping Report does not reflect the delay e.g at the time, the assessment of bat migrations was going to be omitted due to the timing of the studies.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			The matter will be addressed in the draft ESIA.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
The social impact assessment is limited to downstream water users, between Batoka dam site and Kariba dam. Urge for the assessment to extend the limits of the social impacts to include upstream users, especially those between the Victoria Falls and the Batoka Gorge dam who may end up being more negatively impacted more than the downstream users.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa		email	The social impact assessment has predominantly addressed upstream impacts in its assessment given that downstream impacts could be minimal. These will be presented in further detail in the ESIA Report.
Impacts of Batoka Gorge Dam extend beyond borders. Comprehensive assessment of impacts on the downstream infrastructure and dam operations, i.e for i.e. Kariba Dam and Cabora Bassa dam would be necessary. Investigate the impact of the Batoka Gorge dam on downstream environmental flows.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			The downstream impacts will be addressed in the Draft ESIA through the flow assessment.
Wastewater effluents have a significant impact on receiving waters. What will be the impact of wastewater emanating from the sewerage systems in Livingstone and Victoria Falls on the Batoka reservoir? How will eutrophication potential of the reservoir but it is not clear how this will be tackled?	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			The impacts on water quality in the reservoir and downstream will be discussed in the ESIA Report.
Scientific studies on the Zambezi river basin concluded that climate change impacts in the basin will affect hydropower production negatively, with impacts felt both nationally and regionally. Have you assessed the extent of climate change impacts on Batoka hydropower production?	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			This will be addressed in the flow assessment in the Draft ESIA Report.
There have been numerous incidents of huge tremors wrought by Kariba dam especially in the early years. There is no mention of an intention to assess the seismic impacts of the proposed reservoir.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			A reservoir cannot increase the seismic energy release, but can only trigger a fault slip, if it is near failure condition. A basic requirement for the triggering activity is therefore the existence of an active fault or a fault near its failure limit (ICOLD, 2011). For new dams, ICOLD, 2011 suggests that the maximum recorded Reservoir Triggered Seismicity (RTS) in the world should be assumed and states that, "as a rule, modern dams should be able to cope with RTS, as the largest RTS magnitude recorded to date is 6.3. But some appurtenant structures and nearby buildings and structures might require special attention." In the case of Batoka, the initial response to reservoir filling should be lower than for Kariba, given the much smaller reservoir volume. However, because of the greater dam height, it is probable that seismic events of a magnitude similar to those presently experienced will be induced by long term reduction of effective stresses in response to pore pressure adjustments. Looking at the seismic activity of Kariba after about 1966, i.e. the time after which pore pressure-induced quakes became dominant, the maximum magnitude was 5.5. Therefore, and as concluded by the Batoka JV Consultants (1993), the maximum magnitude verifiable at Batoka dam could be 5.5.
Fish production is closely linked to nutrient inflow and water levels in any water body and downstream. Batoka Gorge Dam will alter this water and nutrient flow. What is the potential impact of the proposed dam on fish production downstream of Batoka as it affects the large number of communities on the shores of Lake Kariba, Binga and Mlibizi basin that are totally reliant on this fish supply for their livelihoods? Fish studies from 1998/99 unreliable and obsolete.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			Fisheries studies will be conducted as part of the Environmental Flow and Biodiversity assessments being undertaken as part of the ESIA.
Give prominence to the potential influx of migrants and rapid population growth that lead to similarly large increases in demand for services, incidence of crime and spread of infectious diseases before, during and after the construction phase. Safeguard local people and allow them to benefit from the project should it go ahead.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			This impact will be assessed as part of the ESIA.
Adequately inform the World Heritage Committee and concerned representative other environmental organizations on project potential to reduce existing protected areas as well as encroaching on the World Heritage Site.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			Noted. Comment has been sought from UNESCO with regard to their views on the impact on the World Heritage Site.
Some Zambian communities complained about inadequate consultations. Local communities should be engaged to ensure their full involvement and participation in the development of appropriate mitigation measures. Consultations should not be confined to chiefs but include representatives of the communities and consult in local languages.	Rudo A. Sanyanga (Ph.D.) Africa Program Director	International Rivers, South Africa			Extensive consultation was undertaken with local communities as part of the Scoping Phase of the Project and this will be continued into the ESIA. This is documented in the Scoping Report.
Will the Batoka Gorge project impact on residential and industrial properties in the town of Victoria Falls in terms of possible rental requirements for the Project's personnel?	Ockie Strumpher; Brenda Stumpher	Individual, South Africa			It is anticipated that project personnel will be accommodated in the project townships, but in-migration into the area could have an indirect impact on property values and demand for rentals.
There are still far too many unknowns. It is difficult to consider the full impact of something that is not yet determined.	Ruth Henson	Livingstone Farmer, Zambia and WWF, Zambia			Further information will be provided in the ESIA in terms of both project description and impact assessment.
The analysis of alternative power sources seriously under rates solar power which is getting cheaper with new technology extending its operating hours(by heating salt). Suggest cost comparison using current prices.	Ruth Henson	Livingstone Farmer, Zambia			This will be evaluated in the ESIA. The reality is solar and wind are needed in addition to hydropower as part of the energy mix.
There is mention of city level biogas which is becoming more advanced in many other parts of the world.	Ruth Henson	Livingstone Farmer, Zambia			Feasible and alternatives sources of power have been extensively studied by Zimbabwe and Zambia as well as the SAPP and all projects rates in terms of their priority for implementation. The reality is alternative energy sources are needed in addition to hydropower as part of the energy mix.
There is no mention of other Zambian hydro power sites which should be many, further from drought zones and can be prioritised.	Ruth Henson	Livingstone Farmer, Zambia			This will be detailed in the Draft EIA Report.
No consideration for power saving alternatives e.g., by more efficient lighting (LED), cooking (solar, gas, biogas,etc) and water heating.	Ruth Henson	Livingstone Farmer, Zambia			Power savings have also been considered as have off the grid solar schemes, but the reality is, these initiatives, although helping to reduce the energy deficit, are not sufficient, resulting in the need for future significant generation capacity.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
No financial analysis on cost of the dam vs the risks of under utilization due to reduced rainfall and the loss of the existing and future tourism income. Tourism income lost will impact Livingstone which has no other industry besides tourism.	Ruth Henson	Livingstone Farmer, Zambia			A cost benefit analysis will be undertaken as part of the ESIA.
No cost impacts of flooding the existing power station in case of excessive rainfall	Ruth Henson	Livingstone Farmer, Zambia			
Little information linking the scheme to Livingstone. A power line across land proposed for farming will result in loss of vegetation and opening access to trespassers and thieves, a problem already being faced with existing lines crossing the land. Any compensation for the farm? Would electricity tariffs currently increased to 280% be reduced.	Ruth Henson	Livingstone Farmer, Zambia			ZRA to respond
Would electricity tariffs currently increased to 280% be reduced.	Ruth Henson	Livingstone Farmer, Zambia			ZRA to respond
WWF are thanked for the useful comments received on the Batoka HES ESIA. The ESIA has not been completed and many of the comments will be incorporated into relevant parts of the ecology impact assessment.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	Noted.
Avi-fauna (Zambezian endemic Taita Falcon and Rock Pratincole) – The Comments and Response Report states that appropriate mitigation measures will be developed with regards to adverse impact that might occur to the Taita falcon and other avi fauna. It is important that the gorge is part of the habitat for the identified and other bird species. Exactly what are the proposed mitigation measures for the bird species nesting in the gorge? How will mitigation for birds that are currently nesting in the gorge that will be filled up by the reservoir be carried out?	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	A biodiversity specialist study is being undertaken as part of the ESIA and will make commitments for the management of impacts on avifauna.
Avifauna (African Finfoot) – WWF acknowledges that indeed the African Finfoot is widely distributed throughout Africa, however, where they exist they are very sensitive to alterations in water courses and pollution. The species is considered vulnerable in that respect throughout its range. As a minimum, we would recommend monitoring of the local Finfoot population to establish its status, how it might be affected by the dam and offset measures proposed. Furthermore WWF acknowledges the use of the Zimbabwe Falconry Club and their extensive expertise. We would like to further suggest the inclusion of Zambian expertise in future consultations through the inclusion of BirdWatch Zambia.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	The African Finfoot is not as a threatened species on the IUCN Red List. This bird may persist in the inundated area and thus only be partially displaced. A biodiversity specialist study is being undertaken as part of the ESIA and will make commitments for the management of impacts on avifauna.
Freshwater fisheries (focus on tiger fish) – The CRR document states that although the fish in the river channel where Batoka Gorge reservoir is planned will suffer some adverse impacts in terms of diversity, an upstream riverine habitat for tiger fish breeding will be retained. Firstly tiger fish swim both upstream and downstream and the damming will inadvertently take away flows in this part of the river that will be transformed into a reservoir. This will limit the range of movement and migration for the fish species. Secondly, WWF would like details on how such an upstream habitat retained for tiger fish will be protected to ensure it remains available and habitable for the tiger fish.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	A biodiversity specialist study is being undertaken as part of the ESIA which will investigate and assess this impact.
Freshwater fisheries - WWF Zambia suggests that fish specialist studies in the area should establish if there are any fish species adapted to the harsh environment of Batoka and if there are any migratory species that will require attention. Granted, the harsh environment has presented a natural barrier to the movements of many species, it is probable that this barrier has also created a localised niche of fish species. Furthermore, the Batoka Gorge fishery not being accessible for human exploitation does not render it any less important as ecosystems (species) have inherent value.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	Detailed fish studies will be undertaken as part of the ESIA Environmental Flow Assessment . The Victoria Falls represents a major natural barrier to fish migration, and construction of a Dam will therefore not reduce any long distance fish migrations.
Transmission lines – The transmission lines are infrastructure that will not be on site in terms of BHES. WWF Zambia would therefore like to see that the Impact Assessment includes how impacts of powerline will be mitigated granted that this infrastructure will be off site.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	High level assessment of the impacts of the transmission lines will be included in the ESIA.
Vegetation - Entandrophragma caudatum (Mountain Mahogany) and the Gryocarpus americanus (Propeller Tree) - The response in the CRR focuses on the species of fauna mentioned and does not address the local flora species of interest highlighted. As a minimum, WWF strongly suggests that the ESIA estimates the stocking rates/levels and density of the mentioned localised species, estimate how much will be lost and what off-set measures will be recommended.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	Entandrophragma caudatum is listed as Least Concern on the IUCN Red List while Gryocarpus americanus is not evaluated. Both species are widespread and are not range restricted to the Batoka Gorge. Fieldwork for the ESIA has been completed, and it will not be possible to determine the occurrence of estimate densities of these trees in the gorge. We are however willing to engage with you on why these species are important and what mitigation can be included into the ESIA for these species.
Alien Invasive vegetation (Water hyacinth) – WWF acknowledges the suggestion to use biological control to mitigate future possible water hyacinth proliferation. We would like to suggest that full EIA be carried out for the proposed biological control to ensure that the right environmental protocols authorized in both Zimbabwe and Zambia are adhered to. Moreover the Zambezi is a watercourse shared by other countries further downstream of Batoka such as Mozambique it is important to also understand the position of the Zambezi Watercourse Commission (ZAMCOM) on biological control in this shared watercourse.	Chanda Mwale	WWF Zambia Country Office	22.01.2016	email	We can include a requirement within the current mitigation relating to control of floating aquatic weeds to consider the position of ZAMCOM prior to the use of biological control measures. If an EIA is required, then ZAMCOM should be responsible for raising that. We are aware that stipulating the requirement for an EIA would delay the response time to an outbreak of these floating weeds, which establish very quickly.
As the proprietor of a white-water rafting company based in Livingstone, Zambia, I would like to submit our comments regarding the Scoping Report. To avoid repeating what other rafting operators have submitted to you already (the content of which I support and agree with in full), I will limit myself in this letter to issues that have not been mentioned in those submissions, and that may be more relevant to my operation than to others.	Johannes Stallman	Bundu Adventures Ltd.			Comment noted
An important aspect of my rafting operation are the 'multi-day rafting' activities that we offer, where tourists come to Livingstone specifically to do this activity. These tourists would not come here if we did not offer this adventure, as they are not particularly interested in wildlife or the scenery of the area.	Johannes Stallman	Bundu Adventures Ltd.			The impact on river rafting's will be considered in the ESIA Report.
With the completion of the Batoka Dam the multi-day rafting activities will cease to operate completely, irrespective of the FSL (full supply level) that is eventually chosen.	Johannes Stallman	Bundu Adventures Ltd.			This statement is correct. It may, however be possible to reduce the full supply level during the low flow season to allow continued half day trips down the river.
I am more than willing to submit to you all the detail of numbers concerning my rafting activities: turn-over generated, percentage of turn-over contributed by our rafting activities, number of employees etc. These numbers will prove that it is not feasible for my company to continue without the possibility to offer rafting in the Batoka Gorge as other activities (canoeing, drifts on the upper Zambezi) contribute only a very small percentage (less than 20%) of the turn-over in the company.	Johannes Stallman	Bundu Adventures Ltd.			Thank you for your co-operation. A further understanding of each affected business will be required if compensation needs to be calculated. This is recommended as a further more detailed investigation in addition to the ESIA.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
In the Scoping Report there are numbers given regarding the benefit of employment etc. without the comparison with the loss of employment/revenue that will result from the building of the Batoka Dam. This gives a biased impression right from the beginning. I hope this omission will be rectified in any future assessments.	Johannes Stallman	Bundu Adventures Ltd.			The ESIA Reports will present the anticipated employment and economic figures to address this comment.
We (the rafting operators in Zambia and Zimbabwe) have specific numbers, hard facts. Not estimates! Any proper, balanced assessment must include data of employment/revenue lost due to the construction of the dam.	Johannes Stallman	Bundu Adventures Ltd.			The ESIA Reports will present the anticipated employment and economic figures to address this comment.
Your assumption in the report: 'other activities like adventure canoeing may well realize', give the impression that these may replace rafting (financially and economically) and compensate for the loss of rafting in the Batoka Gorge. That is hypothetical, and in my experience in the tourism industry, most improbable. 'Adventure canoeing' will never be a major attraction in the area of the Batoka Gorge once the dam has been built! We already have the Upper Zambezi (and other areas of the Zambezi River) which are incomparably more suited to 'adventure canoeing' than the Batoka Dam will ever be.	Johannes Stallman	Bundu Adventures Ltd.			ERM will be undertaking a socio-economic assessment of the impacts to ecotourism ventures as a result of the scheme. In addition, ERM commissioned an economic impact assessment for the feasibility of the scheme, which will investigate the macro level socio-economic impacts, as opposed to the former study, which concentrated on the regional socio-economic impacts. We acknowledge these impacts, but so too do we acknowledge other forms of tourism will materialise as a result of the scheme, but as you rightly suggest, this will not replace what is currently there.
In regards to your assumption that hotels and lodges will be built, overlooking the dam, I would like to point out that the lodges and hotels already in existence in that area are there because of the stunning and unique views of the Batoka Gorge: pristine and not under water! Do you think that flooding the area will induce investors to build more hotels and lodges? The development along the edge of the dam will be limited, at best. Awareness of Eco-Tourism is increasing, and will continue to do so. This trend directly contradicts your statements about development in that particular area.	Johannes Stallman	Bundu Adventures Ltd.			ERM will be undertaking a socio-economic assessment of the impacts to ecotourism ventures as a result of the scheme. In addition, ERM commissioned an economic impact assessment for the feasibility of the scheme, which will investigate the macro level socio-economic impacts, as opposed to the former study, which concentrated on the regional socio-economic impacts. We acknowledge these impacts, but so too do we acknowledge other forms of tourism will materialise as a result of the scheme, but as you rightly suggest, this will not replace what is currently there.
It is important to consult investors; tourism specialists before assumptions like these are made.	Johannes Stallman	Bundu Adventures Ltd.			ERM will be undertaking a socio-economic assessment of the impacts to ecotourism ventures as a result of the scheme. In addition, ERM commissioned an economic impact assessment for the feasibility of the scheme, which will investigate the macro level socio-economic impacts, as opposed to the former study, which concentrated on the regional socio-economic impacts. We acknowledge these impacts, but so too do we acknowledge other forms of tourism will materialise as a result of the scheme, but as you rightly suggest, this will not replace what is currently there.
I would like to comment on one more statement in the report: 'solar has repeatedly been shown to be undesirable, mainly due to high capital cost per kW'. The above statement is only true if cost is calculated over a relatively short period of operation (10 – 15 years, for example). And it is only true if all other factors (cost of environmental impact, cost of impact of climate change (the Zambezi Basin is an area of high impact, as you have correctly stated in your report) and cost of employment/revenue loss (relative to estimated gain in employment/revenue) are disregarded in the calculation. Solar is known to be a most desirable source of energy (financially, economically and environmentally) if calculated over a long period of time (20 – 30 years, and beyond).	Johannes Stallman	Bundu Adventures Ltd.			We agree that solar is a very viable form of energy. Comparatively, it is more expensive in terms of unit cost, when compared to Batoka, and cannot provide the generation needs to satisfy the energy deficit. Solar also only provides power during the day and cannot supply base load power, or peaking power as and when needed. What is needed is an energy mix, and solar and hydropower are both needed to fulfil this in both countries.
Any balanced, long term assessment of the Batoka Dam Project must include a serious, independent and impartial assessment of the option of implementing a solar solution to the energy needs of the region.	Johannes Stallman	Bundu Adventures Ltd.			This has been reported by various Government institutions and the SAPP. The feasibility engineers to the project do report on this, citing various sources.
People will be displaced from their homes, unless the company will be willing to compensate them	P. Samakong	Zimba District Council	13.01.2016		A Resettlement action plan will address issues related to displacement and compensation for those displaced by the project.
Flow of water on the Zambezi river will negatively be affected	P. Samakong	Zimba District Council	13.01.2016		This will be considered in the Environmental Flow Assessment being undertaken as part of the ESIA.
I wish to voice my unhappiness at the proposed dam to be built in the gorge. I was born in Zambia & grew up at Livingstone in Zambia. The river was a source of food & enjoyment for all the people who lived there then & still do. Zambia only has agriculture & tourism for their economy growth & the dam will destroy the peoples livelihood. All the river guides will lose their jobs. Please register my TOTAL OBJECTION TO THIS PROPOSAL.	Harry Wise		31.12.2015		The ESIA Report will present the anticipated employment and economic figures to address this comment.
From the previous communication there is need to visit the site, thereafter a full assessment report will be produced. A letter was sent via email on the requirements.	B.Tagwirei		10.12.2015		The ZRA has been notified of this request from ZINWA.
That plan is not very good , we know Zimbabwe needs money from the power sales. Zambians why do you get driven by Zimbabwe goverment.	Clement Chisangwa		16.12.2015		There is a power deficit in the two countries and the region. The Batoka Project is aim contributing to reducing this power deficit.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
It is not clear to me if any further specialist studies have been conducted – the documents seem to refer to studies that will be done in the future. Could you clarify exactly which, if any specialist studies will be done in the Impact Assessment Phase.	Marie-Louise Kellett		08.12.2015		Specialist work has been undertaken as part of the Impact Assessment Phase of the Project. The results thereof will be included in the ESIA Report
It also seems that you will be relying on existing studies or work done by others, e.g. the Falconry Club. Whilst I am not intending to cast aspersion on their knowledge, surely a specialised ornithological study should be done and paid for? Similarly, the WWF did not seem to know of the survey you were referring to - this turned out to be a country wide survey of elephants and certainly not a detailed specialist study for the Batoka Gorge. This applies to each and every concern that has been raised – it is not acceptable to spend millions on specialist engineering studies and then try to meet the requirements for biodiversity, economic and community impact studies and concerns using 'borrowed' data and desktop surveys.	Marie-Louise Kellett		08.12.2015		There is nothing gained by repeating studies for the sake of it. When good data is available, it is sensible to use that data. The ZFC have a good and up-to-date knowledge of the situation with Taita Falcons, also field studies are difficult to conduct because of the rarity and elusiveness of these birds. A sound knowledge of the Taita Falcon's has been acquired. The Batoka project will not have a significant impact to elephant populations or movements. Elephants are not able to access the Batoka Gorge due to the steep terrain. A standalone elephant study is not justified, however the WWF annual elephant survey was being conducted and available data was therefore incorporated.
The response to the many detailed comments and requests from community members with regards to the community development are extremely vague – a generic 'cut and paste' response is given in each case. This is simply not good enough. It looks like you are going through the motions without actually giving a proper response to the issues raised. A proper, completely independent and impartial process of public consultation and an assessment of local community needs must be done.	Marie-Louise Kellett		08.12.2015		Noted. At scoping phase of the ESIA , there usually many unknowns due to the fact that the specialist studies are often not commissioned or are underway and the primary objective of the Scoping Phase is to ensure that issues requiring further investigation are identified. More detailed responses will be provided in the Impact Assessment Phase of the Project.
Provision of details to register available industrial and/or residential property/space within Victoria Falls/Livingstone area/s that could be made available for possible project rental space requirements.	Ockie Strumpher	Gayatri Paper – Western Cape	22.01.2016	Email	This falls beyond the scope of the ESIA and further discussions should be held going forward with the project proponent.
The final document should clearly spell out relocation modalities, recommendations which suggest full compensation of, or to be given be displaced population, and such relocation should be done taking into account the socio-economic and cultural consitutional rights of the affected communities	Mr T Mugoriya	Ministry of Rural Development, Preservation and Promotion of National Culture and Heritage	05.02.2016		A Resettlement Action Plan will address issues related to displacement and compensation for those affected along with the losses of cultural heritage or sacred sites.
Interim Notification					
Sad to hear this is suddenly all back on track, we were under the impression the ESIA was a shambles and would require a complete make over. Anyway, we can but hope that the world sees region, at least this time we hope the tourism industry is sufficiently covered.	Sean Edington	Safari Par Excellence	06.12.2018	Email	A tourism impact study has been undertaken as part of the ESIA process and the impacts of the Project on tourism will be addressed in the ESIA Report, and mitigation measures to reduce the impacts will be included in the Environmental and Social Management Plans.
I am writing on behalf of the proposal of the Batoka Gorge Dam on the Zambezi river. I have traveled to Zambia on three different occasions to visit the Zambezi River. After my first visit, I fell in love with the Zambezi river and the Batoka Gorge. If the dam where to be built it would be a tragedy for humanity. I was given the opportunity to spend two seasons working on the Zambezi river taking tourist from all over the world down the Zambezi river, through the Batoka Gorge. I have spent over 10 years traveling the world working as a guide on rivers and the Zambezi is by far one of the most beautiful and magical places I have ever visited. The social, biodiversity and heritage impacts would be horrific if there was a dam built in the Batoka Gorge. Please, please reconsider building the dam in the Batoka Gorge. There have to be more sustainable ways to approach the need for electricity, whether it be solar or wind. The negative impacts would be terrible for the local communities and for future generations. A dream of mine would be to share the Zambezi river and the rapids, wildlife, and beauty of the Batoka Gorge with my children. Please do not take this dream away from me.	Andrew Matthews		06.12.2018	Email	A tourism impact study has been undertaken as part of the ESIA process, this includes assessing the potential impact on the white water rafting industry. The overall environmental and social impacts of the Project will be assessed in the ESIA Report, in addition, mitigation measures to minimise the impacts will be included in the Environmental and Social Management Plans.
Thank you for this message – there are most certainly some areas of concern with regards to both the environment and tourism viability that are worrying some sectors of our industry and so I look forward to further engagement.	Robin Brown	CANSAF	07.12.2018	Email	Noted, the overall environmental impacts of the Project will be assessed in the ESIA Report, in addition, mitigation measures to minimise the impacts will be included in the Environmental and Social Management Plans.
I was forwarded the recent letter sent to stakeholders for the ESIA Project for this. I was surprised I did not receive one on behalf of the International Rafting Federation as I was sure we had indicated that we were stakeholders, especially as having had face to face meetings with you and a number of email exchanges. Anyway - please can you add us as stakeholders and please use the email address. The names associated with it should be: Sue Liell-Cock (Sec Gen of IRF) and Sean Clarke (IRF Media Rep). Let me know if you need more information.	Sue Liell-Cock	International Rafting Federation	07.12.2018	Email	Noted, you have been added to the stakeholder database for this Project.
I am an interested party in the Batoka Dam issue. Please send me information about the project as it continues.	Gary Wockner		07.12.2018	Email	Noted, you have been added to the stakeholder database for this Project.
Please register me as an interested party (raftingtour operator from Europe) about Batoka Dam project. It would be a pleasure to get the up-to-date information about this project which could destroy our branch and the beautiful nature of the mighty Zambezi river. Thank You in advance.	"Roy" Gergely Környei	AOS Rafting	07.12.2018	Email	Noted, you have been added to the stakeholder database. Further communication will follow with the release of the Draft Environmental and Social Impact Assessment Report in a few months' time.
Just heard the project is back on, would like to help as much as possible to try and stop this environmental nightmare..	Steve Taylor	Askari Safaris LLC	07.12.2018	Email	Noted, you have been added to the stakeholder database for this Project.
Thank you so much for the update about the new developments pertaining the Batoka project.I would like to be part of the ESIA till commencement of the project. Looking forward to the kick start of the project ESIA meetings	Trymore Ndolo		08.12.2018	Email	Noted, you have been added to the stakeholder database. The stakeholder engagement meetings are planned following the release of the Draft ESIA for comment. All registered stakeholders will be notified of the date and time of Project meetings.
I would like to register as an interested party	Fiona Buttrey		08.12.2018	Email	Noted, you have been added to the stakeholder database for this Project.
I would like to register my objection to this project. Please keep me informed	Pam bell		08.12.2018	Email	Noted, you have been added to the stakeholder database for this Project.
I'd like to be registered as an interested party in The Batoka Dam project.	Erin Carey		08.12.2018	Email	Noted, you have been added to the stakeholder database of this Project.
I was told to email you in interest to aiding in protesting the daming the Zambizi. If this is correct please let me know if and how I can help.	Stone		09.12.2018	Email	Noted, you have been added to the stakeholder database for this Project. Please contact ERM to raise any issues of concern for the Project.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
Please add our addresses cc above to your mailing lists. We are definitely stakeholders here as we have tourism operations including lodges within the Batoka Dam area.	Mark Butcher		10.12.2018	Email	Noted. you have been added to the stakeholder database for this Project.
I want to save the zam.	Matt Blue		10.12.2018	Email	Noted, you have been added to the stakeholder database. This platform will provide you with an opportunity to raise issues to inform the development of the ESIA.
I wish to register as an interested party regarding the Batoka assessment.	Richard Addison		12.12.2018	Email	Noted, you have been added to the stakeholder database for this Project.
I wish to inform you that I work for Zambia Environmental Management Agency. We are available to provide guidance on the EIA process for the Batoka Gorge Hydro Electricity Generation Project where required.	Lillian Kalenge		12.12.2018	Email	Noted, you have been added to the stakeholder database. ERM welcomes any guidance from the Zambia Environmental Management Agency as it will inform the development of the ESIA Report.
We are a rafting company and travel agency located in Austria. We organize trips for rafting on the Zambezi and work together with local companies. Please let me know how we can get registered as interested party concerning the Batoka dam project. This dam will not only destroy one of the greatest whitewater rivers on earth but also will badly influence the local eco system and adventure tourism.	Lukas Strobl		21.12.2018	Email	Noted. A tourism impact study and biodiversity study have been undertaken as part of the ESIA process. The impacts of the Project on tourism and livelihoods will be addressed in the ESIA Report, in addition, mitigation measures to minimise the impacts will be included in the Environmental and Social Management Plans.
I'd like to register my objection as an interested and affected party with regards the Zambezi dam	Sam Helliwell	NIRAS	28.12.2018	Email	Noted. you have been added to the stakeholder database for this Project. You are welcome to submit any issues and concerns for consideration during the ESIA Phase .
I would like to register as an interested party concerning the Batoka Gorge. I am one of the owners of Taita Falcon Lodge that will be directly influenced by the building of the dam as we are situated on the edge of the Batoka Gorge above R17 and we are very concerned as nobody has contacted us yet to talk to us even after numerous emails to the people involved.	Anmarie Fourie	Taita Falcon Lodge	03.01.2019	Email	Please be assured that you have been added to our stakeholder database, and will receive communications and information from ERM going forward. A tourism impact study has been undertaken as part of the ESIA process, and the impacts of the Project on tourism and livelihoods will addressed in the ESIA Report, in addition, mitigation measures to minimise the impacts will included in the Environmental and Social Management Plans.
In reference to the above subject, I have been asked to contact you and submit my details as representative for the Ministry of Tourism and Arts in Zambia.	Joseph Thole	Ministry of Tourism Zambia	28.01.2019	Emsil	Noted, you have been added to the stakeholder database. ERM welcomes any guidance from the Ministry as it will inform the development of the ESIA Report.
a short informal Youtube clip on a trip down the gorge has been done. There is obviously reference to the dam being built. As ERM is undertaking the environmental and social impact assessment I am making contact. The clip will probably be seen by many viewers. If it helps with gathering direct input or comment from the general public maybe you could send through an email address / and name that can be shared as a contact for enquiries ? As a resident in Victoria Falls I am concerned about the impact of the dam and the lack of available information on the dam. It still seems unclear or undecided whether the dam will be a storage or run of the river. It is unclear how far up flooding may occur. Is it possible that ERM could urgently provide a detailed statement as to the status of the dam for stakeholders and the wider community ?	Larry Norton	Larry Norton	08.02.2019	Email	Thank you for your correspondence and interest in the Batoka Gorge Hydro-Electric Scheme ESIA. ERM was been appointed by the Zambezi River Authority (ZRA) to prepare an Environmental and Social Impact Assessment (ESIA) for the Project. An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners. Prior to the end of 2015, ERM and its team had completed the Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies had been completed in order to inform the content of an ESIA. A Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared and submitted to the ZRA for its review in late 2015. It was at this stage that the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced. As of October 2018, the ESIA process has recommenced. It is intended that a Final ESIA reports and ESMPs will be submitted to the Regulatory Authorities in both countries mid-2019. The scope of the remaining tasks will be to utilise the work undertaken to date to complete the remaining steps in the ESIA process. In addition, given that there is now a better understanding of the extent of land take associated with some of the Project and its associated infrastructure, the resettlement planning work will also commence. The ESIA will provide further detail around the project description, and will discuss the potential adverse and positive impacts associated with the Project, and proposed mitigation measures to manage impacts will be included in an Environmental and Social Management Plans (ESMPs) which forms part of the draft ESIAs. During this disclosure period, ERM will host a series of public meetings to share the findings of the ESIAs, and all stakeholders on our database will be notified of the date, time and venue of the meetings. We would, therefore, encourage any person interested in Project or wanting to be kept informed, to register as stakeholder by contacting ERM at: batokagorgehes@erm.com Please don't hesitate to contact ERM should you have any further questions.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
I received the mail below late last year. Since then I have heard nothing. Please advise on how we can contribute and what action has been taken since then. 1. What further opportunities for stakeholder engagement have been made available? 2. In terms of the timelines presented in the attached letter; a. What further work on the various impacts have been done? Provide detailed feedback on this please. 3. When will we be able access and comment on the studies done to date on the impact on tourism, ecology etc 4. How does the continued difficult political situation and ongoing human rights abuses in Zimbabwe affect the project?	Marie-Louise Kellett	Gravity Adventures	14.02.2019	Email	Thank you for your email. Per the letter sent through to you in December 2018, ERM intends completing the remaining steps in the Environmental and Social Impact Assessment (ESIA) process, which primarily includes – • Finalisation of the ESIA reports and associated Environmental and Social Management Plans (ESMPs) utilizing the specialist work undertaken to date, which includes: o Water Resource Studies o Biological Studies o Socio-economic studies (including CH, tourism, resettlement) o Economic impact studies • As part of ESIA finalisation the following additional work was undertaken: o Refinement of the operating rules of the dam to find the balance between minimising environmental impacts downstream, together with maximizing power output. o Additional baseline validation field work for project footprint areas that were not covered in previous specialist studies. All specialist studies undertaken as part of the ESIA process will be appended to the draft ESIA reports, which will be made available for a 30 day stakeholder review and comment period once complete. All stakeholders on our stakeholder database will be notified when the draft ESIA reports are available, and informed of how they can access a copy of the reports. It is anticipated that the draft ESIA reports will be available for comment towards mid-2019. Moreover, there will be a series of ESIA stakeholder meetings to disclose the findings of the ESIA, and allow stakeholders to ask questions and provide comment. This round of engagement will also target broader communities in the Project Affected Area. Community engagement will be such that information can be digested by a non-technical audience. Regarding your comment on the political situation and human rights violations in Zimbabwe, our task is to undertake the environmental and social studies for the Project to lender standards. Ultimately, it is the lenders that will need to make an informed decision regarding investment in the Project going forward. Also to note, is that the Project will undertake a detailed Resettlement Action Planning process for both physical and economic displacement. This process will also be undertaken in accordance with international lender requirements.
Comments from Stakeholder Meetings					
Concern that this project has stalled for a long time and people are wondering just when this will become a reality. He further assured the consultants of support from the Southern Province as this project will contribute to the growth of the economy by attracting investors into the province	M Liomba	Southern Province Permanent Secretary-Choma	03.12.2018	Meeting	Comment noted.
The past load-shedding the country experienced is an indicator of the need for additional power. The province is planning to host its first ever provincial trade expo next year starting 15th September 2019.	M Liomba	Southern Province Permanent Secretary-Choma	03.12.2018	Meeting	Comment noted.
The Southern Province permanent secretary can be of assistance, should any problems arise associated with the work that the team is undertaking.	M Liomba	Southern Province Permanent Secretary-Choma	03.12.2018	Meeting	Comment noted, thank you for your assistance.
It would be best if the road was left as currently proposed so that the residents can enjoy the benefits of a good road, especially when it comes to transporting their agricultural products to the market.	Chief Mukuni	HRH Chief Mukuni	04.12.2018	Meeting	Comment noted this will be passed on to the design team.
The chief informed the consultants that the affected people were called to the palace to discuss the possibility of a resettlement as a result of the proposed access road and these affected people understood the potential implications of the project. He also said that looking at the size of his village, resettled people can definitely remain within the same village.	Chief Mukuni	HRH Chief Mukuni	04.12.2018	Meeting	Comment noted, this will be considered in the resettlement phases.
For the resettlement work it will be important to engage with the village matriarch (locally called 'Diyango') as she is the one in charge of land issues while the headman is in charge of dealing with people.	Chief Mukuni	HRH Chief Mukuni	04.12.2018	Meeting	Comment noted, this will be considered in the resettlement phases.
The proposed transmission power line route is not populated. I will help to ensure that the EIA process flows smoothly.	Chief Mukuni	HRH Chief Mukuni	04.12.2018	Meeting	Comment noted., the potential impacts along the transmission line will be assessed in the ESIA.
Engagement with the District Council is important. In previous rounds of engagement, all the meetings were held in Livingstone which does not fall within the project area.	Kazungula District Council	Kazungula District Council	04.12.2018	Meeting	This will be taken into consideration for future engagements.
The Kazungula District Council is responsible for land take greater than 250 ha which will need to be converted into state land. The Council is well equipped and ready to work with the team.	Kazungula District Council	Kazungula District Council	04.12.2018	Meeting	Comment noted, this will be considered in the resettlement phases.
People in the project area as people have high expectations of the project and are tired of hearing about it and want it done.	Kazungula District Council	Kazungula District Council	04.12.2018	Meeting	Comment noted, however it is important the due process is followed in order to obtain the required environmental authorisation.
The project will help with the power deficits that affect this area.	Kazungula District Council	Kazungula District Council	04.12.2018	Meeting	Comment noted
When will this project commence?	Kazungula District Council	Kazungula District Council	04.12.2018	Meeting	Stakeholder referred to the interim introduction letter for this information.
It was agreed that the Town Planner was going to be the direct contact person for the Kazangulu District Council.	Kazungula District Council	Kazungula District Council	04.12.2018	Meeting	Comment noted
How many youths that will be employed by the project?	Chilufya Chibiliti	Livingstone City Council	05.12.2018	Meeting	The exact numbers to be recruited can only be determined at a later stage of the project. Workers will be sourced from both Zambia and Zimbabwe.
Will the Council be consulted on the proposed project? Previously the Council was not kept up to date. The Council is the centre for information dissemination and as such the Council must have latest information to share with the public.	Livingstone City Council	Livingstone City Council	05.12.2018	Meeting	The Council will be added to the stakeholder database and be updated throughout the ESIA process.
We are concerned that ZRA usually tends to go quiet and that leaves the Council in a dilemma when questions are asked about the project.	Livingstone City Council	Livingstone City Council	05.12.2018	Meeting	As a key stakeholder, you will be kept up to date on the ESIA as the process progresses.
What is the involvement and impact of the project on the affected communities?	Livingstone City Council	Livingstone City Council	05.12.2018	Meeting	There are benefits associated with the project in terms of employment and community development Adverse impacts include those associated with physical and economic displacement, impacts on tourism and changes in sense of place. All positive and negative impacts will be assessed in the ESIA.
The project is a very welcome one and it is long overdue.	Livingstone City Council	Livingstone City Council	05.12.2018	Meeting	Comment noted.
Why is the District Council being briefed when they are so far away from the project area?	Elizabeth L Moteto	Zimba District	06.12.2018	Meeting	The transmission line passes through the Zimba District and thus it is important that the Council is engaged as a stakeholder.
You are all welcome. I am aware of the project. I have previously had a meeting with the ZRA who informed me about the proposed project activities in my area of jurisdiction.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	Thank you.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
I am concerned as to what would happen to the water frontage around his area. Will access to the river be lost and what will happen to flows downstream? What are the changes downstream of Kariba like – so I can understand what to expect downstream of this dam.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	The dam will be a run of river operation so flows downstream should not change significantly after the construction of the dam. There may be some change experienced during the construction phase. Access downstream will not be restricted.
Will there be any resettlements in the neighbouring chiefdoms of HRH Chief Mukuni and HRH Chief Sipatunyana?	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	Resettlement in these areas are anticipated but this is likely to be limited.
Will there be a road constructed linking the two countries in the area of the dam.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	There will be a full-fledged border post with all amenities including government facilities and installations and security on both sides.
There is a history of cattle rustlers from his chiefdom who go to steal cattle from the Zimbabwean side. A number of his subjects are still serving jail sentences in Zimbabwe even as we speak. He said that this problem is slowly being dealt with. The road between the countries will need to be properly managed.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	As this will be a control border post, access will be controlled and the road will be managed to mitigate criminal activity.
During the liberation struggle for Zimbabwe, my chiefdom was used as a battlefield. There are many landmines that are scattered in the area and are still present. Just two months ago 14 cows were blown up by these landmines, and about two years ago a group of Germans from the World Bank was also killed by these landmines. Caution should be exercised when visiting that area. There is a man, a former soldier who was part of the battle in the area bordering Mukuni village who is very knowledgeable when it comes to this area and it would be nice if he can be convinced to work with our team as he knows exact locations where these landmines and guns are buried, but he is not a cooperative person. The chief said that the area prone to landmines is the area along Kalomo river bordering between Simwatachela and Mukuni villages.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	Thank you for this information. We will take this into account during our planning as health and safety is a keep priority.
This chiefdom is very rich in minerals including gemstones and coal and there is a very big possibility that there are some oil deposits. I am in early discussions with a Chinese investor to set up a thermal power plant.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	Comment noted.
ERM should set up community development projects so that locals can benefit. There is a very high level of illiteracy and unemployment among my people due to the remoteness of the area.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	Comment noted. ZRA will develop a Corporate Social Responsibility programme for the project that will outline how a portion of funds from the project will be used to help support the economic and social development of directly affected and neighbouring communities.
At what stage is the project currently? We are desperately looking forward to the project.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	The feasibility studies are still underway. The ESIA is being updated and will be released for comment towards the middle of 2019.
The area downstream of McDonald's farm in excess of 3,500ha was given to an investor who never developed it and left after converting it into state land. There are some people who have illegally settled there as the land is still a contentious issue. The fishermen found in the area are illegal fishermen as they do not have the necessary licences and do not observe government fishing bans as they have little chance of being caught by the regulatory authorities. He noted, that with the Batoka Project, the area will become more accessible, such things will cease to happen and revenue collection will become a reality.	Chief Simwatachela	Chief Simwatachela	10.12.2018	Meeting	Comment noted.
Can you assist in profiling the skills levels of the local people so that it becomes easier to identify people to employ in the project?	ZRA	ZRA	10.12.2018	Meeting	I will assist where I can. Most of my subjects do not even have national registration cards and are not registered citizens.
I am currently based in Choma town along Macha road until my palace is rebuilt after I was almost burned to death when my palace was petrol-bombed by unknown people. Two people who were in the house with me were burnt to ashes. I believe that the attack was politically motivated as I am in a predominantly opposition-led province which refuses to work with the Government.I am aware of the project. My people are looking forward to the jobs that will arise from this project. We are in support of the project as it will bring progress in my chiefdom.There are numerous of degree holders in my area.	Chief Mweemba	Chief Mweemba	13.12.2018	Meeting	Comment noted. Please encourage your subjects to attain some form of qualification to stand a better chance of getting some of the anticipated jobs for the project. Please develop a register of the skilled people in the area.
Any projects in your area will be supported since you are one of the chiefdoms that was displaced during the construction of the Kariba dam. We will continue to support your traditional ceremonies.	ZRA	ZRA	13.12.2018	Meeting	Comment noted.
When is the project team going to visit me in my chiefdom so that people can hear for themselves the good news. Meetings with my people are required.	Chief Mweemba	Chief Mweemba	13.12.2018	Meeting	There will be further feedback that is undertaken as part of the ESIA Process and your community will be engaged with during that period.
Are there any security and safety issues in your chiefdom?	ZRA	ZRA	13.12.2018	Meeting	There could be some landmines on the border with Simwatachela chiefdom but there has never been any incident of landmines in my chiefdom. My chiefdom has a considerable number of wild animals but not the carnivorous type.
Some time back I received a large document to comment on for the project. I have not yet looked at this document, but I am aware of the project. People in this chiefdom were forcibly evicted from the current area by the colonial masters and the area was converted into commercial farms which the government then converted into state land. After independence the white farmers left and the people had to buy back their ancestral land which I am not happy about. Currently this is still State Land and even the palace (Farm number 1849) is on State Land and I am renting it. The fight to convert it back to traditional land is still ongoing in courts.	Chief Sipatunyama	Chief Sipatunyama	11.12.2018	Meeting	Comment noted. There is anticipated to be limited impact on your area – displacement associated with the power line.
Will there be a backflow on the Kalomo river since the proposed dam wall will be where the Kalomo river joins the Zambezi river. The locals are looking forward to the backflow as this will help retain some water on the Kalomo river for farming. Are there enough streams to feed into the dam or is the only water source the Zambezi river?	Chief Sipatunyama	Chief Sipatunyama	11.12.2018	Meeting	The project is for a run of river operation and so backflow is not anticipated.
Will the project be as large as Kariba dam? If there are no backflows on the Kalomo River then the project is unlikely to be of too much benefit for my subjects. I am elated to hear about possible jobs as there is a high rate of unemployment in his area.	Chief Sipatunyama	Chief Sipatunyama	11.12.2018	Meeting	This will be a much smaller project. It is anticipated that benefits will be in form of jobs, both skilled and unskilled. Please could you assist us by identifying skilled labour in the area.
How long will the project take?	Chief Sipatunyama	Chief Sipatunyama	11.12.2018	Meeting	There are many factors that still require resolution and authorization before the project can proceed.
I am aware of the fact that the proposed dam will be supplying water to towns in Zimbabwe.	Chief Sipatunyama	Chief Sipatunyama	11.12.2018	Meeting	This is no longer the case, but there were research studies undertaken for the consideration thereof previously
I am happy to hear about ZRA's commitment to supporting traditional ceremonies and existing CSR. It is commendable that an organisation can commit to ploughing back into the community where they work as most other business people do not do this. This chiefdom has a traditional ceremony called 'Musamu Muyumu' loosely translated as 'the big tree', which takes place late August but sometimes due to financial challenges it takes place as late as early November.	Chief Sipatunyama	Chief Sipatunyama	11.12.2018	Meeting	Comment noted.
Are there any safety issues in this chiefdom?	ZRA	ZRA	11.12.2018	Meeting	This area was not affected by the liberation struggle in Zimbabwe. There is no threat of landmines and safety is guaranteed.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
What traditional shrines and sites are in your chiefdom	ZRA/ERM	ZRA/ERM	11.12.2018	Meeting	There is a ridge that was disturbed during the construction of the existing power line on the border with Simwatachela chiefdom. The developers got some stones and I want those stones back as they are important for our tradition and culture. There are also some fruits and trees which should not be cut down, but when it comes to such developments, it is inevitable that they are cut to pave way for the project. Guidance will be provided. There are no shrines in my chiefdom
The Agritex Department (Ministry of Lands) is mandated to resettle communities and is responsible for the identification of eligible land for allocation to beneficiaries. We will require details on specific communities and populations to be resettled.	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted.
Zimbabwe legislation does not require compensation for the physical displacement of households from A2 farms (farms allocated to beneficiaries after agrarian land reform programme). Economic losses are however noted as requiring compensation.	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted, entitlement and compensation will be investigated during the resettlement phase and a Resettlement Action Plan will be developed to ensure a transparent and consistent approach to compensation.
Key considerations used in determining where to resettle households are: • Arable and grazing land availability; • Irrigation potential; • Soil fertility; • Terrain; and • Social infrastructure.	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted, entitlement and compensation will be investigated during the resettlement phase and a Resettlement Action Plan will be developed to ensure a transparent and consistent approach to compensation.
Agritex and Ministry of Lands will select the host sites in consultation with other relevant government departments. Agritex and the Lands Ministry will also determine which existing communities have vacancies for more settlers.	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted.
It is important that the availability of social infrastructure in existing settlements is identified to prevent new settlers from exerting pressure on this infrastructure.	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted, this will be considered as part of the Resettlement Action Plan.
The role of Agritex/Ministry of Lands is as follows: • Identification of lands with other government departments • Ascertaining the carrying capacities of replacement land which is flexible and will depend on the need and stakeholder views. This can range from 103.5 hectares/ household to 40 – 50 hectares/household on A1 farms. Traditional communities have land sizes of 6 hectares per household. • Determining vacancies among existing communities for more households • Determining the availability of social infrastructure in existing settlements to prevent new settlers from exerting pressure on this infrastructure • Providing valuation criteria for assets prior to the relocation of households • Determination of levels of crop loss for households to be resettled • Determination of land viability in destination settlement • Determination of food security components in destination settlement • Determination of farmers' asset worth pre- and post-resettlement • Pegging of land for new settlers (demarcating and allocating land)	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted.
A list of other relevant government departments and communities recommended was provided. This list include the following stakeholders: • DA's office that will contribute to the determination of resettlement costs and ensure that resettled families are provided with habitable structures; • Forestry Commission that may cede land to be used for cultivation or grazing; • National Parks and Wildlife Management Authority may advise on suitability for settlement based on local human- wildlife conflict ; and • Recipient communities to be consulted on the desirability of new households	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted.
It was also recommended that the developer should facilitate the development of clinics and water access to ensure the availability of social services in new settlements (The concern is that the District has poor social infrastructure and new settlers will exert pressure on existing infrastructure).	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted, this will be considered as part of the Resettlement Action Plan.
In terms of livelihood restoration it was suggested that irrigation facilities are provided, avoiding the cooperative approach and individualising access.	Mr Marandu	Hwange District Administration (Ministry of Lands)	27.11.2018	Meeting	Comment noted, this will be considered as part of the Resettlement Action Plan.
We are concerned about the project dates. The commencement of the project is highly anticipated with expectations around employment	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	The feasibility studies are still underway. The ESIA is being updated and will be released for comment towards the middle of 2019.
There is uncertainty as to how the Project will affect tourism.	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	A tourism study has been undertaken as part of the ESIA process, this includes assessing the potential impact on the white water rafting industry. The overall environmental and social impacts of the Project will be assessed in the ESIA Report, in addition, mitigation measures to minimise the impacts will be included in the Environmental and Social Management Plans.
Broad stakeholder consultations involving the local authority, Chiefs, local leaders (Councillors and Headmen as well as village heads) and households to be resettled are required for the Resettlement Action Plan. The Headmen will be updated and kept informed by the Chiefs, but engagement with them is still desirable as their buy-in is critical. Households to be resettled should also be consulted. Communities in the area already have an awareness that post-resettlement their lives should be better off than they currently are. Communities are not against resettlement because they anticipate better lives and economic prospects. One of the local chiefs is already considering potential entrepreneurial opportunities that can be offered by the project. Others are considering using the project for purposes of urbanisation	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	Comment noted, this will be considered as part of the resettlement phase and Resettlement Action Plan.
The District Administrator's office and the Ministry of Lands will be responsible for identification of land for resettling households affected by resettlement	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	Comment noted.
The Hwange Rural District Council (HRDC) is the planning authority and is already aware of the need for resettlement as a consequence of the Batoka Gorge Project. The HRDC is considering creating a settlement for relocated households in the Fuller Forest and Ndhlovu as well as any other less populated areas should they be available.	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	Comment noted.
Project sensitivities include the need for transparency and honouring commitments. There is a legacy of empty promises made for the ZIZZABONA power line project being undertaken by Zimbabwe Electricity Transmission and Distribution Company (ZETDC))	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	Comment noted.
A list of recommended stakeholders to be consulted was provided. This list include the following stakeholders: • A meeting with Chief Shana, who is the Provincial Chairman of all the Chiefs of Matebeleland Provinces • The District Agritex Officer Mr Marandu who used to be the local Chief Lands Officer • The Town Clerk of Victoria Falls on issues of tourism.	Mr Muleya	Hwange District Administration	27.11.2018	Meeting	ERM has accommodated meetings with Chief Shana and the District Agritex Officer as part of this site visit. The Town Clerk of Victoria Falls is on our stakeholder database and will receive notification that the project has recommenced.

Comment/Question+A1:G1	Commentator	Organisation	Date	Source	Response
HRDC experienced a poor resettlement exercise by a developer that elicited resistance from affected communities. The HRDC appreciated the consultative approach being undertaken by ERM.	Mr Mudenda	Hwange Rural District Council	28.11.2018	Meeting	Comment noted, this will be considered as part of the resettlement phase and Resettlement Action Plan.
HRDC has the role of coordination, bringing together the mandates of the DA, Ministry of Lands and Agriculture, Forestry Commission, traditional leaders and elected representatives in development in the District. For planning purposes the Council will require the number of villages, households and people to be affected	Mr Mudenda	Hwange Rural District Council	28.11.2018	Meeting	Comment noted.
Why has the project taken this long to materialise? The HRDC is worried about the endless project time lines.	Mr Mudenda	Hwange Rural District Council	28.11.2018	Meeting	There were outstanding issues related to the engineering design and meeting funder's requirements that needed to be addressed which caused a delay. The World Bank has specific conditions that have to be met to ensure that projects align to various social and economic standards. Project sign off can only proceed when such conditions have been met and all legally required permits are in place, such as environmental authorisation.
The RDC plan to establish a township that would have all support services and housing 6.5 km from the Batoka plant site and proposed to establish this township in collaboration with ZRA. Another urban satellite town was being developed at Ndhlovu and the Batoka Project could also facilitate growth of this urban settlement.	Mr Mudenda	Hwange Rural District Council	28.11.2018	Meeting	Comment noted
What is the Project's rollout plan?	Mr Mudenda	Hwange Rural District Council	28.11.2018	Meeting	The commencement dates depend on the outcome of on-going RPF, RAP and environmental studies as well as the securing of finances to develop the project. The stakeholder notification letter addresses some of these issues.
The issue of resettlement is new to the ward councilor. Resettlement is unlikely to be a problem as the main considerations of people in his constituency are benefits associated with the resettlement process.	Mr Mukoma Shakani	Ward Councillors	28.11.2018	Meeting	Resettlement will be guided by international best practice that seeks to address the impacts of resettlement through mitigation and enhancement measures.
People in my constituency doubt the authenticity of the project given that so much has been said about it and nothing has materialized.	Mr Mukoma Shakani	Ward Councillors	28.11.2018	Meeting	There are still numerous factors influencing the commencement of the project including environmental authorisation, engineering, resettlement and the acquisition of funds.
We are concerned about the relocation to lands with less fertile soils.	The Councillors	Ward Councillors	28.11.2018	Meeting	The IFC Performance Standards provides for resettlement outcomes where the resettled households are at least the same as, but preferably better off than before. Resettlement will be guided by international best practice that seeks to address the impacts of resettlement through mitigation and enhancement measures, such as compensation, replacement structures and livelihood restoration programmes.
There are concerns about how resettlement will affect communities. The message has been conveyed that all households north of the police post will be relocated. Among the Chief's concerns is the demolition of his homestead, schools, Jambezi police station, shops and clinic.	Chief Shana	Chief Shana	30.11.2018	Meeting	Social structures within the road and the power line servitudes will be avoided as far as possible. Where unavoidable, resettlement will be guided by international best practice that seeks to address the impacts of resettlement through mitigation and enhancement measures, such as compensation, replacement structures and livelihood restoration programmes.
I am concerned that households will not easily integrate into the communities into which they are resettled. I have misgivings about the unstructured placement of households in different chiefdoms and villages as this could lead to division. Emigration within the Province and District is not uncommon, but there are procedures and consultations undertaken between various authorities to facilitate this process should it be required. The standard is that immigrants should have referral letters from current settlements and the destination community should deliberate on the acceptability of the incoming family. The size of the cattle herd of the immigrant is a key consideration used to determine whether the immigrant household can fit into the existing settlement on the basis of its grazing requirements. The Chief undertook to liaise with his community on the desirability and availability of space for any immigrants displaced by the project.	Chief Shana	Chief Shana	30.11.2018	Meeting	Your concern is noted, this will be considered as part of the resettlement phase and Resettlement Action Plan.
Communities have been kept on tender-hooks over a prolonged period for this project. People are not aware of when they will be relocated and to where.	Chief Shana	Chief Shana	30.11.2018	Meeting	We apologies for not communicating with the communities earlier with regard to the resettlement process. The Project must ensure that all the legally required permits are in place before it can move forward. We will be providing communities with more information as it becomes available.
On livelihoods, it was suggested that Lukunguni river could be dammed so that those relying on the Batoka Gorge for fishing for livelihoods would not have to travel 15km to the Gorge	Chief Shana	Chief Shana	30.11.2018	Meeting	Noted, an undertaking was made to incorporate this into the RPF.
I am concerned about the uptake of job and contractual opportunities by persons from outside the District and Province at the expense of locals. The Province and District is seriously disadvantaged in terms of educational and training institutions (confirmed by socio-economic baseline). This will have an adverse effect on the prospects of local youths if competitive recruitment criteria are used. As part of the project's Social Responsibility Programme, the Chief suggested that the developer in association with relevant institutions facilitate the development of vocational and training institutions that will make locals eligible for the power generation and hospitality industries that are abundant in the region. The project should also avoid recruiting from outside the region and bribing local leadership to acquiesce to this.	Chief Shana	Chief Shana	30.11.2018	Meeting	Comment noted. Management measures related to local employment and the management of influx will be included in the ESIA.
I have a proposal for quarrying and gravel construction that can produce the requisite raw materials for the Batoka Gorge Project.	Chief Shana	Chief Shana	30.11.2018	Meeting	Comment noted, this information will be passed on to the Project.

Annex C6

Draft Scoping Report Notification Material

Environmental Resources Management

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Great Westerford
240 Main Road, Rondebosch
7700, Cape Town, South Africa

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Tokai, 7966
Cape Town, South Africa

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4th December 2015

Dear Stakeholder

Re: Availability of the Scoping Report, the Non-Technical Summary, the Comments and Response Report and the Grievance Mechanism for the Proposed Batoka Gorge Hydro-Electric Scheme

Background

The Zambezi River Authority (ZRA) is a statutory organization equally owned by the Governments of Zambia and Zimbabwe. ZRA has been appointed by the Governments of Zambia and Zimbabwe as the implementing agency for the development of the Batoka Hydro Electric Scheme (BHES). The proposed HES will be situated approximately 47km downstream of the Victoria Falls. In Zimbabwe, it falls within the province of Matabeleland North and in the Hwange Rural District. In Zambia, it falls in the Southern Province, covering Kazungula, Livingstone, Zimba, Choma and Kalomo Districts.

Environmental and Social Impact Assessment (ESIA)

As part of the statutory requirements in Zambia and Zimbabwe, before development of the project commences, an Environmental and Social Impact Assessment (ESIA) must be completed and environmental authorization granted for the project by both the Zambian and Zimbabwean regulatory authorities. The ESIA will determine and assess the social and environmental impacts that may result from the proposed scheme and will identify ways to manage these impacts through the development of appropriate mitigation strategies.

The ESIA will be undertaken in alignment with the legislation of both countries, as well as international good practice guidelines such as the IFC's Performance Standards. The ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake the ESIA.

Enclosed with this letter is the:

- Non-Technical Summary of the Scoping Report;
- Comments and Response Report; and
- Grievance Mechanism

Non-Technical Summary and Comments and Response Report

A Non-Technical Summary (NTS) has been produced outlining the key findings of the Scoping Report for the proposed Batoka HES.

Registered Office Address
Environmental Resources Management Southern Africa (Pty) Ltd
1st Floor, Building 32
The Woodlands Office Park
Woodlands Drive, Woodmead
2148, Johannesburg, South Africa

Company Registration Number
2003/001404/07

Directors
Ian Bailey (UK) (Chairman)
Grant Bassingthwaighte
Urmilla Bob (Non-Executive)
Jeremy Soboil
Tania Swanepoel
Bruce Walker (Managing)

A member of the Environmental Resources Management Group

We are keen to hear your comments and concerns about the Project and have therefore enclosed a copy of the NTS for your information. The comment period runs from 1st December 2015 and 22nd January 2016, after which:

- comments received will be forwarded to the regulatory authorities; the Environmental Management Agency of Zimbabwe (EMA) and the Zambia Environmental Management Agency (ZEMA) for their further attention;
- the scope of work for the assessment phase of the Project will be modified; and
- the Comments and Response Report (CRR) will be updated. The current CRR (also enclosed) records all the comments we have received to date on the Project, and provides responses to these.

A copy of the full Scoping Report can be accessed at our website http://www.erm.com/batokahesesia, and upon request to Black Crystal and Kaizen Consulting offices (contact details below), as well as public places within the districts affected by the Project including:

Zimbabwe

- Hwange Rural District Council Office
- District Administrators Office in Hwange
- Jambezi Clinic
- Chisuma clinic
- Matebeleland North Provincial Administrators Office
- Victoria Falls Municipal Offices
- Environment Africa Office Victoria Falls
- Black Crystal's Office in Harare (see address below)

Zambia

- Livingstone City Council
- Livingstone District Commissioner's Office
- Kazungula District Council
- Kazungula District Commissioner's Office
- Lusaka Kaizen Consulting Office
- District Commissioners offices in Zimba, Kalomo and Choma
- District Council Offices in Zimba, Kalomo and Choma
- National Assembly Offices Zimba, Kalomo and Choma
- Chiefs Palaces (Sipatunyana, Simwatachela & Chikanta)

Please send through any comments you may have by 22nd **January 2016** via any of the contact means below.

Black Crystal Consulting (Zimbabwe)	**Kaizen Consulting International (Zambia)**
queries@blackcrystal.co.zw	Godfrey_chileshe@yahoo.com, kaizen0601@gmail.com
+263 (0)772876616	+260(0) 977-758-591
1 Fairbairn Drive, Mt Pleasant Harare, Zimbabwe	Suite 3, Floor 21st, Findeco House, Cairo Road, P.O. Box 33526, Lusaka, Zambia
Environmental Resources Management Email: batokagorgehes@erm.com	

Grievance Mechanism

A grievance mechanism has been developed for the proposed Batoka Gorge HES. The purpose of it is to outline ZRA's approach to accepting, resolving and monitoring grievances from those affected by it, and its contractors', activities in relation to the Project.

Grievances can be submitted in writing, telephonically or presented verbally to ZRA's Grievance Manager using the following details:

Name: The Project Manager – Batoka Gorge HES
Phone number: +260 228401/2, 227970/1 or 238665
Email: zaraho@coppernet.zm and Kasaro@zaraho.org.zm
Address: Kariba House, 32 Cha Cha Cha Road, P.O Box 30233, Lusaka, Zambia.

Should you have any queries with regard to the Batoka Gorge HES or comments on the Scoping Report, please feel free to contact us.

Thank you for your participation to date.

Yours sincerely,

Nadia Mol (ERM),

Godfrey Chileshe (Kaizen Consulting)

Tasara Marondedze (Black Crystal)

1 NON-TECHNICAL SUMMARY

1.1 INTRODUCTION

The Zambezi River Authority (ZRA) is a statutory body and was established in 1987. It is jointly and equally owned by the governments of Zambia and Zimbabwe. It is responsible for overseeing the development of the Zambezi River, which runs between the two countries (and forms a common border). As part of this mandate, ZRA has been mandated by the Governments of Zambia and Zimbabwe to develop the Batoka Gorge Hydro Electric Scheme (HES). As part of the proposed project, ZRA has commissioned Environmental Resources Management (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Consultants to undertake an Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydro-electric Scheme (HES). In addition, Studio Pietrangeli Consulting (SP) is undertaking the engineering feasibility study for the Project.

1.2 PURPOSE OF THIS DOCUMENT

This document represents the non-technical summary (NTS) of the Scoping Report for the proposed Batoka Gorge Hydro-electric scheme. It provides a summary of:

- The project description;
- The findings of the scoping exercise;
- The expected environmental and social changes that will occur as a result of the Project; and
- The scope of work for the assessment phase of the ESIA.

It also provides interested and affected parties with the required information as to how and where they can provide their comments or questions on the document, should they wish to do so.

1.3 *THE PROJECT TEAM*

- **The Zambezi River Authority:** The ZRA is the Client and project proponent.
- The ZRA was established as a body corporate in 1987 under the Zambezi River Authority Acts (Act No. 17 and 19 Zambia and Zimbabwe respectively).
- The ZRA is jointly owned by the governments of Zambia and Zimbabwe in equal proportions.
- The ZRA are responsible for overseeing the development of the Zambezi River.

ERM

- **Environmental Resources Management:** ERM is an international environmental consultancy with over 35 years of experience of working with development agencies, developers and governments to address the environmental and social impacts of economic development worldwide.
- ERM has worked extensively throughout Africa and has conducted projects in both Zambia and Zimbabwe.

- **Black Crystal:** ERM's local partner in Zimbabwe
- Registered with the Environmental Management Agency of Zimbabwe to undertake environmental impact assessments (EIAs).

- **Kaizen Consulting International:** ERM's local partner in Zambia.
- Registered with the Zambian Environmental Management Agency (ZEMA), to undertake EIAs.

SP

- Studio Pietrangeli Consulting (SP) is undertaking the engineering feasibility study for the Project.
- Registered by KiNet and SGS Quality assurance as a firm of Assessed Capability in accordance with ISO 9001:2000.

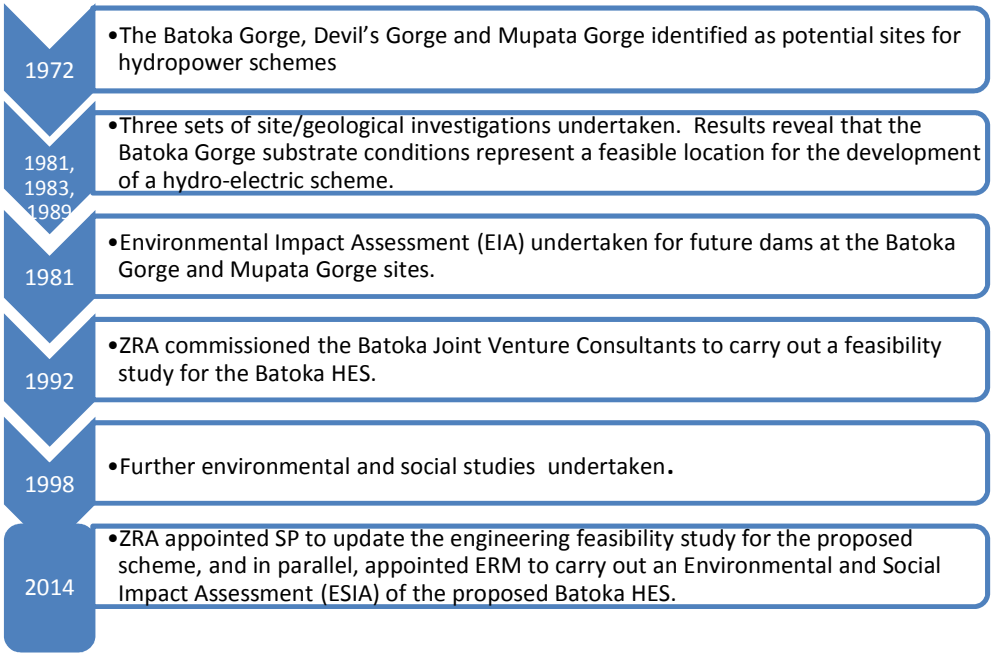
1.4 *MOTIVATION FOR THE PROJECT*

The key motivation for the project is to allow the governments of Zambia and Zimbabwe to meet the growing demands for power. Both countries are currently experiencing significant power shortages as their power generation capacity is too small to meet demands from industry and private house holdings. Zimbabwe depends unsustainably on load shedding to cover the deficit and its economy has been significantly affected by power shortages and unreliable power supplies. Both Zambia and Zimbabwe are experiencing significant costs of unserved energy. The demand for power is expected to become more acute as the economies of both countries grow. (In general, power consumption has been increasing at a rate of about 3 % per annum for the entire Southern African Development Community). If the Batoka HES goes ahead, the generation capacity for power will be increased in both countries and reliance on electricity imports will be reduced. The HES will provide between 1,600 MW to 3,000MW, this will be shared equally between both countries.

The generation of energy through hydropower is a proven technology that is sustainable and which is actively being promoted at a national level in both Zambia and Zimbabwe. With a vast hydropower energy potential, hydropower is considered the most feasible and reasonable electrification option for both countries.

1.5 *PROJECT BACKGROUND*

There has been a wealth of studies already undertaken that have investigated the potential for hydropower schemes on the Zambezi River, as well as the feasibility of developing the Batoka Gorge itself. These are highlighted below.



1.6 *PROJECT LOCATION*

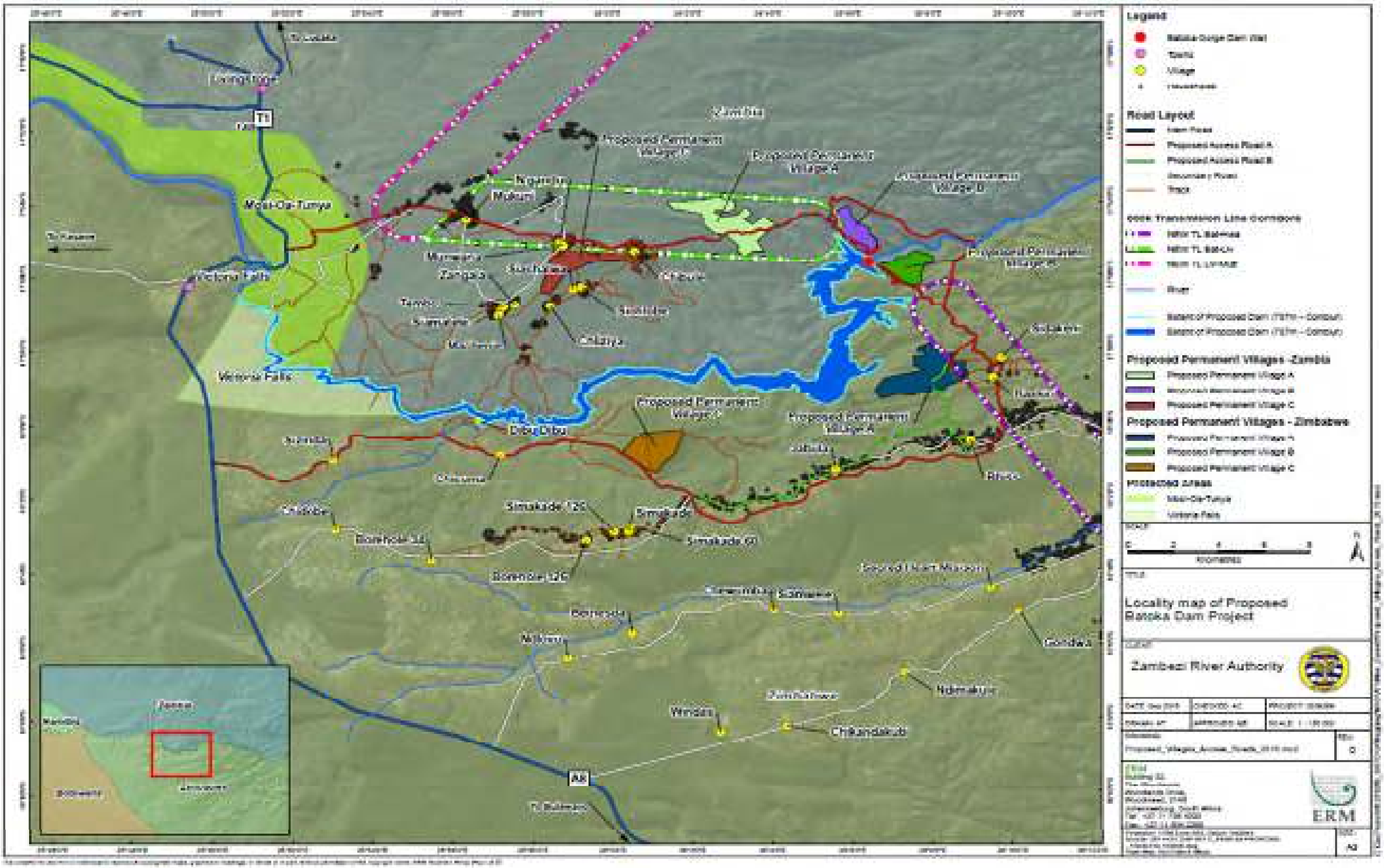
The proposed Batoka HES is to be located at 17°55'38.57"S, 26° 6'28.38"E in the central portion of the Zambezi River Basin and will extend across the international boundary between Zambia and Zimbabwe. It will be situated upstream of the existing Kariba Dam hydroelectric scheme and approximately 50 km downstream of the Victoria Falls.

In Zimbabwe, the proposed scheme falls within the province of Matabeleland North and in the Hwange Rural District. It includes the wards of Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sidinda, Mashala and Simangani. The traditional authorities in the area of impact include chief Shana, Bishop Matata Sibanda (who is Acting Chief for Mvutu who has recently deceased) and Chief Hwange.

In Zambia, the main area of direct impact falls under the Southern Province in the Kazungula District, most notably the wards of Mukuni and Katapazi, which fall under Chief Mukuni's jurisdiction. However, impacts will also be felt in Livingstone District, Zimba District and Choma District and if there are downstream impacts, these may be experienced in the District of Kalomo. The traditional authorities in these areas include Chief Musokotwane, Chief Simwatachela, Chief Sipatunyana, and Chief Singani.

The location of the Batoka HES is provided in the figure oveleaf. It is acknowledged that the Project's indirect influence may be felt more widely than the indicated Area of Influence.

Figure 1.1 Area of Influence for the Proposed Dam, Powerhouses, Spillway, Access Roads and Permanent Camps



1.7 *PROJECT INFRASTRUCTURE*

The key infrastructure for the proposed Batoka HES project includes the following components:

Dam wall and Impoundment: The proposed high gravity arch dam wall will be 181 m in height. The Full Supply Level (FSL) of the reservoir is tentatively set at 757 m above mean sea level. After impoundment to the FSL, the reservoir surface area will cover approximately 23 km^2.

Power Houses: There will be two power houses on each river bank, likely to be located outdoor at the dam toe. Each powerhouse will accommodate six turbines. The spillway will be located in Zimbabwe, approximately 2km from the dam site. Two switchyards are located on either bank of the river.

Transmission lines: In Zimbabwe it is proposed that the transmission lines will comprise of 2 x 70km 330kV lines, running in parallel, and sharing a common right-of-way, to the existing Hwange 330 kV substation. In Zambia, the line will comprise of 2 x 330kV transmission lines measuring 21km running from Batoka and terminating at a new 330kV substation ZESCO will construct in Livingstone. A second line will also be developed which will run in parallel to the existing 220kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km.

Access Roads: Existing roads will be upgraded and new ones will be constructed to allow access to each river bank. In Zambia, it is proposed that the road originating in Palmgrove (near Livingstone) that connects to Mukuni village will be rehabilitated and a new road, measuring 20km in length will be constructed to connect Mukuni to the dam site. In Zimbabwe, the Sizinda Road will bring vehicles 5km East of the Jabula School (Victoria Falls - Jabula School, Trunk A and Trunk B), where an existing secondary road leads firstly to Kasikiri Village (Jabula School – Kasikiri Village), secondly to Batoka Airport and, thereafter, to the Batoka dam site (Kasikiri Village – Batoka Airport). The full alignment will cover a length of approx. 54 km. This proposed alignment requires a new road link (1.8 km long) between the proposed South Township and the main access road to the dam site (i.e. Township – Batoka Airport)

Figure 1.2 Location of Dam Infrastructure

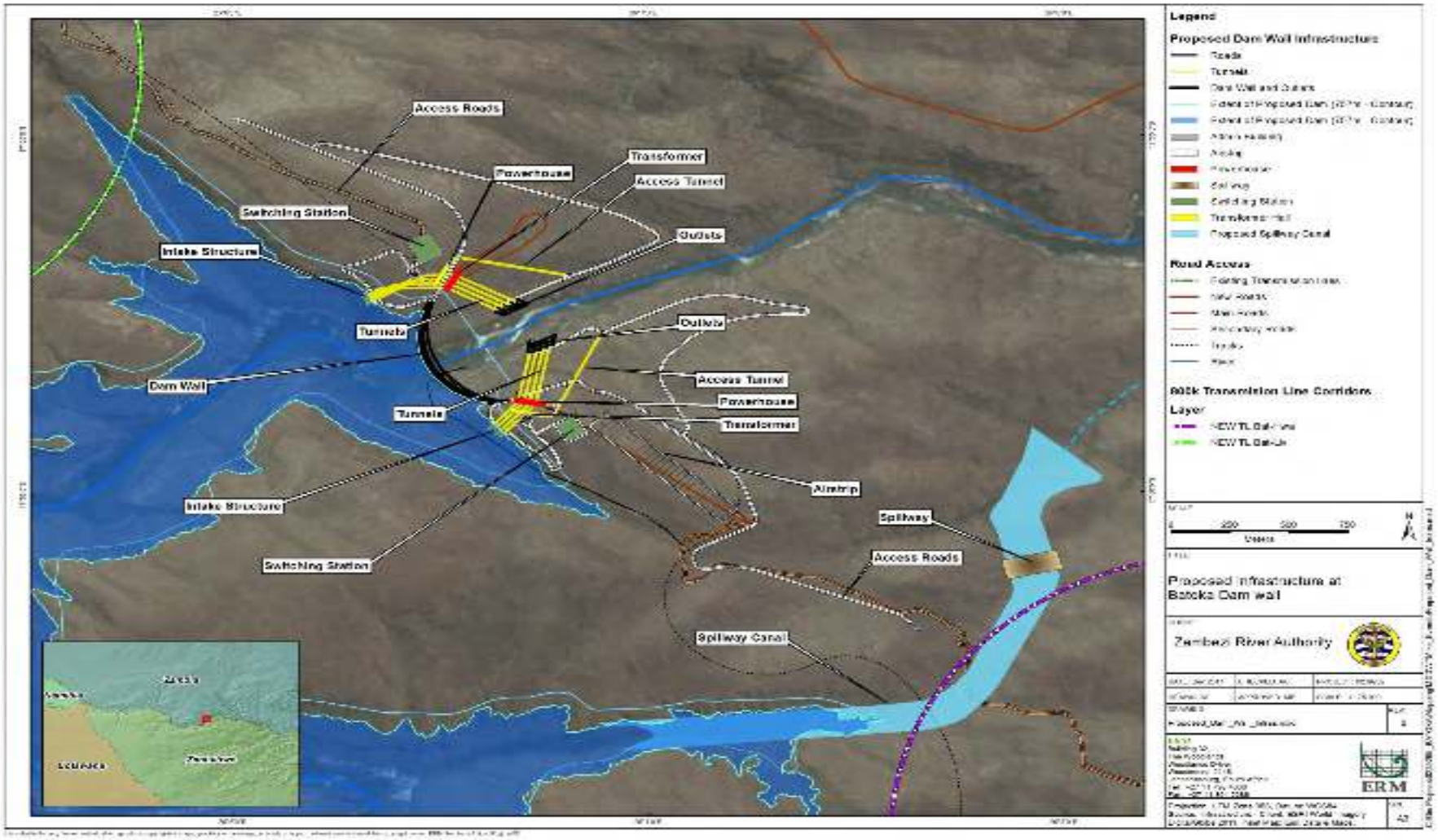
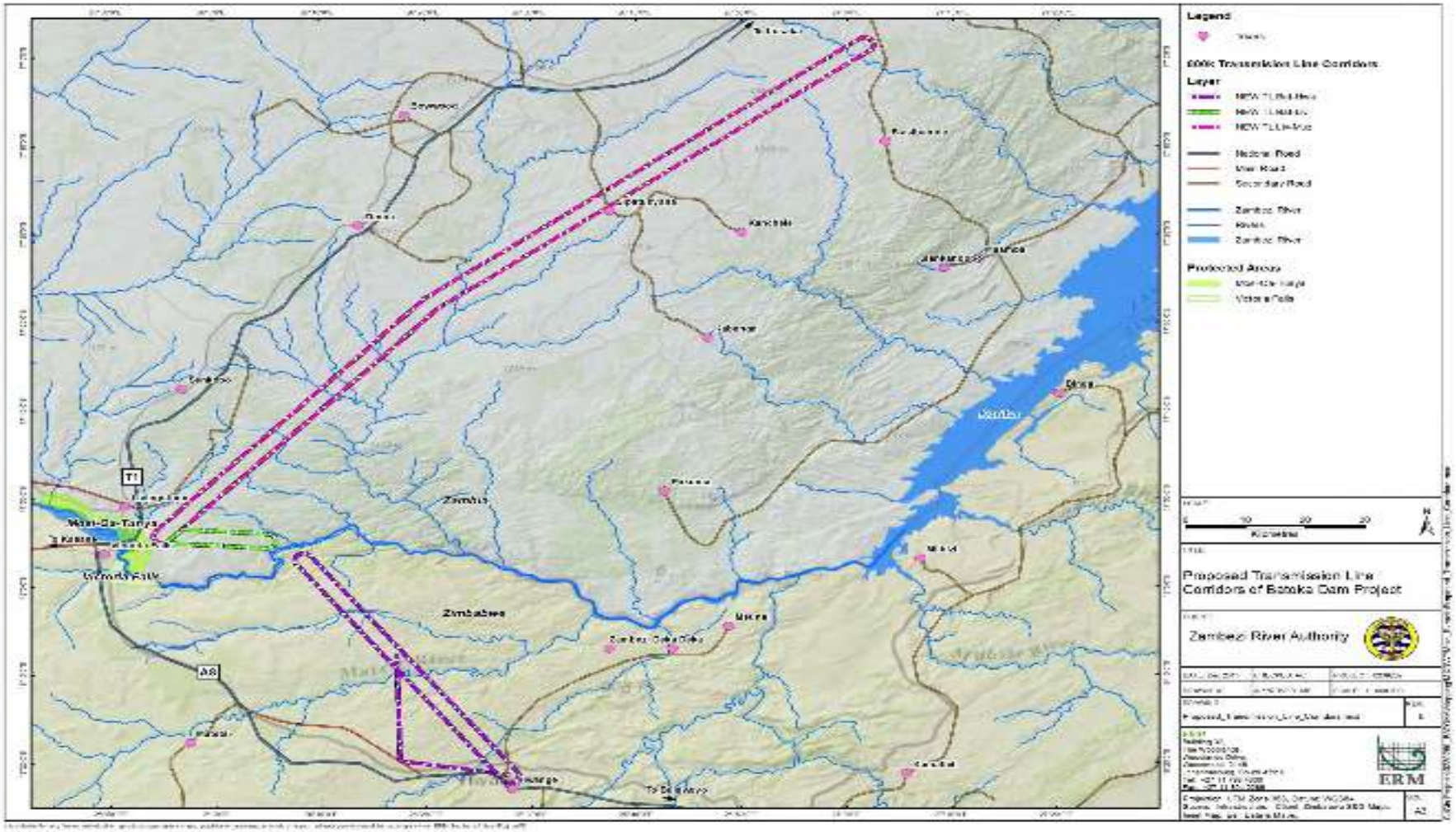


Figure 1.3 Proposed transmission line corridors



Permanent camps: Two permanent camps will be constructed to accommodate approximately 9000 people during the construction phase (ie 3000 employees, plus their families). During the operational phase there will be 750 employees with their families residing in the permanent camps. Three alternatives have been proposed on each side of the river.

Other Ancillary Infrastructure: Quarries, spoil areas, construction and batching camps, as well as construction camps will be required in Zambia and Zimbabwe.

Project alternatives are still under consideration so that sensitive areas such as sites of social/ecological and/or cultural significance can be avoided and environmental factors included in the design of the facility. This is particularly relevant for the proposed transmission line alignments where currently there is a corridor of a 3 km width under consideration which will be reduced significantly when a preferred alignment is selected when a preferred alignment is selected.

1.8 ALTERNATIVES CONSIDERED

A number of alternatives have been considered for the proposed Batoka HES in order to avoid, minimise, and mitigate Project impacts. This has included alternatives to hydropower (such as solar), the positioning of access roads, the dam height, location and type, the use of underground versus outdoor powerhouses, transmission line routings, and the location of spillway, construction camps and permanent townships. These alternatives have been systematically evaluated considering environmental, social and economic sensitivities, as well as engineering criteria, in order to optimise Project design.

Why Hydropower?

Investment in energy is a prerequisite to achieving commercial and industrial development in Zambia and Zimbabwe. The use of solar power is favourable in providing rural and urban areas with access to power; however, if both countries are to achieve those targets and goals detailed in their Vision 2030 and Vision 2040, and other complimentary plans, these countries will require private sector investment in energy technology that is efficient, sustainable and reliable. The generation of energy through hydropower is a proven technology that is sustainable and which is actively being promoted at a national level in both Zambia and Zimbabwe. With a vast hydropower energy potential, hydropower is considered the most feasible and reasonable electrification option for both countries.

Although Zimbabwe has enormous solar energy potential, when comparing like for like capacity with all the competing technologies, solar has consistently shown to be undesirable; this mainly due to a high capital cost per kW to plant factor ratio.

With regards to wind power, Zimbabwean meteorological records do show that that wind power in some areas (Harare, Chivhu, Gweru, Bulawayo, and Chipinge) would be feasible for isolated local uses, but in general, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy is relatively low.

Dam Alternatives

Dam Location

The proposed location of the Batoka HES was first selected in 1971 and thereafter moved approximately 12 km up river in 1981 at a section located at chainage +47 km from Victoria Falls. This location was thereafter studied through numerous geological investigations and compared with two other potential locations. The BJVC (1993) Team established that this was the best site/preferred alternative, as there was no other site that would have such strong advantages in terms of geological, topographical, dam volumes and hydrological conditions (theoretical maximum production at the river section) as the identified site. In 2014 the SP Team also analysed the optimum location for the development of hydropower potential of the Zambezi River between Victoria Falls and Lake Kariba, that included the proposed Batoka HES (the same preferred site), as well as Devil's Gorge HPP, located at chainage + 65 km. Again, the preferred alternative was found to be the site located + 47 km from the Falls.

Dam Height

A full supply level (FSL) of the reservoir of 762 m was fixed by the average river level at the Victoria Falls power station (BJVC, 1993 and SP 2014). The FSL of 762 m has been selected so as to ensure the backwaters from the resulting impoundment do not reach the base of the Victoria Falls or flood the outlets of the existing Victoria Falls Power Station, located in the region of Silent Pool.

A sensitivity analysis of the costs and benefits was undertaken by SP, however, varying the dam height within a reasonable range, determined to be between the Base Case of 762 m FSL and 740 m FSL (minimum). The analysis showed that *l*owering the FSL from 762 m to 757 m and 762 m to 740 m would lead to a loss of benefit of around 140 M US$ and 630 M US $ respectively. This loss in benefit is compared to the loss of revenue from ecotourism. Dropping the FSL by 20 m (FSL of 740 m) would limit the flooded extent of the dam to around the bottom of the 5th gorge (based on low flow conditions in the river), which has environmental and social advantages (such as conserving rapids 1 to 11, which would mean a half-day rafting trip is still a possibility, and less habitat loss in the gorge). The base case for the FSL currently being examined is a FSL of 757 mamsl, with options presented in the Social Impact Assessment (*Chapter 11*) to operate the dam at a FSL at 740 mamsl during the dry season only, to cater for the river rafting season coinciding with low flows in this season (when energy generation capacity is also at its lowest).

Dam Type

The SP (2014) report states that previous feasibility studies compared the two following dam alternatives:

- A roller compacted concrete (RCC) gravity dam; and
- An RCC arch-gravity dam [(1)].

SP's analysis indicated that based on preliminary conclusions the arch-gravity dam type has been selected as the preferred alternative, as adopted in previous feasibility studies.

Spillway

Four layout alternatives were looked at by SP (2014). In terms of the preliminary conclusions, the alternative identified as the preferred alternative by SP (2014), a separate spillway would be designed, ie, moving the spillway to a saddle on the right abutment, about 2 km from the dam site, as opposed to overflow over the top of the dam.

Underground Powerhouses and Waterways (1,600 MW)

Four alternative layouts for the powerhouses were considered including:

- Underground Powerhouses and Waterways (1,600 MW)
- Alternative A- Outdoor Powerhouses and Waterways (1,600 MW)
- Alternative B – Outdoor Powerhouses and Waterways (2,400 MW)
- Alternative C - Powerhouses at the Dam Toe and Waterways (3,000 MW)

Although further studies are still on-going, based on preliminary conclusions, the preferred alternatives are the outdoor power houses and waterways.

Access Roads

The upgrading of existing roads and construction of new roads to access each bank from the main roads linking Livingstone to Lusaka (Zambia) and Victoria Falls to Bulawayo (Zimbabwe) is required.

In Zambia, the network commences in Palmgrove, passes through Mukuni village and reaches the North bank of the dam site. The existing dirt road is viable for vehicles and is 29 km long. A 1.2 km long new road alignment will start from this point and reach the Batoka dam site (Figure 2.5). The overall access length is about 30 km.

(1) It should be noted that earlier assessments also compared two other alternatives to dam type, namely double curvature arch dam and concrete faced rockfill dam, only the most promising alternatives were assessed in the SP report, 2014.

In Zimbabwe, the Sizinda Road will bring vehicles 5km East of the Jabula School (Victoria Falls - Jabula School, Trunk A and Trunk B), where an existing secondary road leads firstly to Kasikiri Village (Jabula School – Kasikiri Village), secondly to Batoka Airport and, thereafter, to the Batoka dam site (Kasikiri Village – Batoka Airport). The full alignment will cover a length of approx. 54 km. This proposed alignment requires a new road link (1.8 km long) between the proposed South Township and the main access road to the dam site (i.e. Township – Batoka Airport).

Permanent Villages

Permanent villages will be located, on the North bank of the dam (in Zambia) and one on the South bank (in Zimbabwe). Six alternatives for their locations were proposed (ie three locations on each side of the river). The alternatives suggested were based primarily on their ability to reduce the likelihood or extent of resettlement required, and on impacts to identified sites of cultural heritage importance. The permanent village locations in both Zambia and Zimbabwe are identified as 'Proposed Permanent Village A' in *Figure 1.1*.

Transmission Schemes

It is proposed that in Zimbabwe, the transmission lines will comprise 2 x 70 km 330 kV lines, running in parallel, and sharing a common right-of-way, to the existing Hwange 330 kV substation. The 330kV transmission lines will have a way-leave of 50 meters (25m on either side).

An alternative has been identified, to take advantage of the existing A8 national road for the future construction and maintenance of the line infrastructure. In view of this, the alternative deviates approximately 30 km from the starting point towards the A8 motorway, and increases the route length by approximately 20 km.

In Zambia, two 330 kV transmission line routes are proposed, each comprising two outgoing lines. The first routing is from Batoka, terminating at a proposed new 330 kV ZESCO substation to be constructed in Livingstone; this route will be 21 km long. The second line will run in parallel to the existing 220 kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km.

At this stage of the project, transmission line corridors of 3 km in width will be investigated to allow for the investigation of possible environmental and social constraints, such as villages and homesteads, agricultural fields, industrial sites, pipelines etc. A way-leave of 50m will be recommended within these 3km corridors, being investigated as part of the ESIA process.

Transmission line routes, and thereafter further refinement of transmission line positioning within the proposed corridors, will be investigated as part of the overall engineering feasibility and ESIA studies.

1.9 *PROPOSED PROJECT PROGRAMME*

The ESIA is scheduled to be submitted to the Governments of Zambia and Zimbabwe in March 2015.

The construction phase is expected to last around nine years. It will be divided into two stages: the first stage will be when access roads and the first permanent camps will be built. It is expected that this will take one to two years. The second phase is when the dam and plants will be constructed; this will take six to seven years.

Project phase	Duration	Dates
ESIA process	11months	May 2014 – December 2015
Construction: phase 1	1—2 years	2016- 2018
Construction: phase 2	6—7 years	2018—2025
Operation phase	For life of dam	2025 onwards

1.10 *WHAT IS AN ESIA?*

In order to commence with the Project an Environmental and Social Impact Assessment (ESIA) must be completed. The ESIA will be undertaken in alignment with the relevant legislation, as well as international good practice guidelines such as the IFC's Performance Standards. In Zimbabwe, the key legislation is set out in Statutory Instrument No. 7 of 2007 the Environmental Management (Environmental Impact Assessments and Ecosystems Protection Regulations) and in Zambia, it is the Environmental Management Act, 2011 and Statutory Instrument 28 of the 1997 EIA Regulations. The objectives of the ESIA are:

- To understand how the proposed Project could impact the local environment and people living and working nearby
- To identify any measures that could be implemented to reduce negative impacts and enhance positive impacts
- The ESIA will advise whether the proposed Project can be developed in an environmentally and socially responsible way and if so, whether permission and funding should be given by the government to develop the Project.

The ESIA studies will identify the likely impacts that will occur as a result of the Project. Some of the types of impacts that may occur are detailed later in this NTS. These impacts will be expanded on, on the basis of comments and

issues raised in the public domain and will be studied and understood in more detail through the Impact Assessment phase in the ESIA. During the Impact Assessment phase, mitigation and management measures will be developed so as to avoid and / or reduce any negative impacts. In addition recommendations will also be developed to enhance any positive impacts.

1.11 BASELINE CONDITIONS

Chapter 4 of the Draft Scoping Report provides a more detailed description of the environmental baseline in the area of the proposed project, based on a thorough review of available secondary information, supplemented by additional surveys carried out by the specialists appointed for the task.

1.11.1 *Environmental Conditions*

Principal points of the environmental baseline include:

Climate: The Zambezi River Basin is subjected to one of the most variable climates of any major river basin in the world, experiencing extreme conditions across the catchment through time. The climate is typically sub-tropical, with a dry season from June to August, and a wet season from December to February. Average temperatures in the basin vary mainly with elevation, but also with latitude. Mean daily temperatures during the warmest months can reach up to 31°C and down to 13 °C in the colder months. Average annual rainfall in the Basin is approximately 950 mm/year.

Geology: The Zambezi River flows through a deep gorge eroded in basalts. There are 13 basalt flows which constitute the dam site, between 350 and 850 m above mean sea level. The basalts form a flat plateau with low flat-topped hills incised by the steep sided gorges of the Zambezi and its tributaries.

Soils: Most of the soils in the project area are regosols (ie have very low or non-existent reserves of weatherable minerals and a low silt/clay ratio).

Hydrology: The major contribution to the flows at the Batoka dam site derive from the upstream sub-catchments including: Kabompo, Lungwe Bungu, and especially the Upper Zambezi sub-catchments (located in the Northern highlands), together with Luanginga sub-catchment. The natural variability of Zambezi River flows is highly modified by large dams, particularly by Kariba and Cahora Bassa dams.

Flooding in the Basin occurs nearly every decade. Multi-year droughts are also observed in the Basin, with implications for river flows and hydropower production. Climate change studies indicate that the Zambezi will experience drier and more prolonged drought periods, and more extreme floods.

Flora: The project falls within an area that is florally rich and characterised by a range of species with a very wide range of distribution which extends beyond southern Africa. It also contains many endemic species. Arid savannas, generally with eutrophic soils, extend to the drier hotter lowland valleys whereas the moist savannas are associated with leach soils of the central African plateau. There are five main vegetation types in the area: Zambezi riparian vegetation, *colophospermum mopane* woodland, *commiphora*/mixed species woodland, tributary riparian vegetation and *acacia nigrescens*/open scree woodland.

Modification of vegetation in the area has occurred through deforestation as a result of logging and due to grazing and browsing mainly by elephants.

Fauna: Within the Batoka Gorge, large mammals adapted to rocky terrain such as vervet monkeys, chacma baboons and kilpspringers can be found. Kudu and buffalo are also occasionally spotted, as well as some large predators such as leopard and hyena. Various bat species have also been found within the numerous crevices and overhangs of the Gorge.

The Batoka Gorge is also an Important Bird Area (IBA) due to the presence of breeding Taita Falcons, a threatened and range restricted species. The Gorge also contains an important breeding population of the White collared or Rock Pratincole, and Black Stork and a high diversity of raptor species.

The fish populations in the gorge can be regarded as near pristine, due to low anthropogenic effects due to limited access points and little nutrient enrichment.

Protected Area: The proposed BHES project area lies adjacent to the protected areas of Zambezi National Park, Victoria Falls National Park, Deka and Matetsi Safari Areas, Fuller Forest in Zimbabwe, and the Mosi-oa-Tunya Park in Zambia. The Victoria Falls or Mosi-oa-Tunya (the smoke that thunders), is a UNESCO world heritage site. In Zimbabwe there is some seasonal movement of wildlife from these protected areas and the adjacent Hwange Communal Land. The project also falls within the international Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA). This regional initiative seeks to adopt common approaches to conservation across the international boundaries of Angola, Botswana, Namibia (Caprivi), Zambia and Zimbabwe. It is important that any major developments such as the Batoka HES take into account the conservation initiatives in the region.

1.11.2 Socio-economic Conditions

Key points of the social and economic baseline include:

Population: In the Project area in Zambia, the majority of households belong to the Leya tribe and speak Leya, a dialect of Tonga, as their primary language. However, there are also small numbers of Tongas, Lozis and Ngoni. In the Zimbabwean Project area, Ndebele is the main ethnicity, followed by Nambiya and Tonga. Accordingly, these are the main languages spoken in the area.

Livelihoods: Communities in the Social Area of Influence in both Zambia and Zimbabwe are principally subsistence farmers, selling what additional crop they produce to generate a small income. Livestock rearing is common and there is also substantial engagement in the curio trade in order to generate additional income for households. Other livelihood activities include trading, the collection and selling of firewood, grass and forest fruits, hunting, fishing, or casual labour and tourism related activities. Some small scale enterprises, such as bricklaying, were also observed.

Tourism: The presence of the Victoria Falls and various national parks has contributed to Matabeleland North province in Zimbabwe and Southern province in Zambia being noted as major tourist destinations in their respective countries. White water rafting on the Zambezi River also attracts people from around the world to the area. Some members of the local communities are engaged in the tourism trade eg working as rafting guides or porters, maids at hotels or, selling of curios.

Health: Residents in the Project Area have to travel vast distances to access health facilities (up to 32km). Very few facilities have their own ambulances and most patients travel on foot in order to access them. Malaria rates were reported to have decreased in recent years due to the effectiveness of preventative measures such as spraying and use of mosquito nets. Households in both countries reported to suffer from food shortages, generally as a result of poor harvests.

Education: In the Project area, schools are sparsely distributed and children have to travel up to 10km to access primary schools and up to 20km to reach secondary schools. Distance to schools and fees act as barriers to attendance in both countries. Approximately 73% of those aged 15 years and older can read and write in the Zambian Project area versus 76% in Zimbabwe.

Housing: Housing is mainly constructed from mud walls and grass thatched roofs. However, a few houses are made from bricks and asbestos roofs, especially those located close to the chief's residences.

Services and infrastructure: Public transport is virtually non-existent and the majority of people either walk or rely on private taxis. Drinking water tends to obtained from wells / boreholes with hand pumps. Its' quality was generally noted to be good however; its availability is variable during the dry season. Wood is the most popular source of energy for cooking, though in Zimbabwe, households also use paraffin. Few households have a latrine, especially in Zambia.

Cultural Heritage: Early Stone Age sites have been identified on the north side of the river and around Victoria Falls in and adjacent to the gorges to the south. In total 65 sites with Middle Stone Age material were identified. A substantial proportion of these sites were found on the plateau edge on either side of the Gorge running eastwards from Batoka Gorge. Some 36 Late Stone Age sites were identified by the Batoka HES heritage surveys. The distribution of Iron Age sites is similar on both sides of the river and concentrated at the north-facing base of Kalahari Sands palaeodunes. A Shongwe site was identified to the east of the contemporary settlement at Ngandu. This produced evidence for iron production as well as settlement. Sites of traditional heritage have also been identified for shrines and rituals on the Zambian side and Chemapoto Hill in Zimbabwe.

Key Impacts, Investigations and Impact Assessment

The key potential environmental and social-economic impacts are highlighted in Sections *1.11.3* and *1.11.4* below. Each significant issue will be investigated further during the Impact Assessment phase of the Project. This will involve an evaluation of the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria. Once this has taken place, mitigation and management measures will also be proposed with the intent of increasing the benefits of the Project and avoiding, minimising, mitigating, managing and/or compensating any negative impacts generated. The significance of the residual impacts that remain following mitigation will then be assessed. Mitigation and management measures will be compiled in a set of Environmental and Social Management Plans that will be implemented by the Project team should the proposed Batoka HES go ahead.

The effect of cumulative impacts will also be considered as part of this assessment. Cumulative impacts are those that act together with other impacts (including those from concurrent or planned future third party activities) and affect the same resources and/or receptors as the Project.

1.11.3 Environmental Impacts

Terrestrial and aquatic flora: The construction of dam infrastructure could result in the removal and /or disturbance of vegetation. This is likely to primarily affect riparian habitats and hill-slope vegetation. Disturbance of riparian vegetation could cause increased river bank erosion in the vicinity of

the construction activities. Aquatic habitats could suffer as a result of diversion of surface flows and increased sedimentation.

Inundation of the reservoir will result in the direct loss of vegetation, primarily riparian vegetation along the river bank and succulent vegetation on the scree slopes of the gorge which could include unique or endemic species. In the immediate catchment area, the impacts are secondary and related to the migration of humans, which may lead to the over-exploitation of hardwood timber.

It is also likely that the reservoir will experience eutrophication (become nutrient rich and productive in terms of aquatic plant or animal life) due to the release of nutrients from the flooded riparian zone. This may deplete oxygen levels in the water and causing a dramatic decline in fisheries production.

Habitat assessment and mapping, including a sensitivity assessment are currently ongoing and will feed into assessment process. Data inputs from the environmental flow assessments will also be used to help determine the impact on the aquatic ecology.

Terrestrial and aquatic fauna (including birds): The noise, dust and human activity from construction activities could affect disturbance-sensitive animals and potentially result in their temporary displacement from current habitats. Bird populations may be affected by loss of breeding and foraging habitat, primarily in the cliff/rocky outcrop habitats at the dam site and in the riparian habitats that could be inundated by the reservoir.

Changes to water quality, both within the impoundment and downstream, including changes to temperature and dissolved oxygen concentrations, may affect the suitability of aquatic habitats for fish and macro-invertebrates and potentially cause a shift in species composition. The number and diversity of riverine aquatic species may decrease and conversely, the habitats for lacustrine species (phytoplankton, zooplankton and lacustrine fish) could increase.

The Batoka HES could provide opportunities to enhance wildlife conservation in the area, particularly through collaborative efforts with community based natural resource management organisations active in the area (such as CAMPFIRE). Opportunities for such positive impacts will be explored in the assessment phase.

Transmission line alignments could impact on avifauna through collision risk and concern has been raised that there are important avifauna migration routes in the project area proposed for this infrastructure.

Data inputs received from wildlife authorities in Zambia and Zimbabwe, local museums, CAMPFIRE, Zimbabwe Falcon Club, local safari hunters and crocodile farming associations and local NGOs will be analysed to better

understand this impact. Analysis of habitat sensitivity and presence of threatened and protected species will also be undertaken to better understand the impact.

Water quality: During construction, water quality could be impacted by sediment loads from erosion, as well as potential spillage of fuels, lubricants and chemicals at the construction site, and by the inadequate treatment and disposal of waste and wastewater from worker compounds.

During operation and inundation, impacts to water quality could occur in the reservoir and downstream river. This could affect aquatic habitats and may affect artisanal fishing and/or water supplies. The timing of water releases downstream and the depth from which these releases are made, may affect the temperature, oxygen concentration, sediment loads and nutrient concentrations in the release water that could in turn, potentially impact on the river downstream and on what lives there. Finally, the rise in water table associated with the reservoir and its operation may lead to changes in groundwater chemistry - and hence local borehole water quality - as chemicals are leached from newly submerged rock and soil formations.

Numerical modelling will be used during the assessment phase to assess impacts on water quality in the reservoir and downstream in the Zambezi River.

Sedimentation and erosion: Changes in the sedimentation levels in the river downstream of the impoundment are likely to occur as a result of alteration of the hydrology (and therefore the energy to move sediments). This may have a significant impact on the river morphology downstream of the dam, whereby patterns of erosion, transport and deposition along the river gradually shift until a new status quo is established over time. This changing morphology could have a consequential impact on river water turbidity and flow velocities, and hence on riverine ecosystems. This will be addressed further in the impact assessment of the project.

Seismicity: While engineering design will take into account the fact that seismic events occur naturally in the region, there is the potential for seismic shocks to be induced by Batoka's artificial reservoir as has been happening at Kariba. As the volume of the lake and its weight on the earth's crust is expected to be less than 2% of that of Lake Kariba, induced earthquake frequencies are expected to be much lower, however maximum magnitude may well reach 5.5 on the Richter Scale. This will be addressed further in the impact assessment of the project.

Downstream impacts: Adverse impacts on the downstream stretch between the dam site and Lake Kariba could occur in terms of potential for changes in water quality (in particular dissolved oxygen and temperature) and changes

in sediment transport and river morphology, both discussed previously. Development of comprehensive planning, and eventually of an operational model for the Zambezi River Basin would result in (amongst others), better flood forecasting and flood management (both to release floods for beneficial uses and to mitigate high flows). Environmental flow conditions in the Zambezi River downstream of the Batoka HES, both before and after the impoundment will be assessed. This will quantify and assess the implications for the river ecosystem - in terms of ecological integrity and status - based upon the operation of the Batoka HES.

Impact to Victoria Falls: Current studies suggest that the Victoria Falls will not be impacted as it is located too far downstream for the Project to have an effect. The decision on the FSL will take careful consideration of the potential impact of the impoundment's backwaters (especially during flooding scenarios) in terms of the Project's potential impact on the Falls. This will be explored more fully during the Impact Assessment Phase.

Reduced Emissions from Thermal Power station: If the Batoka HES goes ahead, it will increase power generation capacity in both Zambia and Zimbabwe, reduce power outages, and also reduce reliance on coal fired power stations.

Impacts of Climate Change on the Batoka HES: The Zambezi River Basin has been classified by the Intergovernmental Panel on Climate Change (IPCC) as the river basin to be subjected to the 'worst' potential effects of climate change among 11 major African river basins reviewed. This classification is largely based on the predicted climate change-induced increased temperature and decreased precipitation in the Basin. The Project engineers will assess the impacts of climate change on dam design, and on the overall feasibility of the scheme. Further information will be provided in the ESIA.

1.11.4 Social Impacts

Physical and Economic Displacement: Economic and physical displacement will occur as a result of the Project however, the number of people that will be affected is not currently known as the exact positioning of Project infrastructure has not yet been defined.

People currently use the proposed project area for the collection of natural resources, subsistence agriculture, livestock grazing and fishing. Communities may lose land on which they currently live and undertake livelihood activities due to the construction of project infrastructure including construction camps, quarries and borrow pits, access roads, spillway, permanent camps and transmission lines. Although no physical displacement

is likely to occur as a result of inundation, economic displacement is likely to occur.

Following the refinement of the Options Assessment and the acceptance of this by the ZRA, which will provide greater detail about the dam design and infrastructure location, a Resettlement Action Plan (RAP) will be developed in order to identify assets and livelihoods affected by displacement. The RAP will more fully assess impacts related to the resettlement of households and will set out the process, compensation framework, engagement and schedule for the resettlement.

Impact on the Economy: The proposed Batoka HES has the potential to bring about local, regional and national economic benefits to both Zambia and Zimbabwe through increased fiscal revenues to the Governments of both countries, job creation and skills enhancement, project-induced economic activity (for example due to local procurement of supplies and services by the camp) and, local community investment initiatives. The project will require a peak of 3,000 construction workers. The Zambezi River Authority has made a commitment to favour the recruitment of people within and around the Project areas, and then elsewhere in Zambia and Zimbabwe, provided that they have the relevant skills and experience. This will lead to increased incomes and potentially improving standards of living for the workforce. It is also likely to result in increased spending on local goods and services in both countries, creating further income generating opportunities and boosting the local economy. However, there is a risk that there could also be an increase in the price of local goods and services. There are also risks associated with any unmet community expectations by the Project's contribution to employment and economic growth. The impact of the Batoka HES on the local economy is currently being investigated through an economic specialist study.

Impact on Tourism: Tourism activities, particularly white water rafting is likely to be affected by the proposed HES. Currently, white water rafting companies in both Zambia (notably in Livingstone) and Zimbabwe (in Victoria Falls) use the river in their provision of half day and full day rafting trips to clients, most notably tourists. White water rafting is thus an important revenue stream to the two towns. The HES will cause a number of rapids to be flooded (the exact number will be dependent upon the Full Supply Level (FSL) chosen), which will detrimentally affect the existence of white water rafting. Other forms of tourism may well be realised, however, such as adventure canoeing, as well as the construction of lodges and hotels overlooking the lake. The economic specialist study will include a particular focus on impacts to tourism, especially in the towns of Livingstone (Zambia) and Victoria Falls (Zimbabwe).

Impacts Related to Project Induced In-Migration: The construction of the dam will require large numbers of workers (peak construction employment is

estimated to be 3,000 workers). Whilst effort will be made to recruit locally, some workers will need to be sourced from further afield where locally skilled labour is lacking. Opportunistic influx is also likely to take place by people in search of jobs. In-migration in the area may place increased pressure on ecosystem services (including increased demand for land, water, firewood, bush meat, fish, charcoal, and other natural resources), as well as increase pressure on social services (education and health facilities for example). There are also risks that high in-migration may also bring about the alteration and / or erosion of cultures and significant weakening of local cultural systems. The combination of rapid influx of people and weakening of traditional structures can lead to changes in behaviours and lifestyles, which could promote prostitution and crime. As part of the social study, investigations will be undertaken to assess how existing infrastructure and services will be able to cope with a surge in demand.

Impacts on Community Health and Safety: The proposed HES has the potential to increase the incidence of communicable diseases (such as acute respiratory infections and tuberculosis), as well as sexually transmitted infections (such as HIV/AIDS and Hepatitis B and C). Measures to manage the interaction between the local community and the workforce would need to be developed and implemented to minimise and manage these risks. There is also the potential that water related and vector borne diseases, such as malaria may increase as a result of poor sanitation and the creation of mosquito breeding grounds. The construction of the dam will require large quantities of building material and other supplies, some of which will be delivered to the site by trucks that are likely to pass in close proximity to homesteads. Accordingly, disturbance due to dust, noise and safety hazards from traffic would be a potential impact. As part of the assessment phase, access to and quality of health services, as well as likely changes in the disease profile at the provincial, district and local level will be analysed. Other ESIA studies (eg water) will also be studied to determine the likely significance of potential health impacts.

Impacts to Cultural Heritage Resources: Access to cultural heritage resources (including archaeological, palaeontological and historical resources) may be threatened by possible uncontrolled immigration, increased tourism, and also due to land acquisition and resettlement. Access to Chemapato Hill, an important cultural/spiritual area, may become problematic due to the flooding of the Gorge. Further baseline data collection will be undertaken so that the existing heritage baseline can be understood in greater detail in order to understand likely impacts.

1.12 PUBLIC CONSULTATION

1.12.1 *Overview*

Stakeholder engagement refers to a process of sharing information and knowledge, seeking to understand and respond to the concerns and expectations of interested groups, and building relationships based on collaboration. As such, stakeholder engagement is a crucial part of the ESIA process, looking to ensure that the views, interests and concerns of interested groups are taken into account in the project design and planning.

1.12.2 *Scoping Phase Engagement*

The Project is currently at a stage of feedback on the Scoping Report.

The purpose of the Scoping Phase stakeholder engagement has been to:

- Officially initiate and notify the public of the formal ESIA process;
- Invite prospective Interested and Affected Parties (I&APs) to register as I&APs;
- Engage with I&APs to identify issues of concern, suggestions and comments about the proposed Project;
- Make suggestions for enhanced Project benefits and reasonable alternatives;
- Verify that issues raised by I&APs have been accurately recorded through a Draft Scoping Report; and
- Define the Terms of Reference for the ESIA specialist studies to be undertaken in the impact assessment phase.

Activities undertaken

Throughout the Scoping phase, on-going stakeholder identification has aimed to establish which organisations and individuals may be directly or indirectly affected by, or have an interest in the Project. Efforts were made to identify marginalised or vulnerable groups (e.g., according to livelihood, gender, age, ethnicity, religion, health status) and to develop a fully inclusive and participatory engagement process allowing all stakeholders a 'voice'.

Scoping phase engagement activities have included meetings and one-on–one interviews with government agencies, interest groups, members of the public, traditional authorities, communities and community representatives and NGOs. Interested and Affected Parties (I&Aps) were informed of, and invited to attend engagements, via:

- Advertisements made in national press
- Advertisements placed in newsletters and via networks
- Distribution of notices / flyers
- Telephonic invite
- Letter invite
- One-on-one discussions

All comments received during stakeholder engagement activities, as well as the responses to them, have been recorded in a Comments and Response Report (CRR).

1.13 SCOPING REPORT DISCLOSURE

The Scoping Report and this NTS has been publicly disclosed, and all I&APs are invited to review and submit comments on the Project on them. The comment period runs from 1st December 2015 to 18th January 2016, after which:

- comments received will be forwarded to the regulatory authorities; the Environmental Management Agency of Zimbabwe (EMA) and the Zambia Environmental Management Agency (ZEMA) for their further attention;
- the scope of work for the assessment phase of the Project will be modified; and
- the Comments and Response Report (CRR) will be updated. The current CRR (also enclosed) records all the comments we have received to date on the Project, and provides responses to these.

A copy of the full Scoping Report, as well as the NTS can be accessed at our website http://www.erm.com/batokahesesia as well as public places within the districts affected by the Project including:

Zambia

- Livingstone City Council
- Livingstone District Commissioner's Office
- Kazungula District Council
- Kazungula District Commissioner's Office
- District Commissioners offices in Zimba, Kalomo and Choma
- District Council Offices in Zimba, Kalomo and Choma
- National Assembly Offices Zimba, Kalomo and Choma
- Chiefs Palaces (Sipatunyana, Simwatachela & Chikanta)

Zimbabwe

- Hwange Rural District Council Office
- Hwange District Administrator's Office
- Jambezi Clinic
- Chisuma clinic
- Provincial Administrators Office
- Victoria Falls Municipal Offices
- Environment Africa Office Victoria Falls
- Black Crystal's office in Harare

Copies will also be available pon request to Black Crystal and Kaizen Consulting offices (contact details below).

1.13.1 *Future Engagement Activities*

Further engagement will take place during the Impact Assessment Phase of the Project. This will include public meetings, as well as making the Draft ESIA and Environmental and Social Management Plans (ESMPs) available for public comment. The purpose of this engagement will be:

- To discuss the identified impacts and proposed mitigation measures with stakeholders allowing for their input; and
- To provide stakeholders with the opportunity to comment on the Draft ESIA report.

All registered I&APs will be notified in due course of the availability of the Draft ESIA, ESMP and engagements that are proposed during this phase. It is currently expected that feedback meetings on the results of the ESIA will take place in the second quarter of 2015. Following this, comments received will be included in the Final ESIA Report which will be submitted to EMA and ZEMA. The environmental authorisation decisions taken by EMA and ZEMA following their review of the ESIA will be advertised in the media and all registered I&APs will be informed.

1.14 *GRIEVANCE MECHANISM*

A grievance mechanism has been developed for the proposed Batoka Gorge HES to ensure that any complaints are addressed in a timely and consistent manner.

Grievances can be submitted in writing, telephonically or presented verbally to ZRA's Grievance Manager using the details below.

Contact Details for Submitting a Grievance
Name: Eng. E. Kasaro, Project Manager – Batoka HES
Phone number: 228401/2, 227970/1 or 238665
Email: zaraho@coppernet.zm and Kasaro@zaraho.org.zm
Address: Kariba House, 32 Cha Cha Cha Road, P.O Box 30233, Lusaka, Zambia.

1.15 *CONTACT DETAILS*

Please send through any comments you may have on this NTS or the Scoping Report by 22nd **January 2016** via any of the contact means below.

Zimbabwe	Zambia
Black Crystal Consulting	Kaizen Consulting International
queries@blackcrystal.co.zw	Godfrey_chileshe@yahoo.com, kaizen0601@gmail.com
+263(0) 772876616	+260(0) 977-758-591
1 Fairbairn Drive, Mt Pleasant Harare,	Suite 3, Floor 21st, Findeco House, Cairo Road, P.O. Box 33526, Lusaka,

Zimbabwe	Zambia
Environmental Resources Management Email: batokagorgehes@erm.com	

Annex C Part II

Interim Engagement (2018)

Annex C7.1

Notification Letters

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6 December 2018

Dear Stakeholder

RECOMMENCEMENT OF THE BATOKA GORGE HYDRO-ELECTRIC SCHEME ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND ASSOCIATED RESETTLEMENT STUDIES

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, ERM and its team had completed the Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies had been completed in order to inform the content of an ESIA. A Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared and submitted to the ZRA for its review in late 2015.

It was at this stage that the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

You were identified as a stakeholder for this ESIA Process in 2014 prior to the ESIA process being placed on hold. This letter serves to notify you of the following:

- The recommencement of the ESIA Process and its associated timeline for delivery;
- Further opportunities for the Engagement of Stakeholders;
- Changes to the Project Team; and
- Our contact details for further communication.

Registered office
Environmental Resources Management
Southern Africa (Pty) Ltd
1st Floor, Building 32, The Woodlands Office Park
Woodlands Drive, Woodmead
2148, Johannesburg, South Africa

Registered number: [illegible]
VAT registration: [illegible]

Offices worldwide
A member of the ERM Group

Directors
Claudio Berrina
Limitabilitas (Non-Executive)
Tania Sewepoel
Namita Rasmussen

1 Recommencement of the ESIA Process

As of October 2018, the ESIA process has recommenced. It is intended that a Final ESIA and ESMP report will be submitted to the Regulatory Authorities in both countries mid-2019. The scope of the remaining tasks will be to utilise the work undertaken to date to complete the remaining steps in the ESIA process. In addition, given that there is now a better understanding of the extent of land take associated with some of the Project and its associated infrastructure, the resettlement planning work will also commence. The following remaining scope items and the proposed programme for these are as follows:

Scope Item	Programme for this
Further identification of downstream water users in Zambia (this has already been undertaken for Zimbabwe).	Nov-Dec 2018
More detailed investigation into the biodiversity, heritage and social impacts associated with the two quarry sites proposed for the Project.	Nov 2018-Jan 2019
Resettlement Policy Frameworks (RPFs) for the Proposed dam site and associated infrastructure (including the site for borrow pits, quarries and the transmission line corridors in both Zimbabwe and Zambia).	Nov 2018-May 2019
Resettlement Action Plans (RAPs) for the Batoka South Access Road in Zimbabwe and Contractor Camps in Zimbabwe and Zambia.	Nov 2018-May 2019
Updating the Draft ESIA and Draft ESMP as per the additional scope items above and incorporating comments raised by the Regulatory Authorities and World Bank on the Scoping Report and draft ESIA.. The ESIA and ESMP will also be split following ZEMA's request that three separate ESIA reports be submitted for each of the components of the Project (the dam, staff villages and borrow pits; the roads; and the Transmission Lines).	Feb and March 2019
Feedback to stakeholders on the Draft ESIAs, ESMPs, RPFs and RAPs.	March-April 2019
Finalisation and submission of report to the Regulatory Authorities.	May-June 2019

2 Next Steps for Stakeholder Engagement

All stakeholders that have been identified in the ESIA process to date have been notified of the recommencement of the studies, and where possible, their contact details have been updated.

Further contact will be made with the relevant communities and their leadership for the gathering of additional baseline information in the proposed Project area, particularly downstream of the proposed dam wall and in the areas proposed for the sourcing of quarry materials.

Following this, your input as a stakeholder to the ESIA, will be required upon the release of the Draft ESIA for public comment. Feedback meetings will then be scheduled to discuss the results of the studies and you will be notified adequately in advance of these feedback meetings.

It is however, important, given the time that has elapsed since the last round of stakeholder engagement, that we have updated contact details available for you. If any of your details have changed since our last communications with you in early 2015, and/or you are aware of other stakeholders that now need to be engaged in the ESIA process, please do not hesitate to contact us to provide us with this information. Our contact details are presented under Section 4 below.

3 Changes to the ERM Project Team

Given the time that has lapsed since the project originally commenced, there have been changes to the Project team. Black Crystal Consulting remains ERM's local consultant in Zimbabwe and will be engaged in all aspects of the Project in Zimbabwe. In Zambia, where there is no need for a locally registered consultant, ERM will be working with a team of locally appointed subconsultants in order to fulfil the required scope of work.

4 Contact Details

For any further queries regarding the content of this letter, or to provide us with updated contact details and/or additional stakeholders, please feel free to contact us as follows:

Contact Name and Organisation	Country	Contact Details
Nadia Mol, ERM	South Africa	+27 (21) 6815400 or by email on batokagorgehes@erm.com
Tasara Marondedze, Black Crystal	Zimbabwe	+(263) 77 2876616
Felix Chisha	Zambia	+(260) 974 074 384

We look forward to your participation in this ESIA going forward.

Yours sincerely

Nadia Mol

Stakeholder Engagement Manager

Mike Everett

Partner

ERM

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www.erm.com

26th Lwezi 2018

Kuwe Ophathekileyo

UKUVUSELELWA KWENHLOLISO YENDAWO YOHLELO LWE BATOKA GORGE HYDRO-ELECTRIC SCHEME KANYE LEZIFUNDO EZIPHATHELANE LOKUHLALISWA KAKUTSHA

Inhlanganiso ye Zambezi River Authority (ZRA), iyinhlanganiso ebunjwe ngomanyano wabohulumende bamazwe womababili, owakwele Zambia lowe Zimbabwe, icebisa ngentuthuko yokusungulwa kohlelo lweBatoka Gorge Hydro-Electric Scheme (oluzakwethulwa njengohlelo). Uhlelo lolu luzakuqhutshelwa emaphethelweni, okungaba ngamakhilomita angamatshumi amane lasikhombisa edolobho le Victoria Falls emfuleni uZambezi.

Njengegxenye yendingeko kwele Zambia lase Zimbabwe, uhlelo lungakaqhutshwa, inhlolisiso ebizwa ngokuthi yiEnvironmental and Social Impact Assessment (ESIA) kumele lugqitshwe, beseluphiwa imvumo yiziphathamandla ezibona ngembali lokudlelana kwayo lendawo ezisuka kumbe eziphansi kwabohulumende bamazwe womabili athi ele Zambia lele Zimbabwe. Ngaphezulu kwendingeko lezi, njengoba uhlelo lweBGHES lufuna usekelo lwenhlanganiso zangaphandle kwelizwe ezibolekisa imali, inhlolisio eye ESIA ehambelana lohlelo lolu kuzamele yenziwe ukuze ihambelane lokuqhutshwa kuhle komsebenzi olufana loluqhutshwa yinhlanganiso yebhanga lomhlaba wonke jikelele olwe World Bank iWorld Bank's Environmental lolubona ngokuqhutshwa lokulandelwa kwezinqumo zenhlelo ezibona ngamandla kagetsi asuka emanzini okubizwa ngokuthi yi*Social Standards and International Hydropower Association (IHA) sustainability protocols*.

Inhlolisiso ye ESIA yasungulwa ngaphakathi laphakathi komnyaka ka2014, yinhlanganiso ye ZRA isebenzelana leye Environmental Resources Management Southern Africa (Pty) Ltd. I(ERM) kanye lezinye inhlanganiso zamazwe akuhlelo lolu(eye Kaizen Consulting International kwele Zambia leye Black Crystal kwele Zimbabwe) ngesikhathi ingcitshi zilungiselela ukuphatha lumsebenzi. Ngaphambilini kwekupheleni komnyaka ka 2015, inhlanganiso ye ERM lamaqula ayo ibisigqibe ibanga lakuqala, eligoqela ukukhulumisana labaphathekileyo kanye lenhlolisiso yendawo lokukhangela njalo okuqakathekileyo ngenjongo yokucebisa okugcweleyo okuphathelane lenhlolisiso. Ugwalo lwe ESIA kanye lenyathelo elibona ngendawo lokulondolozwa kwayo ele Environmental and Social Management Plan (ESMP) lwethulwa kunhlanganiso yeZRA ukuze icubungule ekugqibeni komnyaka ka 2015.

Kukuleli banga lapho inhlolisiso yeESIA eyamiswa khona ngezizatho ezimbalwa eziphathelana lolwazi lezilokwenza lemali; kunjalo nje, ingxoxo zisaqhubekela phambili phakathi kwenhlanganiso yeERM, eye ZRA kanye leyeWorld Bank (abayibo ababephathisa ngemali yalinhlolisiso), njalo inhlolisiso ye ESIA yohlelo isiqalisile njalo.

Wena wakhethwa ukuthi ube yingxenye yenhlolisiso yeESIA ngomnyaka ka 2014 uhlelo lolu lungakamiswa. Incwadi le ijonge ukukwazisa ngokulandelayo:

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Southern Africa (Pty) Ltd
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Woodlands Drive, Woodmead
2148, Johannesburg, South Africa

Registered number: 2003/001404/07
VAT registration: 4780205482

Offices worldwide
A member of the ERM Group

Directors
Claudio Bertora
Urmilla Bob (Non-Executive)
Tania Swanepoel
Marinda Rasmussen

- Ukuqalisa njalo kwenhlolisiso ye ESIA lesikhathi sokugcwalisisa linhlolisiso;
- Amathuba okukhulumisana kwabaphathekileyo ;
- Inguquko yequla eliqhuba uhlelo ; njalo
- Ikheli yethu lalapho esitholakala khona ukuze wazi okunengi.

1 Ukuqaliswa njalo kwenhlolisiso yeESIA

Kusukisela ngenyanga kaMfumfu ngomnyaka ka 2018, inhlolisiso isiqalisile njalo. Kukhangelelwe njalo ukuthi kuzakwethulwa inhlolisiso yokucina eyeESIA lencwadi ekhombisa linhlolisiso yendawo eyeESMP izakwethulwa kuziphathamandla zamazwe womabili ngaphakathi komnyaka ka 2019. Umsebenzi oyabe ususele ngowokusebenzisa osekwenziwe kuze kube namhlanje. Ngaphezulu kwalokho, ngenxa yokuthi sekulokuzwisisa okungcono ngomhlabathi ozathathwa ekuqhubeni uhlelo lolu, izakhiwo, umsebenzi wokuhlela inhlelo zokuhlalisa kutsha abantu uzaqala njalo.Okulandelayo yikho okuseleyo lokuthi kuzaqhutshwa okwesikhathi esinganani:

Okuseleyo	Isikhathi sokuqhuba
Ukukhangela njalo abantu abasebenzisa amanzi kweleZambia (lokhu kwenziwa kudala eZimbabwe).	Lwezi-Mpalakazi 2018
Inhlolisiso egcweleyo ngembali, lokuhlaliseka kwabantu kungaba lendawo ezimbili ezizabe zilungiswa khona amatshe womhlobo we quarry okuyingxenye yohlelo.	Lwezi 2018- Zibandlela 2019
Isinqumo sokuthuthiswa kwabantu ngenjongo yokukhangela indawo engakhelwa idamu lezinye izakhiwo (okugoqela phakathi indawo zokugebha amagodi, amatshe omhlobo we quarry, intambo zamandla kagetsi emazweni athi ele Zimbabwe lele Zambia).	Lwezi 2018- Nkwenkwezi 2019
Inhlelo zokuthuthisa abantu ukuze kwakhiwe umgwaqo oya eBatoka South eZimbabwe kanye lendawo ezizahlala izisebenzi eZimbabwe lakweleZambia.	Lwezi 2018- Nkwenkwezi 2019
Ukwengezelela kugwalo lwenhlolisiso ye ESIA lolwe ESMP njengokwengezelela kokumele kwenziwe phezulu lokubeka njalo imibono eyabe ivela kuziphathamandla lebhanga le World Bank kugwalo lwehlandla lakuqala lohlelo logwalo oluqukethe inhlolisiso olwe ESMP luzakwehlukaniswa kumbe ukuhlephunwa kulandela isicelo esivela ku ZEMA esithi kumele kube zingwalo ezintathu ezehlukeneyo zenhlolisiso ye ESIA ezizathunyezwa zichaza ihlandla linye ngalinye lohlelo lonke (idamu, izindlu zezisebenzi lamagodi; imigwaqo kanye lentambo zamandla kagetsi).	Nhlolanja lo Lwezi 2019

Okuseleyo	Isikhathi sokuqhuba
Imbiko yokwazisa abaphathekileyo ngengwalo lezi ezithi eye ESIA, ESMP, RPF le RAP.	Mbimbitho-Mabasa 2019
Ukugqiba lokwethula ugwalo oluchaza umsebenzi osuqhutshiwe kuziphathamandla.	Nkwenkwezi- Nhlangula 2019

2 Inyathelo elilandelayo lokukhulumisana kwabaphathekileyo kumbe ingxenye zohlelo

Kuze kube namhlanje bonke abaphathekileyo sebekhethiwe kuhlelo lwenhlolisiso olwe ESIA njalo sebebikelwe ngokusungulwa njalo kwenhlolisiso, lapho okudingakalayo, amakheli abo alapho asebehlala khona kumbe aseguquliwe nxa kuke kwaba lokuthutha.

Kuzaqhutshwa kumbe ukukhulumisana labantu besigabeni lenkokheli ngenjongo yokuthola olunye ulwazi olungaphathisa ekuqhutshweni kohlelo, ikakhulu ekucineni kwendawo ezakwakhelwa idamu lendawo ekhethiweyo ukuthi ibe yiyo ezatholakala amatshe okulungisisa iquarry.

Kulandela lokhu, umbono wakho njenge ngxenye yenhlolisiso yeESIA, uzadingakala ngesikhathi kusethulwa ugwalo lweESIA kuzulu ukuthi aphe laye umbono wakhe.Kuzahlelwa imihlangano okucubungula impumela yenhlolisiso njalo uzakwaziswa isikhathi sisekhona ngalimihlangano.

Kusenjalo, kuqakathekile ukunanzelela ukuthi , sekulesikhathi eside umhlangano wabaphathekileyo waqhutshwa, sesilamakheli elingawasebenzisa ukusithinta kumbe ukusethekelela.Nxa kuke kwaba lenguquko yekheli yalapho otholakala khona etshiyeneyo laleyo esayisebenzisayo ngesikhathi sokukhulumisana kumbe ukuxhumana ekuqaleni komnyaka ka 2015, kumbe nxa ungabe ulabanye ocabanga ukuthi kumele baphatheke kunhlolisiso kumbe kuhlelo lweESIA , kumele usazise ngokuphangisa usipha okugcweleyo ngalabo bantu .Amakheli ethu lenombolo zocingo kwethulwe kusahluko sesine ngaphansi.

3 Inguquko yequla leERM

Ngenxa yokuthi kuke kwaba lesikhathi eside uhlelo lolu lumisiwe ngemva kokusungulwa kwalo, kuke kwaba lenguquko kuqula leli.Inhanganiso yeBlack Crystal Consulting yiyo ephathisa iERM kwele Zimbabwe njalo izabe iphatheka kuhlelo lonke kwele Zimbabwe. Kwele Zambia, lapho okungadingakali ngcitshi okusemthethweni, iERM izabe isebenza lequla lengcitshi ezizaqhatshwa kulelo ukuze zigcwalisise kumbe ukuqhuba umsebenzi okumele wenziwe.

4 Amakheli alapho esithokala khona lenombolo zocingo

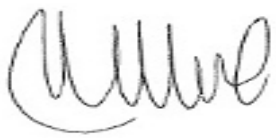
Nxa lingabe lilokuthandabuza kumbe ukungazwisisi ngalincwadi, kumbe nxa lingabe lifuna ukusipha amakheli alapho elitholakala khona kumbe abantu elingafuna ukuthi babe yingxenye yohlelo, khululekani ukusithinta kumakheli alandelayo:

Igama , inhlanganiso	Ilizwe	Inombolo yocingo lekheli yobulembu kumbe iemail
Nadia Mol, ERM	South Africa	+27 (21) 6815400 or by email on batokagorgehes@erm.com
Tasara Marondedze, Black Crystal	Zimbabwe	+(263) 77 2876616

Igama , inhlanganiso	Ilizwe	Inombolo yocingo lekheli yobulembu kumbe iemail
Felix Chisha	Zambia	+(260) 974 074 384

Sikhangelele ukuphatheka kwakho kunhlolisiso yeESIA kusiya phambili.

Yimi othembekileyo



Nadia Mol

Isiphathamandla esibona lokudlelana

Mike Everett

Ingxenye yohlelo

ERM

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www.erm.com

28 November 2018

Nomuyandwa basiminizyi

KWINDULULA KWA KU LANGIZYA ZYINGA ZYIZWA IZYIJATILIZYA ABUKALE A KUSENYA KWA BANTU A KUPANGA MA YAAKE MWA KUPANGILA MAGESI KU BATOKA GORGE

Kabungwe ka Zambezi River Authority (ZRA) aako ka kapangwa ku ma mfulumende ya masi obilo ya Zambia a Zimbabwe bali jisi mizezo ya kusumpula na miyeyo ya kupanga buyake bwa kupanga magesi ku Batoka Gorge iyo itwa kuti Batoka Gorge Hydro-Electric Scheme (Uyo una kwitwa kuti 'Mulimo'). Uyu mulimo uya kuba ma ntamu ali makumi one a musano azyibili (47km) kumbele ya Victoria Falls a mulonga wa Zambezi.

Akwendelana amilawo ya Zambia a Zimbabwe, kautana talika mulimo oyu, mulimo umbi witwa kuti Environmental and Social Impact Assessment (ESIA) ulanganya a zintu zinga zyazwamo izyi nga zyakumya mikalile ya bantu azyoonse zintu zilengwa a Leza izyiyandika kumanizigwa, kunze ya zyezyi neku nga kwaba kuzumizyigwa kuzwa ku masi aya obile ya Zambia a Zimbabwe kutegwa oyu mulimo utolelelwe. Kusankanisizya azyezyo ziyandika, nkambo kakuti ba Batoka Gorge Hydro-Electric Scheme baya kuyanda lugwasho lwa mali kuzwa ku masi ambi, milimo ya ESIA ya mulimo oyu ilelede kuchitwa mbuli mbo ujitwa ku masi ambi kwendelana amilawo ya ba world bank ayo ya jatikiya zintu zilengwa a Leza a mikalile ya bantu kusankanizya a milawo ya ba International Hydropower Association (IHA).

Milimo ya ESIA ya katalika akati ka mwaka wa 2014 a ba ZRA a kabungwe kaitwa kuti Environmental Resources Management Southern Africa (Pty) Ltd (ERM) a tubungwe twa ku chisi cha Zambia a Zimbabwe (Kaizen Consulting International mu Zambia a ba Black Crystal mu Zimbabwe) mbuli ba gwasilizya kubeleka mulimo oyu. Kautanamana mwaka wa 2015, ba ERM a bantu babo bakamanizya kulanganya mulimo, uumo mwali ku bandika akujatikizyana abantu abo mulimo oyu wali kubakumya ukuyungizya a ku langanya azilengwa a leza a mikalile ya bantu ba kamanizya kutegwa ziyungizigwe muli ESIA. Kumamanino a mwaka wa 2015, ESIA wa kutalika antomwe achiitwa Environmental and Social Management Plan (ESMP) echo chilanganya a ku jatikizyanya ezyo zijanwa muli ESIA ya kapangwa akupa ba ZRA kutegwa ba indulukemo.

Chaali checho chiindi ESIA ni yaka imikwa nkaambo ka zintu zinjanji; nakuba bobo kwambauzyanya kwa katolelela akati ka ba ERM, ZRA a ba World Bank (abo babikamo mali) nchechecho sunu na lino milimo ya ESIA yatalika alimwi.

Mwakalisalidwe kutola lubazu ku jatikisya milimo ya ESIA mu mwaka wa 2014 kabatana imikwa. Olu lugwalo lumutondezya zintu mbuli zyezi:

- Kutalika alimwi kwa milimo ya ESIA achiindi chiti ikatolwe;
- Inzila zimbi zibwezegwa akubandika abaabo batola lubazu;
- Ku chincha bantu ba kubeleka limwi; alimwi
- Anzila zya ku tujaninamo kutegwa tutolelele kwambauzyana.

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Tania Swanepoel
Marinda Rasmussen

1. Kutalika alimwi kwa milimo ya ESIA

Kuzwa mu mwezi wa October 2018, milimo ya ESIA ya talika alimwi. Tula miyeeyo na mizezo yakuti milimo ya ESIA yaku maniina a ESMP wa mamanino kuli babo batondezya ku masi aya obile akati ka mwaka wa 2019. Kutegwa tumanisye kufwambana fwambana eyi milimo ya chala kubeleka kuzwa kwa kasimpila milimo ya kaiindi kutegwa tu manizye intamu ya zyacheede muli oyu ESIA. Akusankanizya na kuyungizya, kubona kuti ali chechino chiindi twahiba kabotu bupati bwa busena buti kabwezegwe kuli oyu mulimo uyungizya a buyake buti kayandike, chili buyo kabotu kutegwa imilimo ya kusenya bantu abo bali mu busena bwa milimo inga yatalika. Zitobela zintu zya chala zya tantikwa boobu;

Mulimo	Butantiko bwa chechi
Kuchilila ku hiba bantu bakede mumbali a mulonga ku ya kumbele a mulonga (echi chaachitwa kaindi ku Zimbabwe)	November – December 2018
Kuyandisya kuzyibilawo azimbi izi njanji izijatikizya ku busena, tunsiyansiya a kusankanizya mikalile ya bantu ezyo zinga zyajatilizya ku masena aya obile izyaasalwa kotuna ku gusya mabwe akubeleka oyu mulimo	November 2018 – January 2019
Milawo ijatikizya ku kusenya bantu itwa kuti Resettlement Policy Frameworks (RPFs) bujatikizya a busena bwa salwa kupangilawo damu antomwe a buyake bumbi (akubikilawo busena bwa kusha bulongo bwa kuyakila, kwa kusha mabwe alimwi amuuti kainde intambo izya magesi mu Zimbabwe a mu Zambia)	November 2018 – May 2019
Miyeyo na mizezo ya kusenya bantu itwa kuti Resettlement Action Plans (RAPs) ijatilizya ku mugwagwa wa kubolela ku Batoka ku mbali ya ku Zimbabwe alimwi amaanda akukalilamo ba belesi mu Zimbabwe a mu Zambia	November 2018 – May 2019
Kululamya ESIA a ESMP wakusaanguna kuchilila milimo ezi zili ajulu a kubikila mibuzyo a ku hwila mibuzyo eyo yabuuzigwa a tubungwe tu pa nguzu antomwe a ba world bank muli ESIA wa matalikilo na wa kutalika. Oyu ESIA a ESMP uya kwandaulwa mu zibela zyotatwe mbuli ba ZEMA mbo bayanda kuti a chibeela chomwe chomwe kutegwa chibela cha mulimo chalibeda chalike (buyake bwa damu, munzi wa ba belesi alimwi a busena bwa kugusyawo bulongo bwa bu yake; a migwagwa; a busena bwa kwiizya intambo izya magesi).	February and March 2019
Kujola mibuzyo iyo itikabuzye aabo bakatolede lubazu muli ESIA wa kusanguna, ESMPs, RPFs, alimwi a RAPs	March – April 2019
Kumanizya a kutola makani aya ku tubungwe tupa nguzu izya kubeleka oyu mulimo	May – June 2019

2. Hitikachilile a kuhwana a bati katolemo lubazu

Boonse abo bakasalwa kubweza lubazu ku milimo izya ESIA a kusika buzuba bwa sunu, twa kabambila bwa kutalika lwiiyo, alimwi anzila izya kubajaninamo twa kalemba.

Kuya kuba kutolelela kubandika abantu antomwe abasololeli babo bakala mu masena ayo muya kubeda mulimo oyu kutegwa tukabwezelewo aambi makani, maningi kuli babo bakede kumbele kotuti kapangile damu ababo bakede mu masena munsimunsi akooko kotuna kugusha bulongo amabwe abu yake.

Akuchilila zyezyi, mulaitwambuli ba kubweza lubazu kwambaula ali ESIA wa kusanguna na yazwa. Muya kwitwa mu kujanwa ku miswangano ezyo izyinakukananwa izyizwa mu lwiiyo olu alimwi. Kuzwa wawo ino, kuya kuba miswangano iti kabambwe akutelela mingulo na kuhwilwa a ziyo alimwi tuya kumwita mu chiindi chelede ku muswangano oyu.

Nkaambo cha kuti kwainda chiindi chilafu mbo twa bandikila, chipati chakuti ma nambala anu bambi akachinchiwa andiswe twa kachika kutegwa anobena inga mwibelesya. Na kuli ma nambala nainchintu yanu ya chincha kuzwa mbo twa bandika andinye kuzwa mu 2015, olo ndiza inga mwahibako bantu bambi banga inga babweza lubali muli oyu ESIA inga mwatuzhibya kufwambana fwambana. Ma nambala a kutuzhibya ali ansi aawa achibela cha ne (4).

3. Kwiindana kwa bantu abo babeleka a ERM

Kulanganya chiindi chainda kuzwa oyu mulimo nowakatalika, kuli kwimpana ku bantu ba beleka a ERM. Akampani kaitwa kuti Black Crystal Consulting bachibeleka a ba ERM mu Zimbabwe alimwi baya kubeleka milimo yoonse mu Zimbabwe. Mu Zambia takwe mulawo uyanda buyo kubeleka a kampani. Ba ERM bana kubeleka abantu ba mu Zambia kutegwa ba kamanizye mulimo ooyu.

4. Inzila ya Kwambaula aswebo

Nakuli zyimbi zye muyanda kuhiba zijatikizya lugwalo olu, kutizhibya swebo mu nzila eezi:

Izina a Kabungwe	Chisi	Nambala
Nadia Mol, ERM	South Africa	+27 (21) 681 5400 Email: batokagorgehes@erm.com
Tasara Marondedze Black Crystal Consulting	Zimbabwe	+(263) 77 287 6616
Felix Chisha K	Zambia	+(260) 974 074 384 Email: felixchisha@yahoo.com

Tula langila ku jatihanya mu kusumpula milimo ya ESIA.

Ndi swe,

Nadia Mol	Mike Everett
Stakeholder Engagement Manager	Partner

Annex C7.2

Notification Email

Reinett Mogotshi

From: Reinett Mogotshi on behalf of ERM South Africa Cape Town IAP Project Batoka Gorge HES
Sent: 06 December 2018 03:29 PM
To: ERM South Africa Cape Town IAP Project Batoka Gorge HES
Subject: Notification of the recommencement of the Batoka Gorge Hydro-Electric Scheme Environmental and Social Impact Assessment
Attachments: Interim feedback letter to stakeholders.pdf

Bcc: 'kanyandurah@gmail.com'; 'permsec@mlg.gov.zw'; 'rudo.chitiga@gmail.com'; 'bnmush@gmail.com'; 'gariranoni@gmail.com'; 'kmudereri@gmail.com'; 'amarawa@hotmail.com'; 'energy@energy.gov.zw'; 'power@energy.gov.zw'; 'chitsikorj@moa.gov.zw'; 'mmunodawafa@environment.gov.zw'; 'ommoyo@my.gov.zw'; 'ema@ema.co.zw'; 'fmangwanya@zimparks.go.zw'; 'JongaJk@ddf.gov.zw'; 'ddf@ddf.gov.zw'; 'Chiwera@ddf.gov.zw'; 'ministerofstatematnorth@gmail.com'; 'zgshumba@energy.gov.zw'; 'dchimhanda@gmail.com'; 'patodirectorgeneral@zimparks.gov.zw'; 'hilarymadiri@yahoo.com'; 'parksres@mweb.co.zw'; 'admin@zera.co.zw'; 'idube@zetdc.co.zw'; 'gwasiraf@gmail.com'; 'bchitombo@zinwa.co.zw'; 'fmchabata@yahoo.com'; 'natmus@utande.co.zw'; 'natmus@utande.co.zw'; 'pastar143@yahoo.com'; 'natmys@utande.co.zw'; 'info@zinara.co.zw'; 'info@zinara.co.zw'; 'pr@zinara.co.zw'; 'info@ztazim.co.zw'; 'ce@ztazim.co.zw'; 'ceozct@gmail.com'; 'dumienyoni@yahoo.com'; 'lungiledhlomo@yahoo.co.uk'; 'pmdmatnorth@mines.gov.zw'; 'pamatnorth@gmail.com'; 'kamutema@transcom.gov.zw'; 'emasocha@zinara.co.zw'; 'atm4@gmail.com'; 'btagwirei@zinwa.co.zw'; 'emantoh@yahoo.com'; 'nkhcthwe84@yahoo.com'; 'masawir@caaz.co.zw'; 'sinsamba@caaz.co.zw'; 'aaromuna@gmail.com'; 'ngwenyabkt@gmail.com'; 'ngwenyabrt@gmail.com'; 'owenmukombero@yahoo.co.uk'; 'tclerkvfm@comone.co.zw'; 'info@vfm.co.zw'; 'nmoyo@vfm.co.zw'; 'tsjura@yahoo.com'; 'emakuwe@yahoo.com'; 'edmorengosi@yahoo.com'; 'faithchirambavf@gmail.com'; 'mambom23 @gmail.com'; 'kmangwiro37@gmail.com'; 'lovemorencube21@gmail.com'; 'trosen@zinwa.co.zw'; 'bvamburetaruvinga@gmail.com'; 'dumienyathi@gmail.com'; 'edmorengosi@yahoo.com'; 'engosi@zimparks.org.zw'; 'chizatm@gmail.com'; 'cgurure@zimparks.org.zw'; 'tngotosa@hotmail.com'; 'alfredojijah@gmail.com'; 'schomhlanga@gmail.com'; 'makeyincube@gmail.com'; 'mukomajai@yahoo.com'; 'ndunamacebo@yahoo.com'; 'mhlanga.timothy314@gmail.com'; 'ncubeprevious@gmail.com'; 'dahwange@gmail.com'; 'chrispenchauke@yahoo.com'; 'natmus@utande.co.zw'; 'nqobilemabhena@gmail.com'; 'trymorendolo@gmail.com'; 'alicmudenda@gmail.com'; 'dahwange@gmail.com'; 'hwangeruraldc@gmail.com'; 'elisabethm@intengwe.org'; 'racmaasdorp@gmail.com'; 'zambezi@mweb.co.zw'; 'nyika@roseofcharity.org'; 'campfir@id.co.zw'; 'campfire@internet.co.zw'; 'robin@cansaf.com'; 'jonathan@saflodge.co.za'; 'cephas@shearwatervf.com'; 'skinner@wildhorizons.co.zw'; 'clive@wildhorizons.co.zw'; 'barbara@wildhorizons.co.zw'; 'garya@wildhorizons.co.zw'; 'brent@adventurezonevicfalls.com'; 'riverops@adventurezonevicfalls.com'; 'philani@shockrafting.com'; 'nyathimarvel@gmail.com'; 'ben@khanondotravil.com'; 'andrew@gravity.co.za'; 'raz@dinganetours.com'; 'stevej@lionencounter.com'; 'tendavies@yahoo.co.uk'; 'croccagediving@gmail.com'; 'dabula@africaonline.co.zw'; 'mike@shearwatervf.com'; 'mike@sheawaterct.co.za'; 'ioan.gibbs@bonisair.com'; 'jonathan@saflodge.co.zw'; 'rob@imvelosafarilodges.com'; 'gm@victoriafallshotel.com'; 'dgm@victoriafallshotel.com'; 'hfc@victoriafallshotel.com'; 'dkung@legacyafricahotels.com'; 'martin@ilalalodge.co.zw'; 'gm.rainbowvfa@rtg.co.zw'; 'hilda.magaso@rtg.co.zw';

Bcc: 'fungai@heritageexpeditionsafrica.com'; 'nmoyo@legacyafricahotels.com'; 'kofficer@ehr.africansun.co.zw'; 'jonathan@saflodge.co.zw'; 'zondo@matupula.co.zw'; 'imvelo@imvelosafarilodges.com'; 'info@ztazim.co.zw'; 'marketing@ztazim.co.zw'; 'retosa@iafrica.com'; 'info@retosa.co.za'; 'retepstrebor@yahoo.co.uk'; 'joshggm@mweb.co.zw'; 'Joshggm@mweb.co.zw'; 'cheziyacrocs1@gmail.com'; 'editor@victoriafallswonders.com'; 'roger@vicfallswildlifetrust.org'; 'jessica@vicfallswildlifetrust.org'; 'ecolynx@zol.co.zw'; 'namo@environmentafrica.org'; 'edith@environmentafrica.org'; 'charlie@environmentafrica.com'; 'charlie@greenlineafrica.org'; 'JuliaPierini@birdlifezimbabwe.org'; 'ecolynx@zol.co.zw'; 'yvonne@routesthrouafrica.com'; 'sparrow.alan@gmail.com'; 'oliver@environmentafrica.org'; 'galorand@mweb.co.zw'; 'cat@yoafrica.com'; 'info@environmentafrica.org'; 'namo@environmentafrica.org'; 'galorand@mweb.co.zw'; 'rudo@internationalrivers.org'; 'grace.cc.wu@gmail.com'; 'ranjit.deshmukh@berkely.edu'; 'cmuvirimi@wwf.org'; 'communications.zw@undp.org'; 'gsmaphosa@gmail.com'; 'hhsansole@gmail.com'; 'mahyde@gmail.com'; 'manyise@xceldent.com'; 'admin@thehealthbridge.com'; 'tlanezim@gmail.com'; 'efinnity@psmi.co.zw'; 'fovf@yoafrica.com'; 'ngomap@yahoo.com'; 'Frank_jordan_23@yahoo.com'; 'engramandi@gmail.com'; 'aramandi@zpc.hps.co.zw'; 'mmberengwa@zpc.hps.co.zw'; 'tncube@zpc.hps.co.zw'; 'tchovivofa@zpc.hps.co.zw'; 'langtonkhumalo59@gmail.com'; 'achuma@hwangecolliery.co.zw'; 'hhsansole@gmail.com'; 'nmunengami@hwangecolliery.co.zw'; 'langtonkhumalo59@gmail.com'; 'tsahondo@gmail.com'; 'ncubeleon@gmail.com'; 'lmumpande@vfm.co.zw'; 'nndlovu@vfm.co.zw'; 'nncube@vfm.co.zw'; 'shsibanda@vfm.co.zw'; 'pmabhureni@vfm.co.zw'; 'rmosesdanlayston@yahoo.com'; 'psndlovu@vfm.co.zw'; 'ratidzainyazenga@zcbc.co.zw'; 'isla.grundy@gmail.com'; 'isla.grundy@gmail.com'; 'schenaux-repond@bluewih.ch'; 'drrobbie@icon.co.za'; 'nick.zimson@gmail.com'; 'jchikeya@gmail.com'; 'petersrtebo@yahoo.co.uk'; 'drtnhiwatiwa@gmail.com'; 'mbarson91@gmail.com'; 'amend@aka-design.de'; 'whileyjean@gmail.com'; 'drew@gmail.com'; 'bncube2@hotmail.com'; 'helencave@xtra.co.nz'; 'scottnramsay@gmail.com'; 'ockie.strumpher@gayatripaper.co.za'; 'maya@leopardleap.co.za'; 'mcdonalddaniel@gmail.com'; 'josh@chezyacrocodiles.co.zw'; 'achivurayise@zpc.hps.co.zw'; 'ngunip@gmail.com'; 'cmunyamana@hwangecolliery.co.zw'; 'fmapfuwa@hwangecolliery.co.zw'

Dear Stakeholder

The Zambezi River Authority (ZRA) proposes the development of the Batoka Gorge Hydro-Electric Scheme located approximately 47km downstream of Victoria Falls, on the Zambezi River.

An Environmental and Social Impact Assessment (ESIA) was commissioned in mid-2014 and Environmental Management Resources and its local partners were appointed to undertake this work. A Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies was completed. The Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared by the consulting team, but then the project was placed on hold for numerous technical and commercial reasons.

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- Changes to the Project Team; and
- Our contact details for further communication.

Please find the attached letter for additional information.

We look forward to your participation in this process.

Kind Regards

Reinett Mogotshi
Consultant II

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1st Floor | Great Westerford | 240 Main Road | Rondebosch | 7700 | Cape Town | South Africa
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E reinett.mogotshi@erm.com | **W** www.erm.com

ERM *The business of sustainability*

Read our FY18 Sustainability Report and ERM Foundation Annual Review

Reinett Mogotshi

From: Reinett Mogotshi on behalf of ERM South Africa Cape Town IAP Project Batoka Gorge HES
Sent: 06 December 2018 03:16 PM
To: ERM South Africa Cape Town IAP Project Batoka Gorge HES
Subject: Re: Notification of the recommencement of the Batoka Gorge Hydro-Electric Scheme Environmental and Social Impact
Attachments: Interim feedback letter to stakeholders.pdf

Bcc: fewdayschanka@gmail.com; chikwenyan@gmail.com; smmbewe@yahoo.com; mwila.daka@mcti.gov.zm; duchi45@yahoo.com; maketo.mulele@mndp.gov.zm; jmukoloba2000@yahoo.com; kennethnyundu@gmail.com; changanongoi@yahoo.co.uk; zaridirector@zari.gov.zm; pklungu@gmail.com; jmwango60@googlemail.com; sweetkajipaike@yahoo.co.uk; bensonmwenya@hotmail.com; nkumbusiame@yahoo.com; kennedymalama@yahoo.com; arnmils.simwaba806@gmail.com; frachisangano@yahoo.com; jmpishi2001@yahoo.com; everistokasumba2 @gmail.com; oscarsilembo@yahoo.com; swilliams@erb.org.zm; florence.chibwesha@hrc.org.zm; lukupulo@gmail.com; lukpulo@yahoo.com; infor@hotmail.com; matthew.ngulube@ncc.org.zm; nrfa@zament.zm; cmuleya@nwasco.org.zm; kchitumbo@nwasco.org.zm; MChisenga@roads.gov.zm; emwape@roads.gov.zm; info@rtsa.org; southernwater@swasco.co.zm; alexadra@wasaza.org.zm; ndakalac@yahoo.com; hmmilumbe@gmil.com; ckaniki@zesco.co.zm; fkmshalwindi@gmail.com; mwamulowek@netscape.net; mwamsprog@mail.com; ndiyoi@yahoo.co.uk; kanguyaisaac@yahoo.com; s_nyondo@yahoo.com; serahnyondo@yahoo.com; lzulu@mota.gov.zm; lzullu@gmail.com; aggrey.siuluta@moe.gov.zm; aggrey81@yahoo.com; msimabenga@gmail.com; smwiinga@erb.org.zm; luzy.mwale@gmail.com; jonesmasonde@zawa.org.com; jkmasonde@yahoo.co.uk; jonesmasonde@zawa.org.zm; robertchilembo@gmail.com; stembo@zema.org.zm; simon.tembo1@gmail.com; lkalenge@gmail.com; lnundwe@zema.org.zm; lloyd.numdwe@gmail.com; cmateke@gmail.com; oshalwindi@gmail.com; Kairajohn@ymail.com; mulombajk15@yahoo.com; samsonsakala@yahoo.com; samsondsakala@yahoo.com; minyoyipamela@gmail.com; mhabanji@gmail.com; msimabenga@gmail.com; muvwimigetrude@yahoo.com; gisfordb@yahoo.com; kalumbamwaandwe@gmail.com; pasmuso@yahoo.com; kelysonm@yahoo.co.uk; juliussimfukwe@gmail.com; edioyoba@yahoo.com; josephkalubila@yahoo.co.uk; Ronaldhamaimbo@gmail.com; maambolilanda@gmail.com; sepiso.k@gmail.com; bfyacepa@yahoo.com; mchvywanga@gmail.com; preciousmusa69@yahoo.com; emma@thebutterflytree.org.uk; alexadra@wasaza.org.zm; hanampotab@yahoo.co.uk; infor@ms.zm; jackiengoma@yahoo.com; melpezy88 @gmail.com; richard.nawa@gmail.com; infor@jesuits.org.zm; gchiwoneso@yahoo.co.uk; rhensonzam@gmail.com; cmateke@gmail.com; nchongo.zcbnrm@gmail.com; rhensonzam@gmail.com; veronicasiachenga@gmail.com; info@ngocc.org.zm; rouridhe@adventure-logic.com; ruaridh@adventure-logic.com; jo@bunduadventures.com; jo@bunduadventures.com; eumatours@zamnet.zm; elissa@adventure-africa.com; kingsley@limbolodge.com; lta@microlink.zm; manager@marambariverlodge.com; s.j.sikaneta@gmail.com; hamida@mukwatravel.co.zm; s.j.sikaneta@gmail.com; zaminfo@safpar.com; spezam@safpar.com; zamops@safpar.com; zaminfo@safpar.com; dgyles@safaritrekafrica.com; walks@savannah-southern-safaris.com; info@stanleysafaris.com; tabonina@yahoo.com; taita-falcon@microlink.zm; anmariefourie@gmail.com; waslodge@zamnet.zm; waslodge@yahoo.com; wecsz@microlink.zm; grace1msambachinanda@yahoo.co.uk; ncunesco@zamnet.zm;

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Dear Stakeholder

The Zambezi River Authority (ZRA) proposes the development of the Batoka Gorge Hydro-Electric Scheme located approximately 47km downstream of Victoria Falls, on the Zambezi River.

An Environmental and Social Impact Assessment (ESIA) was commissioned in mid-2014 and Environmental Management Resources and its local partners were appointed to undertake this work. A Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies was completed. The Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared by the consulting team, but then the project was placed on hold for numerous technical and commercial reasons.

This notification serves to inform you of the following:

- The recommencement of the ESIA Process and its associated timeline for delivery;
- Further opportunities for the Engagement of Stakeholders;
- Changes to the Project Team; and
- Our contact details for further communication.

Please find the attached letter for additional information.

We look forward to your participation in this process.

Kind Regards

Reinett Mogotshi
Environmental Consultant

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E batokagorgehes@erm.com| **W** www.erm.com

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Annex C7.3

Proof of Postage

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ZESCO LTD
P. O. BOX 60594
LIVINGSTONE
P. O. BOX 680145
CHOMA
THE PROVINCIAL MINISTER
SOUTHERN PROVINCE
P. O. BOX 680145
CHOMA
ATTN:- HON. EDIFY HAMUKALE

THE DIRECTOR OF PLANNING
LIVINGSTONE CITY COUNCIL
P.O. BOX 60029
LIVINGSTONE
ATTN - MS MAMBWE CHISINGA
MR CHOOLWE SHALWINDI
KEEPER OF BOTANY
LIVINGSTONE MUSEUM
P.O. BOX 60498
LIVINGSTONE

THE DISTRICT COMMISSIONER
LIVINGSTONE CITY COUNCIL
P.O. BOX 60029
LIVINGSTONE
ATTN:- MS. HARLIET KAWINA
EMMA KENNEDY
THE BUTTERFLY TREE
P.O. BOX 61181
MUKUNI VILLAGE
LIVINGSTONE

THE PERMANENT SECRETARY
SOUTHERN PROVINCE
P. O. BOX 63001
CHOMA
ATTN: Mr. LIOMBA MAHANGALA
HIS WORSHIP THE MAYOR
LIVINGSTONE CITY COUNCIL
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ATTN:- Mr. EUGENE MAPUNO

YUSUF M. DODIA
CHAIRPERSON
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LUSAKA
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ZIMBA
ATTN: Ms. ELIZABETH KALALUKA

THE DISTRICT COMMISSIONER
KALOMO DISTRICT COUNCIL
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KALOMO
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DISTRICT AGRICULTURAL COORDINATOR
MINISTRY OF AGRICULTURE
C/O CHOMA DISTRICT COUNCIL
P.O. BOX 630145
CHOMA
ATTN:- Mr. GOLIATH CHOOYE

TO TAWANDA GOTOSA
2PWMA
PO BOX 2283 Bush Awando
Sealed
TO S CHENAUX AGMOND
PO BOX 131
VICTORIA FALLS
Sealed
TO DR DREW CONBOARE
P O BOX 177
VICTORIA FALLS
Sealed

TANANDA GOTOSA
2PWMA
PO BOX 2283 Bush Antares
Sealed
S CHENAUX ALPOND
PO BOX 161
VICTORIA FALLS
Sealed
DR DREW ONBEARE
PO BOX 177
VICTORIA FALLS
Sealed

THE PERMANENT SECRETARY
MINISTRY OF AGRICULTURE
P.O. BOX 50197
LUSAKA

Annex C7.4

Meeting Minutes

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	3 December 2018
Stakeholder group	Southern Province Permanent Secretary-Choma
Attendees (Attendance Register number)	• M Liomba (Permanent Secretary)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Felix Chisha K
Minute-taker	Felix Chisha K

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

This meeting is being held for the following purposes:

- To notify stakeholders of the recommencement of the environmental and social studies;
- To re-identify and confirm the stakeholders with whom the team should be engaging in the ESIA process as well as their communication procedures and needs;
- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
Concern that this project has stalled for a long time and people are wondering just when this will become a reality. He further assured the consultants of support from the Southern Province as this project will contribute to the growth of the economy by attracting investors into the province	M Liomba	Comment noted.	Felix Chisha K
The past load-shedding the country experienced is an indicator of the need for additional power.	M Liomba	Comment noted.	Felix Chisha K
The province is planning to host its first ever provincial trade expo next year starting 15th September 2019.	M Liomba	Comment noted.	Felix Chisha K
The Southern Province permanent secretary can be of assistance, should any problems arise associated with the work that the team is undertaking.	M Liomba	Comment noted.	Felix Chisha K

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	M Liomba
Stakeholder Group	Southern Province Permanent Secretary-Choma
Position	Permanent Secretary
Address	
Telephone number	097 742 9941
Email address	mwaliomba@gmail.com

Figure 1 Photograph from the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	4 December 2018
Stakeholder group	HRH Chief Mukuni.
Attendees (Attendance Register number)	• Chief Siloma Mukuni (Monarch) • Stanley Syamapa (Syachulubwi) • Phillip Ziduche (ZRA Manager-environment)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K (ERM consultant)

Introduction

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Record of the Meeting

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Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
It would be best if the road was left as currently proposed so that the residents can enjoy the benefits of a good road, especially when it comes to transporting their agricultural products to the market.	Chief Mukuni	Comment noted.	Johan Oosthuizen
The chief informed the consultants that the affected people were called to the palace to discuss the possibility of a resettlement as a result of the proposed access road and these affected people understood the potential implications of the project. He also said that looking at the size of his village, resettled people can definitely remain within the same village.	Chief Mukuni	Comment noted.	Johan Oosthuizen
For the resettlement work it will be important to engage with the village matriarch (locally called 'Diyango') as she is the one in charge of land issues while the headman is in charge of dealing with people.	Chief Mukuni	Comment noted.	Johan Oosthuizen
The proposed transmission powerline route is not populated. I will help to ensure that the EIA process flows smoothly.	Chief Mukuni	Comment noted.	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Chief Siloma Mukuni	Stanley Syamapa (Syachulubwi)
Stakeholder Group	HRH Chief Mukuni.	HRH Chief Mukuni.
Position	Chief	
Address	Box 61133 Livingstone	Box 61133 Livingstone
Telephone number	097 1013 664	097 949 3442
Email address	kingmukuni@yahoo.com	-

- Additional stakeholders that need to be addressed

Stakeholder	**Contact details**
Village Matriach	Details still to be sourced from the chief

Figure 1 Photograph from the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	4 December 2018
Stakeholder group	Kazungula District Council
Attendees (Attendance Register number)	• Mutoka Watson (Kazungula Council • Kelyson Manzioza (Kazungula Council Planner) • Chrosebery Nchimunya Kazungula Council Planner) • Philip Ziduche (ZRA)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K (ERM Consultant)

Introduction

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- To re-identify and confirm the stakeholders with whom the team should be engaging in the ESIA process as well as their communication procedures and needs;
- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
Engagement with the District Council is important. In previous rounds of engagement, all the meetings were held in Livingstone which does not fall within the project area.	Kazungula District Council	This will be taken into consideration for future engagements.	Johan Oosthuizen
The Kazungula District Council is responsible for land take greater than 250 ha which will need to be converted into state land. The Council is well equipped and ready to work with the team.	Kazungula District Council	Comment noted	Johan Oosthuizen
People in the project area as people have high expectations of the project and are tired of hearing about it and want it done.	Kazungula District Council	Comment noted	Johan Oosthuizen
The project will help with the power deficits that affect this area.	Kazungula District Council	Comment noted	Johan Oosthuizen
When will this project commence?	Kazungula District Council	Stakeholder referred to the interim introduction letter for this information.	Johan Oosthuizen
It was agreed that the Town Planner was going to be the direct contact person for the Kazangulu District Council.	Kazungula District Council	Comment noted	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Mutoka Watson	Kelyson Manzioza	Chrosebery Nchimunya
Stakeholder Group	Kazungula District Council	Kazungula District Council	Kazungula District Council
Position		Planner	Planner
Address		P O Box 65 Kazungula	
Telephone number	096 572 7726	097 770 0700	095 319 9672
Email address	Mulokawatson@gmail.com	kelysonm@yahoo.co.uk	chrozlyn@gmail.com

- Suggested feedback communication

Means of feedback	**Yes**	**No**
Meeting	✓	
Written		
Report review		
If a meeting, notice period required		
Representatives/communities that should attend such meetings		
Preferred date for a meeting		

Figure 1 Photograph from the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	5 December 2018
Stakeholder group	Livingstone City Council
Attendees (Attendance Register number)	• Bertha Nkhata (Assistant Director City Planning) • Muyunda Muyambango (Assistant Director, Engineering) • Chilufya Chibiliti (Town Clerk) • Philip Ziduche (ZRA)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K. (ERM Consultant)

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

This meeting is being held for the following purposes:

- To notify stakeholders of the recommencement of the environmental and social studies;
- To re-identify and confirm the stakeholders with whom the team should be engaging in the ESIA process as well as their communication procedures and needs;
- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
How many youths that will be employed by the project?	Chilufya Chibiliti	The exact numbers to be recruited can only be determined at a later stage of the project. Workers will be sourced from both Zambia and Zimbabwe.	Johan Oosthuizen
Will the Council be consulted on the proposed project? Previously the Council was not kept up to date. The Council is the centre for information dissemination and as such the Council must have latest information to share with the public.	Livingstone City Council	Comment noted.	Johan Oosthuizen
We are concerned that ZRA usually tends to go quiet and that leaves the Council in a dilemma when questions are asked about the project.	Livingstone City Council	Comment noted.	Johan Oosthuizen
What is the involvement and impact of the project on the affected communities?	Livingstone City Council	There are benefits associated with the project in terms of employment and community development Negatively the project will have construction phase impact and impacts associated with physical and economic displacement.	Johan Oosthuizen
The project is a very welcome one and it is long overdue.	Livingstone City Council	Comment noted.	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Bertha Nkhata	Muyunda Muyambango	Chilufya Chibiliti
Stakeholder Group	Livingstone City Council	Livingstone City Council	Livingstone City Council
Position	Assistant Director City Planning	Assistant Director, Engineering	Town Clerk
Address		P O Box 60029 Livingston Council	P O Box 60029 Livingston Council
Telephone number	097 983 6371	097 782 7746	096 678 5778
Email address	Bnkhata89@gmail.com	mmuyambngo@yahoo.com	livcity@gmail.com

Figure 1 Photograph from the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	6 December 2018
Stakeholder group	Zimba District
Attendees (Attendance Register number)	• Katuta Mbewe (Zimba Council) • Josephine Chiila (Zimba Council) • Elizabeth L Moteto (Council Secretary) • Chrispin Namakando (ZRA)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K.

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

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Record of the Meeting

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Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
Why is the District Council being briefed when they are so far away from the project area?	Elizabeth L Moteto	The transmission line passes through the proposed project area and thus it is important that the Council is engaged as a stakeholder	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Katuta Mbewe	Josephine Chiila	Elizabeth L Moteto
Stakeholder Group	Zimba District	Zimba District	Zimba District
Position	Deputy Director of Works	Planning Officer	Council Secretary
Address	c/o Zimba Town Council P O Box 610100	c/o Zimba Town Council P O Box 610100	c/o Zimba Town Council P O Box 610100
Telephone number	097 412 7417	097 245 0206	096 668 4975
Email address	kutatambewe@gmail.com	chiilajosephine@gmail.com	elizabethlondwe@yahoo.com

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	10 December 2018
Stakeholder group	Chief Simwatachela
Attendees (Attendance Register number)	• HRH Chief Simwatachela • Chrispin Namakano, ZRA • Elizabeth Karonga, ZRA • Phillip Ziduche, ZRA • Felix Chisha, ERM • Johan Oosthuizen, ERM
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K.

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

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Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
You are all welcome. I am aware of the project. I have previously had a meeting with the ZRA who informed me about the proposed project activities in my area of jurisdiction.	Chief Simwatachela	Thank you.	Johan Oosthuizen
I am concerned as to what would happen to the water frontage around his area. Will access to the river be lost and what will happen to flows downstream? What are the changes downstream of Kariba like – so I can understand what to expect downstream of this dam.	Chief Simwatachela	The dam will be a run of river operation so flows downstream should not change significantly after the construction of the dam. There may be some change experienced during the construction phase. Access downstream will not be restricted.	Johan Oosthuizen
Will there be any resettlements in the neighbouring chiefdoms of HRH Chief Mukuni and HRH Chief Sipatunyana?	Chief Simwatachela	Resettlement in these areas are anticipated but this is likely to be limited.	Johan Oosthuizen
Will there be a road constructed linking the two countries in the area of the dam.	Chief Simwatachela	There will be a full-fledged border post with all amenities including government facilities and installations and security on both sides.	ZRA
There is a history of cattle rustlers from his chiefdom who go to steal cattle from the Zimbabwean side. A number of his subjects are still serving jail sentences in Zimbabwe even as we speak. He said that this problem is slowly being dealt with. The road between the countries will need to be properly managed.	Chief Simwatachela	Comment noted.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
During the liberation struggle for Zimbabwe, my chiefdom was used as a battlefield. There are many landmines that are scattered in the area and are still present. Just two months ago 14 cows were blown up by these landmines, and about two years ago a group of Germans from the World Bank was also killed by these landmines. Caution should be exercised when visiting that area. There is a man, a former soldier who was part of the battle in the area bordering Mukuni village who is very knowledgeable when it comes to this area and it would be nice if he can be convinced to work with our team as he knows exact locations where these landmines and guns are buried, but he is not a cooperative person. The chief said that the area prone to landmines is the area along Kalomo river bordering between Simwatachela and Mukuni villages.	Chief Simwatachela	Thank you for this information Could you assist be providing the geographical locations of the landmines?	Johan Oosthuizen ZRA
This chiefdom is very rich in minerals including gemstones and coal and there is a very big possibility that there are some oil deposits. I am in early discussions with a Chinese investor to set up a thermal power plant.	Chief Simwatachela	Comment noted.	Johan Oosthuizen
ERM should set up community development projects so that locals can benefit. There is a very high level of illiteracy and unemployment among my people due to the remoteness of the area.	Chief Simwatachela	Comment noted.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
At what stage is the project currently? We are desperately looking forward to the project.	Chief Simwatachela	The feasibility studies are still underway.	ZRA
The area downstream of McDonald's farm in excess of 3,500ha was given to an investor who never developed it and left after converting it into state land. There are some people who have illegally settled there as the land is still a contentious issue. The fishermen found in the area are illegal fishermen as they do not have the necessary licences and do not observe government fishing bans as they have little chance of being caught by the regulatory authorities. He noted, that with the Batoka Project, the area will become more accessible, such things will cease to happen and revenue collection will become a reality.	Chief Simwatachela	Comment noted.	Johan Oosthuizen
Can you assist in profiling the skills levels of the local people so that it becomes easier to identify people to employ in the project?	ZRA	I will assist where I can. Most of my subjects do not even have national registration cards and are not registered citizens.	Chief Simwatachela

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	HRH Chief Simwatacheka
Stakeholder Group	Zimba District
Position	Senior Chief
Address	c/o Simukanda School Box 80 Zimba
Telephone number	097 632 0291
Email address	bsialeka@gmail.com

Figure 1 Photograph of the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	11 December 2018
Stakeholder group	Chief Mweemba
Attendees (Attendance Register number)	• HRH Chief Mweemba • Alex Simiwichembu • Chrispin Namakano, ZRA • Elizabeth Karonga, ZRA • Phillip Ziduche, ZRA • Felix Chisha, ERM • Johan Oosthuizen, ERM
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K.

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

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Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
I am currently based in Choma town along Macha road until my palace is rebuilt after I was almost burned to death when my palace was petrol-bombed by unknown people. Two people who were in the house with me were burnt to ashes. I believe that the attack was politically motivated as I am in a predominantly opposition-led province which refuses to work with the Government.	Chief Mweemba	Comment noted.	Johan Oosthuizen
I am aware of the project. My people are looking forward to the jobs that will arise from this project. We are in support of the project as it will bring progress in my chiefdom. There are numerous of degree holders in my area.	Chief Mweemba	Please encourage your subjects to attain some form of qualification to stand a better chance of getting some of the anticipated jobs for the project. Please develop a register of the skilled people in the area.	ZRA
Any projects in your area will be supported since you are one of the chiefdoms that was displaced during the construction of the Kariba dam. We will continue to support your traditional ceremonies.	ZRA	Comment noted.	Johan Oosthuizen
When is the project team going to visit me in my chiefdom so that people can hear for themselves the good news Meetings with my people are required.	Chief Mweemba	There will be further feedback that is undertaken as part of the ESIA Process and your community will be engaged with during that period.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
Are there any security and safety issues in your chiefdom?	ZRA	There could be some landmines on the border with Simwatachela chiefdom but there has never been any incident of landmines in my chiefdom. My chiefdom has a considerable number of wild animals but not the carnivorous type.	Chief Mweemba

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	HRH Chief Mweemba	Alex Simiwichembu
Stakeholder Group	Choma District	
Position	Senior Chief	Chief Retainer
Address		
Telephone number	097 563 5832	097 918 3297
Email address		

- Suggested feedback communication

Means of feedback	**Yes**	**No**
Meeting	✓	
Written		
Report review		
If a meeting, notice period required		
Representatives/communities that should attend such meetings	The chief has requested that his community be engaged with. Little engagement has been held with them to date given that he is part of an opposition party to the ruling party.	
Preferred date for a meeting		

Figure 1 Photograph of the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	11 December 2018
Stakeholder group	Chief Sipatunyama
Attendees (Attendance Register number)	• HRH Chief Sipatunyama • Tennyson Sinoane, Chairman of Royal Establishment Committee • Wesly Simweena, Vice Chairman, Mutala Settlements • Shabby Mulemba, Chiefs Retainer • Elizabeth Karonga, ZRA • Phillip Ziduche, ZRA • Felix Chisha, ERM • Johan Oosthuizen, ERM
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Felix Chisha K.

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

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Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
Some time back I received a large document to comment on for the project. I have not yet looked at this document, but I am aware of the project. People in this chiefdom were forcibly evicted from the current area by the colonial masters and the area was converted into commercial farms which the government then converted into state land. After independence the white farmers left and the people had to buy back their ancestral land which I am not happy about. Currently this is still State Land and even the palace (Farm number 1849) is on State Land and I am renting it. The fight to convert it back to traditional land is still ongoing in courts.	Chief Sipatunyama	Comment noted. There is anticipated to be limited impact on your area – displacement associated with the powerline.	Johan Oosthuizen
Will there be a backflow on the Kalomo river since the proposed dam wall will be where the Kalomo river joins the Zambezi river. The locals are looking forward to the backflow as this will help retain some water on the Kalomo river for farming. Are there enough streams to feed into the dam or is the only water source the Zambezi river?	Chief Sipatunyama	The project is for a run of river operation and so backflow is not anticipated.	ZRA

Comment	Stakeholder	Response	Respondent
Will the project be as large as Kariba dam? If there are no blackflows on the Kalomo River then the project is unlikely to be of too much benefit for my subjects. I am elated to hear about possible jobs as there is a high rate of unemployment in his area.	Chief Sipatunyama	This will be a much smaller project. It is anticipated that benefits will be in form of jobs, both skilled and unskilled. Please could you assist us by identifying skilled labour in the area.	ZRA
How long will the project take?	Chief Sipatunyama	There are many factors that still require resolution and authorization before the project can proceed.	Johan Oosthuizen
I am aware of the fact that the proposed dam will be supplying water to towns in Zimbabwe.	Chief Sipatunyama	This is no longer the case, but there were research studies undertaken for the consideration thereof previously	ZRA
I am happy to hear about ZRA's commitment to supporting traditional ceremonies and existing CSR. It is commendable that an organisation can commit to ploughing back into the community where they work as most other business people do not do this. This chiefdom has a traditional ceremony called 'Musamu Muyumu' loosely translated as 'the big tree', which takes place late August but sometimes due to financial challenges it takes place as late as early November.	Chief Sipatunyama	Comment noted.	Johan Oosthuizen
Are there any safety issues in this chiefdom?	Johan Oosthuizen	This area was not affected by the liberation struggle in Zimbabwe. There is no threat of landmines and safety is guaranteed.	Chief Sipatunyama

Comment	Stakeholder	Response	Respondent
What traditional shrines and sites are in your chiefdom?	Johan Oosthuizen	There is a ridge that was disturbed during the construction of the existing power line on the border with Simwatachela chiefdom. The developers got some stones and I want those stones back as they are important for our tradition and culture. There are also some fruits and trees which should not be cut down, but when it comes to such developments, it is inevitable that they are cut to pave way for the project. Guidance will be provided. There are no shrines in my chiefdom.	Chief Sipatunyama

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	HRH Chief Sipatunyama	Tennyson Sinoane	Wesley Simweena	Shabby Mutemba
Stakeholder Group	Kalomo/Zimba District			
Position	Senior Chief	Chairman of the Royal Establishment Committee	Vice Chairman, Mutala Settlements	Chiefs Retainer
Address	Box 620357 Kalomo			
Telephone number	097 732 8492	095 353 9830	097 655 2565	097 514 7877
Email address				

Figure 1 Photograph from the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	27 November 2018
Stakeholder group	Hwange District Administration (Ministry of Lands)
Attendees (Attendance Register number)	• Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Tasara Marondedze (Black Crystal Consulting)

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

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Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
The Agritex Department (Ministry of Lands) is mandated to resettle communities and is responsible for the identification of eligible land for allocation to beneficiaries	Mr Marandu	Comment noted.	Johan Oosthuizen
We will require details on specific communities and populations to be resettled.	Mr Marandu	Comment noted.	Johan Oosthuizen
Zimbabwe legislation does not require compensation for the physical displacement of households from A2 farms (farms allocated to beneficiaries after agrarian land reform programme). Economic losses are however noted as requiring compensation.	Mr Marandu	Comment noted.	Johan Oosthuizen
Key considerations used in determining where to resettle households are: • Arable and grazing land availability; • Irrigation potential; • Soil fertility; • Terrain; and • Social infrastructure.	Mr Marandu	Comment noted.	Johan Oosthuizen
Agritex and Ministry of Lands will select the host sites in consultation with other relevant government departments	Mr Marandu	Comment noted.	Johan Oosthuizen
Agritex and the Lands Ministry will also determine which existing communities have vacancies for more settlers.	Mr Marandu	Comment noted.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
It is important that the availability of social infrastructure in existing settlements is identified to prevent new settlers from exerting pressure on this infrastructure.	Mr Marandu	Comment noted.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
The role of Agritex/Ministry of Lands is as follows: • Identification of lands with other government departments • Ascertaining the carrying capacities of replacement land which is flexible and will depend on the need and stakeholder views. This can range from 103.5 hectares/ household to 40 – 50 hectares/household on A1 farms. Traditional communities have land sizes of 6 hectares per household. • Determining vacancies among existing communities for more households • Determining the availability of social infrastructure in existing settlements to prevent new settlers from exerting pressure on this infrastructure • Providing valuation criteria for assets prior to the relocation of households • Determination of levels of crop loss for households to be resettled • Determination of land viability in destination settlement • Determination of food security components in destination settlement • Determination of farmers' asset worth pre- and post-resettlement • Pegging of land for new settlers (demarcating and allocating land)	Mr Marandu	Comment noted.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
A list of other relevant government departments and communities recommended was provided. This list include the following stakeholders: • DA's office that will contribute to the determination of resettlement costs and ensure that resettled families are provided with habitable structures; • Forestry Commission that may cede land to be used for cultivation or grazing; • National Parks and Wildlife Management Authority may advise on suitability for settlement based on local human-wildlife conflict ; and • Recipient communities to be consulted on the desirability of new households	Mr Marandu	Thank you for this information.	Johan Oosthuizen
It was also recommended that the developer should facilitate the development of clinics and water access to ensure the availability of social services in new settlements (The concern is that the District has poor social infrastructure and new settlers will exert pressure on existing infrastructure).	Mr Marandu	Comment noted.	Johan Oosthuizen
In terms of livelihood restoration it was suggested that irrigation facilities are provided, avoiding the cooperative approach and individualising access.	Mr Marandu	Comment noted.	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Misheck Marandu
Stakeholder Group	Agritex
Position	Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement
Address	P.O.Box 300 Hwange
Telephone number	077 278 5503
Email address	mambom23@gmail.com

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	27 November 2018
Stakeholder group	Hwange District Administration
Attendees	Mr Muleya (District Administrator) Mrs Masoja (Assistant District Administrator)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Tasara Marondedze (Black Crystal Consulting)

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

This meeting is being held for the following purposes:

- To notify stakeholders of the recommencement of the environmental and social studies;
- To re-identify and confirm the stakeholders with whom the team should be engaging in the ESIA process as well as their communication procedures and needs;
- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
We are concerned about the project dates. The commencement of the project is highly anticipated with expectations around employment	District Administrator	Comment noted.	Johan Oosthuizen
There is uncertainty as to how the Project will affect tourism.	District Administrator	Comment noted.	Johan Oosthuizen
Broad stakeholder consultations involving the local authority, Chiefs, local leaders (Councillors and Headmen as well as village heads) and households to be resettled are required for the Resettlement Action Plan. The Headmen will be updated and kept informed by the Chiefs, but engagement with them is still desirable as their buy-in is critical	District Administrator	This will be accommodated in resettlement planning.	Johan Oosthuizen
Households to be resettled should also be consulted. Communities in the area already have an awareness that post-resettlement their lives should be better off than they currently are.	District Administrator	Comment noted.	Johan Oosthuizen
Communities are not against resettlement because they anticipate better lives and economic prospects. One of the local chiefs is already considering potential entrepreneurial opportunities that can be offered by the project. Others are considering using the project for purposes of urbanisation	District Administrator	Comment noted.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
The District Administrator's office and the Ministry of Lands will be responsible for identification of land for resettling households affected by resettlement	District Administrator	Comment noted.	Johan Oosthuizen
The Hwange Rural District Council (HRDC) is the planning authority and is already aware of the need for resettlement as a consequence of the Batoka Gorge Project.	District Administrator	Comment noted.	Johan Oosthuizen
The HRDC is considering creating a settlement for relocated households in the Fuller Forest and Ndhlovu as well as any other less populated areas should they be available.	District Administrator	Comment noted.	Johan Oosthuizen
Project sensitivities include the need for transparency and honouring commitments. There is a legacy of empty promises made for the ZIZZABONA power line project being undertaken by Zimbabwe Electricity Transmission and Distribution Company (ZETDC))	District Administrator	Comment noted.	Johan Oosthuizen
A list of recommended stakeholders to be consulted was provided. This list include the following stakeholders: • A meeting with Chief Shana, who is the Provincial Chairman of all the Chiefs of Matebeleland Provinces • The District Agritex Officer Mr Marandu who used to be the local Chief Lands Officer • The Town Clerk of Victoria Falls on issues of tourism.	District Administrator	ERM has accommodated meetings with Chief Shana and the District Agritex Officer as part of this site visit. The Town Clerk of Victoria Falls is on our stakeholder database and will receive notification that the project has recommenced.	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Mr Muleya	Mrs Masoja
Stakeholder Group	DA Agritex	DA Agritex
Position	District Administrator	Principal Administrative Officer
Address	P.O.Box 121 Hwange	P.O.Box 121 Hwange
Telephone number	077 228 0761	077 786 6790
Email address	dahwange@gmail.com	nyaradzomagoja@gmail.com

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	28 November 2018
Stakeholder group	Hwange Rural District Council
Attendees (Attendance Register number)	• Mr Mudenda (HRDC Engineer) • Mr Phiri (HRDC Treasurer) • Mrs Kwidini (HRDC Human Resources Manager) • Mr Moyo (HRDC Auditor)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Tasara Marondedze (Black Crystal Consulting)

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

This meeting is being held for the following purposes:

- To notify stakeholders of the recommencement of the environmental and social studies;
- To re-identify and confirm the stakeholders with whom the team should be engaging in the ESIA process as well as their communication procedures and needs;
- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
HRDC experienced a poor resettlement exercise by a developer that elicited resistance from affected communities. The HRDC appreciated the consultative approach being undertaken by ERM.	Mr Mudenda	Comment noted.	Johan Oosthuizen
HRDC has the role of coordination, bringing together the mandates of the DA, Ministry of Lands and Agriculture, Forestry Commission, traditional leaders and elected representatives in development in the District	Mr Mudenda	Comment noted.	Johan Oosthuizen
For planning purposes the Council will require the number of villages, households and people to be affected.	Mr Mudenda	Comment noted.	Johan Oosthuizen
Why has the project taken this long to materialise? The HRDC is worried about the endless project time lines.	Mr Mudenda	There were outstanding issues related to the engineering design and meeting funder's requirements that needed to be addressed which caused a delay. The World Bank has specific conditions that have to be met to ensure that project impacts adhere to various social and economic standards. Project sign off can only proceed when such conditions have been met.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
The RDC plan to establish a township that would have all support services and housing 6.5 km from the Batoka plant site and proposed to establish this township in collaboration with ZRA. Another urban satellite town was being developed at Ndhlovu and the Batoka Project could also facilitate growth of this urban settlement.	Mr Mudenda	This was noted.	Johan Oosthuizen
What is the Project's rollout plan?	Mr Mudenda	Johan explained that commencement dates are not very specific as they depend on the outcome of on-going RPF, RAP and environmental authorisation studies as well as the securing of finances to develop the project. The stakeholder notification letter addresses some of these issues.	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Mr Mudenda	Mr Phiri	Mrs Kwidini	Mr Moyo
Stakeholder Group	Hwange RDC	Hwange RDC	Hwange RDC	Hwange RDC
Position	HRDC Engineer	HRDC Treasurer	HRDC Human Resources Manager	HRDC Auditor
Address	Box 165 Hwange	Box 165 Hwange	Box 165 Hwange	Box 165 Hwange
Telephone number	077 504 4194	077 104 7558	077 340 2408	0771154468
Email address	alicemudenda@gmail.com	paulwphiri@yahoo.com		

Figure 1 Photograph from the Meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	28 November 2018
Stakeholder group	Ward Councillors
Attendees (Attendance Register number)	• Mr Mukoma Shakani (Ward Councillor Chidobe Ward) • Mr Green Zulu Dropper (Ward Councillor Mbizha Ward)
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Tasara Marondedze (Black Crystal Consulting)

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

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- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

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Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
The issue of resettlement is new to the ward councilor. Resettlement is unlikely to be a problem as the main considerations of people in his constituency are benefits associated with the resettlement process.	Mr Mukoma Shakani	Resettlement will be guided by international best practice that seeks to address the impacts of resettlement through mitigation and enhancement measures.	Johan Oosthuizen
People in my constituency doubt the authenticity of the project given that so much has been said about it and nothing has materialized.	Mr Mukoma Shakani	There are still numerous factors influencing the commencement of the project including environmental authorisation, engineering, resettlement and the acquisition of funds.	Johan Oosthuizen
We are concerned about the relocation to lands with less fertile soils.	The Councilors	The IFC Performance Standards provides for resettlement outcomes where the resettled households are at least the same as, but preferably better off than before. IFC Performance Standards will be applied in this project	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Mr Mukoma Shakani	Mr Green Zulu Dropper
Stakeholder Group	Ward Councillors	Ward Councillors
Position	Ward Councillor Chidobe Ward	Ward Councillor Mbizha Ward
Address	Box 56 Chisuma Vic Falls	P.O.Box 233 Hwange
Telephone number	077 195 0259	077 195 0259
Email address		

Figure 1 Photograph from the meeting

Batoka Gorge Hydro-electric Scheme: Notes from interim feedback discussions held Between 27th November and 13th December 2018

Date	30 November 2018
Stakeholder group	Chief Shana
Attendees (Attendance Register number)	• Chief Shana • Chief Shana's Aide
Purpose of discussion	Interim notification and Resettlement Policy framework
Facilitator	Johan Oosthuizen (ERM Consultant)
Minute-taker	Tasara Marondedze (Black Crystal Consulting)

Introduction

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the Project). The Project will be situated approximately 47km downstream of the Victoria Falls, on the Zambezi River.

As part of the statutory requirements in Zambia and Zimbabwe, before the Project commences, an Environmental and Social Impact Assessment (ESIA) must be completed, and environmental authorisation granted for the Project by both the Zambian and Zimbabwean environmental regulatory authorities. In addition to these requirements, as the BGHES requires the support of international lenders, the ESIA specific to this Project will need to be undertaken to align with international good practice guidelines such as the World Bank's Environmental and Social Standards and International Hydropower Association (IHA) sustainability protocols.

An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced.

This meeting is being held for the following purposes:

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- To introduce the resettlement planning studies;
- To identify any queries and/or concerns.

Record of the Meeting

A record of the meeting is provided in Table 1 below.

Table 1 Record of interim notification discussions

Comment	Stakeholder	Response	Respondent
There are concerns about how resettlement will affect communities. The message has been conveyed that all households north of the police post will be relocated. Among the Chief's concerns is the demolition of his homestead, schools, Jambezi police station, shops and clinic.	Chief Shana	Resettlement will avoid social structures within the road and the power line servitudes wherever possible. Where unavoidable appropriate planning will address compensation and livelihood restoration issues for affected social infrastructure and affected households.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
I am concerned that households will not easily integrate into the communities into which they are resettled. I have misgivings about the unstructured placement of households in different chiefdoms and villages as this could lead to division. Emigration within the Province and District is not uncommon, but there are procedures and consultations undertaken between various authorities to facilitate this process should it be required. The standard is that immigrants should have referral letters from current settlements and the destination community should deliberate on the acceptability of the incoming family. The size of the cattle herd of the immigrant is a key consideration used to determine whether the immigrant household can fit into the existing settlement on the basis of its grazing requirements. The Chief undertook to liaise with his community on the desirability and availability of space for any immigrants displaced by the project	Chief Shana	Comment noted.	Johan Oosthuizen
Communities have been kept on tender-hooks over a prolonged period for this project. People are not aware of when they will be relocated and to where.	Chief Shana	We apologise for not communicating with the communities earlier with regard to the resettlement process.	Johan Oosthuizen
On livelihoods, it was suggested that Lukunguni river could be dammed so that those relying on the Batoka Gorge for fishing for livelihoods would not have to travel 15km to the Gorge	Chief Shana	Noted, an undertaking was made to incorporate this into the RPF.	Johan Oosthuizen

Comment	Stakeholder	Response	Respondent
I am concerned about the uptake of job and contractual opportunities by persons from outside the District and Province at the expense of locals. The Province and District is seriously disadvantaged in terms of educational and training institutions (confirmed by socio-economic baseline). This will have an adverse effect on the prospects of local youths if competitive recruitment criteria are used. As part of the project's Social Responsibility Programme, the Chief suggested that the developer in association with relevant institutions facilitate the development of vocational and training institutions that will make locals eligible for the power generation and hospitality industries that are abundant in the region. The project should also avoid recruiting from outside the region and bribing local leadership to acquiesce to this.	Chief Shana	Comment noted.	Johan Oosthuizen
I have a proposal for quarrying and gravel construction that can produce the requisite raw materials for the Batoka Gorge Project.	Chief Shana	Comment noted.	Johan Oosthuizen

Supplementary information

The following additional information was collected:

- Stakeholder contact details

Name	Chief Shana	Chief Shana's Aide
Stakeholder Group	Chief Shana	Chief Shana
Position		
Address		
Telephone number		
Email address		

Figure 1 Photograph from the meeting

Annex C7.5

Attendance Registers

CHOMA 03/12/18

01

BATOKA GORGE HYDRO PROJECT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

REGISTER OF STAKEHOLDERS (2018)

Date	Name	Representing	Designation	Contact details (phone & email)	Signature
1	M. LIOMBA	PIA SP	PS	0977429944 mwalionba@gmail.com	
2.	Felix Chisha K	ERM	ERM Consultant	0974074384	

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

Chief Mukuni Palace 04/12/18 02

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
MUNOKALYA (MONARCH) SILOMA MUKUNI	MUNOKALYA MUKUNI ROYAL ESTABLISHMENT	+260970103664	kingmukuni@yahoo.com	Box 61133 LIVINGSTONE	
STANLEY SYAMAPA SYACHULUBWI	MUKUNI ROYAL ESTABLIMENT	0979493442		Box 61133 LIVINGSTONE	
FELIX CHISHA K	ERM	0974074384	felix.chisha@yahoo.com	21/10 Lusaka	
Phillip Ziducha	ZRA-MANAGER-ENVIRONMENT	+263773109342	pziducha@zarabo.org.zm	32 CHACHACHA RD, LUSAKA	
Johan Oosthuizen	ERM	+27 82 557 3947	johan.oosthuizen@erm.com		

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

04/12/18

Kazungula Council Meeting

03

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
MUTOKA WATSON	KAZUNGULA COUNCIL/ BoW	0965727726	Mutokawatson@gmail.com	065 KTS	
KELYSON MANZIRA	KAZUNGULA COUNCIL/PLANNER	0977770700	kelysonmanzira@yahoo.co.uk	P.O. BOX 65 KAZUNGULA	
CHROSEBERY. NCHIMUNYA SIABANYAMA	KAZUNGULA COUNCIL PLANNER	0955159672	Chrozlyn@gmail.com	P.O Box KZ 065	
Felix Chisha K	ERA	0972407438	felixchisha@yahoo.com	Lusaka	
Johan OOSTHUIZEN	ERA				
Philip Ziduche	ZRA				

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

05/12/18

LIVINGSTONE CITY COUNCIL

04

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
BERTHA NKHATA ASSISTANT DIRECTOR OF CITY PLANNING	LIVINGSTONE CITY COUNCIL	0974836371	bnkhata28@gmail.com		
MMYUNDA MUYAMBANGO ASSISTANT DIRECTOR OF ENGINEERING	LIVINGSTONE CITY COUNCIL	0977827446	mmuyambango@yahoo.com	P.O. BOX 60029 LIVINGSTONE COUNCIL	
Chiluba a Chibilili TOWN CLERK	Livingstone City council	096678 5778	livcity@gmail.com	BOX 60029	
Felix Chisha K	ERM Consultant	0974074384	felixchisha@yahoo.com	21/10 Lusaka	
Johan OOSTHUIZEN	ERM				
Philip Ziduche	ZRA				

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

Zimba District

06/12/18

05

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
KATUTA MBEWE	ZIMBA COUNCIL DEPUTY DIRECTOR OF WORKS	0974127447	katutambewe@gmail.com	C/O ZIMBA TOWN COUNCIL P.O. BOX 610100	
JOSEPHINE CHIILA	ZIMBA COUNCIL DISTRICT PLANNING OFFICER	0972450206	chiilajosephine@gmail.com	c/o ZIMBA TOWN COUNCIL BOX 610100	
ELIZABETH L. MUTETO	COUNCIL SECRETARY	0966684975	elizabethlundwe@yahoo.com	P.O. BOX 610100 ZIMBA	
Felix Chisha K	ERM Consultant	0974074384	felixchisha@yahoo.com	21110 Lusaka	
John OOSTHUIZEN	ERM				
Chrispin Hamakambu	ZRA				

ERM

06/12/18

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

Kalomo Town Council

06

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
Mr Future Chisenga	KALOMO TOWN COUNCIL - CIVIL ENGINEER -	0962488048	sirfyu17@gmail.com	Box ~~600~~ 620061	[signature]
Mr. TRAVOR MULENGA	KALOMO TOWN COUNCIL - CHIEF ADMIN.	0955552717 0977605290	trevormulenga2@gmail.com	KTC P.O. BOX 620061	[signature]
MUZYANI FRANCIS	KALOMO COUNCIL	0977-744477 0965744477	muzyanifrancis@gmail.com	BOX 620061 Kalomo	[signature]
FELIX CHISHA K	ERM Consultant	0974074384	felixchisha@yahoo.com	21/10 Lusak	[signature]
JOHAN OOSTHUIZEN	ERM				
CHRISPIN NAMAKANDO	ZRA				

ERM

10 ~~05~~/12/18

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

07

Chief Simuatachela Meeting

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
BETHWELL SIMEKA HRH CHIEF SIMUATACHELA	CHIEF	09763202 91	bsimeka76@gmail.com	Simukanda Sch Box 80, Zimba	[signature]
ENG. CHRISPIN NAMAKANDO	WATER RESOURCES ENGINEER/ ZAMBEZI RIVER AUTHORITY	+260-977-807758	namakando@zaraho.org.zm	Box 30233, LSK	[signature]
Elizabeth KARONGA	P.R. + COMMUNICATIONS MANAGER ZAMBEZI River Authority	+260 977 318735	karonga@zaraho.org.zm	"	[signature]
Phillip Ziduche	ZRA	+263773107342	pziduche@zaraho.org.zm	21 Lake Dave Kanda ~~Box 3~~	[signature]
Felix Chisha K	ERM Consultant	0974074384	felixchisha@yahoo.com	21/10 Lusaka	[signature]
Johan Oosthuizen	ERM Senior Consultant	+27 82 557 3947	johan.oosthuizen@erm.com	/	[signature]

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

Senior Chief Mweemba – Choma 11/12/18 (08)

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
EBSON SHAMU	HIS ROYAL HIGHNESS SENIOR CHIEF MWEEMBA	0975635832	–		
ALEX SIMUNCHEMBU	CHIEF RANTINER	0977183297	–		
ENG. CHRISPIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY WATER RESOURCES ENGINEER	0977-807158	namakando@zarahq.org.zm	BOX 30233, LUSAKA	
Phillip Ziducho	ZAMBEZI RIVE AUTHORITY MANAGER ENVIRONMENT	+260973107312	ziduche@zarahq.org.zm	Box 30233, Lusaka	
Elizabeth KARONGA	PR & COMMUNICATION MANAGER Zambezi River Authority	+260977318795	karonga@zarahq.org.zm	"	
Johan Oosthuizen	ERM Senior Consultant	+27 82 557 7147	johan.oosthuizen@erm.com	–	

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

11/12/18

Chief Sipatunyana – Kalomo/Zimba

09

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
TIMONTH MASAKA CHIEF SIPATUNYANA VI	CHIEF	0977 328492	—	BOX 620357 KALOMO	[signature]
TENNYSON S. SINAONE	CHAIRMAN OF RECO. Royal Establishment Committee	0953539830		MUTALA SETTLEMENTS.	[signature]
WESLY SIMWEENA	VICE CHAIRMAN MUTALA SETTLEMENTS.	0976552565		MUTALA SETTLEMENTS.	[signature]
SHABBY MUDENDA	CHIEF'S RETAINER	0975147877		MUTALA SETTLEMENTS	[signature]
Elizabeth KARONGA	PR & Communication Manager Zambezi River Authority	0977318735	karonga@zaraho.org.zm		[signature]
Phillip Ziduche	ZAMBEZI RIVER AUTHORITY - MANAGER ENVIRONMENT	+263773107342	pziduche@zaraho.org.zm	32 [illegible]	[signature]
ENG CHRISPIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY / WATER RESOURCES ENGINEER	0977-807758	namakando@zaraho.org.zm	Box 30233, LSK	[signature]
Felix Chisha K	ERM Consultant	0974074384	felixchisha@yahoo.com	21/10 Lusaka	[signature]
Johan Oosthuizen	ERM Senior Consultant	+27 82 557 3947	Johan.oosthuizen@erm.com	—	[signature]

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
MULEYA SIMON MR	MINISTRY OF LOCAL GOVERNMENT DISTRICT ADMINISTRATOR	077228074	dahwange@gmail.com	P. O BOX 121 HWANGE	
MRS NYARADZO MAGOJA	MINISTRY OF LOCAL GOVERNMENT PRINCIPAL ADMINISTRATIVE OFFICER	0777866790	nyaradzomagoja@gmail.com	P.O BOX 121 HWANGE	
MARANDU MISHECK	Min. of LANDS, Agric, Water, Climate & rural resettlement	0772785503	mambom23@gmail.com	BOX 370 HWANGE	
MUDENDA ALIC	HWANGE RDC	0775044194	alicmudenda06@gmail.com	Box 165 HWANGE	
WILLARD PAUL PHIRI	HWANGE RDC	0771047558	paulwphiri@yahoo.com	"	
Sithokozile Kwidini	HWANGE RDC	0773402408	[illegible]@gmail.com	Box 165 HWANGE	
Sikhumbuzo Moyo	HRDC	0771154468	smoyofes@gmail.com	Box 165 HWANGE	
ZULU GREGORY DROPA	HRDC	0778529185	N/A	WARD 6 MBIZHA PO BOX R33 HW COUNCILLOR	DROPA
MUKOMA SHAKANI	HRDC CLLR	0771950257	N/A	CHISUMA Box 56 Vic Falls	

ERM

Batoka Gorge HES – Attendance Registers for Interim Notification Meetings

Title, First name & Surname	Organisation/ Position	Telephone / Cellphone Number	Email Address	Postal Address	Signature
Eng. Avitol Nkweendenda	Zambezi River Authority - Engineer	+260 977320756	avitween@yahoo.com		
Cllr Bino Moyo	Councillor Jankezi Ward 7	0773 863 768		NEJAMBEZI SEC BOX 40 VIC FALLS	

Annex C

Part III ESIA Engagement 2020-2021

Annex C (8.1)

Comments and Responses Report

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Interim Notification 2018						
Sad to hear this is suddenly all back on track, we were under the impression the ESIA was a shambles and would require a complete make over. Anyway, we can but hope that the world sees region, at least this time we hope the tourism industry is sufficiently covered.	Sean Edington	Safari Par Excellence	06-Dec-18	Email	A tourism impact study has been undertaken as part of the ESIA process and the impacts of the Project on tourism will be addressed in the ESIA Report, and mitigation measures to reduce the impacts will be included in the Environmental and Social Management Plans.	Potential Effects on Tourism and the Local Economy
I am writing on behalf of the proposal of the Batoka Gorge Dam on the Zambezi river. I have traveled to Zambia on three different occasions to visit the Zambezi River. After my first visit, I fell in love with the Zambezi river and the Batoka Gorge. If the dam where to be built it would be a tragedy for humanity. I was given the opportunity to spend two seasons working on the Zambezi river taking tourist from all over the world down the Zambezi river, through the Batoka Gorge. I have spent over 10 years traveling the world working as a guide on rivers and the Zambezi is by far one of the most beautiful and magical places I have ever visited. The social, biodiversity and heritage impacts would be horrific if there was a dam built in the Batoka Gorge. Please, please reconsider building the dam in the Batoka Gorge. There have to be more sustainable ways to approach the need for electricity, whether it be solar or wind. The negative impacts would be terrible for the local communities and for future generations. A dream of mine would be to share the Zambezi river and the rapids, wildlife, and beauty of the Batoka Gorge with my children. Please do not take this dream away from me.	Andrew Matthews		06-Dec-18	Email	A tourism impact study has been undertaken as part of the ESIA process, this includes assessing the potential impact on the white water rafting industry. The overall environmental and social impacts of the Project will be assessed in the ESIA Report, in addition, mitigation measures to minimize the impacts will be included in the Environmental and Social Management Plans.	Potential Effects on Tourism and the Local Economy
Thank you for this message – there are most certainly some areas of concern with regards to both the environment and tourism viability that are worrying some sectors of our industry and so I look forward to further engagement.	Robin Brown	CANSAF	07-Dec-18	Email	Noted, the overall environmental impacts of the Project will be assessed in the ESIA Report, in addition, mitigation measures to minimize the impacts will be included in the Environmental and Social Management Plans.	Potential Effects on Tourism and the Local Economy
I was forwarded the recent letter sent to stakeholders for the ESIA Project for this. I was surprised I did not receive one on behalf of the International Rafting Federation as I was sure we had indicated that we were stakeholders, especially as having had face to face meetings with you and a number of email exchanges. Anyway - please can you add us as stakeholders and please use the email address. The names associated with it should be: Sue Liell-Cock (Sec Gen of IRF) and Sean Clarke (IRF Media Rep). Let me know if you need more information.	Sue Liell-Cock	International Rafting Federation	07-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
I am an interested party in the Batoka Dam issue. Please send me information about the project as it continues.	Gary Wockner		07-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
Please register me as an interested party (rafting tour operator from Europe) about Batoka Dam project. It would be a pleasure to get the up-to-date information about this project which could destroy our branch and the beautiful nature of the mighty Zambezi river. Thank You in advance.	"Roy" Gergely Környei	AOS Rafting	07-Dec-18	Email	Noted, you have been added to the stakeholder database. Further communication will follow with the release of the Draft Environmental and Social Impact Assessment Report in a few months' time.	Potential Effects on Tourism and the Local Economy
Just heard the project is back on, would like to help as much as possible to try and stop this environmental nightmare..	Steve Taylor	Askari Safaris LLC	07-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
37	Trymore Ndolo		08-Dec-18	Email	Noted, you have been added to the stakeholder database. The stakeholder engagement meetings are planned following the release of the Draft ESIA for comment. All registered stakeholders will be notified of the date and time of Project meetings.	Stakeholder Engagement Process
I would like to register as an interested party	Fiona Buttrey		08-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
I would like to register my objection to this project. Please keep me informed	Pam bell		08-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
I'd like to be registered as an interested party in The Batoka Dam project.	Erin Carey		08-Dec-18	Email	Noted, you have been added to the stakeholder database of this Project.	Stakeholder Engagement Process
I was told to email you in interest to aiding in protesting the damming the Zambezi. If this is correct please let me know if and how I can help.	Stone		09-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project. Please contact ERM to raise any issues of concern for the Project.	Stakeholder Engagement Process
Please add our addresses cc above to your mailing lists. We are definitely stakeholders here as we have tourism operations including lodges within the Batoka Dam area.	Mark Butcher		10-Dec-18	Email	Noted. you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
I want to save the zap.	Matt Blue		10-Dec-18	Email	Noted, you have been added to the stakeholder database. This platform will provide you with an opportunity to raise issues to inform the development of the ESIA.	Stakeholder Engagement Process
I wish to register as an interested party regarding the Batoka assessment.	Richard Addison		12-Dec-18	Email	Noted, you have been added to the stakeholder database for this Project.	Stakeholder Engagement Process
I wish to inform you that I work for Zambia Environmental Management Agency. We are available to provide guidance on the EIA process for the Batoka Gorge Hydro Electricity Generation Project where required.	Lillian Kalenge		12-Dec-18	Email	Noted, you have been added to the stakeholder database. ERM welcomes any guidance from the Zambia Environmental Management Agency as it will inform the development of the ESIA Report.	Stakeholder Engagement Process
We are a rafting company and travel agency located in Austria. We organize trips for rafting on the Zambezi and work together with local companies. Please let me know how we can get registered as interested party concerning the Batoka dam project. This dam will not only destroy one of the greatest whitewater rivers on earth but also will badly influence the local eco system and adventure tourism.	Lukas Strobl		21-Dec-18	Email	Noted. A tourism impact study and biodiversity study have been undertaken as part of the ESIA process. The impacts of the Project on tourism and livelihoods will be addressed in the ESIA Report, in addition, mitigation measures to minimize the impacts will be included in the Environmental and Social Management Plans.	Potential Effects on Biodiversity
I'd like to register my objection as an interested and affected party with regards the Zambezi dam	Sam Helliwell	NIRAS	28-Dec-18	Email	Noted. you have been added to the stakeholder database for this Project. You are welcome to submit any issues and concerns for consideration during the ESIA Phase .	Stakeholder Engagement Process
I would like to register as an interested party concerning the Batoka Gorge. I am one of the owners of Taita Falcon Lodge that will be directly influenced by the building of the dam as we are situated on the edge of the Batoka Gorge above R17 and we are very concerned as nobody has contacted us yet to talk to us even after numerous emails to the people involved.	Annmarie Fourie	Taita Falcon Lodge	03-Jan-19	Email	Please be assured that you have been added to our stakeholder database, and will receive communications and information from ERM going forward. A tourism impact study has been undertaken as part of the ESIA process, and the impacts of the Project on tourism and livelihoods will addressed in the ESIA Report, in addition, mitigation measures to minimize the impacts will included in the Environmental and Social Management Plans.	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
a short informal YouTube clip on a trip down the gorge has been done. There is obviously reference to the dam being built. As ERM is undertaking the environmental and social impact assessment I am making contact. The clip will probably be seen by many viewers. If it helps with gathering direct input or comment from the general public maybe you could send through an email address / and name that can be shared as a contact for enquiries ? As a resident in Victoria Falls I am concerned about the impact of the dam and the lack of available information on the dam. It still seems unclear or undecided whether the dam will be a storage or run of the river. It is unclear how far up flooding may occur. Is it possible that ERM could urgently provide a detailed statement as to the status of the dam for stakeholders and the wider community ?	Larry Norton	Larry Norton	08-Feb-19	Email	Thank you for your correspondence and interest in the Batoka Gorge Hydro-Electric Scheme ESIA. ERM was been appointed by the Zambezi River Authority (ZRA) to prepare an Environmental and Social Impact Assessment (ESIA) for the Project. An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) and its local partners. Prior to the end of 2015, ERM and its team had completed the Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies had been completed in order to inform the content of an ESIA. A Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared and submitted to the ZRA for its review in late 2015. It was at this stage that the ESIA was placed on hold for numerous technical and commercial reasons; however, ongoing discussions have been held between ERM, the ZRA and the World Bank (the funder of the feasibility studies), and the ESIA process for the Project has since recommenced. As of October 2018, the ESIA process has recommenced. It is intended that a Final ESIA reports and ESMPs will be submitted to the Regulatory Authorities in both countries mid-2019. The scope of the remaining tasks will be to utilise the work undertaken to date to complete the remaining steps in the ESIA process. In addition, given that there is now a better understanding of the extent of land take associated with some of the Project and its associated infrastructure, the resettlement planning work will also commence. The ESIA will provide further detail around the project description, and will discuss the potential adverse and positive impacts associated with the Project, and proposed mitigation measures to manage impacts will be included in an Environmental and Social Management Plans (ESMPs) which forms part of the draft ESIAs. During this disclosure period, ERM will host a series of public meetings to share the findings of the ESIAs, and all stakeholders on our database will be notified of the date, time and venue of the meetings. We would, therefore, encourage any person interested in Project or wanting to be kept informed, to register as stakeholder by contacting ERM at: batokagorgehes@erm.com Please don't hesitate to contact ERM should you have any further questions.	Stakeholder Engagement Process
I received the mail below late last year. Since then I have heard nothing. Please advise on how we can contribute and what action has been taken since then. 1. What further opportunities for stakeholder engagement have been made available? 2. In terms of the timelines presented in the attached letter; a. What further work on the various impacts have been done? Provide detailed feedback on this please. 3. When will we be able access and comment on the studies done to date on the impact on tourism, ecology etc. 4. How does the continued difficult political situation and ongoing human rights abuses in Zimbabwe affect the project?	Marie-Louise Kellett	Gravity Adventures	14-Feb-19	Email	Thank you for your email. Per the letter sent through to you in December 2018, ERM intends completing the remaining steps in the Environmental and Social Impact Assessment (ESIA) process, which primarily includes – • Finalisation of the ESIA reports and associated Environmental and Social Management Plans (ESMPs) utilizing the specialist work undertaken to date, which includes: o Water Resource Studies o Biological Studies o Socio-economic studies (including CH, tourism, resettlement) o Economic impact studies • As part of ESIA finalisation the following additional work was undertaken: o Refinement of the operating rules of the dam to find the balance between minimising environmental impacts downstream, together with maximizing power output. o Additional baseline validation field work for project footprint areas that were not covered in previous specialist studies. All specialist studies undertaken as part of the ESIA process will be appended to the draft ESIA reports, which will be made available for a 30 day stakeholder review and comment period once complete. All stakeholders on our stakeholder database will be notified when the draft ESIA reports are available, and informed of how they can access a copy of the reports. It is anticipated that the draft ESIA reports will be available for comment towards mid-2019. Moreover, there will be a series of ESIA stakeholder meetings to disclose the findings of the ESIA, and allow stakeholders to ask questions and provide comment. This round of engagement will also target broader communities in the Project Affected Area. Community engagement will be such that information can be digested by a non-technical audience. Regarding your comment on the political situation and human rights violations in Zimbabwe, our task is to undertake the environmental and social studies for the Project to lender standards. Ultimately, it is the lenders that will need to make an informed decision regarding investment in the Project going forward. Also to note, is that the Project will undertake a detailed Resettlement Action Planning process for both physical and economic displacement. This process will also be undertaken in accordance with international lender requirements.	Stakeholder Engagement Process
ESIA DISCLOSURE MARCH/APRIL 2020						
Dear Lindsey and Mike Thanks for this. Please provide me with your list of "Zambezi River Users" so that I can distribute this information more widely if needed.	Marie-Louise Kellett	Save the Zambezi International Rafting Federation	09-Mar-20	Email	I have attached a list of the stakeholders included on our stakeholder database. Please understand that I cannot share contact information as this would be in violation of South Africa's Protection of Personal Information Act, 2013.	Stakeholder Engagement Process
Hi I am just reading through the ESIA for Project access roads in both Zambia and Zimbabwe; and already notice some inaccuracies. The chiefs on our side are Acting chief Mvutu and Chief Shana. You have Chief Hwange. This is not correct and Chief Shana is the main chief of where the project is and you have no mention of him. This is a big error and it is things like this that upset the communities. Please please relook at this as a matter of urgency and correct before if possible sending it out to the wider community.	Charlene Hewat	Greenline Africa Trustee	03-Mar-20	Email	Thank you for this information. Chief Shana recognised as one of the Chiefs in the Project Area of Influence in Chapter 7 of the EISA. Chief Shana has been engaged throughout the ESIA process and during the ESIA disclosure phase, the Authority, together with ERM local partners, met with Chief Shana on 2 December 2020 share the ESIA findings (refer to Annex C for meeting notes).	Stakeholder Engagement Process
We shall be looking at the documents in more detail and will have representation at the meeting to be held in Victoria Falls. It is important that the rural communities are appraised of the developments and more importantly that they understand them, which is always the challenge. We have our community centre near Chisuma Clinic and will see what we can do to help communities understand the developments.	Charlene Hewat	Greenline Africa Trustee	04-Mar-20	Email	Thank you for your email, and we look forward to meeting you. I have included our schedule for community meetings below, as you may wish to attend one or two of those. Our community meetings will have a slightly different scope compared to the open house. The objective will be to disclosure ESIA findings more relevant to the local communities, and the tone of the message will be less technical. Date Village/ Community Meeting Venue Time 17 March 2020 Hwange Hwange District Council 10:00 17 March 2020 Kasibo Kasibo Primary School 14:00 18 March 2020 Manuna Mununa Clinic 10:00 18 March 2020 Batoka Batoka Primary School 14:00 19 March 2020 Chisuma Chisuma Village Meeting Place 10:00 19 March 2020 Sizinda UNICA 14:00 20 March 2020 Monda Monde Primary School 10:00	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Dear Solistor, Jocelyn and Felix, I hope this finds you well. Please find below the greatly accelerated response window for the “proposed” Batoka Dam. The window below is incomprehensibly narrow and there is absolutely no chance of us constructing a reply. ERM have had six years to consult with stakeholders and it has been done extremely haphazardly, now to steamroll the below without due diligence seems a gross subversion of due process. This is most certainly not an endeavor we need to enter into lightly and in future years this process is going to be picked to pieces. It is imperative that as stakeholders in one of Zambia’s top tier industries we have a chance to be acknowledged. We are asking for a formal letter from ZTA, asking for an extension taking the below into account. 1. We are entering the busy Easter holiday period and we will not have time to interrogate these documents properly until mid-April 2. The ongoing Covid-19 crisis is having very unpredictable effects on all spheres of business, particularly travel and causing delays, cancellations and general disruption – we need to allow extra time for these impacts. 3. In any event, 6 weeks would not be sufficient time for civil society bodies and institutions to read, process, consult and respond to this ESIA. We are not paid to do this, and need to carve out time in order do it. 4. This is a project with massive international ramifications and this process should be undertaken thoroughly and robustly. We are surprised that they are even proposing such a short consultation period – in our view, this does not meet the required standard for public consultation. We further request the full list of I&Aps and stakeholders. Please can you advise what is the correct way forward to ensure that our community and livelihoods are adequately represented in a humane and professional manner.	Sean Edington, Director of Activities	The Explorer Club Africa	05-Mar-20	Email	On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for a six week comment period, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. A notification letter was sent out to stakeholders on 19 March 2020, informing them that the public meetings had been post-poned until further notice, but that the comment period would remain open until such time that the Authority and ERM would be able to hold the ESIA disclosure meetings, or until further notice was given by the Authority and ERM. On 16 November 2020, ERM notified stakeholders that a webinar would be held on 2 December 2020 to share the ESIA findings, and that the comment period for the draft ESIA will be closing on 25 January 2021. The comment period for the draft ESIA was open for over 10 months, from 03 March 2020 to 25 January 2021. While the COVID-19 pandemic presented unprecedented circumstances, ERM are of the opinion that stakeholders had adequate time to review the ESIA documentation and comment on the draft ESIAs.	ESIA Process, Project Description and Mitigation
Dear Black Crystal Consulting and Batoka Gorge ERM, Please can you make available to all rafting companies the last Environmental and Social Impact Assessment proposed for the Batoka Gorge Hydro-Electric scheme in order for all rafting companies to make constructive and informed comments which must be submitted before the 30th April 2020.	Clive Bradford	Wild Horizons	04-Mar-20	Email	Digital copies of the documents can be accessed through the project website here as well as the hard copies located at the offices in the list. Thank you for your participation https://www.erm.com/bghes-esia/ Draft ESIAs Non-technical Summary of draft ESIAs	ESIA Process, Project Description and Mitigation
Thank you for the email. As the IRF’s lead with the United Nations Framework for Climate Change, I firmly believe the deadline to review the documents and provide comment is far too short. So much of this ESIA revolves on sustainability and six weeks is simply not long enough. Most consultations of this size have review periods in excess of four to six months - not weeks as proposed below. As an organisation with vested international interests in the use and promotion of the river, and also as a signatory to the United Nations Framework for Climate Action, we have a large number of individuals and organisations to consult with and review these documents. Primarily on the sustainability issues, we will require large amounts of time to form independent views and reviews of the impacts which cannot be underestimated in a project of this size. Especially given recent issues with similarly fast tracked construction of dams in Uganda which have since proved detrimental to the environment and local communities and subsequent inability to keep to budget, time and agreed "benefits" to the community. As such, a minimum consultation period of six months is required. Nothing less shall be accepted. Please ensure I am included on the register of interested parties. I will also seek inclusion from the United Nations, International Olympic Committee and other signatories of the UNFCCC.	Sean Clarke	International Rafting	05-Mar-20	Email	On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for a six week comment period, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. A notification letter was sent out to stakeholders on 19 March 2020, informing them that the public meetings had been post-poned until further notice, but that the comment period would remain open until such time that the Authority and ERM would be able to hold the ESIA disclosure meetings, or until further notice was given by the Authority and ERM. On 16 November 2020, ERM notified stakeholders that a webinar would be held on 2 December 2020 to share the ESIA findings, and that the comment period for the draft ESIA will be closing on 25 January 2021. The comment period for the draft ESIA was open for over 10 months, from 03 March 2020 to 25 January 2021. While the COVID-19 pandemic presented unprecedented circumstances, ERM are of the opinion that stakeholders had adequate time to review the ESIA documentation and comment on the draft ESIAs.	ESIA Process, Project Description and Mitigation
Thanks for this message. I would like to request an extension of the deadline for comments on these documents for the following reasons; 1. We are entering the busy Easter holiday period and I will not have time to interrogate these documents properly until mid-April 2. The ongoing Covid-19 crisis is having very unpredictable effects on all spheres of business, particularly travel and causing delays, cancellations and general disruption – we need to allow extra time for these impacts. 3. In any event, 6 weeks would not be sufficient time for civil society bodies and institutions to read, process, consult and respond to this ESIA. We are not paid to do this and need to carve out time in order do it. 4. This is a project with massive international ramifications and this process should be undertaken thoroughly and robustly. I am surprised that you are even proposing such a short consultation period – in my view, this does not meet the required standard for public consultation. Please also provide me with the full list of I&Aps and stakeholders.	Marie-Louise Kellett	Save the Zambezi International Rafting Federation	03-Mar-20	Email	On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for a six week comment period, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. A notification letter was sent out to stakeholders on 19 March 2020, informing them that the public meetings had been post-poned until further notice, but that the comment period would remain open until such time that the Authority and ERM would be able to hold the ESIA disclosure meetings, or until further notice was given by the Authority and ERM. On 16 November 2020, ERM notified stakeholders that a webinar would be held on 2 December 2020 to share the ESIA findings, and that the comment period for the draft ESIA will be closing on 25 January 2021. The comment period for the draft ESIA was open for over 10 months, from 03 March 2020 to 25 January 2021. While the COVID-19 pandemic presented unprecedented circumstances, ERM are of the opinion that stakeholders had adequate time to review the ESIA documentation and comment on the draft ESIAs.	ESIA Process, Project Description and Mitigation
The International Rafting Federation supports Marie-Louise's call for an extension, with particular emphasis on points 3 and 4.	Sue Liell-Cock	International Rafting	04-Mar-20	Email	On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for a six week comment period, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. A notification letter was sent out to stakeholders on 19 March 2020, informing them that the public meetings had been post-poned until further notice, but that the comment period would remain open until such time that the Authority and ERM would be able to hold the ESIA disclosure meetings, or until further notice was given by the Authority and ERM. On 16 November 2020, ERM notified stakeholders that a webinar would be held on 2 December 2020 to share the ESIA findings, and that the comment period for the draft ESIA will be closing on 25 January 2021. The comment period for the draft ESIA was open for over 10 months, from 03 March 2020 to 25 January 2021. While the COVID-19 pandemic presented unprecedented circumstances, ERM are of the opinion that stakeholders had adequate time to review the ESIA documentation and comment on the draft ESIAs.	ESIA Process, Project Description and Mitigation
Thank you – more reasonable time frame for a project of this magnitude, complexity and importance would be 6 months, minimum. The project team has had 7 years and a substantial budget to put it together.	Marie-Louise Kellett	Save the Zambezi International Rafting Federation	04-Mar-20	Email	On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for a six week comment period, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. A notification letter was sent out to stakeholders on 19 March 2020, informing them that the public meetings had been post-poned until further notice, but that the comment period would remain open until such time that the Authority and ERM would be able to hold the ESIA disclosure meetings, or until further notice was given by the Authority and ERM. On 16 November 2020, ERM notified stakeholders that a webinar would be held on 2 December 2020 to share the ESIA findings, and that the comment period for the draft ESIA will be closing on 25 January 2021. The comment period for the draft ESIA was open for over 10 months, from 03 March 2020 to 25 January 2021. While the COVID-19 pandemic presented unprecedented circumstances, ERM are of the opinion that stakeholders had adequate time to review the ESIA documentation and comment on the draft ESIAs.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Dear Ms. Bungartz, I am the General Counsel of Water keeper Alliance, a global network of water protectors focusing on drinkable, fishable, swimmable water and clean and free-flowing rivers. The Zambezi River through Batoka Gorge offers a world-class rafting experience, and has global ecological and scientific significance. We are therefore engaging in the permitting process with local partners around the proposed Batoka Gorge Hydropower Scheme. The documents that you have released to the public for review consist of 2,874 pages of highly technical information that the consulting company took seven years to complete. We believe that the 57-day public-comment period that you have proposed is much too short for accurate technical analysis and drafting of meaningful comments, and also violates the standards and practices of the World Bank Environmental and Social Framework and the International Finance Corporation. We respectfully request that the comment period be extended to August 31, 2020, giving stakeholders a full six months. This extension will give non-profit, public-interest groups, such as Water keeper Alliance and our local partners the time needed to fully evaluate the Draft ESIA. We appreciate your urgent consideration and attention to this reasonable request. Respectfully yours, Daniel E. Estrin, Esq. General Counsel & Advocacy Director Water keeper Alliance, Inc. 180 Maiden Lane, Suite 603 New York, NY 10038 (212) 747-0622 ext. 132 destrin@waterkeeper.org Pronouns: he/him/his	Daniel E. Estrin	Water keeper Alliance	09-Mar-20	Email	On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for a six week comment period, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. A notification letter was sent out to stakeholders on 19 March 2020, informing them that the public meetings had been post-poned until further notice, but that the comment period would remain open until such time that the Authority and ERM would be able to hold the ESIA disclosure meetings, or until further notice was given by the Authority and ERM. On 16 November 2020, ERM notified stakeholders that a webinar would be held on 2 December 2020 to share the ESIA findings, and that the comment period for the draft ESIA will be closing on 25 January 2021. The comment period for the draft ESIA was open for over 10 months, from 03 March 2020 to 25 January 2021. While the COVID-19 pandemic presented unprecedented circumstances, ERM are of the opinion that stakeholders had adequate time to review the ESIA documentation and comment on the draft ESIAs.	ESIA Process, Project Description and Mitigation
A friend of mine advised me that the 30-day comment period on the ESIA is now open. Is this correct? If so, when does it close? In case the deadline is soon, I am sending preliminary comments now, though I have not had time to thoroughly scrutinize the extensive documentation. Please pass my comments (below and attached) to the relevant authorities. My relationship to this project is that of a concerned global citizen who grew up in Zimbabwe, has a degree in ecology and who is employed by an environmental charity which, though based in the UK, does some work in Southern Africa.	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS		14-Mar-20	Email	Your preliminary comments, together with a response from the Project team will be included in the ESIA submission to the competent Authorities, Environmental Management Agency (EMA) in Zimbabwe and the Zambia Environmental Management Agency (ZEMA). The comment period for the draft ESIAs is open until 30 April 2020, so you are welcome to submit additional comments. We will add you to our stakeholder database so that you receive future communication throughout the remainder of the ESIA process.	Potential Effects on Biodiversity
The ESIA documents consist to a large extent of 'should' and 'could'. There are many fine words on mitigation options and strategies but there is no guarantee that any of these will be followed once the dam is a fait accompli. Given the outstanding ecological merits of the site (see, for example, https://www.internationalrivers.org/resources/batoka-gorge-dam-zambezi-river-8291), this is a cause for grave concern. In some cases these 'mitigation options and strategies' are downright risible. For example, in the document titled 'Review of ESIA against the WCD and IHA Guidelines & background on the World Commission on Dams & International Hydropower Association's Sustainability Guidelines & Hydropower Sustainability Assessment Protocol' in the section on 'Rare and endangered species' the following are listed: Plans to manage this issue need to be developed prior to construction and options for mitigation identified and assessed. Habitats of critical importance should be identified (within a wider regional context) and impacts to these avoided or minimised as much as possible during the design phase. Targeted management plans need to be developed for species of conservation significance. Translocations or habitat rehabilitation may be options, along with identification of suitable habitat for 'reserve'	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS		14-Mar-20	Email	A guarantee that ESIA requirements are implemented is indeed a useful tool, but such an instrument is typically outside of the ESIA. For example the World Bank standards use a legally-binding ESCP (Environmental and Social Commitment Plan - which is compiled by the Bank and not the ESIA consultant). The IFC typically requires monitoring of Client commitments and carefully compiled contractor appointment procedures. The ESIA should not be judged because those tools are not yet available. Regarding requirements of the WCD section on 'Rare and endangered species'. The ESIA has identified areas that qualify as critical habitat, mitigation has been identified 'as much as possible', dam design has been thoroughly scrutinized to find feasible least-impact options, and the ESIA clearly identifies residual impacts that will be outstanding. Management plans are developed, although the ESIA highlights the gap in the baseline understanding of Taita Falcons and the need for further assessment before appropriate plans can be developed.	
As the habitat for several species (rare raptors at least) is being completely eliminated at the site, these words ring hollow. Suitable alternative habitats will already be occupied, meaning that populations will simply be significantly reduced. Without detailed knowledge of the interaction between sub-populations, population genetics, and the threats facing other populations it is impossible to be sure that some species will not be critically threatened.	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS		14-Mar-20	Email	The ESIA has a strong focus on raptors. It highlights concerns for Taita Falcon, and includes requirements for further assessment that the client is committed to implement. The ESIA does identify the Batoka Gorge as a Critical Habitat for various reasons, one being the designation of the area as an Important Bird Area (IBA) by Birdlife International. The IBA is designated due to the rich diversity of raptors that nest in the Gorge. However many of the cliff-nesting raptors are unlikely to be displaced, but nevertheless, the ESIA highlights very prominently that there is no feasible mitigation to avoid, minimize or restore the impact of loss of critical habitat. To use correct terminology - the ESIA clearly highlights that Net Gain requirements regarding loss of critical habitat are not met, and requires the client to further pursue studies into the feasibility of offsetting programmes. Offsetting has been beyond our scope as ESIA developers and could therefore not be included.	Potential Effects on Biodiversity
With climate change an ever-growing threat, it is understandable that sustainable electricity generation should be a priority. However, large hydro-power projects have a notoriously bad track record as far as social and environmental impacts are concerned, as well as with regard to corruption. My comments above relate to the first two points. Here are just a few references on the last one: https://www.waterintegritynetwork.net/2015/01/15/fighting-corruption-in-the-construction-of-large-dams/ **(article does not have option for download- its about: Fighting Corruption in the construction of large dams)** https://www.theguardian.com/global-development-professionals-network/2017/may/23/why-latin-america-obsessed-mega-dams **(article does not have option for down- its about: Why is Latin America so Obsessed with mega dams)** https://www.theguardian.com/world/2016/apr/08/brazil-rousseff-corruption-belo-monte-dam **(article does not have option for download- its about: (Brazil: insider claims Rousseff coalition took funds from Belo Monte mega-dam)** https://www.internationalrivers.org/resources/companies-charged-with-corruption-on-lesotho-dams-3863 **(Page not found)** https://theecologist.org/2015/jun/18/commerce-or-corruption-rainforest-dams-sarawak **(Article about: Commerce or Corruption? The rainforest dams of Sarawak)** https://www.internationalrivers.org/blogs/227/the-vicious-circle-of-corruption-dams-and-disaster **(Its a press release on Rapid gains in giving rivers rights)**	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS	14/7 Wardlaw Street Edinburgh EH11 1TR Scotland, UK	14-Mar-20	Email	The articles referred to were reviewed by ERM	Potential Effects of Climate Change on the Project
Unless there is complete transparency with regard to the beneficiaries of this massively expensive project, I believe it is reasonable to fear that it will be riddled with corruption, and that any financial benefits will simply enrich an already wealthy few (who will siphon the money into tax havens), increasing inequality.	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS	14/7 Wardlaw Street Edinburgh EH11 1TR Scotland, UK	14-Mar-20	Email	Transparency: To date the Authority has undertaken the ESIA studies and the associated ESIA report disclosed to the Public through various platforms i.e. physical meetings, radio broadcasts and webinars to communicate the findings of the ESIA and obtain comments from the stakeholders. During the project execution, transparency will be enhanced through the Project recruitment strategies, the implementation of the Stakeholder Engagement Plan (refer to Annex B) and SMEs Participation strategies put in place, which seek to ensure equitable benefits especially to the host communities. Employment of the workers will be transparently done with local leaders involved to ensure benefits are passed on to deserving people. Beneficiaries: The Project is multi-national in nature and the citizens and economies of the two countries will benefit from the project. ZESCO and ZESA will be given first priority in purchasing the power and only the excess power will be exported. The project will employ locals and some private sector players will have an opportunity to provide services and materials for the project. Refer to pages 11-44 to 11-49 of the ESIA report Corruption: A deliberate, clear , well structured Governance system has been put in place to manage the project with approvals and audits being done at various levels. Further, Different and independent institutions such as ZEMA and EMA will carry out environmental audits and monitoring to ensure compliance regards project implementation conditions by the Authority and its implementing agents. Moreover, the involvement of Multilateral Development partners such as the African Development Bank and others will also strengthen monitoring and in the process minimising chances of corrupt practices during implementation. So structured governance will be undertaken throughout the whole project life cycle. Overall, the two contracting states have extended their Policy provisions regards mitigating corruption to the implementation of the project. Financial Benefits: 20% of the Project Value is set to benefit the Local Zambian and Zimbabwean Companies. There will also be taxes collected by the governments through the project that will be used for the economic development and other than the financial benefits are the accessibility to social amenities and people will have access to health facilities. Financial auditing will be carried out during the execution of the project both by the authority and other cooperating partners.	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
In general, I would argue that sustainable solutions to power should put control in the hands of local communities and, in places like Southern Africa, solar power offers enormous promise. In the document titled 'Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River;, VOLUME I - Environmental and Social Impact Assessment (ESIA) for the Project Area of Inundation, Staff Villages and Quarries' it would seem that solar power is dismissed with these words: This indicates that solar is presently an undesirable technology from an investment efficiency perspective when compared to other technologies. Development of solar PV can therefore for now only be supported by strong renewable energy polices rather than technology competitiveness. This is consistent with the ENVIRONMENTAL RESOURCES MANAGEMENT BGHES ESIA REPORT 6-4 penetration of solar technology in other electricity markets (ZETDC, 2015). Where solar PV has penetrated the market significantly, high electricity tariffs reflect the cost of energy.' This ignores the fact that the cost of photovoltaics is falling rapidly. See, for example: https://www.theguardian.com/environment/2017/jun/06/spectacular-drop-in-renewable-energy-costs-leads-to-record-global-boost (Newspaper article on: Spectacular drop in renewable energy costs leads to record global boost) https://www.forbes.com/sites/dominicdudley/2018/01/13/renewable-energy-cost-effective-fossil-fuels-2020/ (Article about: Renewable Energy will be consistently cheaper than fossil fuels by 2020) I am confident that economics of these has changed drastically since the report was commissioned, and I urge the authorities to review these figures and project how they will continue to change in the coming years. The glib dismissal of solar power is a major flaw in the ESIA (and raises suspicions re vested interests/corruption).	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS	14/7 Wardlaw Street Edinburgh EH11 1TR Scotland, UK	14-Mar-20	Email	Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from alternative renewable technologies (such as wind and solar) alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
The wording would also seem to suggest that power schemes should be judged primarily from the perspective of large-scale investment opportunities. At a time of massive biodiversity loss, coupled with climate change and growing inequality, should this be the main criterion? Solar power should in my opinion, largely be diffuse, small-scale and locally owned, even down to the level of individual households. Grand large-scale schemes are wide open to wastage, delays, corruption, etc., to say nothing of losses in long-distance transmission, infrastructure failures, etc. Another major point, related to the dismissal of solar, is the unpredictability of rainfall in this era of climate change. According to International Rivers (https://www.internationalrivers.org/resources/batoka-gorge-dam-zambezi-river-8291): (See document 5: Batoka Gorge Dam, Zambezi River)	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS	14/7 Wardlaw Street Edinburgh EH11 1TR Scotland, UK	14-Mar-20	Email	The objective of the ESIA report is to provide a clear motivation as to why the BGHES is needed from a national / regional perspective, but it also explicitly states that the BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments. The ESIA elaborates on key social issues including (amongst others) displacement impacts and livelihood restoration for those economically affected. Moreover, the ESIA elaborates on key physical & biophysical issues including (amongst others) impacts on riverine ecosystems due to flow disturbances, impacts associated with loss of rapids as a direct consequence of the reservoir impoundment and transformation of critical habitat through inundation by the BGHES reservoir. The ESIA also acknowledges that the BGHES is not immune to these challenges. The ESIA therefore describes both the benefits of the BGHES as well as the environmental and social impacts associated with it. Where impacts are identified, detailed mitigation measures to reduce the significance of these impacts are described; also, where impacts may not be mitigated, this too has been described. In the case of positive impacts, measures to enhance such positive impacts are provided. Please refer to response provided above regarding small-scale solar PV projects. ERM agrees that increased use of solar power should be explored; however, this should be done in addition to larger renewable projects such as hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Project Alternatives
Harrison & Whittington (2002) carried out some climate modeling on the proposed Zambezi dams and found that the Batoka Gorge Dam is likely to lose 6-22% production due to declining rainfall as a result of a warming climate in the basin. In his 2012 report on the hydrological risks of planned Zambezi dams (Batoka included), Beilfuss reported that these dams are unlikely to deliver the expected services over their lifetime.' It follows that any assumptions regarding the dam's future operation and generating capacity can only be considered to be wildly speculative. By contrast, solar energy is far more reliable.	Robert Eric Swanepoel, PhD, MSc (Ecology), BVSc, MRCVS	14/7 Wardlaw Street Edinburgh EH11 1TR Scotland, UK	14-Mar-20	Email	The results of the Climate Change Risk Review included in the ESIA indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the landtake associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the landtake required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal	Project Alternatives
Dear sir, Thank you for the information. I will proceed to read the document and provide feedback where necessary .	Kelyson Mang'ola		19-Mar-20	Email	Thank you for your participation in the process, we look forward to receiving any comments you may have.	ESIA Process, Project Description and Mitigation
Given that you will be unable to consult effectively with stakeholders for the foreseeable future, please confirm that the comment period for the ESIA will also be extended accordingly and that no further physical work (building of access roads etc.) on this project will occur until the ESIA is complete.	Marie-Louise Kellett	Save the Zambezi International Rafting Federation	20-Mar-20	Email	The Zambezi River Authority (the Authority) has noted that they are obligated to undertake maintenance work on existing roads, but that no works will be undertaken by the Developer on project activities until the ESIAs until all necessary permits are in place. As stated in the notification issued 20 March 2020, comment period for the draft ESIAs will remain open until such time that the Authority and ERM are able to hold the ESIA disclosure meetings, or until further notice is given by the Authority and ERM.	ESIA Process, Project Description and Mitigation
Please add this email address to your records for the following IAP: Save the Zambezi. a Watershed Project Please also send us a complete list of all registered IAPs.	Marie-Louise Kellett	Save the Zambezi.	03-May-20	Email	Save the Zambezi. a Watershed Project has been added to the stakeholder database. I have attached a list of the stakeholders included on our stakeholder database. Please understand that I cannot share contact information as this would be in violation of South Africa's Protection of Personal Information Act, 2013.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
From an American surgeon, MIT trained scientist, and Wall Street investor I ask that you please do not build this damn. You have a beautiful world treasure with amazing whitewater recreation and this whitewater seems to protect people from crocodiles and hippos. This can all be destroyed for power. There are wealthy people all over the world who would be interested in helping Africa with power and saving your irreplaceable treasures. GE who is scheduled to help do construction could bring on investors and fund energy in other ways. I myself badly want to visit your falls and raft this river. I will probably accelerate a trip as soon as COVID allows it. I have the financial means to do this immediately but billions of potential tourists will lose the option to visit your treasure. I think you should use the amazing tourism option, expand it and combine the rafting and water falls with safaris and other African treasures and bring more Americans, Asians, Europeans, and Middle Eastern people to your beautiful treasures, You can increase prices, ask for donations, and use these funds to purchase energy. Earth's treasures are irreplaceable. Thank you for your consideration.	Sean Lavin		06-Aug-20	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	Stakeholder Engagement Process
The Zambezi River Authority released a press statement today regarding compensation for the resettlement action plan for the Batoka Gorge Hydro-Electric Power Scheme. In the statement it was indicated that the draft ESIA had been released on March 2 and that disclosure meetings were being scheduled with stakeholders. I have a few follow-up questions: 1. Please could I receive a copy of the draft ESIA?	Terrence Creamer	Creamer Media	14-Aug-20	Email	The EISAs can be accessed via the project website: https://www.erm.com/bghes-esia/	Stakeholder Engagement Process
2. How many people will needed to be resettled and what is the anticipated compensation budget?	Terrence Creamer	Creamer Media	14-Aug-20	Email	To provide some context: ERM has prepared Resettlement Policy Framework (RPFs) for the Batoka Gorge Hydro-electric Scheme (BGHES) Project as a whole (one RPF for Zimbabwe and one for Zambia); this as a pre-cursor to a full Resettlement Action Plan (RAP). The RPFs outlines a framework for resettlement that seeks to avoid, and where avoidance is not possible mitigate the risks posed by displacement, through sound planning and resettlement implementation, and adherence to national laws and international standards of good practice. The RPFs are used to guide the compensation of losses and mitigation of potentially adverse Project effects experienced by persons and/or communities through the construction and operation of all components of the Project. Moreover, it defines the principles and steps to be implemented in the development of the Livelihood Restoration Plans (LRPs) or Resettlement Action Plans (RAPs) for Project activities that result in economic and / or physical displacement. A LRP is developed to establish the entitlements of affected persons and/or communities that are economically displaced by a Project (i.e. loss of crops, fields, access routes). In comparison, a RAP is a plan prepared to resettle and compensate people and communities that are physically displaced by a Project. As part of ERM's scope, we have prepared two LRPs for the Project (Annex S of the ESIAs), one for the Staff Township in Zambia and another for the Staff Township and Batoka South Access Road in Zimbabwe. LRP's are being developed as opposed to RAPs because only economic displacement will occur as a result of the Project activities. The LRPs have been prepared in line with the applicable Zambian and Zimbabwean national legislative requirements, as well as per the requirements of the International Finance Corporation (IFC) Performance Standards (particularly Performance Standard 5 – Land Acquisition and Involuntary Resettlement). Separate RAPs/LRPs will also be commissioned for the following Project components– • Displacement (physical and economic) of upstream / downstream water users; • Displacement (physical and economic) of Project affected peoples in footprints associated with BGHES transmissions lines; access road in Zambia; quarries; and other BGHES associated infrastructure. To Note – RAPs/LRPs for upstream water users (specifically tourism operators), will only be undertaken at a later stage, as inundation of the Batoka Gorge (filling of the BGHES reservoir) is proposed in 2027 / 2028. These separate RAPs/LRPs will be undertaken in accordance with the regulatory requirements of the Republics of Zambia and Zimbabwe, and International Best Practice (IBP) requirements.	Potential Economic or Physical Displacement
3. Which areas will be most affected by the scheme?	Terrence Creamer	Creamer Media	14-Aug-20	Email	In Zimbabwe, the proposed scheme falls within the province of Matabeleland North and in the Hwange Rural District. It includes the wards of Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sidinda, Mashala and Simangani. The traditional authorities in the area of impact include chief Shana, Bishop Matata Sibanda (who is Acting Chief for Mvutu who has recently deceased) and Chief Hwange. In Zambia, the main area of direct impact falls under the Southern Province in the Kazungula District, most notably the wards of Mukuni and Katapazi, which fall under Chief Mukuni's jurisdiction. However, impacts will also be felt in Livingstone District, Zimba District and Choma District and downstream impacts will be experienced in the District of Kalomo. The traditional authorities in these areas include Chief Musokotwane, Chief Simwatachela, Chief Sipatunyana, and Chief Singani.	Potential Economic or Physical Displacement
4. Has land been earmarked for resettlement and where is it?	Terrence Creamer	Creamer Media	14-Aug-20	Email	The traditional authorities responsible for those areas will allocate alternative land for those affected by the construction of the Zambian and Zimbabwean Staff Townships and Batoka South Access Road. The allocation of alternative land will be guided by the LRP's compiled by ERM (Annex S of the ESIAs). The allocation of land for other Project components (upstream / downstream water users; transmissions lines; access road in Zambia; quarries; and other BGHES associated infrastructure) will need to be guided by the RAPs/LRPs specifically prepared for those Project components (again, the development of these plans are not part of ERM's current scope; however, they have been committed to by the Zambezi River Authority (Authority) in the ESIAs).	Potential Economic or Physical Displacement
5. When will the stakeholder meetings begin and where?	Terrence Creamer	Creamer Media	14-Aug-20	Email	On 3 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe in April 2020. However, in light of the current COVID-19 pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings scheduled to take place in March and April 2020. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. Given the ongoing level of global uncertainty associated with COVID-19, the Authority and ERM are unable to determine with certainty the timing that these meetings can be reasonably rescheduled and the approach / manner in which these meetings will be held. This said, ERM is currently in discussions with the Authority on alternative engagement approaches that are aligned with local and IBP requirements. Once agreement has been reached on alternative approaches they will be communicated well in advance to Project stakeholders.	Stakeholder Engagement Process
6. For how long will that process continue and with which communities?	Terrence Creamer	Creamer Media	14-Aug-20	Email	The Environmental and Social Impact Assessment (ESIA) and associated stakeholder engagement process is being conducted in accordance national legislative requirements of Zambia and Zimbabwe, as well as good international industry practice, in particular the requirements of the World Bank Environmental and Social Framework and the IFC Performance Standards. Moreover, the engagement process is now also considering the requirements of the recently published Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19. The draft ESIAs and associated Non-technical Summaries (NTS) (note – the NTS was also translated into Tonga and Ndebele – the two locally spoken languages) were made available for review and comment on 2 March 2020. At the time of postponing the March and April 2020 disclosure meetings, ERM informed all stakeholders (including communities) that that the review and comment period for the draft ESIAs and NTS will remain open until such time that the Authority and ERM are able to hold the ESIA disclosure meetings, or until further notice is given by the Authority and ERM. Stakeholders are encouraged to access the ESIAs via the Project website, https://www.erm.com/bghes-esia/ and submit any comments or questions to ERM.	ESIA Process, Project Description and Mitigation
7. When will the final ESIA be published?	Terrence Creamer	Creamer Media	14-Aug-20	Email	The final ESIAs will be published following completion of all disclosure meetings. At this stage, the exact date of ESIA finalisation is still uncertain.	ESIA Process, Project Description and Mitigation
8. Besides resettlement, what other environmental and social impacts are envisaged and how will these be mitigated?	Terrence Creamer	Creamer Media	14-Aug-20	Email	Please refer to the Chapters 10, 11 and 12 for an assessment of biophysical, socio-economic and cumulative impacts of the BGHES. These chapters also include the recommended mitigation measures associated with the impacts assessed and residual impact assessments. For a summary of impacts and associated mitigation recommendation you can also refer to the NTSs which are included upfront in all ESIAs. Note that 3X separate ESIAs were prepared as follows – 1. ESIA associated with the dam wall and impoundment, including the spillway facility; surface power houses, one on each side of the river; and project townships (in both Zambia and Zimbabwe) and other ancillary infrastructure (such as quarries, spoils area and batching areas) 2. ESIA associated with the access roads in Zambia and Zimbabwe 3. ESIA associated with the transmission lines in Zambia and Zimbabwe As mentioned previously, these ESIAs are available for review on our Project website, https://www.erm.com/bghes-esia/	ESIA Process, Project Description and Mitigation
9. What are the next ESIA and project milestones and when are these expected?	Terrence Creamer	Creamer Media	14-Aug-20	Email	As previously mentioned, the exact date of ESIA disclosure and subsequent ESIA finalisation are still uncertain. However, this said, once the ESIA disclosure process is complete and the ESIAs have been finalized, these will be submitted to the Zambia Environmental Management Agency (ZEMA) and the Environmental Management Agency of Zimbabwe (EMA) for review and approval decision.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
I am writing to oppose the Batoka Gorge Dam. Drowning a priceless gem such as this, for only 30 to 50 years' "gain," should be seriously reevaluated. Thank you for your time and reconsideration, and for your reply.	Lisa Benham		15-Aug-20	Email	The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project and monitored by both the ZRA and relevant environmental authorities.	Stakeholder Engagement Process
Thank you for the opportunity to put forward my concerns. I am a Professor Emerita of Anthropology, Johns Hopkins University and I spent two years, 1984 and 1985, living in Mola studying the lives of the Tonga people who had lost their land on the banks of the Zambezi River (and I spent significant time over the next six years studying and writing about the conditions in which they live). If anyone working on the project has read my two books, then I need say no more. The books are "Dance Civet Cat. Child Labor in the Zambezi Valley" and "Lwaano Lwanyika. Tonga Book of the Earth". Compared with their former lives as owners of the land; as farmers of two crops a year on the flood planes; as people with access to the flora and fauna; and as a community with a proud history of some two thousand years as owners in the Valley their lives now are mean. They have been denied any meaningful share in the products of the Kariba Dam. I have no doubt that you are aware of this scenario but I fear that another huge dam will destroy much in the interest of people and businesses who cannot give recompense to the destruction of the environment and a way of life. I have read little about the project except that houses will be built for the people. Houses without the secure means to afford a way of life that sustains property and insures rights is of little use. There is, besides, much research that argues against the value of enormous lakes. I shall listen with interest to your plans. The conference held a few years ago on the effectiveness of the Kariba Dam had no adequate representation from the Tonga. Their interests were not heard. The issues I raise are large and will not be able to be adequately aired on zoom but I look forward to the discussion.	Pamela Reynolds	Johns Hopkins University Honorary Professor, University of Cape Town	30-Nov-20	Email	Thank you for your email and interest in the Project. I just wanted to let you know that in addition to the webinar, we have been undertaking some in-person engagement with the directly affected communities in the Project Area - with COVID-19 precautions in place, so that communities have an opportunity to be heard. In addition to this, both a social impacts assessment and a cultural heritage assessment have been undertaken and describe in great detail, the baseline conditions in the affected communities, including the Tonga people that inhabit the area. No physical resettlement will be required as a result of the inundation of the dam as the water is contained entirely in the gorge, which is deep enough to carry the water capacity. Further, those who will have their livelihoods or structures affected by the staff villages and the access roads will be compensated as per the requirements of IFC Performance Standard 5, that requires people receive the same or superior living/livelihood standards following displacement. Please refer to the Cultural Heritage Study (Annex L and M, the Resettlement Framework Policy (Annex P), the Livelihood Restoration Plan (Annex P) for detailed studies relating to economic and physical displacement	Potential Economic or Physical Displacement
It has come to our attention that you are engaging with all stakeholders that are affected by the building of the Batoka dam up to 11 December. I would like to please ask you to please contact us as we are directly affected by the building of the dam. We, Taita Falcon Lodge, are situated above Rapid 17 and the building of the dam will directly affect us as it will change the view of the Gorge in front of our Lodge drastically and might also affect us geologically once the water comes up and causes rock falls and possible tremors.	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	Thank you so much for your email. We appreciate your concerns relating to the BGHES. I assure you that the questions you have posed will be answered in the virtual engagement that you have been invited to on 4 December at 14:00pm (click on the following link to register https://us02web.zoom.us/webinar/register/WN_8p9muSBLQuSMw9DslG7glQ). Your concerns are addressed in the responses provided below.	Stakeholder Engagement Process
Issues that needs to be discussed - 1. Will we be compensated for any damage to our property because of any rock falls or tremors in the Gorge once the water moves up into all the cracks.	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	The scheme has been designed as a baseload plant on a runoff river regime with limited capacity for peaking for environment compliance. The reservoir associated with the scheme will be relatively small (over 100 times smaller than the size of the Kariba) and contained within the gorge. The preliminary reservoir slope stability assessment carried out by ZRA's independent Engineering Consultants indicate that the reservoir rim is stable. Further, additional site investigations are currently being carried out by the Developer. Further, it is not expected that the water will significantly rise at your location. Through the on-going public disclosure process, river user concerns are being recorded and incorporated into the ESIA process. As part of the ESIA process, a Resettlement Policy Framework (RPF) was developed. The RPF provides the framework for physical and economic displacement impacts that will be associated with development of Project components. The RPF is operationalized through development of specific Resettlement Action Plans (RAP). RAPs specific to the compensation of river users are yet to be developed, as filling of reservoir will only take place around 2027. The Authority will develop the said RAP's in full consultation with the affected persons and other key governmental and community stakeholders.	Potential Economic or Physical Displacement
2. How high will the water be rising in the Gorge in front of our Lodge	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	The Maximum full supply level for the scheme is 757m asl, which is still within the Gorge, and about 93m below the highest point at the dam site. With an altitude of about 880m asl at your location, the water level is expected to rise to about 123m below the top surface, which is still confined to the gorge.	ESIA Process, Project Description and Mitigation
3. As the view in front of our Lodge, the whole ambience as well as ethos of our Lodge will be changing, will we be compensated for new photos, marketing material etc. that will be needed with the "new" view - as it is not a beautiful gorge anymore but something between a dam and a nearly "gorge"? We have no idea what is going to be.	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	The scheme has been designed as a baseload plant on a runoff river regime with limited capacity for peaking for environment compliance. The reservoir associated with the scheme will be relatively small (over 100 times smaller than the size of the Kariba) and contained within the gorge. The preliminary reservoir slope stability assessment carried out by ZRA's independent Engineering Consultants indicate that the reservoir rim is stable. Further, additional site investigations are currently being carried out by the Developer. Further, it is not expected that the water will significantly rise at your location. Through the on-going public disclosure process, river user concerns are being recorded and incorporated into the ESIA process. As part of the ESIA process, a Resettlement Policy Framework (RPF) was developed. The RPF provides the framework for physical and economic displacement impacts that will be associated with development of Project components. The RPF is operationalized through development of specific Resettlement Action Plans (RAP). RAPs specific to the compensation of river users are yet to be developed, as filling of reservoir will only take place around 2027. The Authority will develop the said RAP's in full consultation with the affected persons and other key governmental and community stakeholders.	Potential Economic or Physical Displacement
4. As our name suggest -we have from time to time Taita Falcons breading in the Gorge as well Black Eagles, Peregrine Falcons etc. What are the plans to mitigate the affect on all birdlife and game in the Gorge.	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	A reconnaissance survey to assess the status of Taita Falcon was undertaken in the Batoka Gorge by the Wildlife Departments of Zambia and Zimbabwe in 2018. The upper 25 km stretch of the gorge was surveyed for the presence of Taita Falcon; however, a large part of the Batoka Gorge that will be impacted by the BGHES remain unassessed – this limitation was acknowledged in the survey. The impact of creating a reservoir on the Taita Falcon population is unknown, and key baseline gaps in the ecological understanding continue to exist. This said, the ZRA are committed to an action plan that outlines approaches to have species specialists thoroughly assess the entire Batoka Gorge to determine the occurrence and status of Taita Falcons; workshopping with all species specialists to pool available knowledge, raise the level of confidence on potential threats and impacts, and identify if mitigation to address threats is feasible; and develop an appropriate Biodiversity Action Plan to address the risks.	Potential Effects on Biodiversity
5. We have a multi day hiking trail for international school groups in the gorge running from Rapid 14 to Rapid 21. This brings us a very good income each year. How are we going to be compensated for the loss of this income?	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	The scheme has been designed as a baseload plant on a runoff river regime with limited capacity for peaking for environment compliance. The reservoir associated with the scheme will be relatively small (over 100 times smaller than the size of the Kariba) and contained within the gorge. The preliminary reservoir slope stability assessment carried out by ZRA's independent Engineering Consultants indicate that the reservoir rim is stable. Further, additional site investigations are currently being carried out by the Developer. Further, it is not expected that the water will significantly rise at your location. Through the on-going public disclosure process, river user concerns are being recorded and incorporated into the ESIA process. As part of the ESIA process, a Resettlement Policy Framework (RPF) was developed. The RPF provides the framework for physical and economic displacement impacts that will be associated with development of Project components. The RPF is operationalized through development of specific Resettlement Action Plans (RAP). RAPs specific to the compensation of river users are yet to be developed, as filling of reservoir will only take place around 2027. The Authority will develop the said RAP's in full consultation with the affected persons and other key governmental and community stakeholders.	Potential Economic or Physical Displacement
6. We are losing our beaches down in the Gorge which we used for picnics and overnights for our clients	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	The scheme has been designed as a baseload plant on a runoff river regime with limited capacity for peaking for environment compliance. The reservoir associated with the scheme will be relatively small (over 100 times smaller than the size of the Kariba) and contained within the gorge. The preliminary reservoir slope stability assessment carried out by ZRA's independent Engineering Consultants indicate that the reservoir rim is stable. Further, additional site investigations are currently being carried out by the Developer. Further, it is not expected that the water will significantly rise at your location. Through the on-going public disclosure process, river user concerns are being recorded and incorporated into the ESIA process. As part of the ESIA process, a Resettlement Policy Framework (RPF) was developed. The RPF provides the framework for physical and economic displacement impacts that will be associated with development of Project components. The RPF is operationalized through development of specific Resettlement Action Plans (RAP). RAPs specific to the compensation of river users are yet to be developed, as filling of reservoir will only take place around 2027. The Authority will develop the said RAP's in full consultation with the affected persons and other key governmental and community stakeholders.	Potential Economic or Physical Displacement
We have been asking , for many years now, for someone involved with the building of the dam to come and see us personally without any result. See below the last emails correspondence in 2019. Please make sure to come and see us within your period of engaging with stakeholders. Please let know when this would be possible. We expect a reply from you asap.	Anmarie Fourie	Taita Falcon Lodge	25-Nov-20	Email	Thank you for your email. We have received your comments, which, together with a response from the Project Team will be included in the Comments and Responses Report. Once again, we have forwarded your request for a meeting directly to the Zambezi River Authority (copied on the email). Please feel free to respond to this email should you have any further queries. Additional response was sent via email from ZRA: The Authority is available for any queries you may have regarding the project. We can set up an appointment with. You can contact me if you have specific points of clarification you need from the Authority. Otherwise, our Independent Consultant , ERM is in the process of engaging all identified Interested and Affected stakeholders to ensure the project addresses their concerns	Stakeholder Engagement Process
I would like to challenge the recommendations of the ESIA with regards to the Batoka Gorge Dam. It would be a disastrous decision to go ahead with a dam in this area. Truly the thinking behind this is lazy and is not in touch with the reality of what it would mean on the ground, for people and for wildlife.	Ruth Danziger		25-Nov-20	Email	Your objection is acknowledged. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project and monitored by both the ZRA and relevant environmental authorities.	Stakeholder Engagement Process
There are many, many financial reasons why this dam project makes no sense. A tremendous amount of destruction will result, the dam is likely to start falling apart by the time it is 50 years old and the likely negative fallout of disease, flooding and an unrealistic burden for the future will result.	Ruth Danziger		25-Nov-20		Value of constructing the dam: The power demand projections for Zambia and Zimbabwe show an increasing trend - with Zambia growing from 1,911 MW in 2015 to 5,508 MW in 2035 while the Zimbabwe demand will grow from 2,116 MW in 2015 to 5,301 MW in 2035. The Power demand deficit requires significant investments in new power sources if the two countries are to meet the demand by the targeted years. The construction of the BGHES, with 2,400 MW will help in meeting the demand. Dam's design life span: Quality assurance has been incorporated in the planning and design of the project and this will be extended to the construction as guided by internationally accredited standards to ensure the quality of the product is achieved. Moreover, during operation there will be continuous monitoring through use of the installed dam monitoring instrumentation. However, for the Batoka, the use modern technologies to employed in the construction of this Batoka dam will also ensure the robustness and longevity of the BGHES dam lifespan. Emergency Preparedness: In the event of emergencies the provisions of the dam Emergency Preparedness Plan will be implemented (refer to Annex O). Suffice to note, the reservoir will be	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
This is not a time in our history as a people, to take action based on assumptions that appeared to be right 100 years ago. It is a time to re-assess, learn from what we know now and take action based on a renewed understanding of the value of nature with which we are all interdependent. To base this level of action on unexamined assumptions is irresponsible and destructive. And dare I mention the inherent value of a river system such as Batoka Gorge for so many vital reasons. There are better ways to look at the issue of electricity than this one. I am horrified that a large agency like the ESIA can still be so far behind what the public knows and what any individual involved probably knows too about how we see our habitat and how we must change, listen to direct evidence and adapt to reality. Please let me know what you plan to do about this.	Ruth Danziger		25-Nov-20	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognized; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognized. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	Project Alternatives
I write to voice my opposition to the plans for the new Kariba hydro-electric dam and two power-plants on each side of the Zambezi River. These copyright of the next two paragraphs is owned by Wikipedia: " … Like in the proposal in the 1990s that was stopped, and now again, stakeholders and the local community are strongly opposed to the dam's construction. The tourism industry generated by the current Batoka Gorge, including its whitewater rafting, employs thousands of local individuals both directly and indirectly, and has been acknowledged as the 3rd largest contributor to Zambia's economy. While destroying the tourism industry, the dam will also not accomplish its desired effect and not provide electricity to the rural, local population, as it will be exported to the Southern African Power Pool.	Jonathan Tyler.		27-Jan-21	Email	Your opposition to the Project is acknowledged. The tourism assessment found that tourism in the Study Area makes a significant contribution to the value of tourism in both Zimbabwe and Zambia (23% and 10% of the tourism value, respectively), and that the Batoka Project will have a significant negative impact on the tourism industry and the livelihoods of those that depend on it. Compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation have been considered - including loss of sense of place, loss of non-use values held by society, loss of livelihoods for those with few alternatives and those that benefit informally from local tourism that are unlikely to be considered in the compensation process.	Stakeholder Engagement Process
Other than the economy, the local community is also concerned about the environment. According to the January 26, 2015 article published in Zambezi, the dam could cause the river to back-up to within 650 meters of the Victoria Falls, a UNESCO World Heritage Site. Contrary to the UNESCO World Heritage Site restrictions, this would be a direct violation of the agreed-upon 12 km boundary preservation below the Falls.[8] Consequently, both Zimbabwe and Zambia would be in direct violation of their international legal obligations pursuant to the Convention Concerning the Protection of the World Cultural and Natural Heritage (Adopted by the General Conference at its seventeenth session (Paris, 16 November 1972)).[9] In other words, if the dam proposal moves forward, the deleterious effect is tantamount to the Victoria Falls becoming a "World Heritage in Danger".	Jonathan Tyler.		27-Jan-21	Email	The ESIA does emphasize the impacts to the World Heritage Site. Moreover, UNESCO are aware of the Project and associated ESIA and they have confirmed that the State Parties are responsible for submitting the ESIA for review. In aligning with existing protocol, the Zambezi River Authority is engaging the State Parties to ensure the ESIAs are provided to and reviewed by UNESCO.	Stakeholder Engagement Process
I understand that if the Batoka Dam is built, will there even be enough water flowing down it (climate change) to generate the power expected?	Jonathan Tyler.		27-Jan-21	Email	The results of the Climate Change Risk Review included in the ESIA indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
It will not only destroy the area flooded and do no good to the area downstrem, but no benefits would go to the people in the area.	Jonathan Tyler.		27-Jan-21	Email	There will be a number of direct and indirect employment opportunities created by the Project, either with Authority or through contractors on construction and operation of the Project r through the growth and emergence of new, informal trade. It is anticipated that there will be up to 8,000 direct Project employment opportunities at the peak of construction and 1,500 direct opportunities during operation. Indirect employment opportunities will be created through the procurement of goods and services to support construction and operation and will therefore include jobs created in the Project supply chain and their suppliers or sub-contractors/service providers. Induced employment (i.e. jobs created through spending in the local economy by direct and indirect employees on the Project may also occur. The BGHES Project is a power generation project, however, the Zambezi River Authority cannot determine the distribution of the power generated by the Project. ZESA in Zimbabwe and ZESCO in Zambia, as the national utility determine where the power will be distributed. The Project will, however, include Community Development Project during operations, and there may be potential to assist schools and hospitals with viable and sustainable power solutions through these projects. A Community Development Framework has been prepared for the Project, and more detailed community development plans, which could include school electrification, irrigation schemes, improved infrastructure for clinics etc., will be prepared in consultation with communities as the project transitions from construction to operations.	Community Development and Benefits
The proposed damming of the Zambezi river must be stopped. There is no justification for the dam as it will take twenty years or more to repay construction costs before income ever comes to Zambia and that is without even mention of the environmental and human quality of life costs. Also electric power can generated far more economically via solar and wind renewables.	Daniel Sterk		26-Jan-21	Email	Mode of development: The project will be developed as a build–operate–transfer, and the amount of time taken to repay the debt is generally in line for projects of a similar nature and development mode. Impact on the environment and human quality life: The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors. Further, directly effected people will be compensated through the LRP and Cooperate Social Responsibility (CSR) initiatives that include but are not limited to construction/rehabilitation of schools/clinics, drilling boreholes, small irrigation projects etc., the model to be adopted is more or less like the Zambezi Valley Development Fund (ZVDF) Model. The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity.	ESIA Process, Project Description and Mitigation
In addition to my email, sent on Saturday, 23. Jan. 2021 at 13:49 hrs. with the Subject: Stop the damming of the mighty Zambezi! sent from my other email-account <annamaracuja@googlemail.com>, I would like to add the following to the list of my objections: 1.) Damming our rivers is very outdated and as you can see at Kariba and Cahora Bassa, very unreliable. In 2019 there were power cuts in Zambia and Zimbabwe because of the falling water level due to a short – "The hydropower production system of southern African region is likely to be strongly affected by changes in climate. These results show that the future climate within and around the Zambezi catchment will get drier with temperatures higher than those in the current period. The temperature projections in the basin indicate an increase up to 2.7 °C by end of the century." see page 15 from the attached PDF "Hydropower Production in Future Climate Scenarios Zambezi River 2016" rainy season.	Andie K Amend,	Destination Marketing of the Victoria Falls and the Zambezi area in Zambia and Zimbabwe. Germany	25-Jan-21	Email	The International Commission on Large Dams (ICOLD) is an international non-governmental organization dedicated to the sharing of professional information and knowledge on the design, construction, maintenance, and impact of large dams and according to its reports damming of rivers is important especially to curb against the impacts of climate change. The ICOLD also embraces the damming of the rivers for the purposes of sustainable power generation. ICOLD recognized the need for additional water storage infrastructure at its meeting in Japan in 2012 to sustainably meet the demands of social-economic development and many Countries around the World, and organizations like the Authority continue to implement the resolution but with sustainable approaches incorporated in the planning and actual implementation of hydro power project. The Authority has not only undertaken all the requirements under a transparent ESIA Study process, but also subjected the project to the hydro power sustainability assessment protocol (HPSAP), using highly qualified independent assessor to identify suitability gaps and develop implementation plans and mechanisms to enhance them prior to actual project implementation. The Authority carried out detailed Climate Change Assessment and factored findings into the design of the project at feasibility stage. At feasibility study stage, climate change assessment conclusions of the studies were: • from -4 to -34% on average flows, considering the most probable emission scenario (RCP4.5), • from -1% to -20% on energy production, considering the most probable emission scenario (RCP4.5), • "a slight but clear decrement of the discharges quantities" for floods. Moreover, the use of over 100 year Hydrological Data Results in the design provides a fair assurance of the feasibility of the scheme. The BGHES will be run of the river with limited peaking for environmental compliance, and evaporation losses wont be as significant. Because of their cascade nature the BGHES, and the Kariba Power Plants will be operated conjunctively allowing for peak production at Batoka during wet months and baseload production at Kariba while "storing the water" for peak production during dry months. this operation alone will add extra power to the system. Moreover, the two schemes will benefit from the reuse of the same water for power generation.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
2.) What a waste of resources like Copper for the power lines transmitting the energy thousands of kilometers for example to the Copper plants in Zambia. While transmitting, lots of power will be lost on the long way. Not to mention the destruction of forests and bushes for clearing to build the transmission lines.	Andie K Amend,	Destination Marketing of the Victoria Falls and the Zambezi area in Zambia and Zimbabwe. Germany	25-Jan-21	Email	The evacuation of power from generating source to distribution is a consideration in any power project, and the cost of evacuation, including loss associated with transmission is factored into feasibility studies and decision making around the cost per unit of energy. Power generation is linked to a resource, be it coal, hydro, solar or wind and the location of these resources determines where power generating projects can be developed. Where possible new projects will link into the existing power grid, which reduces the cost of transmission. The BGHES will not require thousands of kilometers of transmission lines, there are three transmission lines included in the scope of this ESIA, totaling less than 250km: Mukuni300 kV transmission line-approximately 22 km Muzuma300 kV transmission line-approximately 152 km Hwange 400 kV transmission line-approximately 67 km	Project Alternatives
3.) It is way more sustainable to produce power right at the spot, such as solar power production, which is quite easy to produce in Southern Africa as there is sunshine almost every day of the year. Solar power produced by the sun is much more reliable in Southern Africa than water. SOLAR POWER IS THE FUTURE!	Andie K Amend,	Destination Marketing of the Victoria Falls and the Zambezi area in Zambia and Zimbabwe. Germany	25-Jan-21	Email	Agreed that the increased use of solar power in both Zimbabwe and Zambia, and to a lesser degree wind, should be explored; however, the power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels.	Project Alternatives
4.) The rising water level also effects the rivers flowing from both sides into the Zambezi at the Batoka Gorge. It effects their gorges and valleys also. The study doesn't show the exact water levels line. The study also misses the effect in the side river valleys of the Zambezi river.	Andie K Amend,	Destination Marketing of the Victoria Falls and the Zambezi area in Zambia and Zimbabwe. Germany	25-Jan-21	Email	The BGHES accurately mapped along the 757 masl contour, and the extent of impact along the Zambezi River (and associated tributaries of the Zambezi River) have been mapped and assessed as part of the overall ESIA.	ESIA Process, Project Description and Mitigation
PLEASE FIND ATTACHED: Water Policy 2 (2000) 65±81 Management of shared river basins: the case of the Zambezi River Osborne N. Shela Box 31231, Lilongwe 3, Malawi- **See document 2 under annex C7.2** Hydropower Production in Future Climate Scenarios; the Case for the Zambezi River Byman H. Hamududu and Ånund Killingtveit Published: 30 June 2016 -**See document 3 under C7.3**	Andie K Amend,	Destination Marketing of the Victoria Falls and the Zambezi area in Zambia and Zimbabwe. Germany	25-Jan-21	Email	The referenced documents can be viewed in Annex C7.	
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/Ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Marie-Louise Kellett	Save the Zambezi	21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognize that there may	Stakeholder Engagement Process
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Marie-Louise Kellett	Save the Zambezi	21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognize that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Marie-Louise Kellett	Save the Zambezi	21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Marie-Louise Kellett	Save the Zambezi	21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Marie-Louise Kellett	Save the Zambezi	21-Jan-21	Email	ERM has not compromised its approach to fully disclose the ESIA and the resulting impacts. The same content disclosure process was provided to the Zambian and Zimbabwean authorities as was provided to general stakeholders, river users and the biodiversity-focused group. The UNESCO World Heritage Commission have been engaged regarding impacts to the World Heritage Site (which overlaps the national parks), but have stated they will review the ESIA and take up the issues directly with the client. The ESIA is therefore unable to present UNESCO's findings.	Stakeholder Engagement Process
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Marie-Louise Kellett	Save the Zambezi	21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognized; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognized. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
National Museums and Monuments of Zimbabwe notes the contents of the Report's "Cultural Heritage Baseline Report for the Proposed Batoka Gorge Hydro-Electric Scheme-Zimbabwe" done by the heritage consultant Rob Burret.. 91 heritage sites were located in the project footprint with 36 recorded prior the project and 55 new ones located during the ESIA process. 13 sites were identified(p.154 of report) for mitigation and further work was recommended for the Chemapato Living heritage site in addition to mitigation at the 13. National Museums and Monuments affirmed the need for the mitigation and thus recommends to the ERM team that according to the National Museums and Monuments Act 25:11 project work should be preceded by the mitigation as recommended by your heritage consultant/specialist	K T Chipunza - Chief Curator	National Museums and Monuments of Zimbabwe (NMMZ)	25-Jan-21	Email	Thank you for your feedback. The impact assessment of sites of physical cultural heritage sensitivity (included in the Section 11.7.1 of the ESIA) states that additional pre-construction archaeological survey will need to be carried out once the feasibility stage of the project has been completed. This survey will need to involve the relevant archaeologists from both Zambia and Zimbabwe, focusing on the areas that will be directly affected. This will include the Chemapato Living Heritage Site and the 13 sites identified by Rob Buerret. Surveys will be systematic and intensive, with the objective of identifying sites that will be affected. Moreover, survets will adhere to local heritage legislative requirements and the requirements of international best practice and IFC Performance Standard 8. Should sites of medium or high archaeological sensitivity be identified by these pre-construction surveys, time and resources will be provided to permit more detailed recording/investigation ahead of the commencement of the construction process. This could involve any of the following methods of investigation: • Systematic surface collection; • Trial trenching (using mechanical excavators to save time if necessary/appropriate); • Test Excavation; • Non-invasive techniques such as ground penetrating radar (GPR); and • Archaeological monitoring/watching briefs. It must also be noted that a chance find procedure will be implemented. These requirements have been included as commitments in the relevant Environmental and Social Management Plans (ESMPs) for the BGHES.The implementation of the ESMPs will monitored	Potential Effects on Cultural Heritage Resources

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
The ESIA mentions several major negative environmental impacts, with little to no available ways in which to mitigate the effects. Likewise, several negative effects on local tourism were identified, again with little ability for mitigation. Whilst the report does mention some alternative design implementations, it does not begin to consider different sources of power generation. The need for power generation in the region is clear, but I would question whether a large hydro project is the most appropriate way to do this. The Batoka Dam offers little redundancy against the increasing droughts expected in future years due to climate change, and it would clearly cause catastrophic damage to a UNESCO world heritage site. Alternative means such as solar power would be well suited to the local environment, and more resistant to the effects of the dry season. Combination with large-scale battery storage (e.g. Hornsdale Power Reserve) would allow for fluctuation in power demands and night time use. Moreover, both technologies are scalable and proven. Solar combined with thermal storage (e.g. Ouarzazate Solar Power Station) could also provide a viable alternative. Of course, hydropower need not be totally excluded, but perhaps smaller-scale projects (e.g. run of river hydro) would be preferable given their reduced environmental impacts. A combination of power generation techniques would give much greater redundancy.	Tristan Edey		25-Jan-21	Email	Results from climate change risk review undertaken for the BGHES indicates that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations. Agreed that the increased use of solar power in both Zimbabwe and Zambia, and to a lesser degree wind, should be explored; however, the power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the landtake associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be	ESIA Process, Project Description and Mitigation
My second concern relates to the consultation stage of the ESIA. Given the Covid-19 pandemic, there has been little opportunity for proper community consultation. It would therefore seem more reasonable to postpone this consultation, until after the pandemic has passed. This would allow for proper community consultation.	Tristan Edey		25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process are documented in Chapter 7 of the ESIA. ERM recognize that in-person engagement for the disclosure of the BGHES ESIA would have been preferable, as was our intention in March and April 2020. We altered our approach to engagement due to the unprecedented circumstances associated with COVID-19 pandemic. In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context Of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. As part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. The Draft ESIAs were made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration.	Stakeholder Engagement Process
This damn will be an environmental disaster. We can no longer destroy our environment for the purpose of use and profits. Please do not allow this to go through.	Janet Abbey		25-Jan-21	Email	The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors.	
I am responding to the request posted on the Project website: https://www.erm.com/bghes-esia inviting comments and questions in response to the draft ESIAs regarding the proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River. In preparing these comments, I have reviewed the technical documents posted on the website and attended the two public Zoom meetings hosted by ERM for stakeholders in November and December 2020. I am familiar with the Batoka Gorge and its environs having served as the resident Zimbabwe National Parks ecologist for the Matetsi Parks and Wildlife Complex from 1979 – 1988 and participated in the first EIA process of this proposed project in 1983	Vernon Booth		25-Jan-21	Email	Thank you for your comments, and for taking the time of consult the material prepared by the ESIA team. Responses to your comments and questions are provided below.	ESIA Process, Project Description and Mitigation
In preparing my comments and questions, I have consulted the various technical reports and annexes posted on the website. I have used the document named "The Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River – VOLUME I - Environmental and Social Impact Assessment (ESIA) for the Project Area of Inundation, Staff Villages and Quarries" dated September 2019 as my main source of reference and is referred to as "the report" in the text that follows. I note from this document (see 0.3 The Need for The Project) that the objective of the proposed BGHES project is to: • To increase power generation capacity in both Zambia and Zimbabwe and subsequently mitigate the current power deficits currently experienced in both countries; • To reduce the overall power tariffs in both Zambia and Zimbabwe • Conjunctive operation of both the proposed BGHES and Kariba Complex; • To reduce power outages; and • Contribute to the sustainable and renewable energy Agenda in the two countries thereby reducing reliance on coal fired power stations. It is against these objectives that the ESIA process should be assessed.	Vernon Booth		25-Jan-21	Email	Thank you for your comments, and for taking the time of consult the material prepared by the ESIA team. The summation of the Project objectives is correct. Responses to your comments and questions are provided below.	ESIA Process, Project Description and Mitigation
GENERAL COMMENTS ON THE REPORTS ERM has produced a comprehensive set of reports covering all aspects of the EIA process. These are professionally written; however, each report is lengthy, often over 200 pages. For those not familiar with the scientific language or the biophysical complexities, these can be daunting to assimilate. • Although these documents have been available for several months, one must question whether all key stakeholders have had the time and capacity to thoroughly consult and interpret each report. • Much of the initial data was gathered in 2014 – 2015. It is unlikely that any significant changes would have occurred by 2018 – 2019 where this applies to ecological factors. However, significant economic changes have taken place since 2015 that are very likely to have a significant impact on the conclusions of the ESIA. • Moreover, there have been advances in alternative technology (solar, river turbines etc.) that have not been discussed in the updated reports.	Vernon Booth		25-Jan-21	Email	Thanks your for your comment. We acknowledge that the ESIA reports and lengthy and technical documents. It is for this reason that ERM also compiled separate Executive Summaries for each ESIA, which sumamrises the key aspects of the ESIA document. Moreover, as part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars where audiences were taken through key aspects of the ESIAs. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. As you have mentioned, the Draft ESIAs were also made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge. Regarding your comment on the validity of the socio-economic data collected between September 2014 and March 2015, we completely agree. Given that substantial time had passed since the collection of primary data and that there is likely to have been an update to secondary data since then, ERM (in 2019) went through a process whereby we updated the social baseline (including the tourism study) peviously undertaken. The pocess invovled data collection in areas where there had been significant change in social baseline and where this had a material impact on our impact assessment. Lastly, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019 (dur to more advanced technologies), with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the landtake associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the landtake required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
THE NEED FOR THE PROJECT The report provides a compelling argument as to why this project is needed. It states: "Investment in energy is a prerequisite to achieving social and economic development. The use of solar power is favorable in providing rural and urban areas with access to power; however, if the Republics of Zambia and Zimbabwe are to achieve those targets and goals detailed in their respective Vision 2030 and Vision 2040 Plans, and other complimentary plans, these countries will require private sector investment in energy technology that is efficient, sustainable and reliable. The generation of energy through hydropower is a proven technology that is sustainable and is actively being promoted at a national level in both Zambia and Zimbabwe. With a vast hydropower energy potential, hydropower is considered the most feasible and reasonable electrification option for both countries.	Vernon Booth		25-Jan-21	Email	This text provides context, and a response to related comment is provided below.	
The rationale for this project is also brought to the attention of the reader (see Project Rationale) that highlights the shortfalls incurred in Zambia and Zimbabwe. It states: "Southern Africa's electricity security situation, although diverse, looks generally bleak (Gaylor Montmasson-Clair and Bhavna Deonarain, 2017). The region has been suffering from electricity shortages, with severe implications for economic growth and social development. Over the past decade or so, Botswana, Namibia, South Africa, Tanzania, Zambia and Zimbabwe have had to resort to load shedding as a stop-gap measure to conserve energy. As of November 2015, available generation within the region was only 46,910MW while the peak demand, including reserves, stood at 55,157MW, giving a deficit of 8,427MW (SADC Energy Monitor, 2016)." "For the Southern African, power consumption, between the years 2010 to 2040, is expected to increase from ~200 TW hours to over 1,000 TW hours (Figure 3.1).Demand for electricity in the Southern Africa Development Community (SADC) is growing, and is predicted to follow economic growth trends of between 3 and 6% (Stockholm Environment Institute, 2018). JICA (2010) report that the peak power demand in the Southern African Power Pool (SAPP) (1) countries will increase by a total of ~121,400 MW over the period 2012 to 2045; corresponding to an average annual rate of increase of 3 %. The increase in demand may even accelerate, as most SADC countries have set themselves ambitious targets for economic growth – in most cases exceeding 5 % per year. In parallel there is a considerable suppressed demand for electricity access in the SADC with, in general, only 32% of the region's population having access to electricity (SADC 2012, REN21 2015). To increase access to electricity and meet the predicted growth trends in the demand, there is urgent need to increase electricity generation including tapping into the region's vast renewable energy potential to diversify the power mix."	Vernon Booth		25-Jan-21	Email	This text provides context, and a response to related comment is provided below.	
COMMENT It is clear from the data presented that both Zambia and Zimbabwe currently have an electricity deficit where demand exceeds the available supply. What does not come out of the discussions is the circumstances that prevailed at the time that led to these deficits viz: • Power generating infrastructure (mostly from coal) had not been maintained/upgraded and was under performing. • Kariba Dam was at an all-time low as a result of droughts and not producing power for both Zambia or Zimbabwe. • In the case of Zimbabwe, it faced difficulties meeting import payments for power from Mozambique and South Africa. It is suspected that Zambia may have faced the same circumstances. Both Zambia and Zimbabwe initiated several "new generation options" to mitigate the deficits in power generation. The report refers to these but does not explore in any detail the pros and cons of these options. For example, the economic analysis prepared by Stratecon does not appear to provide objective alternative scenarios or expose the decision makers or stakeholders to the advances being made with "new generation options". Moreover, the report does not refer to the International Renewable Energy Agency (IRENA, https://www.irena.org/) that provides comprehensive analysis of the cost of hydro vs wind vs geothermal vs solar energy production. IRENA draws on cost data from projects around the world to provide comprehensive cost studies to highlight the latest trends for each of the main renewable power technologies. Instead, it is concluded that the proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives but without providing data to support this conclusion. My questions therefore are: 1. Why the revised ESIA report has not provided the reader/stakeholders with a comprehensive review detailing the advantages and disadvantages of hydro vs solar power energy production?	Vernon Booth		25-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal	Project Alternatives
2. Can the economic analysis justify imposing on both Zambia and Zimbabwe a debt of US$4.5 billion given that there are cheaper alternative sources of power? Related to the above: a. Why has the report not drawn the attention of the reader to the cost implications of the Steigler Gorge Hydro Electric scheme in Tanzania which is of similar scale and magnitude? b. Can the ESIA provide a cost benefit analysis under different budget overruns? For example, what will be the impact on the cost of power to the consumer if the final construct costs double or treble (as has happened with	Vernon Booth		25-Jan-21	Email	The results of the Cost Benefit Analysis (attached as Annex K to the ESIA) indicates that the benefits of the BGHES outweigh the costs by a factor of 4.1. It is better for both countries to incur the debt of constructing the project but to be able to harness the benefits of the electricity necessary for economic growth. Please note that the Cost Benefit Analysis does mention that the assessment did not consider the economic equity or sustainability and the associated risks, including the ability of the countries to pay off the loans required to service the costs. The Analysis indicates that even with the Kafue Gorge Lower and the Luapula River schemes (both of which are estimated to produce more expensive electricity than the BGHES), Zambia would run out of production capacity by 2028 with a 5.1% increase in annual demand and by 2035 for a more subdued 3% increase in demand. According to the BGHES Feasibility Engineers (Studio Pietrangeli, 2018), BGHES would produce the fourth cheapest electricity of all the options for Zambia and at 3.71c/kWh is only marginally more expensive than the cheapest option (Itezhi Tezhi at 3.08c/kWh). It also produces the most annual energy and about seven times that of Itezhi Tezhi. The situation for Zimbabwe is more dire and even if a host of viable projects are implemented before the BGHES, it would still run out of generation capacity by 2028. BGHES produces the cheapest electricity of all the potential projects listed for Zimbabwe (Studio Pietrangeli, 2018) and at prices three to four times cheaper than the aforementioned viable projects. Furthermore, many firms and households have resorted to their own generation of electricity to counter the rolling blackouts, options which are far more expensive than the electricity expected to be generated by the BGHES and which also uses imported fuel. The savings from these own, small scale and expensive generation options have been incorporated into the overall Economic Analysis for the BGHES. To complement the rationale provided above, the economic analysis compared the results of the BGHES to alternative forms of electricity generation (such as solar PV, wind and coal) and on a scale similar to that which would be produced by the BGHES. This analysis used regional levelised costs of electricity generation and included components such as capital costs, operating costs, storage costs (important for wind generation), land costs and externality costs (environmental costs). BGHES produced the cheapest electricity of all generation options. With reference to Stiegler Gorge comment, the Cost Benefit Analysis based its assessment on the viable alternatives in each of Zambia and Zimbabwe, as presented in the Final Options Assessment Report (Studio Pietrangeli, 2018). This report presents a ranking of 75 SAPP power plants in Southern Africa, based on the Unit Investment costs of US$/kW. The BGHES at 2,400MW ranks 11 in terms of cost and the BGHES at 1,600MW ranks 18. The Stieglers Gorge hydro plant (at 1,200MW capacity) ranks substantially lower at 49. Its investment costs are more than double those of the BGHES 2,400MW option. The BGHES 2,400MW option is the highest ranked project for either Zambia or Zimbabwe on the list and ranks higher than the Kariba South Extension. • Usually, a cost benefit analysis performs a sensitivity analysis on the overall benefit cost ratio (BCR) for variations in the construction price. This is usually done for a 20% variation in construction price and not as much as double or treble, as requested. This sensitivity analysis on the construction price was initially considered for the BGHES but due to the high BCR of 4.1 it would not be a meaningful test. The BCR of 4.1 means that the benefits outweigh all the costs (and not only the construction costs) by a factor of more than four. Consequently, the section on the sensitivity analyses concentrated on variables that could reduce the benefits and potentially render the project inefficient. However, a separate sensitivity analysis has now been run on the construction price and it would need to increase to five times its estimated amount for it to switch the project to being economically inefficient. The impact on the cost of power for double or triple construction costs would need to be determined by the project engineers. The levelized cost of electricity is a function of many variables, including the initial capital costs, operating and	Project Alternatives
3. The report estimates the solar energy potential of Zimbabwe at 16–20 mega joules (MJ)/m²/day and acknowledges that this source of energy is greatly underexploited. Why has the report not shown how much has been invested by the private sector in solar energy since 2016/2017 to offset the impact of load shedding?1 a. Can the ESIA provide a summary of the amount of energy that the private sector is producing from solar to mitigate the impact of load shedding?	Vernon Booth		25-Jan-21	Email	It must be recognized that the BGHES is a significant electricity generation project for the SAPP, not only for Zambia and Zimbabwe. SAPP studies have shown that for large scale electricity generation, the BGHES represents one of the most feasible options for the SAPP, and will serve to reduce SAPP's over reliance on thermal coal power production. What the ESIA also explicitly states, is that other renewables such as solar and wind are required as part of the energy mix, in addition to the BGHES. Also to released, is that solar currently (in terms of cost per kWh) is significantly more expensive that hydropower.	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
4. How can the BGHES be financially feasible if the cost of production increases and the demand for hydro power decreases because of improved alternative energy sources?	Vernon Booth		25-Jan-21	Email	If one looks at the energy gap of all countries in the SAPP, wind and solar will certainly play a role in reducing this energy gap, but so will the BGHES. In addition, the BGHES will contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
5. According to the report, ZETDC (in 2015) stated that solar has consistently shown to be undesirable, mainly due to a high capital cost per KW and "*to plant factor ratio that erodes the overall investment efficiency of the resultant generation fleet and technology mix*" . The report then states *"As such, ZETDC,ZERA and the Ministry of Energy are* ***encouraging increased uptake*** *of demand connected solar technologies in all forms (solar thermal, roof top solar panels etc.)", noting that there is a high demand for solar energy systems, especially in remote rural areas where there is no power grid, however the cost is prohibitive.* *a. Why has the undated reports not analyzed this further given that the cost of solar installation has drastically reduced since 2015? For example, it is possible to install an entry level 2KVA solar system for under $1000 at current prices.*	Vernon Booth		25-Jan-21	Email	With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity.	Project Alternatives
a. ZPC has identified and plans to develop three solar power projects with a total installation capacity of about 300 MW (i.e., 30% of the BGHES capacity in 2015) by 2022 to contribute towards meeting the country's energy needs. Why has the ESIA not provided models to demonstrate how much solar power could be installed using the estimated $4.5 billion earmarked for the BGHES project?	Vernon Booth		25-Jan-21	Email	With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels.	Project Alternatives
Conclusion Returning to the objectives, it is questionable whether the BGHES project will: •Mitigate the current power deficits currently experienced in both countries in the long term. This project intends to invest in a project that will provide a finite source of energy (1200 MW for each country) using hydro power that is facing the impact of increasing climatic changes as opposed to investing in alternative technology that has room for expansion both in terms of technology and capacity, and one that is comparatively far cheaper in the long term. • The ESIA has not demonstrated with any confidence that the overall power tariffs in both Zambia and Zimbabwe will be reduced. On the contrary, there is a very high likelihood that the project will become a white elephant as alternative and cheaper sources of energy are developed.	Vernon Booth		25-Jan-21	Email	The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently). The matter of tariffs associated with the BGHES is out of the scope of this ESIA. The ZRA notes that the forecasted tariff for Zimbabwe is 7.5445c/kWh while for Zambia is 8.4171c/kWh according to the Developer's proposal and the parties will be commence tariff negotiations which may result in further reductions. It is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower.	ESIA Process, Project Description and Mitigation
• The private sector is taking steps to mitigate power outages by investing in alternative solar energy. With innovative thinking, the respective power utility agencies in both countries could role out various models to increase the uptake of various forms of solar technologies (e.g. household, business, community IPP etc.)	Vernon Booth		25-Jan-21	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. Solar Power is an intermittent form of energy, which is not available during the evenings and night. Hydropower is base load that is required to stabilize power systems. Land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels.	Project Alternatives
• It is agreed that any technology that contributes to reducing reliance on coal fired power stations is an advantage. The importance of providing reliable, sustainable, and cost effective power to the economies and growth of both Zambia and Zimbabwe is recognized. Nonetheless, it is questionable whether a project, such as the BGHES, is worth the risk when there are alternatives available. Zimbabwe planned 3 solar systems to provide 300MW by 2022 – why cannot a further 3, 6, 9 or more such schemes be developed rather than sacrifice one of the natural wonders of the world by developing a project that has significant environmental and economic challenges? Moreover, the BGHES project is finite and therefore is not likely to address the needs of both countries going forward. Most solar power technologies can be scaled to smaller sizes without significant increases in costs, to reflect power demand growth more closely in the medium term. Solar power can also be built from the largest utility-sized farms to the smallest size serving mini-grids and is competitive at all scales. In contrast, the BGHES hydropower project would have a higher Levelised Cost of Electricity (LCOE) i.e. cost/Kw Hour, making it less competitive.	Vernon Booth		25-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated	Project Alternatives
Secondly, dependency on one technology and one large source of power increases the probability of supply interruptions compared to a more diversified and distributed generation system. The calculation of 'firm energy' in the BGHES project documents is based on historic hydrological data and may underestimate future hydrological uncertainties.	Vernon Booth		25-Jan-21	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. ZESCO has a department called renewable energy whose core mandate is to identify alternative sources of energy apart from Hydro source. The BGHES comes in so as to compliment other sources of power generation. ZESCO has began to explore other sources of energy such as Solar PV Plants , Wind Energy to help supplement the ever growing demand of power in the nation and the region. ZESA has an energy mix comprised of hydro and thermal power plants. In addition, ZESA has a project portfolio constituted of a 600 MW thermal power plant (under execution), solar plants (candidate projects), mini-hydro plant (candidate project) and small-thermal plant revivals (procurement stage). Most of the aforementioned projects are expected to be completed prior to commissioning of BGHES. With such a broad energy mix, ZESA will have operational flexibility in the event of poor hydrology at the Batoka Gorge Hydro Electric Scheme. The Authority has carried out detailed Climate Change Assessment and incorporated findings of the study in feasibility designs. Moreover, the use of over 100 year Hydrological Data Results in the design provides a fair assurance of the feasibility of the scheme. The BGHES will be run of the river with limited peaking for environmental compliance, and evaporation losses wont be as significant.	Project Alternatives
Thirdly, because of rapid changes in the costs of different technologies, the assumption that solar power as an alternative is more costly is probably no longer correct. As new renewable technologies are rapidly becoming more competitive, even lower cost alternatives are becoming available. IRENA shows that the costs of these new technologies are all reaching a point where neither hydropower nor coal can compete.	Vernon Booth		25-Jan-21	Email	It is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
The data presented by ERM and the conclusions reached in the various technical reports need to expose the key decision makers and stakeholders to these developments.	Vernon Booth		25-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognized; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognized. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
1. This project has to be stopped as it has impact to the rural communal people and also stake holders because 98% of people in rural area were not consultant about this project and also stake holders as not all were able to attend some online zoom meetings. I am saying so because I am a stake holder plus I was born in Batoka and have home in Batoka area	Anonymous		25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process are documented in Chapter 7 of the ESIA. ERM have held numerous community meetings and focus group discussions in the Project Area between 2014 and 2020, as well as meetings with traditional and local leaders, as detailed in Chapter 7 of the ESIA. We have also distributed project information in the form of background information documents and non-technical summaries in English and local languages across the Project Area. In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. As part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. The Draft ESIAs were made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration.	Stakeholder Engagement Process
2. Economic Impact study is flawed; This is going to affect the whole country as most tourist visiting Falls were rafters of which 70% did it. Many people are going to be unemployed, companies will close and booking Agents will lose revenue as well	Anonymous		25-Jan-21	Email	It is true that white water rafting has been a major drawcard and continues to attract tourists to the study area. There is no doubt that the dam will have an impact on white water rafting and that the knock-on effects will be significant and negative. This is all included in the Tourism Study included as an Annex to the ESIA. Our report also includes the impact on broader society, non-use values and also the knock-on effects of the white water rafting on employment and revenues. The economic impact and displacement of river-based tourism activities and non-river based tourism have been rated as having a MAJOR negative post-mitigation significance rating, while the impact to the local economy is rated as having a MODERATE negative post-mitigation significance rating, as described in Chapter 11 of ESIA.	Potential Economic or Physical Displacement
Alternative Why not built a solar panel factory to supply all Southern African Countries with solar energy! We have land that is not being used why not clear and put solar plants? This is economically smarter and will have only tiny effects on our planet. It will create more jobs for locals than this Utopia project which destroys this outstanding and sensitive Batoka Gorge.	Anonymous		25-Jan-21	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. However, Solar Power is an intermittent form of energy, which is not available during the evenings and night. Hydropower is base load that is required to stabilize power systems. Further, solar power and other renewable sources will assist in further conserving water in the reservoirs during the day. Long term strategy is to have an energy mix of hydropower, solar, wind, biomass, and thermal technologies because they shall all complement each other. Further, solar technology is currently not as robust as hydropower technology and has a shorter life span (approximately 25 years). The number of direct and indirect jobs to be created over the construction and operation life of the project is over 26,000. Solar power is not without adverse effects, for example, land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors.	Project Alternatives
3. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Anonymous		25-Jan-21	Email	Results from climate change risk review undertaken for the BGHES indicates that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
4. Compensation – this is worst of time to tell us that we will be compensated by this this government, thus a joke not with this corruption we are facing. As a stakeholder I will be happy if compensation can come direct from the funders to the people affected not via government.	Annonymous		25-Jan-21	Email	One of the requirements for compensation according to the local and international best practice is that no person should be any worse off after a resettlement process and as a minimum should retain his/her standard of life and livelihood potential. All affected people will be helped to ensure that their livelihoods are restored or, that they can access new income streams. This is further detailed in the livelihood restoration plans, attached to the ESIAs as Annex P.	Potential Economic or Physical Displacement
5. For the safety of my life and my family I will stop here but if I am given a go ahead to call or do a one on one meeting I will tell you what I have been through about this project. As much as I don't trust and don't know who will see or read my email and get my contact I am stopping I rather let the dam be built than to disappear	Annonymous		25-Jan-21	Email	We have heard reports from stakeholders that this is the case in the Project Area and this concern is acknowledged. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards (refer to Chapter 7 of the ESIA for record of the stakeholder engagement). ERM has complied with the requirements set out for a fair and inclusive process. While we are confident that our process has been inclusive and culturally appropriate, we recognize that there may be barriers that prevent stakeholders from fully participating, commenting, raising concerns or objecting to the Project, that are beyond our control to mitigate. In statement released by the Zambezi Authority, they note: The Authority takes such allegations very seriously and has carried out preliminary investigations on these claims. We wish to out rightly and categorically refute the allegations as there is no evidence of such actions. As an organization that is concerned about the welfare of all its stakeholders, the Authority will continue investigating the matter and share an update on the same at an opportune time.	Stakeholder Engagement Process
Local Land and water defenders are opposing the creation of a dam across the Zambezi River. It has been reported that there have been threats of violence against people living in the Project Area of Influence who have opposed or questioned the BGHES Project. I stand in solidarity and oppose this dam	Mike Bucci	Deep Green Resistance	25-Jan-21	Email	In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards (refer to Chapter 7 of the ESIA for record of the stakeholder engagement). ERM has complied with the requirements set out for a fair and inclusive process. While we are confident that our process has been inclusive and culturally appropriate, we recognize that there may be barriers that prevent stakeholders from fully participating, commenting, raising concerns or objecting to the Project, that are beyond our control to mitigate. We have heard reports from stakeholders that this is the case in the Project Area and this concern is acknowledged and has been shared with the Zambezi River Authority. In statement released by the Zambezi Authority, they note: The Authority takes such allegations very seriously and has carried out preliminary investigations on these claims. We wish to out rightly and categorically refute the allegations as there is no evidence of such actions. As an organization that is concerned about the welfare of all its stakeholders, the Authority will continue investigating the matter and share an update on the same at an opportune time.	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Thank you for the opportunity to respond to the ESIA for the proposed Batoka Gorge Hydro-Electric Scheme. Please find here attached a joint position paper by BirdLife Zimbabwe and BirdWatch Zambia. Document 1 under annex C7.1. We do hope that the position paper and our recommendations will be taken into serious consideration. **Summary** As organizations that are focused on the conservation of avian biodiversity and the preservation of the environment it occupies, BirdLife Zimbabwe and BirdWatch Zambia are highly opposed to the construction of an impoundment and hydropower scheme on the Batoka Gorge. The project will result in the permanent and un-mitigated submergence of a very rare, restricted and unique habitat that is globally recognized as a site of scenic and world heritage value. Potentially the continued recognition of Victoria Falls/Mosi-oa-Tunya as a UNESCO World Heritage Site will be in jeopardy until such time as a review of the impact of the Batoka Gorge Hydroelectric Scheme and all of its associated infrastructures on the Outstanding Universal Value (OUV) property is ascertained. There are no indications that this review has been undertaken, especially since the World Heritage Committee has published a position that is incompatible with dams with large reservoirs, and furthermore the draft ESIA does not address the impacts of all associated infrastructures. The environmental impact of extensive transmission infrastructure, specifically powerlines and pylons linking hydropower generators to the national grids of affected countries, and development of two large townships at the dam wall site have not been assessed. This deficiency in assessing the impacts of transmission infrastructure on avian biodiversity raises both local and global concern as it potentially affects known and important populations of vulture species, amongst other bird species, that are now categorized as Endangered or Critically Endangered, in terms of conservation status. In this respect, we consider the ESIA to be out-dated as it fails to accurately assess the overall impact of the project in the contextof updated conservation priorities, such as re-categorizations of species conservation status as well as commitments towards multi-lateral environmental agreements (e.g.. Zimbabwe is signatory to the Convention on Biological Diversity, Ramsar Convention and AEWA). Within the protracted period that has elapsed in completing the ESIA there have been improved alternative sources of energy and energy generation. The Batoka Gorge Hydro-Electric Scheme (BGHES) is not the only significant power generation scheme in the sub-region and the predicted expanded generation capacity of other projects suggests that use of transmission connectors offers a more cost effective and environmentally friendly solution to hydropower, with a quicker turn around. At best the BGHES will only supply power in 9 years, assuming it ever reaches completion. Both Zambia and Zimbabwe have encountered difficulties in financing other hydropower and large dam construction projects which has led to significant delays in completion of these projects. The perceived increased vulnerability of hydropower to the effects of climate change amongst global financial institutions does not improve either Zimbabwe or	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	This is a summary and responses to issues raised in the summary are addressed in the responses below.	Potential Effects on Biodiversity
In addition to the inadequate assessment of environmental impact of transmission infrastructure, a number of previously identified deficiencies in assessed biological impacts have still not been addressed in the ESIA or public disclosure. Despite a commitment made two years ago to survey the entire length of the Batoka Gorge for Taita Falcon (Falco fasciinucha) presence and nesting, this has yet to be initiated. Only the top 27 Km has been surveyed for this species and although much emphasis has been placed on the impact of the project on the Taita Falcon, a promised workshop dedicated to exploring mitigation for the species has also not materialized. The potential environmental impacts of the Batoka Gorge Impoundment on the habitat, ecology and biodiversity of the river and rapids of the upper gorges, closest to the Victoria Falls are classified as having a Major Negative (Red) Impact with no scope for downgrading this categorization through mitigation. Although previously recognized as being an area of exceptional species diversity and biomass, still no effort has been made to identify or quantify the species assemblage that will be affected. The indications are that at least two species of fish, new to science, will be rendered extinct before they are even described. Failure to address these long recognized deficiencies casts doubt over the sincerity and thoroughness of the biological assessment of potential impacts of the B.G.H.E.S. and only serves to further the resolve to ensure that other key aspects, in particular impact of associated transmission infrastructure is assessed in this draft ESIA. We reject the suggestion that this aspect will be the subject of a separate EIA and insist that publically announced commitments be honored before construction of the dam commences.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Agreed the full impact of the BGHES and all associated infrastructure needs to be holistically assessed. This will be the responsibility of the Lender or consortium of lenders that choose to finance this project. They are the decision-makers with the responsibility to determine whether impacts are adequately identified and mitigated. Regarding the Taita Falcon, Taita Falcon specialists have expressed grave concern at the apparent decline in the Batoka Gorge Taita Falcon population, but there is very little documented evidence of this. Recent surveys of the upper 25 km (formerly the prime area for these falcons) by the appropriate specialists did not find any Taita Falcons, until the last survey found a single individual during the breeding season. There is a lot of concern that the species is no longer breeding there. This situation is thought to be caused by the regular low-flying helicopter flights through the gorge for tourists. The ESIA clearly highlights that there is a gap in the baseline data as the lower 25 km of the proposed reservoir extent has not been surveyed. There is also no documented data on the suitability of the gorge or occurrence of Taita Falcons below the proposed dam wall site. Surveys by the global Taita Falcon specialists were planned and budgeted for these areas during the breeding season, but beyond ERM's scope to implement these surveys.	Potential Effects on Biodiversity
Issues and Concerns The ESIA carried out by ERM is fully aware and primarily focuses on the main impact of this project which will permanently submerge a very rare, restricted and unique habitat and a site of scenic and world heritage value. There is no scope for substantial mitigation of the environmental and aesthetic impacts of the project and are defined as such in the ESIA. Once the gorges are flooded the habitat and natural ecological function is irretrievably lost. The ESIA report advises that the Governments of Zimbabwe and Zambia need to weigh up and balance the environmental losses as well as other impacts with the perceived gains from the project before making a decision on physical implementation of the project. However, in referring to project documentation (ESIA, CESMP and OESMP), attending of the project public disclosure meetings, and investigating other sources, we believe there are a number of issues, concerns and deficiencies that need to be addressed, or at least require further explanation, in order for the respective governments to reach an appropriately considered and justified decision in terms of national interest, civil society, global heritage and biological conservation.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Agreed, the habitat and natural ecological function is irretrievably lost once the described area of the gorge is flooded. The ESIA has highlighted key areas for further investigation which the client has committed to address.	Potential Effects on Biodiversity
In the first instance, we believe this ESIA to be incomplete and consequently deficient as it does not address the impact of this proposed project in its entirety. None of the potential environmental impacts of transmission infrastructure connecting the dam to the national grids of the respective countries have been adequately assessed. This transmission infrastructure potentially has serious consequences for avian biodiversity, specifically a number of Critically Endangered and Endangered Vulture species. The ESIA mentions three power lines, two in Zambia and one in Zimbabwe, that will connect the dam to substations in Hwange (Zimbabwe), Livingstone (Zambia) and Choma (Zambia), however in other reports there is also a suggestion of a further 2 x 400kV lines are to be developed in Zimbabwe to feed energy intensive platinum operations in the centre of the country. While it was indicated in the technical Public Disclosure meeting that there are intentions to conduct separate ESIAs of the impact of transmission infrastructure, these assessments (for power transmission lines and roads etc.) must be developed in conjunction with the main ESIA and shared for public scrutiny at the same time. Very simply; these ESIAs cannot be separated from the main ESIA. If there is no dam then there is no need for significant transmission infrastructure. The same argument holds true for the superficial treatment of the environmental impact of the townships that will be built to accommodate the estimated 8000 workers to be employed in construction of the dam. The effects of social impacts, such as immigration and subsequent laying off of construction workers on completion of the dam, or changed urbanisation along the margins of the Batoka Gorge as a result of substantial road infrastructure developed for access to these townships, have not received adequate consideration. While this initial response is registered, the following text addresses the issues and concerns related to the project from our perspectives as national conservation NGO's based in Zambia and Zimbabwe, that are both additionally aligned and partnered to global conservation initiatives.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA does not claim to provide a complete assessment of every ecological parameter. The ESIA does however highlight gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	ESIA Process, Project Description and Mitigation
Scope and Rationale of the Project in a Global context We question the rationale and perceived benefits of the project in context of global trends and opinion in respect of the greatly increased and prioritised value placed upon environmental resource and biodiversity equity, versus potential value and benefit of generated power and unquantifiable environmental damage.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA undertaken and has been done so independently. The ESIA presents an objective and independent assessment of the impact of the development of the scheme. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. The BGHES is not immune to these challenges. This ESIA has therefore attempted to describe both the benefits of the proposed BGHES as well as the environmental and social sensitivities associated with it. Where impacts are identified, detailed mitigation measures to reduce the significance of these impacts are described; also, where impacts may not be mitigated, this too has been described. In the case of positive impacts, measures to enhance such positive impacts are provided. ERM has recommended that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	Potential Effects on Biodiversity
Protected Areas of Global significance In the face of development and degradation protected areas have become one of the key instruments for protecting and safeguarding biodiversity and the physical parameters that sustain it, especially water. They are critical for safeguarding species and habitats and act as buffers against climate change and they bring cultural, ecological, spiritual, and scientific benefits to society. The Victoria Falls and the gorges below the falls are a site of global importance and they fall into several categories of protected area that are globally significant.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	We are in agreement with this statement on the importance and global significance of conservation areas. The ESIA is developed to align with the IFC Performance Standards which are recognised as the highest standard of global best practice for environmental and social assessment. Protected areas are an important component of the Performance Standard 6, and the ESIA does identify and recognise the significance of the affected legally protected areas and internationally recognised areas of high biodiversity value.	Potential Effects on Biodiversity

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
World Heritage Site There are three protected areas in the vicinity of the project of which two, Victoria Falls and Mosi-oa-Tunya National Parks are directly impacted through construction of the dam. Victoria Falls/Mosi-oa-Tunya was proclaimed a UNESCO World Heritage Site on the basis that it contains superlative natural phenomena, areas of exceptional natural beauty and aesthetic importance and an outstanding example representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	We are in agreement regarding the importance and global significance of conservation areas. The ESIA does identify and recognise the significance of the legally protected areas and internationally recognised areas that are mentioned in this comment. The UNESCO World Heritage Site is of particular significance. We have engaged with UNESCO World Heritage Commission but they have stated they will review the ESIA and take up the issues directly with the client. The ESIA is therefore unable to present UNESCO's findings.	Stakeholder Engagement Process
The World Heritage Committee has previously requested that the ESIA for the Batoka Gorge Hydroelectric Scheme include "a specific assessment of the impacts of the dam and all of its associated infrastructures, on the Outstanding Universal Value (OUV) of the property, in line with the IUCN's World Heritage Advice Note on Environmental Assessment" (Decision 41 COM 7B.22). The Zimbabwean and Zambian governments' response was to provide assurances that the relevant agencies would review the ESIA to ensure that the impact of the Scheme was ascertained, and any possible detrimental impact on OUV mitigated (2019 State of Conservation Report). However, the draft ESIA contains no explicit assessment of the impact of the dam and associated infrastructure on OUV. Moreover, the World Heritage Committee has repeatedly requested that the draft ESIA be submitted to the World Heritage Centre for review by the IUCN (Decisions 41 COM 7B.22 and 43 COM 7B.34). This must be done before any final decision on this project is taken. The dam will inundate 14 km of the World Heritage Site. Has the draft ESIA been submitted to the World Heritage Centre and reviewed by the IUCN and, if so, what was the outcome of this review and has there been any response from the World Heritage Committee to this document? We note further in this regard that, in addition to the above-mentioned decisions, which are directed specifically towards this project, the World Heritage Committee, in Decision 40 COM 7 (State of Conservation of World Heritage properties), states that "construction of dams with large reservoirs within the boundaries of World Heritage properties is incompatible with their World Heritage status, and urges State Parties to ensure that the impacts from dams that could affect properties located upstream or downstream within the same river basin are rigorously assessed in order to avoid impacts on the Outstanding Universal Value (OUV)". Any un-mitigatable negative impacts on OUV should be considered a fatal flaw in this project and should result in the applications for authorisation being rejected.. We believe any response from UNESCO to be a matter of public record.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	We have engaged with UNESCO World Heritage Commission but they have stated they will review the ESIA and take up the issues directly with the client. Impacts to the OUVs of the Victoria Falls/Mosi-oa-Tunya WHS are assessed, and the ESIA will be presented by the client to the UNESCO World Heritage Commission. This is a process outside of the ESIA and the study is therefore currently unable to present their findings.	Stakeholder Engagement Process
Ramsar Site Part of the project area affected by the dam is a wetland of international importance, designated under the Ramsar Convention, although the official description seems to be limited to the southern part of the Victoria Falls National Park. Parties to the Ramsar Convention are required to promote the conservation of Ramsar sites and the wise use of all wetlands in their territories (Article 3.1). 'Conservation' in this context has been defined to mean maintenance of a site's ecological character (COP Recommendation 4.2). It is therefore important that the ESIA consider any potential impacts on the ecological character of the Ramsar site concerned. Per Article 3.2 of the Convention, any likely change in the site's ecological character must be reported to the Ramsar Convention's Secretariat. The Ramsar Advisory Mission (RAM) is one of the most valuable tools available to Contracting Parties to the Ramsar Convention on Wetlands. A RAM is a technical assistance mechanism through which a Contracting Party may request expert advice about how to respond to threats to the ecological character of a Ramsar Site and associated wetland issues. To our knowledge no such RAM has been requested by either Zimbabwe or Zambia and this represents an oversight in the assessment.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The Ramsar Site is overlapped entirely by the UNESCO World Heritage Site and the impacts are therefore the same. A UNESCO WHS is the highest status for a Internationally Recognised Area of biodiversity importance, and the impacts are therefore not escalated in significance by the presence of the Ramsar Site. The Ramsar Convention will be made aware of the potential impacts.	Potential Effects on Biodiversity
Key Biodiversity Area (KBA)/ Important Bird Area (IBA)-Please see document 1 under annex C7.1 for list of species There are two Key Biodiversity Areas (KBAs) and Important Bird Areas (IBAs), each located on either side of the Zambian-Zimbabwean border - Mosi-oa-Tunya National Park and Batoka Gorge (Zambia) and Batoka Gorge (Zimbabwe).On the Zambian side, the site comprises the Mosi-oa-Tunya National Park and the adjacent Batoka Gorge which extends downstream as far as the confluence of the Zambezi with the Kalomo River. At 6,600 ha, the park is Zambia's smallest, but it is the most popular as it flanks a stretch of the Zambezi river just south of Livingstone that includes the Victoria Falls. As well as riparian habitats such as sandbars and fringing forest, there is woodland (mainly mopane) and the immense basalt gorge below the falls (much of which is over 100 m deep). The site is most important for the species occurring in and around the gorge. The Taita Falcon (F. fasciinucha) has been recorded with some regularity and is known to nest here—Hartley (1993) estimated that 8–10 pairs occurred in the gorge along 60 km of its length—but it is perhaps not as common as some local tour operators might suggest, possibly due to confusion with other species such as Peregrine (Falco peregrinus). Other breeding species of interest include Black Stork (Ciconia nigra), Verreaux' Eagle (Aquila verreauxii) and African Black Swift (Apus barbatus) and, along the river above the falls, White-Backed Night-Heron (Gorsachius leuconotus), African Finfoot (Podica senegalensis) and Rock Pratincole (Glareola nuchalis).	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Designation of the Batoka Gorge as a Birdlife-recognised IBA is made clear in the ESIA, as well as the recognition of the IBA as an IUCN Key Biodiversity Area (KBA). These designations are included as strong arguments for recognising the entire Batoka Gorge as a Critical Habitat, which is the highest level of biodiversity sensitivity recognised by the IFC Performance Standards. The ESIA therefore fully acknowledges the critical sensitivity of the IBA, and uses this to support the arguments that the impact is of Major significance.	Potential Effects on Biodiversity
On the Zimbabwean side, the Batoka Gorge is recognised as an Important Bird and Biodiversity Area (for the presence of bird species of global conservation concern, for supporting significant congregations of one or more bird species and for holding a good selection of bird species of that are characteristic of that particular biome). The Batoka Gorge is a major breeding site for cliff-nesting raptors, in particular Taita Falcon. Eighteen pairs of Peregrine Falcon have been recorded nesting there. The gorge also holds 35 other raptor species, Black Storks and large numbers of Rock Pratincole, nesting Hooded Vulture (Necrosyrtes monachus) and White-backed Vulture (Gyps africanus) which use the gorge as a flyway. The lake produced by the proposed dam would severely constrain the breeding opportunities for cliff-nesting raptors and given the reduced space (upstream) and the competitive dominance shown by Falco peregrinus, it is debatable whether F. fachiinucha would survive there. In addition, if Batoka Gorge held a lake rather than a rushing river, then increased access to the lake would be bound to increase, with the consequence of greater disturbance (upstream) to the remaining raptors. As party to the Convention on Migratory Species and the Agreement on the Conservation of African-Eurasian Migratory Waterbirds, Zimbabwe has international obligations in respect of several of these species. In terms of the southern African population of Black Stork, parties are obliged to take measures to restore this population to a favourable conservation status – including through habitat conservation.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Taita Falcon specialists have expressed grave concern at the apparent decline in the Batoka Gorge Taita Falcon population, but there is very little documented evidence of this. Recent surveys of the upper 25 km (formerly the prime area for these falcons) by the appropriate specialists did not find any Taita Falcons, until the last survey found a single individual during the breeding season. There is a lot of concern that the species is no longer breeding there. This situation is thought to be caused by the regular low-flying helicopter flights through the gorge for tourists. The ESIA clearly highlights that there is a gap in the baseline data as the lower 25 km of the proposed reservoir extent has not been surveyed. There is also no documented data on the suitability of the gorge or occurrence of Taita Falcons below the proposed dam wall site. Surveys by the global Taita Falcon specialists were planned and budgeted for these areas during the breeding season, but beyond ERM's scope to implement these surveys. The ESIA acknowledges that the presence of the reservoir is expected to impact some raptors, but many of the raptors and other species (such as Black Stork) that nest on the cliffs and forage in generalist habitats far beyond the Batoka Gorge are unlikely to be adversely affected. The ESIA does require that the Batoka Gorge is managed as a protected area which will increase the level of security for these habitats over their current status. The ESIA therefore presents the required steps that need to be followed. This was discussed with members of the Taita Falcon specialists during the disclosure meetings, and no objection to the approach was expressed.	Potential Effects on Biodiversity
Big Dam Project **Hesitant Implementation**. Aside from the established negative environmental impacts, Big Dam projects have a number of associated draw-backs and problems. In developing countries many proposed projects have gone through cycles of proposal, assessment, shelving, re-proposal and re-assessment. While many sites in Africa were proposed in the early 1900s and then again in the 70s, 80s and 90s, few of these have been constructed. Others, such as Batoka Gorge in Zimbabwe/Zambia are still being reassessed over 100 years after first investigation. The protracted period between conception and commitment to physical development still speaks to ongoing concerns for the cost/benefit of this project, particularly in the light of progress made toward alternative power generation technologies and the scope for improved efficiencies in existing power generation infrastructure (see section on Alternative Energy Sourcing). A comparative ranking of the environmental impacts of hydroelectric generation of power involving use of large dams or reservoirs is controversial, although considered by some to be amongst the most environmentally damaging forms of power generation. This is assuming they even reach completion!	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	It is true that many hydropower project take a long time to come to fruition, and this Project is no expectation. The feasibility studies, site and geological investigations must be undertaken to inform decision making around the viability of a Project. A hydropower project of this scale requires a significant capital investment, and investors and other stakeholders want a certain level of comfort that the Project is feasible, the costs/ benefits have been explored and that the project can supply power at a cost in line with what is considered affordable by off-takers. Further, feasibility studies associated with the Project have been updated as new technology becomes a available. For example one study for the BGHES undertaken in 1993 considered 18 different configurations for development, which were costed and compared (BJVC, 1993). In 2014, the ZRA initiated a further study on the proposed BGHES by appointing Studio Pietrangeli (SP) Consulting Engineers of Italy to update the engineering feasibility studies for the proposed BJVC (1993) scheme, and in parallel appointed Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) of South Africa to update and carry out an Environmental and Social Impact Assessment (ESIA) of the proposed BGHES. Between 2014 and present, there has been a close working interaction between ERM and the design and decision making process, and changes to Project design as a result to certain environmental and social sensitivities. A key area covered between ERM and the project engineering consultants included the Environmental Flow Assessment work undertaken for the indicated impacts to downstream aquatic ecology. ERM together with the ZRA and engineering consultants workshopped and subsequently refined the operating rules for the project such that a balance between minimising environmental impacts downstream, together with maximising power output was sought. Moreover, ERM worked with the project engineering consultants and ZRA to come up with a Full Supply Level (FSL), as well as suggested operating rules for the FSL, to accommodate white water rafting in the low flow season. Lastly, ERM provided guidance around positioning of project infrastructure, specifically roads, project townships, and transmission lines, to avoid possible environmental, social and cultural heritage sensitivities. Although not immune to significant environmental and social challenges, the BGHES project has progressed in the right direction from an environmental and social perspective over the last 4 or so years. The ESIA has attempted to describe both the benefits of the proposed Project as well as the environmental and social sensitivities associated with it. Where impacts are identified, detailed mitigation measures to reduce the significance of these impacts are described; also, where impacts may not be mitigated, this too has been described. In the case of positive impacts, measures to enhance such positive impacts are provided. It is recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Funding and Disinvestment. Funding for construction and operation of large dams is often unclear and the BGHES is no exception. These projects represent significant risk and due to their size and long lead times ahead of commissioning. Consequently they are often subject to cost overruns. Long term financial planning can be fickle and difficult to guarantee, but it is the national governments (in this case Zambia and Zimbabwe) that will ultimately pay for the dam. Recently, the Zambian Government has encountered difficulties in the financing of the Lower Kafue Gorge Power Station. As recognised on pages 10 -69 of the draft ESIA, not all of the criteria in IFC performance Stand 6 can be satisfied by this project. This could present a hurdle to securing additional funding. Similarly construction of the Tokwe-Mukosi Dam in south-eastern Zimbabwe was halted and almost abandoned due to non-payment, resulting in a delay in completion of over 15 years. So conceivably the worst case scenario is for the B.G.H.E.S. financing to also become problematic leading to delays in completion and possibly abandonment after the gorge had been impacted. Clarity on the financing plan for the B.G.H.E.S., including the nature of the investors is needed, and explicitly; what is the contingency for disinvestment? The Mphanda Nkuwa Dam (MND) Project in Mozambique, which would have been built on the Lower Zambezi River, has been placed on hold as this Dam Project did not meet any of the seven criteria laid down by the World Commission of Dams (WCD). As with the MND Project, one of the needs assessments indicate a clear need for rural electrification, a necessity the project does not mention at all. Affected communities were not involved in the decision-making process and have unacceptably low levels of information. The options assessment does not present any alternative options such as solar, wind, or natural gas. The project does not address the problems caused by existing dams and further exacerbates these problems. In the case of sustaining rivers and livelihoods the project will further damage the already ecologically fragile lower Zambezi River system and delta.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The project financial risks are outside the scope of this ESIA and are being managed through a risk management framework and to date the implementation of such is being done by the Authority to monitor prefinancial project close risks. The cited Projects like Tokwe-Mukwosi were publicly funded which led to the 15 year delay due to non-payments obviously owing to the economic situation obtaining in the contracting state, albeit the project has been commissioned. The BGHES Project is being funded using the build-operate-transfer model. The developer is funding the implementation of the works for setting up the project infrastructure. The Mpanda Nkuwa project implementation in Mozambique has also greatly advanced with the establishment of an implementation structure and appointment of a technical advisor. The aspect of rural electrification is addressed by this Project in the sense of deliberate plans to ensure the project area communities have access to electricity will be part of the implementation modalities. The options assessment was undertaken under the feasibility study for the project. the project was subjected to Hydropower Sustainability Assessment Protocol (HSAP) to compliment the efforts under the ESIA studies, in terms of enhancing the sustainability factors of the project and sustaining of project area ecosystem even as the project is implemented. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors. Lastly, the ESIA is developed to align with the IFC Performance Standards which are recognised as the highest standard of global best practice for environmental and social assessment. Protected areas are an important component of the Performance Standard 6, and the ESIA does identify and recognise the significance of the affected legally protected areas and internationally recognised areas of high biodiversity value.	
Long-term Lifespans of dams While it is argued that hydroelectric projects provide sustainable power generation, the limited lifespans of dams are ignored. Most dams designed and built in the last 100 years have projected lifespans of 50-100 years. Kariba Dam, completed in the 1960's, has a projected lifespan of 140 years and has recently already undergone extensive repairs to meet this lifespan. The lifespan is also dependent on experience and workmanship of the construction contractor. This has been questioned in other ESIA's, such as the Egyptian company being used in construction of the Stiegler's Gorge Project.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Solar and wind farm facilities typically have a lifespan of 25 years, which can be extended with refurbishment. In comparison, the lifespan of dam is significantly longer, 50 to 100 years. Measures and best practice have been included in the dam design. The BGHES has been designed with this in mind and the selected development partner is well experienced and internationally recognised regards the building of RCC dams.	ESIA Process, Project Description and Mitigation
Climate change A 2011 World Bank report states: "Heavy reliance on hydropower creates significant vulnerability to climate change and is a feature that many low and middle-income countries have in common". The Batoka Gorge project is no exception to this. The issue of climate change is addressed in Annex Hof the ESIA, however by its own admission this is a broad, short-term study.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The climate change study has benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in such studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations. Results from climate change risk review undertaken for the BGHES indicates that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment.	Potential Effects of Climate Change on the Project
For such a large project, and several others that are also proposed for the Zambezi River, it would be prudent to undertake a comprehensive climate change study, especially since climate change has begun to change precipitation patterns significantly and unpredictably. On the one hand, more frequent droughts will make many hydropower projects uneconomic, while on the other, more extreme rainfall will increase siltation of dams (reducing their useful lifetimes) and increase the risk of dam failures and catastrophic flood releases. River flows are becoming increasingly unpredictable with reduced flows resulting in reduced power outputs, thereby making projects unsatisfactory. Kariba Dam immediately downstream of the proposed dam site, and mainly reliant on Zambezi River flow, has been exactly in that position for the last few years in that water levels have been critically low resulting in severely limited generating capacity. Building a second large dam on the Zambezi increases the risks of over-relying on one river catchment for both Zimbabwe and Zambia. In any case, the long-term prognosis is that dams are not forever and this will be the case for Batoka as well. Does it really make sense to use expensive and damaging large hydropower schemes as our main	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
Alternative energy sourcing The main justification for the BGHES is potential output of 2,400 MW, and it is rationalized that alternative energy generation cannot match this output. Notwithstanding previously mentioned drawbacks, at best this output may be achieved only in 9 years and in the interim contributes zero energy to increasing and immediate demand. The proposed development of the BGHES is not the only significant power generation initiative under consideration in the sub-region. Based on a World Bank study from 2015, the Government of Mozambique estimates to have expanded generation capacity to 3,138 MW by 2022 and 4,163 MW by 2030. A least cost and easily implementable solution for access to energy is that of transmission Interconnectors. Their overall impact on the environment is substantially less than a hydropower plant, with lower capital and operating costs and a noticeably short turn around in terms of implementation. Entering into commercial agreements with their neighbors such as Mozambique, such as those that already exist, to purchase power from them would enable all parties to access excess energy, which is a SADAC strategy, and in this particular scenario, IPPs become the largest group of generators. Consequently, on the above points alone, we question whether all alternative power generation schemes to	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	A number of projects are being undertaken by the utilities and will be commissioned ahead of the BGHES commissioning. Studies undertaken by the Authority and utilities for the power demand and projections indicate a gap in the power supply as such the development of the BGHES is needed in order to compliment initiatives and other projects being undertaken by the utilities to combat power shortages in both countries. The Project is part of the energy developmental plans of the two Countries and regards energy mix, this includes hydropower development of which Batoka is key. The BGHES like many other projects including the ones being undertaken by the government of Mozambique are part of the regional infrastructural development master plans of SADC as such BGHES is key in the regional integration agenda and its transmission line infrastructure is part of the interconnectors under the Southern Africa Power Pool (SAPP). Alternative power sources within the SADC region have ably been considered and studied during the Feasibility Study for the Batoka project. The Batoka project is one of the least cost power supply alternative in the region. Apart from power supply, the project is going to open up the project site to economic development and other economic activities in the area. The project is likely to start generating electricity earlier as the impoundment of water progresses. As the dam will be combined within the gorge, this minimises the project negative impacts especially regards land-use and communities, but where the transmission lines are likely to impact households, the already developed Resettlement Policy Framework will see the development of Resettlement Action Plans to compensate affected persons prior to resettlement. The ESMP has outlined how flora and fauna impacts identified will be mitigated so that overall the impacts on these are mitigated.	Project Alternatives
Gas-fired generation. With the large gas fields in the Rovuma Basin, Mozambique/Tanzania, the option of channeling gas from these fields to Zimbabwe or Zambia via existing infrastructures should be investigated. The potential for gas to power projects is certainly considerable. In addition, the benefits to industrialise the countries by importing gas forms a strong motivation to consider this option. Furthermore, there are four coal fired power stations in Zimbabwe that could potentially be repurposed. These power plants are already established and supporting infrastructure is already in place. For example, the Hwange coal fired station has been beset by problems related to aging infrastructure and lack of maintenance over the last few decades and repurposing to gas generation is potentially a logical and viable option to improve efficiency and output of this obsolete existing power generation facility. From a T&D perspective and land allocation to the site, repurposing makes sense as well as addressing arising environmental concerns over planned expansion of Hwange coal fields.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The proposal is noted and will be passed on the Utility providers in Zambia and Zimbabwe. Such projects would require extensive studies and investigations prior to consideration and is out of the scope of this ESIA.	Project Alternatives
Roof-top solar installation. Since much of the high demand resides in the built-up areas of city centres and urban developments, the opportunity to develop and implement wide scale roof top solar power generation schemes is available. Currently this is a practice followed in-country, mostly due to load shedding rather than as a coordinated and systematic approach. Medium to large power users could be incentivized to install sizable installations through a REFIT tariff regime.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. ZESCO/ZESA are embarking on the BGHES to fill up the demand for power deficit that will be able to provide the nation and the region with reliable and stable power generation as compared to Solar PV which is weather dependent and cant be fully reliable upon to drive the economic growth of a nation and region in terms of dispatching power consistently. ZESA is considering to incorporate roof-top solar projects to the existing project portfolio. A pilot project is under consideration for implementation at ZESA Head Office in Harare. This includes promotion and introduction net metering system as part of renewable energy penetration. Overall, the two implementing Countries for the project have energy development programs that includes a varied energy source mix that includes solar and hydro power at identified locations.	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Floating solar farms. While still in its infancy, the potential for floating solar farms is evident and the technology is fast growing to suit these environments. Have studies been run to determine the potential of floating PV farms? Surely there is potential for this technology to augment energy generation on sites, such as Kariba, which already has the necessary transmission infrastructure and vast surface area?	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. The implementation of floating solar plant is also already under consideration for Lake Kariba. This is to compliment the existing hydro power generation capacity and in line with the renewable energy Policies of Zambia and Zimbabwe.	Project Alternatives
Wind generation. While the wind potential may not be huge, there are some areas where some potential could be leveraged. If no wind studies have been performed, then the actual potential is unknown. These should be factored in when considering power generation options.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix.	Project Alternatives
Upgrade of existing facilities. Hwange power station has long been associated with poor maintenance leading to power outages. Upgrade of this facility would greatly alleviate short-term power shortages in Zimbabwe and would also allow the development and investigation of some of the options discussed above before deciding that a large dam is the only option.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Hwange Life Extension Project is already underway and currently at project scoping and specification stage. The project is envisaged to rehabilitate and extend the productive life of Hwange Power Station Stages 1 and 2. It is important to note that the cost of maintenance for thermal power plants are higher and also there are detrimental environmental impacts due to emissions produced during operation. From the power demand and projections undertaken to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix.	Project Alternatives
Beneficiation of generated power Although the ESIA documentation stresses that the project is for the benefit of the host countries, it appears that an agreement has been reached between GE (General Electric) and Power China to construct and run the dam on behalf of the Zambezi River Authority (ZRA). The details of this agreement are not clear, in this respect there needs to be transparency to ensure that the beneficiaries are indeed the citizens of the host countries and not the business of exporting power for the benefit of the developers.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The priority of the BGHES is to satisfy local demand of the contracting states. Only excess power will be offloaded to the SAPP regional market. Power Utilities are currently assessing their Power needs and possible offtake arrangements from Batoka. The two Countries have decided to implement the project using a build-operate-transfer model, hence it is expected that the investor will operate the scheme for a negotiated concession period before handing back operations to the two countries. The Power Utilities and ZRA will be involved in the operation of the BGHES.	Community Development and Benefits
Cumulative effects Secondary benefits, such water storage or development of fisheries are often included in the rationales for construction of Big Dam projects. In the case of BGHES perceived benefits are limited to only generation of electricity as there is no justification for increased water storage and no mention of possible fisheries development. Presumably for the latter there is none, as the characteristics of the impounded gorge offer little scope for a productive fishery. However the cumulative effect of altered nutrient flows, the Batoka Gorge impoundment is effectively a nutrient trap due to its proposed position, and flow regimes could conceivably have a profound effect on the productivity of the Lake Kariba fisheries, which is Zimbabwe's largest and significant commercial fishery. Inflow regimes and consequent nutrient cycling are well known to affect recruitment and productivity of Kapenta (Limnothrissa miodon), a principal species of the commercial catch from the Kariba fishery. In the technical disclosure meeting a question was raised to the assessment of downstream cumulative effect, however this point was quickly discounted on the grounds that Kariba absorbs any cumulative effect. The potential effect of the BHGES on a major fishing industry, and source of livelihood for many, appears to be unconsidered in the ESIA?	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	A limnological study was undertaken for the BGHES, and the risks associated with eutrophication were appropriately modelled. The eutrophication risk associated with the BGHES is considered to be low, given the low residence time of water in the impoundment. The environmental flow assessment studies undertaken as part of the ESIA also ensured that riverine health downstream of the BGHES would be maintained to within acceptable limits. The ESIA associated with the dam has also considered the development of potential fisheries (refer to Chapter 10 & 11). Fishing habitats will be fundamentally altered by the Batoka reservoir as a result to changes in water temperature, quality and flow. Population size of the riverine fish communities will be significantly reduced with the loss of the upstream gorge habitat, and an interim die-off of fish is possible as a result of early eutrophication due to the decomposition of flooded terrestrial vegetation. However, pelagic habitats will be created and large populations of Tiger fish could potentially be established, if adequate prey populations (such as pelagic fish) exist. Once access roads have been developed (e.g. new roads constructed or existing ones upgraded), access to the greater vicinity of the Batoka Gorge will be enhanced. This could serve to increase fishing activities in the area. Fishing may improve as a result of the development of a reservoir. However, it is not known if the potential increase of Tiger fish would match the decline in riverine fish. The degree of household reliance on fishing downstream has not been fully quantified, however, change in the flow regime of the river downstream could result in a decline in fish resources. Any decline in fish numbers has the potential to impact on food security and income levels of fishermen. As a mitigation, the ESIA recommends that fisheries be established in the BGHES reservoir and this be done in collaboration with the Departments / Units of Fisheries in Zambia and Zimbabwe. Two types of fisheries could be established, namely a capital intensive Kapenta-based pelagic fishery and an artisanal gill-net fishery. As a result of the introduction of Karpenta, a healthy population of Tiger Fish in the reservoir may be established, provided water quality is maintained. The fisheries could be utilized as a commercial resource which can be marketed regionally. Sport fishing for Tiger Fish could also be developed into a valuable industry that supports local economies and should receive consideration in the management of the fisheries.	ESIA Process, Project Description and Mitigation
Precedent for other Big Dam projects Zambezi River Authority documentation reveals several other proposed dam sites along the Zambezi (e.g. Devil's Gorge and Mupata Gorge). If the Devil's Gorge proposal should become a reality then the entire system of gorges below the Victoria Falls will be altered forever. Gorges and their unique ecology represent a very minor part of the world's ecosystems and have already been heavily impacted through construction of impoundments despite their outstanding environmental value. Care should be taken before destroying them.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The necessary pre-development studies are undertaken before the actual developments are conducted to manage and mitigate adverse impacts from Power Projects, and enhance economical, environmental and social benefits for the two nations. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors. While the water levels may rise within the Gorge, owing to the gorge depth, the water would still be contained within the gorge, As part of the ESIA studies an Environmental Flow study was undertaken to ascertain the required downstream flow to sustain the ecology. Refer to Annex J - Environmental Flow Report and section of Environmental Flow Assessment pages 10-29 to 10-35 and 10-43 to 10-46	ESIA Process, Project Description and Mitigation
Effects on Wildlife Considerable effort has been made towards assessing the potential environmental impacts of the Batoka Gorge Impoundment on the habitat, ecology and biodiversity of this unique system. In some aspects these are classified as having a Major Negative (Red) Impact with no scope for downgrading this categorization through mitigation. Despite the severity of this categorization and acknowledgement in the ESIA that there are still critical information gaps in terms of biological impacts, commitments to address these deficiencies have yet to be undertaken. Specific cases are detailed below. Furthermore, since assessment in the ESIA the conservation status of a number of bird species, including most vulture species and the Black Stork have been reviewed resulting in their re-categorization to Endangered and Critically Endangered. In the light of this observation, it is conceivable that the ESIA is already out of date in its assessment of impacts on such species, particularly in respect of potential impacts on global populations. As previously indicated, further gaps have been identified in terms of the potential risks to avian biodiversity from transmission infrastructure that is not even addressed in the current ESIA. Moreover, several residual impacts have been assigned lower significance ratings, despite the draft ESIA acknowledging a myriad of uncertainties regarding both the impacts of the project and the effectiveness of mitigation measures. If predictions regarding the effectiveness of mitigation measures cannot be supported by evidence, the precautionary principle should be applied when assessing residual impacts and the significance ratings should not be lowered.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA does recognise the Critically Endangered status of vulture species. However the Black Stork (Ciconia nigra) is currently listed on the IUCN Red List as Least Concern (checked on 3 Feb 2021). ESIA is correct as per the date that it was compiled, but recognises that Red List ratings do change over time, which is addressed through adaptive management processes included within the ESMP. As stated in above responses, the ESIA defines the Batoka Gorge as a critical habitat. The ESIA clearly states that there are no mitigation measures available to effectively avoid or result in no residual impact if development of the hydropower scheme goes ahead. Measures are therefore required to offset these impacts in an appropriate manner, however offsetting has been beyond the scope of ERM's involvement in this project.	Potential Effects on Biodiversity
Transmission Infrastructure If not designed safely, transmission or electricity distribution lines can result in devastating impacts on birds, especially those that are medium and large-bodied, such as raptors and storks. Surprisingly, some "modernized" lines in certain countries (e.g., Mongolia or Morocco) are having a higher negative impact, due to dangerous configurations of pylons, especially those of metal or concrete with metal cross-arms, which are in some cases more dangerous than some older traditional distribution power lines constructed with wood. It is calculated that there are over 65 million km of medium- and high voltage power lines across the world, with this figure rising at a rate of 5% each year (Jenkins et al., 20101). The impact of these linear infrastructures includes the death by collision and electrocution of millions of birds and other animals, such as monkeys and bats, as well as habitat degradation and fragmentation. The environmental risks posed by transmission infrastructure is additionally exacerbated depending on the landscape and location of intended distribution. Probability of negative impact is increased where birds may use transmission infrastructure to perch and nest upon or where there are natural concentrations of flying birds, such as paths of migration and topographic features that influence air currents and consequently flight patterns of birds.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA does include an assessment of impacts to birds as a result of transmission lines; however, the ESIA does however highlight gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	Potential Effects on Biodiversity
In terms of the B.G.H.E.S., the victims of electrocutions or collisions with transmission infrastructures are potentially an important factor of mortality, threatening endangered species at a regional level or larger scale. Upon these grounds we insist that detailed track, location and technical specifications (including technical drawings) of all transmission infrastructure relating to the project is included within the ESIA, and that these are assessed in terms of their environmental impact. Implications of these potential impacts need to be interpreted in respect of all endangered species, including all vulture species, certain eagles, and other large bird species, such as storks. The superficial and dismissive assessment of "important birds" in this draft of the ESIA relates to only a small portion of the total envisaged transmission infrastructure relating to the project and critically understates potential environmental impact on a suite of endangered bird species.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The proposed transmission lines will be high voltage lines (400 kV) with large towers that widely separate the live wires and conductors. Many definitive studies have demonstrated that electrocution risks on these large structures are therefore very much reduced compared to smaller transmission lines typically constructed on wooden poles. The ESIA provides an assessment of impacts and appropriate mitigation for the transmission lines that transmit power northwards to Zambia. There is minimal natural habitat along these routes and the expected impact to birds of high conservation value such as vultures is therefore expected to be low. The transmission line for transmitting power southwards into Zimbabwe will pass through extensive natural habitat, which passes through and close to large conservation areas. The ESIA does however highlight gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	Potential Effects on Biodiversity

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Taita Falcon The ESIA places much emphasis on the impact of the project on the Taita Falcon (Falco fasciinucha) population that resides in the Batoka Gorge. There has been considerable historical and recent survey effort towards monitoring this population, including one dedicated to a survey of the species commissioned by the principal, however this effort has mostly concentrated on the upper 25-27Km of the Gorge with little in the remainder of the system down to the proposed dam wall site. The principal recognized this deficiency in 2018 and proposed further survey of the lower section of the Gorge at that time. Furthermore the principal also proposed a workshop focusing on the issue of Taita Falcon conservation and detailed discussion of potential mitigation for the species. These commitments were further confirmed in the 2nd technical disclosure meeting (4 December 2020). Two years have elapsed since these proposals were made and no progress has been made in these undertakings and in the face of imminent commencement of construction, is there actually any intention to honor these undertakings, or is it just discourse to pacify detractors? It is reiterated that there is historical record of Taita Falcon nesting sites on the Zambezi River within the lower section of the Gorge. There are also suitable secondary cliff faces away from the main river course that have never been surveyed that may host Taita Falcon nesting sites, as well as other cliff-dwelling raptor species.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The client has committed to conducting a full assessment of the baseline status and potential impacts to Taita Falcons. This commitment is included in the ESIA documents and was publicly reiterated during the disclosure meetings. The proposed plan was also supported by key members of the Taita Specialist community during the disclosure meetings. A detailed background to the Taita Falcon studies is outlined in a response to comments above by the same author as this comment.	Potential Effects on Biodiversity
The eroded valleys of the lower reaches of the Batoka Gorge also host riparian vegetation that supports at least 1 pair of the recently up-listed Martial Eagle (Polemaetus belicosus), but could support nesting activity of the Critically Endangered Hooded Vulture (Necrosyrtes monachus) amongst other species. These areas will be directly and permanently affected by the project as will be inundated by the water level. In this respect, the absence of survey of these areas is a serious deficiency in the ESIA, especially since even the principal has recognized the importance of this aspect of the biological assessment. It is noted that survey of the lower Batoka Gorge allows the principal to address another deficiency of the ESIA, which is preliminary assessment of potential impact of inundation on sites of archaeological significance and cultural heritage. There is causal relationship between topographical features, specifically cliffs, required by Taita Falcons and distribution of caves that potentially could have been occupied by	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Importance of the Batoka Gorge riparian vegetation for tree-nesting raptors is acknowledged within the ESIA. As stated in comments above, the Batoka Gorge recognition as an IBA is used as an argument for recognising the gorge as a critical habitat. Also as stated above, the ESIA acknowledges there is no mitigation possible to effectively avoid or minimise impacts to this critical habitat. This is particularly relevant to the riparian habitat and its importance for raptors at the bottom of the gorge. The ESIA therefore emphasises that the feasibility of compensating for these impacts through offsetting needs to be investigated. The Cultural Heritage Reports (attached to the ESIA) states that the Batoka Gorge was not full explored (due to access); however, areas accessed indicated that the relief was steep and that there was no sign of past human habitation. It is likely that these areas were simply too steep and lacking in resources to have supported past settlement. This absence may be real but there remains a strong possibility that heritage sites may have been missed along the greater length of the Gorge. The Cultural Heritage Report states that there are scattered, shallow caves along the lower slopes in some areas of brecciated basalt. While caves may have been scoured out during times of flood, it is possible that traces of heritage may still exist, including rock art, Stone Age deposits and sites of burial and intangible importance. Similar cave-like features occur in some of the tributary gorges.	Potential Effects on Biodiversity
Hydrological Impacts of the Impoundment The ESIA dedicates a section to the effect of the impoundment on changed river flow regime on aquatic invertebrate macro fauna and fish. Sites were identified and sampled for these aspects of species biodiversity. All of the sample sites were downstream of the location of the proposed dam wall location and none positioned to assess the upstream effect of altered water flow regimes on the ecology of the upper gorges, even though this represents highly unique habitat in terms of location, below an impassible natural barrier (the Victoria Falls), and comprising rapids and riffles of a magnitude and frequency found nowhere else. Efforts to preserve an estimated 9Km of this unique and highly productive habitat by reducing the proposed maximum wall height by 4m are both recognized and commended, but also demonstrate the importance of this section of the river from an environmental impact perspective. However, there has been no assessment of potentially affected biodiversity and biomass, especially aquatic invertebrate macro fauna and fish species, of this apparently unique habitat which will to a large extent be inundated and altered permanently. Has any survey of aquatic invertebrate macro fauna of the Batoka Gorge ever been undertaken? The ESIA report records the finding of a potentially new and undescribed Mormyrid fish species, and the contracted expert, Mr. Denis Tweddle, also mentioned in the disclosure meeting the possible existence of yet another undescribed fish species, also of the Family Mormyridae, in the river downstream of the proposed dam wall site which host smaller and less dramatic rapids and riffles. In his opinion it seemed that both species may be lost as a result of construction of the impoundment. In light of these findings of unique and probably endemic ichthyofauna there is an obligation to at least describe what species biodiversity, specifically aquatic macro fauna, invertebrate and vertebrate, stands to be lost/exterminated by progressing this project.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	As noted in the comment, fish studies have been conducted and samples taken of a potential new subspecies of Mormyrid fish in the lower end of the Batoka Gorge. Habitats at the lower end of the Batoka Gorge will not be lost as a result of this Project, and there is no reason to suspect that the existence of that subspecies will be jeopardised. Detailed fish surveys within the upper Batoka Gorge were proposed; however, are outside the scope of the current ESIA process. Such gaps are highlighted, however the fish fauna of the Zambezi River is well known and we consider it unlikely that undescribed (and by implication highly threatened) species will be lost as a result of development of the Hydropower Project.	Potential Effects on Biodiversity
Besides, this baseline data on natural function of this ecosystem offers the opportunity to demonstrate mitigation of this 'Category Red' environmental impact if favourable comparison can be made post construction. It is understood that that the 730 m operating level will be 10 km below the falls and the 757m operating level will be 4.5 km below the falls. This still leaves 5-6 km that will be submerged to a depth 25 m for six months of the year at its lowest end.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	This statement is correct	Potential Effects on Biodiversity
Recommendations Thus, from our inputs provided in this document, BirdLife Zimbabwe and BirdWatch Zambia propose the following measures and processes to enhance the protection of the Batoka Gorge OUV as the draft ESIA does not address the impact of the project in its entirety: 1. That clarity on the financing plan for the B.G.H.E.S be provided including the nature of the investors.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The project will be developed using the Build, Operate and Transfer mode. The financing arrangements have not been concluded as negotiations are yet to commence, and are not within the scope of this ESIA. The information will be made public at optune time once the processes are concluded. Suffice to indicate that the Developer is currently engaging different financiers in this respect. The ESIA and its ESMP were disclosed with a view to enhance the mitigation measures and comments received are being incorporated to update the document.	
2. That the contingency plan for disinvestment be shared with stakeholders	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The disinvestment plan is not available for the public at this stage.	
3. That the potential environmental impacts of transmission infrastructure connecting the dams to the national grids of the respective countries be adequately assessed and reported	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA provides an assessment of impacts for the transmission lines that will transmit power northwards into Zambia. There is minimal natural habitat along these routes and the expected impact to birds of high conservation value such as vultures is therefore expected to be low. The transmission line for transmitting power southwards into Zimbabwe will pass through extensive natural habitat, which passes through and close to large conservation areas. The ESIA does however highlight gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	
4. That the ESIA assessing the impact of townships and roads that are proposed to be built be prepared in conjunction with the main ESIA and shared with stakeholders and Government ahead of any approvals made in terms of the development	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Following the submission and approval of the Scoping report (in December 2015), the Zambian Environmental Agency (ZEMA) requested that three separate ESIA reports be submitted for each of the components of the BGHES. Accordingly, ERM have compiled three separate ESIA reports for - • Dam wall and impoundment, including the spillway infrastructure; surface powerhouses, one on each side of the river; and project townships (in both Zambia and Zimbabwe) and other ancillary infrastructure (such as quarries, spoils area and batching areas) • Transmission Lines in Zambia and Zimbabwe • Access Roads in Zambia and Zimbabwe; As such, E&S impacts associated with the staff townships and access roads have been assessed and specific mitigation/management measures have been proposed. All three ESIA documents (and associated ESIA annex, ESMPs and Executive Summaries) have been disclosed with stakeholders. as part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars where audiences were taken through key aspects of the ESIAs. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. The Draft ESIAs were also made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge. Lastly, stakeholders will be informed on the outcome of the ZEMA and EMA approval process.	
5. That the draft ESIA be submitted to the World Heritage Centre and reviewed by the IUCN and that the outcome of this review be shared with stakeholders before any final decision on this project is taken	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	UNESCO are aware of the Project and associated ESIA and they have confirmed that the State Parties are responsible for submitting the ESIA for review. In aligning with existing protocol, the Zambezi River Authority is engaging the State Parties to ensure the ESIAs are provided to and reviewed by UNESCO.	Stakeholder Engagement Process
6. That the BHGES development be reported to and the ESIA be shared with the Ramsar Convention and that the Governments of Zimbabwe and Zambia request a Ramsar Advisory Mission to assess the threats to the ecological character of the Victoria Falls Ramsar Site and submit their report to be shared with stakeholders before any final decision on this project is taken	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Agreed, this process will be followed	
7. That the draft ESIA include a full investigation to determine whether commitments made in respect of Multi-lateral Environmental Agreements (MEAs) e.g.. Convention on Migratory Species, Convention of Biological Diversity and Convention on Africa-Eurasian Migratory Waterbirds (AEWA), Ramsar Convention are being adhered to by Zimbabwe and Zambia (where they are signatories to these MEAs) for key species e.g.: Black Stork, Hooded Vulture, White-backed Vulture	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA does outline regulatory frameworks (including international conventions) and their requirements have been considered as [art of the ESIA process; however, it is beyond its scope of this ESIA to assess two governments adherences to their commitments to international conventions.	

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
8. That a comprehensive climate change study be undertaken, especially since climate change has begun to change precipitation patterns significantly and unpredictably	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	A Climate Risk Review has been undertaken as part of the overall ESIA process. Results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
9. That all alternative power generation schemes to offset the need for Hydro Electric Plant be comprehensively investigated	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
10. That ESIAs be developed for the several other proposed dam sites along the Zambezi (e.g. Devil's Gorge and Mupata Gorge) to understand the cumulative impact before any decision is made for BGHES	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	As per legal requirements in the two States, the ESIA processes will be undertaken as part of any plans to implement the projects listed, and this would include a cumulative impact assessment. Cumulative impacts for the BGHES at this stage are addressed in Chapter 12.	
11. That the draft ESIA include assessments of vulture species (White-backed Vulture and Hooded Vulture), the Black Stork and Martial Eagle due to their re-categorization to Endangered and Critically Endangered in particular relation to potential impacts on global populations.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA does include assessments to threatened bird species, which acknowledges the CR and EN status of various vulture species and Martial Eagles. However the exclusion of the southward transmission line from our scope, as mentioned in responses above, is relevant to this comment.	
12. That the potential risks to avian biodiversity from transmission infrastructure be investigated and addressed in the draft ESIA	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA provides an assessment of impacts for the transmission lines that will transmit power northwards into Zambia. There is minimal natural habitat along these routes and the expected impact to birds of high conservation value such as vultures is therefore expected to be low. The transmission line for transmitting power southwards into Zimbabwe will pass through extensive natural habitat, which passes through and close to large conservation areas. The ESIA does however highlight gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	
13. That the commitment by the ESIA team to facilitate a further Taita Falcon survey of the lower section of the Gorge and that the proposed workshop focusing on the issue of Taita Falcon conservation and detailed discussion of potential mitigation for the species honored before decision is made for BGHES	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The client has committed to conducting a full assessment of the baseline status and potential impacts to Taita Falcons. This commitment is included in the ESIA and was publicly reiterated during the disclosure meetings. Respected members of the Taita Specialist community attended one of the disclosure meetings and there was no objection to the proposed plan.	
14. That the ESIA investigate the effect of altered water flow regimes on the ecology of the upper gorges upstream from the impoundment	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA does assess the effect of altered flow regimes above the dam wall, and explains that the fast-flowing riverine conditions will be transformed into a deep water pelagic habitat, also that a small stretch of riverine habitat will remain upstream of the impoundment but will be fragmented from other riverine habitat. The habitat is classified as critical and these impacts are dramatic but there are no feasible options to avoid or effectively minimise these impacts. The ESIA therefore strongly emphasises the need to investigate the feasibility of compensating these impacts through biodiversity offsets, as explained in various responses above.	
15. That a survey of aquatic invertebrate macro fauna of the Batoka Gorge be undertaken. There is an obligation to at least describe what species biodiversity, specifically aquatic macro fauna, invertebrate and vertebrate, stands to be lost/exterminated by progressing this project.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Surveys of the aquatic invertebrate macro fauna of the Batoka Gorge have been undertaken, however further surveys would be supported.	
16. That the potential cumulative effect of altered nutrient flows by the BHGES on the major fishing industry in Kariba be investigated and reported before any decision is made on BGHES	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Current nutrient flows through the Batoka Gorge are high as a result of dysfunctional sewage systems in Livingstone and Victoria Falls. Construction of the reservoir could allow nutrients to settle and so may partially alleviate these existing impacts, but presence of nutrients present a eutrophication threat to the reservoir, and mitigation is therefore included in the ESIA for respective governments to upgrade their sewage facilities. Further assessment of cumulative impacts on nutrient flow is unlikely to result in a different outcome	
17. That the potentially new and probably endemic ichthyofauna Mormyrid fish species in the river downstream of the proposed dam wall site be investigated and be described before a decision is made on the BGHES	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The species has been sampled by qualified ichthyologists and specimens are therefore available for taxonomic studies and writing up their description. The ESIA is unable to influence that process of describing new species and/or subspecies.	
18. That SEAs be performed to determine best the energy mix – considering social, economic and environmental factors - to power development in Zimbabwe and Zambia for the twenty-first century.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Contracting States have adopted the SEA approach to the energy mix, this is beyond the scope of this ESIA.	
19. That the ESIA should assess the entire assemblage of raptors (including Critically Endangered vultures) in considering the impacts of the inundation of the gorge.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	Assessment of the full assemblage of raptors in the Batoka Gorge will be a side-outcome of the ornithological studies required for Taita Falcon that are strongly emphasised in the ESIA.	
20. That the feasibility of offsets, and the costs associated with securing and managing these areas be investigated in more detail before a decision is made.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA already emphasises this point.	
No decision should be made until such steps have been taken, and that any authorisations granted should not allow construction to commence until offset sites have been secured (ideally through legal designation as protected areas) and sufficient funding set aside for their continued management.	Julia Pierini	CEO Birdlife Zimbabwe & BirdWatch Zambia	24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the scheme. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. The BGHES is not immune to these challenges. This ESIA has therefore attempted to describe both the benefits of the proposed BGHES as well as the environmental and social sensitivities associated with it. Where impacts are identified, detailed mitigation measures to reduce the significance of these impacts are described; also, where impacts may not be mitigated, this too has been described. In the case of positive impacts, measures to enhance such positive impacts are provided. ERM has recommended that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Take the money instead and built a solar panel factory to supply all Southern African Countries with solar energy!. This is economically smarter and will have only tiny effects on our planet. It will create more jobs for locals than this Utopia project which destroys this outstanding and sensitive Batoka Gorge.	Andie K Amend,	Destination Marketing	23-Jan-21	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. However, Solar Power is an intermittent form of energy, which is not available during the evenings and night. Hydropower is base load that is required to stabilise power systems. Further, solar power and other renewable sources will assist in further conserving water in the reservoirs during the day. Long term strategy is to have an energy mix of hydropower, solar, wind, biomass, and thermal technologies because they shall all complement each other. Further, solar technology is currently not as robust as hydropower technology and has a shorter life span (approximately 25 years). The number of direct and indirect jobs to be created over the construction and operation life of the project is over 26,000. Solar power is not without adverse effects, for example, land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors.	Project Alternatives
And i am not talking about the loss of jobs in the tourism industry. You know by now, that most people who are living around this outstanding and world renowned area are against this Dam! Most People in Victoria Falls are earning their income from tourism. Please have in mind that one tourism employee supports up to ten family members! Besides the above, I do agree 100 % with the below letter written by Marie-Louise Kellett.	Andie K Amend,	Destination Marketing	23-Jan-21	Email	Your objection is acknowledge. The tourism assessment found that most (more than two thirds) of the businesses and locals interviewed in Victoria Falls and Livingstone were strongly opposed to the construction of the BGHES. This is stated in our report and the ESIA. We recognise in our assessment the knock-on effects of negative impacts on the tourism industry and the important role it plays in providing income to local communities. Refer to Chapter 11 for further details on the Impacts to Tourism. The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	Potential Effects on Tourism and the Local Economy
1. You have mentioned that you will circulate a copy of the Comments and Responses Report once it has been finalised. Surely this should have been circulated already so people could include its contents in their consideration for comments? Will we receive this before or after it has been included in the final ESIA? There were some errors in the calculations on the financial effects of the reduction of rafting - this should have been made available to all Stakeholders BEFORE the commenting period closes so that more accurate comments could be lodged.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	The Comments and Responses Report will be circulated when the comment period is closed and all comments are collated, and responses have been drafted and reviewed, as is standard practice in the ESIA process. The bulk of the comments recieved during the 10 month ESIA comment period were received in the 3 days prior to the closure of the comment period, to respond to these prior to the comment period closing would not be feasible. Recordings of the webinar question and answer sessions were, however, made available on the Project website while the comment period was still open. Further more, ERM responded directly to many queries and questions received as they were sent to us throughout the comment period. Calculations on how rafting numbers and revenues would change under the BGHES were based on the low water season as this is what will remain if the project goes ahead. These calculations were based on information shared by the white water rafting businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. These changes will be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%."	Stakeholder Engagement Process
2. Impacts on Flow Upstream during Operation: - you have it listed as a Major Impact, and then, after Mitigation you list it as a Minor Impact. As pointed out your calculations on the impact on the tourism industry, particularly the rafting and kayaking industry on that section is flawed and under estimates the impact considerably. Even before these numbers have been rectified the overall loss of income is massive and in absolutely no way is a "Minor" Impact at any time with any proposed mitigation. Please explain how you get to it being a "Minor" Impact. In all analysis it must remain as a Major Impact, not even a Moderate Impact.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	Impacts on Flow Upstream during Operation (Chapter 10, Section 10.2.4) relate the impact on the physical environment, the impact on white-water rafting (WWR, economic displacement of river-based activities) is addressed under "Economic Displacement of Whitewater Rafting" in Chapter 11 of the ESIA. The residual significance rating has been amended and remains as a MAJOR impact post-mitigation, given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on indirect impacts.	Potential Effects on Tourism and the Local Economy
3. Insufficient studies have been done on the impact on the wild life in the area. Therefore this cannot be listed as a Minor Impact as it is not known and at this stage is showing it could well be a Major Impact, or, at minimum, a Moderate Impact.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	There is no important loss of habitat for wildlife (large mammals). Baseline studies did not reveal the presence of important wildlife populations in the proposed township sites. Other areas, with the exception of the southward transmission line (see below), are settled by local communities and support limited wildlife populations. The residual impact classification as Minor is therefore acceptable. The transmission line for transmitting power southwards into Zimbabwe will pass through extensive natural habitat, which passes through and close to large conservation areas. The ESIA does however highlight gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	Potential Effects on Biodiversity
4. Economic Impact and Displacement of River Based Tourism Activities during Operation (including reservoir filling): This too should remain as a Major Impact for the reasons set out in point 2 above. Plus the proposed mitigations are totally unrealistic - considering the well known corruption in both Zambia and Zimbabwe and their state of debt - compensation is not likely to happen at all. And would never be able to compensate for the permanent removal of the income that would be stopped forever.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	Based on feedback received during ESIA disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries.	Potential Economic or Physical Displacement
5. We feel strongly that the Public Participation process was totally inadequate: many of the river companies in the region knew nothing of the Webinars and say they have never been contacted by ERM. Considering the income that is drawn to this area through these companies surely these companies should all have been approached directly and individually? And if they have not been contacted then who else has not been contacted?	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process are documented in Chapter 7 of the ESIA. ERM have held numerous community meetings and focus group discussions in the Project Area between 2014 and 2020, as well as meetings with traditional and local leaders, as detailed in Chapter 7 of the ESIA. We have also distributed project information in the form of background information documents and non-technical summaries in English and local languages. The P In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context Of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. As part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. The Draft ESIAs were made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration.	Stakeholder Engagement Process
6. Intimidation in the region: this is well known and has been long standing. Locals have stated that anyone saying anything against the ZRA would be threatened with losing licenses to operate or lose their jobs meaning no one feels safe to object. This leaves this Public Participation process flawed as it cannot get true input from the people in the region.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards (refer to Chapter 7 of the ESIA for record of the stakeholder engagement). ERM has complied with the requirements set out for a fair and inclusive process. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may be barriers that prevent stakeholders from fully participating, commenting, raising concerns or objecting to the Project, that are beyond our control to mitigate. We have heard reports from stakeholders that this is the case in the Project Area and this concern is acknowledged and has been shared with the Zambezi River Authority. In statement released by the Zambezi Authority, they note: The Authority takes such allegations very seriously and has carried out preliminary investigations on these claims. We wish to out rightly and categorically refute the allegations as there is no evidence of such actions. As an organization that is concerned about the welfare of all its stakeholders, the Authority will continue investigating the matter and share an update on the same at an opportune time.	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
7. Alternatives for power: the study is old and does not include the many new options available as well as the fact that prices on alternative options have dropped radically since the study was done. Therefore the report stating that the dam is more viable than alternatives is flawed.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	The ESIA does acknowledge that there is an increased use of solar power in both Zimbabwe and Zambia, and to a lesser degree wind, and that investment into a myriad of renewable power options should be explored; however, the power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
8. Community Anger over Unmet Expectations during Construction: this is also totally unrealistic as it is already happening and none of the proposed mitigations have been put in place and are highly unlikely to ever be put in place. And construction has started before the ESIA has even been completed. Trust is already totally broken.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	The mitigation measures prescribed to manage stakeholder expectations are included in the Project's Construction and Operation Environmental and Social Management Plans (ESMPs). The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors. With regard to the mitigation measures outlined in Chapter 11.4.4, significant progress in furtherance of these measures has been made, as described below: • Implement the Grievance Redress Programme - this has been developed and is owned the Authority. • Adopt mitigation for employment and procurement - local employment and procurement requirements will applicable to all contractors on the Project. • Develop a stakeholder engagement programme and hold ongoing engagement with stakeholders - A stakeholder engagement plan has been prepared for the Project which provides a framework for ongoing engagement beyond the ESIA. • Establish a community development programme - A community Development Framework has been prepared for the Project. This document will guide the preparation of fit for purpose community development programmes going forward. The construction of the BGHES has not yet commenced. In a statement released by the ZRA, it is noted that "some pre-construction activities have been undertaken by the Developer on both sides of the River, but these should not be viewed as actual dam construction activities." Such activities included further geotechnical surveys.	ESIA Process, Project Description and Mitigation
8. Worker Health and Safety Impacts during Construction: as above in 8.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	The potential impacts on worker health and safety are addressed in Chapter 11.6 of the ESIA and the mitigation measures prescribed in this section have been included in the Project's Construction and Operation Environmental and Social Management Plans (ESMPs). The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors.	ESIA Process, Project Description and Mitigation
We (the IRF) feel that this ESIA is not ready to be finalised as there are still major issues and flaws in the report that have not been addressed. We support Marie-Louise of Save the Zambezi's call for an extension to the comment time, especially during this time of severe Covid issues, and also due to the lack of full engagement with all Stakeholders, and the other issues that we have raised, and that the other stakeholders have raised now and during the Webinars and other engagements.	Sue Liell-Cock	International Rafting Federation	23-Jan-21	Email	ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration. The draft ESIAs were made available for a 10 month comment period. Based on feedback received during ESIA disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are extremely limited (and untested) and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries.	Stakeholder Engagement Process
There is a strong feeling that in Zambia, largely due to historical context, people cannot speak out against what the government is saying or doing for fear of retribution. Such retribution may be subtle (like having your livelihood taken away) rather than open threats/ acts of violence. The proposed BGHES Project is seen as a government driven Project and, therefore, people are not willing to question it. There is not a culture of speaking out against government, as such, people who may be opposed to the BGHES might not voice their opinion for fear of the consequences. It has been reported that there have been threats of violence against people living in the Project Area of Influence who have opposed or questioned the BGHES Project. There is no written documentation to support this claim, however, it was noted that if people wanted to report threats, they do not know who they can report to. Local police, and even local traditional and government leadership are not necessarily trusted to act on such information, and are typically seen as part of a government structure seeking to suppress opposition.	Max Wilbert-Executive Director	Deep Green Resistance	23-Jan-21	Email	In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards (refer to Chapter 7 of the ESIA for record of the stakeholder engagement). ERM has complied with the requirements set out for a fair and inclusive process. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may be barriers that prevent stakeholders from fully participating, commenting, raising concerns or objecting to the Project, that are beyond our control to mitigate. We have heard reports from stakeholders that this is the case in the Project Area and this concern is acknowledged and has been shared with the Zambezi River Authority. In statement released by the Zambezi Authority, they note: The Authority takes such allegations very seriously and has carried out preliminary investigations on these claims. We wish to out rightly and categorically refute the allegations as there is no evidence of such actions. As an organization that is concerned about the welfare of all its stakeholders, the Authority will continue investigating the matter and share an update on the same at an opportune time.	Stakeholder Engagement Process
It was also noted that while the ESIA report states that there are no migratory fish species that would be effected by the construction of the dam, a stakeholders disagrees with this statement, noting that there are in fact migratory fish species that would be impacts by the presence of a dam. The stakeholder has, therefore, questioned whether the specialist report was rush, or whether they might have been paid off.	Max Wilbert-Executive Director	Deep Green Resistance	23-Jan-21	Email	The ESIA states that the reservoir will not block fish migrations as the Victoria Falls present a natural barrier to fish movement. Fish movements have already been heavily impacted by the downstream development of Kariba, which has fragmented the mid-Zambezi through the loss of a vast length of riverine habitat and introduced a diversity of alien fish species.	Potential Effects on Biodiversity
1. You have not adequately considered a significant and dominant alternative to the proposed infrastructure It is my understanding that the primary objective for the dam is for the generation of power, using hydro electricity generation. 1a. It is a well established and internationally accepted fact that electricity generation from photovoltaic panels is currently the most cost effective method of power generation, both from initial capital investment and operating costs. The two constraints to photovoltaic power generating are land availability (large areas of land are sterilised) and time of day limitations (generation possible during sun hours only).	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further (and as you have pointed out) the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from solar and other renewable options (such as wind) alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
Consider the following solution: 1a Land availability: Rather than sacrifice valuable land, consider the option of floating photovoltaic panels on the Kariba dam (floating solar panels are not only common, they are becoming the preferred solution). Even a fraction of the Kariba dam's surface area will readily generate a quantum of power greater (and cheaper) than the output of the proposed Batoka Dam. 1b Time of day limitations: Admitted, the photovoltaic solar panel solution provides power during sunlight only. However, since the Kariba dam generates hydro power, the two power sources can augment each other, solar during the day and hydro at night. If well matched, the power generation capacity of the solar-hydro Kariba power generation system will be at least double or three times the current Kariba system output.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The BGHES is part of the energy mix in the systems development plans for the two Countries of Zambia and Zimbabwe. The installation of PV Solar Farms even on Lake Kariba is an alternative that is currently under study by the utilities. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. In regard to the land use in areas where displacement may be required the Resettlement Action Plans or LRPs will be commissioned by the Authority. The Authority will ensure affected people are better off after the project than before.	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
1c further advantages of this solution are:- the solar panels will reduce water evaporation from the dam, increasing the hydro power and downstream irrigation capacity of the dam - the Kariba photovoltaic solar solution has a minimal environment impact, especially when compared to the Batoka Dam solution. it could be argued that floating solar panels on the Kariba have no environmental impact, as the dam is man-made, so any addition is moot. Significantly, no land is "lost", no communities displaced, pristine Zambezi river and gorge not impacted, adequate Kariba dam's surface retained for tourism, leisure and water sport - the capital investment costs of the Kariba solar are a fraction of the Batoka Dam, probably an order of magnitude less. - the time to power delivery of the Kariba photovoltaic solution is significantly lest than the Batoka project. If constructed in phases, the first power could be delivered within 6 months of the Environment Approval, and full power in half the time it will take the Batoka Dam to generate it's first power - see:https://www.pv-tech.org/news/worlds-largest-floating-solar-plant-connected-in-china **(Article does not have the download option-its about: World's largest floating solar plant connected in China)** https://www.rechargenews.com/transition/worlds-largest-floating-solar-plant-outside-china-ready-in-weeks-after-record-build/2-1-754179 a **(Article does not have the download option-its about: World's largest floating solar plant outside China**) https://www.power-technology.com/news/600mw-floating-solar-farm-india-start-operations-2023-madhya-pradesh/**(Article does not have the download option-its about: World's largest floating solar farm to start operations by 2023)** An Indian state government has announced the world's largest floating solar project will begin operations in 2022-23 The government of Madhya Pradesh made the announcement concerning the 600MW capacity facility on the Narmada river. The floating panels will be installed in the backwaters of the Omkareshwar dam and cover approximately 2000ht of water area the in Khandwa district From this project description, 2000 hectares produce 600 MW Assume conservatively that 1 m2 generates 0.1 kW. Then 1 hectare generates 1 MW 2400 hectare (24 km2) generate 2.4 GW (the projected output of the Batoka Dam Kariba dam's surface area is 5 400 km2. The solar panels for 2.4 GW will use less than 0.5% of Kariba surface area.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The BGHES is part of the energy mix in the systems development plans for the two Countries of Zambia and Zimbabwe. The installation of PV Solar Farms even on Lake Kariba is an alternative that is currently under study by the utilities. Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. Solar Power is an intermittent form of energy, which is not available during the evenings and night. Hydropower is base load that is required to stabilise power systems. Further, solar power and other renewable sources will assist in further conserving water in the reservoirs during the day. Long term strategy is to have an energy mix of hydropower, solar, wind, biomass, and thermal technologies because they shall all complement each other.	Project Alternatives
Other considerations: 2. The Economic Impact study is flawed, as it does not consider alternatives such as the one above. In addition a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High".	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The economic assessment is based on a methodological approach as described in Annex K of the ESIA. The study is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Based on feedback received during ESIA disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are extremely limited (and untested) and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries.	Potential Economic or Physical Displacement
b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	Calculations were based on information shared by the white water rafting businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%."	Potential Effects on Tourism and the Local Economy
c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease.	Potential Effects on Tourism and the Local Economy
d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The intangible impacts caused by displacement have been duly considered in the ESIA and as such, the impact ratings are high and the mitigation measures recommended extensive. A comprehensive Resettlement Action Plan will be developed to address the displacement impacts and will include all of the necessary requirements as per best international practice to ensure the emotional/cultural/intangible impacts are correctly managed and compensated for in a manner that is appropriate and fair to both the businesses operating in the area as well as the local communities.	Potential Economic or Physical Displacement
e. The study does not take into account those who earn income from the Gorge but are from outside of the area - this includes travel agents, tour operators etc.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The economic assessment was undertaken within the predefined study area, with all tourism-related businesses within this study area included. Those businesses outside of the study area were acknowledged and the study does include them through the "overall economic impacts" section where the indirect value added is estimated. The study also does estimate the indirect tourism spend associated with gorge activities which would include spend on some of these businesses. Under the mitigation section of the ESIA we clearly state that if the Project were to go ahead then it would be necessary to adequately compensate all losers, including companies and employees in associated sectors that gain from the gorge activities (e.g. tour operators, agents) as well as other businesses that benefit from use of the gorge. However, realistically this would be very difficult and costly to achieve.	Potential Economic or Physical Displacement
In conclusion: Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, feasible, superior alternative options are available, must be considered.	Walter Ringelmann (Pr Eng)	Save the Zambezi	22-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further (and as you have pointed out) the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from solar and other renewable options (such as wind) alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently). The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
I received an incredibly disturbing WhatsApp message from a contact in Vic Falls , Zim. It is copied below. It appears that my concerns around human rights abuses are already a reality. It also seems like construction has started. Finally, it also seems that my concerns around the validity of the public consultation process are warranted. Please find out what you can and respond before I make this information public. If I were ERM, I would have serious doubt about the ethics of my involvement in this project "I support your move to stop the Batoka Dam construction, the Bridge too. We ought to protect the Zambezi River, the River Villagers & the very fragile Ecosystems in that region which is rich in Cultural Biodiversity . Have you heard the horror stories from exploited workers, who were recruited from village's on the onset of lockdown. There has been serious injuries and deaths at the bridge construction site . Workers with families earn approx. US $26 per month. The Batoka Dam & Bridge construction is not only about human rights violation, it is ECOCIDE taking place before our eyes. 💔" "according to villagers they are working at a bridge construction site where the dam is or will be . I did not visit the site. Majority of villagers do not have phones there only a few, so communications with the outside world is a great challenge. Old school phones are used by a few, they are more reliable out there."	Marie-Louise	Save the Zambezi	22-Jan-21	Email	In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards (refer to Chapter 7 of the ESIA for record of the stakeholder engagement). ERM has complied with the requirements set out for a fair and inclusive process. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may be barriers that prevent stakeholders from fully participating, commenting, raising concerns or objecting to the Project, that are beyond our control to mitigate. We have heard reports from stakeholders that this is the case in the Project Area and this concern is acknowledged and has been shared with the Zambezi River Authority. In statement released by the Zambezi Authority, they note: The Authority takes such allegations very seriously and has carried out preliminary investigations on these claims. We wish to out rightly and categorically refute the allegations as there is no evidence of such actions. As an organization that is concerned about the welfare of all its stakeholders, the Authority will continue investigating the matter and share an update on the same at an opportune time. The construction of the BGHES has not yet commenced. In a statement released by the ZRA, it is noted that "some pre-construction activities have been undertaken by the Developer on both sides of the River, but these should not be viewed as actual dam construction activities." Such activities included further geotechnical surveys. Prior to commencement of the construction phase, the Project will need to obtain the necessary National approvals and permits.	Stakeholder Engagement Process
Thank you for the opportunity to respond to the ESIA for the proposed Batoka Gorge Hydro-Electric Scheme. I am aware that BirdLife Zimbabwe is compiling a more detailed analysis of the ESIA but I would like to present some key issues that I think are especially pertinent from an international perspective: **INTERNATIONAL CONSIDERATIONS** 1. The proposed Batoka Gorge Hydro-Electric Scheme has regional and global significance, with potential impacts on Zimbabwe's and Zambia's commitments to the following Multilateral Environmental Agreements: a. World Heritage Commission b. Convention on Biological Diversity (CBD) c. Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) d. RAMSAR	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	Thank you for your comments. We have received the submission from BirdLife Zimbabwe and have responded to those comments in this Comments and Responses Report. The Multilateral Environmental Agreements that you mention must be taken into consideration by the environmental authorities, EMA and ZEMA, when making a decision on this Project. A number of mitigation measures have been included in the CESMPs and the OESMP to manage impacts on the biological environmental so that both Zambia and Zimbabwe are able to meet their obligations to these Agreements. Further, of particular importance is the urgent development of an action plan that outlines an approach to thoroughly assess the occurrence of Taita Falcons, obtain an improved level of confidence on status of the population and potential threats, and to identify suitable mitigation that will be accepted by the international specialist community.	ESIA Process, Project Description and Mitigation
SOCIO-ECONOMIC/DEVELOPMENT CONSIDERATIONS SOCIO-ECNOMIC 1. Batoka Gorge Hydro-Electric Scheme is situated upstream of Kariba on the Zambezi River. Droughts such as the severe drought recently experienced demonstrate the risks of over-relying on one source of energy and it is not wise for Zimbabwe and Zambia to put all their energy eggs in one basket (two major hydro-power schemes on one river).	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	A Climate Risk Review has been undertaken as part of the overall ESIA process. Results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations. Once completed, the proposed BGHES will contribute significantly to the electricity supply of both countries, and also serve to distribute power within the Southern African Power Pool (SAPP). The power deficit in the SAPP is such that generation from solar and other renewable options (such as wind) alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently). Apart from having a significantly higher generation cost, power generation through thermal coal is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.	Project Alternatives
2. Zimbabwe and Zambia should think carefully before embarking on an extremely expensive (billions of dollars) hydro-electric project that will cause them to be indebted for decades to come.	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	The project is being implemented as a build-operate-transfer, whereby the Developer will be raising the finances. The implementation of a Risk Management Framework is underway and will ensure allocation of risks to parties best able to manage them. Mitigation measures will be developed in order to reduce the risk.	Project Alternatives
3. With enormous solar power and other energy resources, Zimbabwe and Zambia should commission Strategic Environmental Assessments (SEA) for energy, considering social, economic and environmental factors, to facilitate decision-making on the best energy mix that will meet the development needs for each country. For example, solar power can be deployed at speed at smaller scale, at much lower cost, enabling much faster start to energy production and return on investment, yet it can be scaled up as necessary. Note that in the UK, a country with a fraction of the solar potential of Zimbabwe and Zambia, installed solar capacity was 13,259 MW by June 2019.	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. Solar Power is an intermittent form of energy, which is not available during the evenings and night. Hydropower is base load that is required to stabilise power systems. Further, solar power and other renewable sources will assist in further conserving water in the reservoirs during the day. Long term strategy is to have an energy mix of hydropower, solar, wind, biomass, and thermal technologies because they shall all complement each other. Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity.	Project Alternatives
ENVIRONMENTAL CONSIDERATIONS 1. Special effort should be devoted to ensuring that the impact on the Victoria Falls/Mosi-oa-Tunya World Heritage Site is avoided.	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	The ESIA considers impacts associated with direct loss of Critical Habitat through (in particular) filling of the reservoir. The Batoka Gorge qualifies as a Critical Habitat for Taita Falcons based on the large unique environment that it present, its status as a key biodiversity area the presence of two national parks and the UNESCO Natural and Mixed World Heritage Site. Critical habitats represent the highest levels of ecological sensitivity and both World Bank and International Finance Corporation (IFC) standards stipulate stringent requirements that need to be met where critical habitats are impacted, such as demonstrating a net gain for the components that trigger a critical habitat status. A large area of the Batoka Gorge critical habitat will be transformed through inundation by the BGHES reservoir, and there are no direct measures that mitigate this loss and demonstrate net gain of the critical habitat components. The World Commission on Dams report states for the majority of large hydropower schemes: "it is not possible to mitigate many of the impacts of reservoir creation on terrestrial ecosystems and biodiversity" An offset to compensate this loss provides the only option to address the impact; however, the magnitude of such an offset would need to be large to adequately compensate this impact. A recent update (6 February 2019) to guidance notes to the IFC Performance Standard 6 (paragraph GN55) states that projects impacting UNESCO Natural and Mixed World Heritage Sites "will not be acceptable for financing, with the possible exception of projects specifically designed to contribute to the conservation of the area". The World Commission on Dams suggests the establishment of trust funds through grants from developers to manage parts of the revenue stream and use it for environmental purposes as a means to compensate ecosystem and biodiversity loss. This approach does not align with the World Bank Environmental and Social Standards, and may therefore need a specific approval from financial institutions committing to financing development of the BGHES. A waiver of the IFC interpretation provided by guidance note GN55 (Feb-2019) to the Performance Standard 6 may also be required.	ESIA Process, Project Description and Mitigation
2. The impact on migratory species (such as Rock Pratincole, an intra-African migrant) and IUCN Red-listed species (globally threatened species such as e.g.. Taita Falcon, Hooded & White-backed Vultures and Black Stork) needs to be avoided and minimized where possible, and effective mitigation measures implemented where impacts cannot be avoided. In considering reduction of the impact on raptor species, the entire assemblage of raptors, including vultures found in the area, needs to be assessed.	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	The ESIA requires specialist ornithological assessment to investigate the Taita Falcon ecology and to predict and mitigate impacts. Impacts to Rock Pratincole are assessed in the ESIA, but are not as severe as the impacts to raptors. Observations of all raptors within the Gorge will be noted and the data assessed. There are impacts to raptors expected as a result of the southward transmission line that transmits power to Zimbabwe, however the ESIA highlights gaps that need to be addressed for a more comprehensive assessment of the affected biodiversity. A detailed biodiversity assessment of impacts resulting from the southward transmission line through Zimbabwe has been outside of the scope of this ESIA, and the client has committed to supporting a full impact assessment of this associated infrastructure. It is not an unusual approach to have separate impact statements for different project components, and such an approach does not compromise the capacity of Govt authorities or financial lenders to assess the overall impacts of the project.	Potential Effects on Biodiversity
3. The ESIA for Batoka Gorge Hydro-Electric Scheme does not give adequate analysis to the impact of inundation (due to the reservoir) on the rich aquatic invertebrate fauna that underlies the entire ecology of the gorges.	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	The ESIA does explain that aquatic habitats will be transformed from a fast-flowing riverine system to a deep water pelagic system, and that all vertebrate and invertebrate fauna will be dramatically impacted. The ESIA states that the reservoir will need to be stocked with fish species appropriate to the habitat that is created. The ESIA does, however, not understate the significance of this impact, as the Batoka Gorge and all biodiversity supported there is classified as a critical habitat, which is the highest level of ecological sensitivity recognised by the standards. This significance of the residual impact on the critical habitat is also classified as Major, which is the highest available level of significance.	Potential Effects on Biodiversity

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
4. Evidence from the World Commission on Dams and more recent research (see the EDF report and here) demonstrates that hydroelectric dams may have a severe adverse impacts on the environment and climate and are not necessarily a source of green energy.	Bruce Liggitt-Senior International Casework Officer	BirdLife International	22-Jan-21	Email	Correct, the World Commission on Dams report states for the majority of large hydropower schemes: "it is not possible to mitigate many of the impacts of reservoir creation on terrestrial ecosystems and biodiversity". The ESIA does consider impacts to critical habitats. A large area of the Batoka Gorge critical habitat will be transformed through inundation by the BGHES reservoir, and there are no direct measures that mitigate this loss and demonstrate net gain of the critical habitat components. The World Commission on Dams report states for the majority of large hydropower schemes: "it is not possible to mitigate many of the impacts of reservoir creation on terrestrial ecosystems and biodiversity". Conversely, once completed, the proposed BGHES will contribute significantly to the electricity supply of both countries, and also serve to distribute power within the Southern African Power Pool (SAPP). The power deficit in the SAPP is such that generation from solar and other renewable options (such as wind) alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addititon, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently). Apart from having a significantly higher generation cost, power generation through thermal coal is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc. The ESIA acknowledges that the BGHES is not immune to significant E&S challenges. The ESIAs have therefore attempted to describe both the benefits of the proposed Project as well as the environmental and social sensitivities associated with it. Where impacts are identified, detailed mitigation measures to reduce the significance of these impacts are described; also, where impacts may not be mitigated, this too has been described. In the case of positive impacts, measures to enhance such positive impacts are provided. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
I would like to add my support to the concerns and objections raised by Marie-Louise Kellett of Save the Zambezi (text copied in below). I strongly object to the way in which this project is seemingly being driven roughshod over the people, businesses and ecosystems of the Batoka Gorge. The Batoka Gorge is a precious natural treasure (right next to a UNESCO World Heritage Site) and surely demands much more circumspection and care.	Andrew Atkinson		22-Jan-21	Email	Your objection is acknowledged. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project to manage the negative impacts and enhance the benefits associated with the Project. The implementation of the ESMPs will monitored by the ZRA, relevant environmental authorities, and investors.	ESIA Process, Project Description and Mitigation
As described in Comment 3 below, alternatives to the dam have not been adequately studied. Climate change in southern Africa is an unfortunate reality. A hugely expensive dam that relies on rainfall that is becoming ever more unreliable just does not make sense (I reference the recent problems at Kariba!) . And even if this dam were viable now, within a few years advances in technology will render it obsolete anyway. Yet in the reports I do not see that an extensive attempt has been made to look at less intrusive and environmentally harmful alternatives, neither current nor emerging. We should be making every effort to preserve the Batoka Gorge for future generations.	Andrew Atkinson		22-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently). Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and	Project Alternatives
The project of building a dam and putting another line of pylons from Batoka to muzuma is a welcome move it's nice project. The people of siandwazi and sindowe where the pylons pass(that's muzya area which is called mangonda this word means confusion because people were confused when they were chased)through were displaced in 1948 to pave way to white ex soldiers who fought in the second world war and the people were chased like dogs from their mother land, their belonging got destroyed during the journey , animals were attacked killed by lion, leopard and hyanas these people where not compensated ,instead they were pushed to settle in hilly area without good infrastructures like roads schools clinics and no clean water. In early 1970s again during the construction of pylons from Victoria falls to muzuma the same people lost a lot of Hectors of land to this project during this people were displaced again lost their homes and important sites like graves of ancestors yet no compensation, though power passes over their heads the people enjoying power are those in copper belt, the same areas still in dack 56years after Independence. Zesco employ workers every year for bush clearing through pylon line but they don't employ people from the affected areas people in zimba district don't even know where they recruit these workers from,Young ones a denied the opportunity to work	Victor Sindowe-Chief Sipatunyana's rep in Zimba district		09-Dec-20	Email	Any persons that will be displaced due to the project will be adequately compensated and this will be spelt out in the RAP that will be conducted by the Authority taking note of the requirements in both countries and international best standard. The Authority will also engage in the Corporate Social Responsibility initiatives and these have been identified in response no.5. The recruitment will also be considered for project affected communities and this has been highlighted in response no.1. The project area communities will be given priority in terms of consideration for jobs available under the project and this is already being undertaken even under the Kariba Dam Rehabilitation Project where the local community members have been given priority for job considerations. As is already the case at Kariba, a Grievance Redress Mechanism (GRM) will be put in place under the Batoka project to identify, assess and address any grievances from the local communities and this process will be undertaken with full consultation and inputs from the project area communities.	Potential Employment Opportunities
WAYFORWARD, (a) Engaged rural electricity program to put power to the following institutions muzya clinic and primary school, sindowe and kapani primary schools. (b)work on road infrastructure zimba muzya to sindowe road (c)Requesting for employing- more casual workers from this area for them to test the fruit of this project.	Victor Sindowe-Chief Sipatunyana's rep in Zimba district		14-Dec-20	Email	The Authority has developed a community outreach framework for the Project that identifies community needs in the Project and provides a framework for supporting community outreach. As the Project moves into the construction phase, this framework will be further developed into a detailed Community Outreach Plan in consultation with affected communities. The Outreach Programme will then be implemented by the Authority.	Community Development and Benefits
I am an Ecologist and was part of the Black Crystal Consulting team that worked with ERM on the Batoka ESIA. I undertook the field work in August 2014 and compiled the Terrestrial Biodiversity report in early 2015.On reading the ESIA downloaded from your website I note that most of my report has been included as I wrote it but there are no photo acknowledgements.	Susan Childes	Black Crystal	01-Dec-20	Email	Thanks for noting this. We have acknowledged that you were part of the ESIA study team in the introduction of all ESIAs, but will certainly reference your photos included in the relevant biophysical sections of the ESIAs.	ESIA Process, Project Description and Mitigation
As an overall comment I feel that there has not been sufficient attention paid to the endemic, rare and restricted range plant species in the Gorge. The impact analyses have quite rightly focused on the avifauna but please do not forget the flora. There needs to be a management plan to locate and save as many of the special plants as possible, should the dam go ahead.	Susan Childes	Black Crystal	01-Dec-20	Email	Requirements to locate as many of the threatened and special plants as possible are included within the ESIA, and the recommendation to relocate those that will be within the inundation zone where possible. However, many of the scree slopes where threatened species are reported to occur are not easily accessible, also many of the scree slopes will not be inundated and those habitats should remain secure.	Potential Effects on Biodiversity
There is also a huge gap in our knowledge about the bat fauna in the Gorges and this must be addressed before there is any major disturbance to their habitat and roosting sites.	Susan Childes	Black Crystal	01-Dec-20	Email	The data gap in the Bat fauna is noted.	Potential Effects on Biodiversity

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
The construction of this project may result in irreversible harm to local communities.. This project has resulted in **threats of violence** toward local community members who are opposed to the dam, on both sides of the border. This has had the effect of silencing legitimate opposition and making a sham of democratic principles. This project must be halted indefinitely while an outside, impartial group investigates and recommends for prosecution any business employees, government officials, or other parties who are engaged in bullying, violence, or threats.	Max Wilbert	Deep Green Resistance	18-Dec-20	Email	In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards (refer to Chapter 7 of the ESIA for record of the stakeholder engagement). ERM has complied with the requirements set out for a fair and inclusive process. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may be barriers that prevent stakeholders from fully participating, commenting, raising concerns or objecting to the Project, that are beyond our control to mitigate. We have heard reports from stakeholders that this is the case in the Project Area and this concern is acknowledged and has been shared with the Zambezi River Authority. In statement released by the Zambezi Authority, they note: The Authority takes such allegations very seriously and has carried out preliminary investigations on these claims. We wish to out rightly and categorically refute the allegations as there is no evidence of such actions. As an organization that is concerned about the welfare of all its stakeholders, the Authority will continue investigating the matter and share an update on the same at an opportune time.	Stakeholder Engagement Process
This project impact statement shows **clear, unambiguous, and severe negative impacts** to wildlife, fish, natural flora, and other important wild habitats. Continuing with such a project despite these clear negative impacts shows that a project such as this will be considered an enemy of the people and of the future, and should be resisted in any way possible.	Max Wilbert	Deep Green Resistance	18-Dec-20	Email	The ESIA has attempted to present an independent and objective assessment of the impacts, the options available for mitigation, and the data gaps that need to be addressed to provide data for an informed decision.	Potential Effects on Biodiversity
I am writing, because I believe the Batoka Gorge Dam is an incredibly bad and dangerous plan. The reasons why are outlined in this article I wrote that was published in Earth Island https://www.earthisland.org/journal/index.php/articles/entry/dam-threatens-batoka-gorge-zambezi-river/ (article does not have download option. Its about: Massive Dam Threatens Spectacular Gorge Downstream of Victoria Falls) I would like this article submitted to your process as evidence and rationale why going forward with this project would be more harmful than beneficial.	Rebecca Wildbear		09-Dec-20	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA reports. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
I am a Professor Emerita of Anthropology, Johns Hopkins University and I spent two years, 1984 and 1985, living in Mola studying the lives of the Tonga people who had lost their land on the banks of the Zambezi River (and I spent significant time over the next six years studying and writing about the conditions in which they live). If anyone working on the project has read my two books, then I need say no more. The books are "Dance Civet Cat. Child Labor in the Zambezi Valley" and "Lwaano Lwanyika. Tonga Book of the Earth". Compared with their former lives as owners of the land; as farmers of two crops a year on the flood planes; as people with access to the flora and fauna; and as a community with a proud history of some two thousand years as owners in the Valley their lives now are mean. They have been denied any meaningful share in the products of the Kariba Dam.	Pamela Reynolds- Professor Emerita	Johns Hopkins University Honorary Professor, University of Cape Town	01-Dec-20	Email	Thank you for your email and interest in the Project. I just wanted to let you know that in addition to the webinar, we have been undertaking some in-person engagement with the directly affected communities in the Project Area - with COVID-19 precautions in place, so that communities have an opportunity to be heard. In addition to this, both a social impacts assessment and a cultural heritage assessment have been undertaken and describe in great detail, the baseline conditions in the affected communities, including the Tonga people that inhabit the area. No physical resettlement will be required as a result of the inundation of the dam as the water is contained entirely in the gorge, which is deep enough to carry the water capacity. Further, those who will have their livelihoods or structures affected by the staff villages and the access roads will be compensated as per the requirements of IFC Performance Standard 5, that requires people receive the same or superior living/livelihood standards following displacement. Please refer to the Cultural Heritage Studies (Annex L and M), the Resettlement Framework Policy (Annex P), the Livelihood restoration Plan (Annex S) for detailed studies relating to economic and physical displacement.	Community Development and Benefits
I have no doubt that you are aware of this scenario but I fear that another huge dam will destroy much in the interest of people and businesses who cannot give recompense to the destruction of the environment and a way of life. I have read little about the project except that houses will be built for the people. Houses without the secure means to afford a way of life that sustains property and insures rights is of little use. There is, besides, much research that argues against the value of enormous lakes. I shall listen with interest to your plans. The conference held a few years ago on the effectiveness of the Kariba Dam had no adequate representation from the Tonga. Their interests were not heard. The issues I raise are large and will not be able to be adequately aired on zoom but I look forward to the discussion.	Pamela Reynolds- Professor Emerita	Johns Hopkins University Honorary Professor, University of Cape Town	01-Dec-20	Email	Thank you for your email and interest in the Project. I just wanted to let you know that in addition to the webinar, we have been undertaking some in-person engagement with the directly affected communities in the Project Area - with COVID-19 precautions in place, so that communities have an opportunity to be heard. In addition to this, both a social impacts assessment and a cultural heritage assessment have been undertaken and describe in great detail, the baseline conditions in the affected communities, including the Tonga people that inhabit the area. No physical resettlement will be required as a result of the inundation of the dam as the water is contained entirely in the gorge, which is deep enough to carry the water capacity. Further, those who will have their livelihoods or structures affected by the staff villages and the access roads will be compensated as per the requirements of IFC Performance Standard 5, that requires people receive the same or superior living/livelihood standards following displacement. Please refer to the Cultural Heritage Studies (Annex L and M), the Resettlement Framework Policy (Annex P), the Livelihood restoration Plan (Annex S) for detailed studies relating to economic and physical displacement	Potential Economic or Physical Displacement
National Museums and Monuments of Zimbabwe notes the contents of the Report's "Cultural Heritage Baseline Report for the Proposed Batoka Gorge Hydro-Electric Scheme-Zimbabwe" done by the heritage consultant Rob Burret.. 91 heritage sites were located in the project footprint with 36 recorded prior the project and 55 new ones located during the ESIA process. 13 sites were identified(p.154 of report) for mitigation and further work was recommended for the Chemapato Living heritage site in addition to mitigation at the 13. National Museums and Monuments affirmed the need for the mitigation and thus recommends to the ERM team that according to the National Museums and Monuments Act 25:11 project work should be preceded by the mitigation as recommended by your heritage consultant/specialist	K T Chipunza	National Museums and Monuments of Zimbabwe (NMMZ)	19-Jan-21	Email	Thank you for your feedback. The impact assessment of sites of physical cultural heritage sensitivity (included in the Section 11.7.1 of the ESIA) states that additional pre-construction archaeological survey will need to be carried out once the feasibility stage of the project has been completed. This survey will need to involve the relevant archaeologists from both Zambia and Zimbabwe, focusing on the areas that will be directly affected. This will include the Chemapato Living Heritage Site and the 13 sites identified by Rob Buerret. Surveys will be systematic and intensive, with the objective of identifying sites that will be affected. Moreover, surveys will adhere to local heritage legislative requirements and the requirements of international best practice and IFC Performance Standard 8. Should sites of medium or high archaeological sensitivity be identified by these pre-construction surveys, time and resources will be provided to permit more detailed recording/investigation ahead of the commencement of the construction process. This could involve any of the following methods of investigation: • Systematic surface collection; • Trial trenching (using mechanical excavators to save time if necessary/appropriate); • Test Excavation; • Non-invasive techniques such as ground penetrating radar (GPR); and • Archaeological monitoring/watching briefs. It must also be noted that a chance find procedure will be implemented. These requirements have been included as commitments in the relevant Environmental and Social Management Plans (ESMPs) for the BGHES. The implementation of the ESMPs will monitored	Potential Effects on Cultural Heritage Resources
A project of this significance cannot be approved based only on an online consultation process. This definitely does not meet the requirement for adequate public consultation, especially given the socio-economic realities of the local area.	Marie-Louise Kellett	Save the Zambezi	19-Dec-20	Email	ERM recognize that in-person engagement for the disclosure of the BGHES ESIA would have been preferable, as was our intention in March and April 2020. We altered our approach to engagement due to the unprecedented circumstances associated with COVID-19 pandemic. In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context Of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. Our approach took into consideration the access to technology, literacy, ability to engage and other factors of our stakeholders and the engagement undertaken included the following: ERM and the ZRA hosted four separate webinars, ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions, ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp.	Stakeholder Engagement Process
In person meetings are essential and should be accompanied by workshops (including translation into local languages) to educate local people about exactly what the dam will entail, potential alternatives and what their rights are in terms of opposing it.	Marie-Louise Kellett	Save the Zambezi	19-Dec-20	Email	See response above and below. Included in all engagement have been details of the Project, including the extent of the footprint, the associated environmental and social impacts of the Project, and details of how stakeholders can contact ERM, raise concerns and comment on the ESIA.	Stakeholder Engagement Process
Business and leisure travel in the region is open – there is no reason at all why in person meetings and workshops cannot be arranged.	Marie-Louise Kellett	Save the Zambezi	19-Dec-20	Email	While travel was open in Zimbabwe and Zambia, ERM's internal H&S policies relating to COVID-19 meant that international travel, and hosting events such as workshops that would constitute as "social gatherings" during the pandemic was not feasible. The ZRA, together with in-country partners, undertook limited in-person meetings as explained above.	Stakeholder Engagement Process
The ESIA cannot be considered complete until the above items are addressed. Given the above, I would like to motivate that the comment period be extended until adequate consultation has taken place.	Marie-Louise Kellett	Save the Zambezi	19-Dec-20	Email	The comment period for the ESIA has been open for almost 10 months, and will be closing on 25 January 2021. There is intention from the ZRA to undertake further stakeholder engagement for the Livelihood Restoration Planning activities associated with the economic displacement from Project. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration.	Stakeholder Engagement Process
Reference is being made to the Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro- Electric Scheme between Zambia and Zimbabwe on the Zambezi River and the Webinar meeting that was held on the 11th of December 2020. Zimbabwe Parks Wildlife Management Authority highlighted the need to protect the environs of the proposed Batoka dam by establishing a recreational park as was done in Kariba and Kyle Recreational Parks. From these examples, Zimbabwe has benefited from the conservation of biodiversity and water-based activities such as fishing and tourism. We are therefore proposing that ESIA should take into account the establishment of a recreational park for the Batoka dam		Parks and Wildlife Management Authority, Harare	21-Dec-20	Email	Yes, alternative livelihoods (particular for the river rafting community) would be included in the resettlement planning associated with the BGHES, specifically the resettlement process associated with the area of inundation.	Potential Effects on Biodiversity

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
How to help in opposing this damn, I work on Wall Street and have many influential friends.	Sean Lavin		01-Jan-21	Email	As the independent consultants responsible for preparing the Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydropower Scheme (BGHES), our mandate is to identify and assess the potential environmental and social impacts associated with the project, and facilitate an appropriate public participation process. This includes disseminating the findings of the ESIA, and gathering stakeholder inputs, comments and concerns as well as providing responses to comments. I am going to direct you to Marie-Louise Kellet from "Save the Zambezi" who would most likely be interested in connecting. Marie-Louise Kellett Save the Zambezi, A Watershed project savethezam@gmail.com +27 82 692 4399 If you have comments or questions or comments pertaining to the Project or the ESIA (including objections to the Project), please send to us and we will provide a response and include them in the comments and responses report which will be submitted to the Environmental Authorities as part of the ESIA. Note that the comment period for the ESIA, which has remained open since 03 March 2020 will be closing 25 January 2021. Please ensure that any comments reach ERM on or before 25 January 2021.	Stakeholder Engagement Process
Save the Zambezi Foundation works in conjunction with the Zambian Department of Fisheries working against illegal fishing practices and the well being of the endemic fish populations in the Zambezi River System. After sitting through the ESIA webinar it became very apparent that not enough research has been done from an ichthyological point of view. When we posed the question on how the migration of certain endemic fish species that move in and out of the Batoka Gorge for breeding purposes would be affected. We were given a pathetic answer of, "There are no species of fish that migrate up and down the waters of the Batoka Gorge." and "We can always stock the dam to replenish the fish numbers" This is not true! The endemic Mormyridae or Snoutfishes such as Cornish Jack or Bottlenose will travel in and out of the Batoka Gorge for breeding purposes as will the Genus Hippopotamyrus, Distichodontidae and Malapteruridae to name a few. All of these species CANNOT be bread in fish farms and re-stocked as mentioned in the answer we were given.	James Hitchins	Save the Zambezi Foundation.	05-Jan-21	Email	The message during the disclosure meetings was as written in the ESIA, which states that the reservoir will not block fish migrations as the Victoria Falls presents a natural barrier to fish movement. Fish movements are already heavily impacted by the development of Kariba, which has transformed a vast length of formerly riverine habitat to pelagic habitat and introduced a diversity of alien species. Aquatic ecology assessments have detected the Mormyridae which enter from the Kariba reservoir into the lower end of the Batoka Gorge, and that environment will not be lost or impacted to the extent of the upper parts of the Batoka Gorge. The ESIA explains that fish species will need to be introduced into the reservoir and appropriate fisheries management practices implemented, as few if any of the riverine fish species will adapt to that habitat. This mitigation is not in any way a compensation for the loss of the Batoka Gorge habitat and does not render the residual impact of the loss to negligible. Instead the ESIA designates the Batoka Gorge as a critical habitat, which includes all biodiversity therein, including all aquatic fauna and fish, riparian species, birds, mammals and all other groups. The ESIA clearly states that there is no mitigation that avoids or effectively minimises the impact of the reservoir on this critical habitat, and that compensation in the form of offsets will be needed to meet international best practice standards and qualify for international lender financing. However assessing he feasibility of offsets was beyond the scope provided to us, and could not be included into the ESIA. The ESIA does clearly indicate this gap.	Potential Effects on Biodiversity
This is not true! The endemic Mormyridae or Snoutfishes such as Cornish Jack or Bottlenose will travel in and out of the Batoka Gorge for breeding purposes as will the Genus Hippopotamyrus, Distichodontidae and Malapteruridae to name a few. All of these species CANNOT be bread in fish farms and re-stocked as mentioned in the answer we were given.	James Hitchins	Save the Zambezi Foundation.	05-Jan-21	Email	Addressed in above response	Potential Effects on Biodiversity
As a Foundation, we request a copy of the Ichthyological survey that was done and would like to see what efforts were made to consider a fish ladder system or any plan to help the migration of these sensitive endemic fish species.	James Hitchins	Save the Zambezi Foundation.	05-Jan-21	Email	The BGHES wall will be approximately 180 meters high, so fish ladders may not be a feasible option. There are no feasible options for fish ladders for such a system, and options have not been further investigated. The ESIA has quoted data from old reports by Minschull, and impacts were informed by field surveys conducted by Southern Waters, whose report is ncluded as an Annex to the overall ESIA.	Potential Effects on Biodiversity
We believe that there needs to be another company voted in to do another more in depth survey on the delicate ecosystem of the Batoka Gorge rather than one that seems to have been manipulated by powers above. Otherwise this Dam Scheme is going to eradicate endemic species from the Gorge and must NOT go ahead!	James Hitchins	Save the Zambezi Foundation.	05-Jan-21	Email	The ESIA undertaken and has been done so independently. The ESIA presents an objective and independent assessment of the impact of the development of the scheme. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. The BGHES is not immune to these challenges. This ESIA has therefore attempted to describe both the benefits of the proposed BGHES as well as the environmental and social sensitivities associated with it. Where impacts are identified, detailed mitigation measures to reduce the significance of these impacts are described; also, where impacts may not be mitigated, this too has been described. In the case of positive impacts, measures to enhance such positive impacts are provided. ERM has recommended that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	Potential Effects on Biodiversity
I have registered but have also heard from others that the Zoom link did not work. Please note following comments/questions. Please make sure that these are registered as being from all of the entities I represent – Gravity Adventures, PaddleZone and Save the Zambezi	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	01-Dec-20	Email	This concern is acknowledged. Prior to sending out invitations, ERM tested the ZOOM link which functioned it should. ERM provided support to people who had trouble registering for the ZOOM webinar.	Stakeholder Engagement Process
1. The online webinar and focus group, whilst useful, do not meet the requirements for adequate public consultation. Large sectors of the people who will be impacted on by this project are not able to participate, obtain information or express their opinions. Until adequate public consultation happens, the SEIA cannot be concluded.	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	01-Dec-20	Email	ERM recognize that in-person engagement for the disclosure of the BGHES ESIA would have been preferable, as was our intention in March and April 2020. We altered our approach to engagement due to the unprecedented circumstances associated with COVID-19 pandemic. In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context Of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. As part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. The Draft ESIAs were made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration.	Stakeholder Engagement Process
2. Given the scale and context of this project, the following is required, at a minimum, to meet the requirements for free, informed and prior consent; (**a**). In person workshops where the project can be presented to the local communities who will be directly affected. These workshops need to include an educational component so that people understand their rights in terms of public comment, how a SEAI process works, the direct impacts of the project on their lives, livelihoods and food security, the impacts of the project downstream etc. **(b)** These workshop will need to be held in all areas where the project will have impacts, not just Livingstone, Vic Falls, Lusaka and Harare	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	01-Dec-20	Email	Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". There are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM recognize that in-person engagement for the disclosure of the BGHES ESIA would have been preferable, as was our intention in March and April 2020. We altered our approach to engagement due to the unprecedented circumstances associated with COVID-19 pandemic. In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context Of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. As part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. The Draft ESIAs were made available for a 10 month comment period. ERM has complied with the requirements set out for a fair and inclusive process as detailed in the ESIAs, we are confident that our process has been inclusive and culturally appropriate, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration.	Stakeholder Engagement Process
3. In terms of Victoria Falls' status as a World Heritage site, the public consultation process should include a global component, specifically targeting NPOs, civil society and the tourism sector in the entire SADC region.	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	01-Dec-20	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process are documented in Chapter 7 of the ESIA, including ERM's approach to stakeholder identification. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards. We have developed an extensive stakeholder database that has been updated throughout the ESIA process, and includes a wide variety of local, national and international NGOs, civic organisations and special interest groups. Newspaper adverts to notify the public of the Project, Scoping meetings, availability of the draft ESIA, and closure of the comment period were placed in national newspapers in Zambia and Zimbabwe (refer to Chapter 7 for more detail), and the Project has been widely cited in conventional and social media outlets. While ERM sought to cast a wide net i the identification of stakeholders, much of the focus of our engagement has been intentionally focused those who will be directly impacted by the Project, to ensure they are aware of the Project and ESIA, have an opportunity to raise concerns and ask questions, obtain their input in the Scoping and ESIA reports. These stakeholders include: • Communities settled in or within the Project Area • Relevant traditional, local/ district, and provincial authorities in who's derestriction the Project Area falls • The tourism sector and river users, particularly in around Livingstone and Victoria Falls who may be affected by changes to flow regimes of the Zambezi	Stakeholder Engagement Process
4. Please let me know if you have had any interaction with the Peace Parks Foundation KAZA sector.	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	01-Dec-20	Email	We have not had interaction with the Peace Parks Foundation KAZA sector as part of the engagement for this ESIA.	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
5. Finally, it should be noted for the record that the public consultation process is fatally flawed since civil society does not have the time or resources to adequately interrogate the various specialist reports. Support should be given to enable this to take place for this process to be credible.	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	01-Dec-20	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process are documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Prior to the outbreak of COVID-19, ERMs in country sub-consultants distributed the Draft ESIA Reports and Non-Technical Summary Report to the following central localities: Draft ESIAs NTS of draft ESIAs • Livingstone City Council • District Council Offices in Kazungula, Zimba, Kalomo and Choma • ZRA offices in Lusaka • Hwange District Council • Victoria Falls Municipal Offices • Black Crystal's Office in Harare • Livingstone District Council • Chiefs Palaces (Mukuni, Sipatunyana and Simwatachela) • Hwange District Council • Jambezi Clinic Chisuma Clinic • Matebeleland North Provincial Administrators Office In addition to this, the local sub-consultant distributed comment sheets to the impacted communities in order to ensure that information reached as many stakeholders as possible and that they were able to make comment. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to our community stakeholders despite constraints presented by the Covid-19 pandemic. Radio Broadcasts, which targeted Project area listeners, were undertaken between the 14th and 18th of December 2020. Broadcasts were undertaken in the local languages, often with multiple languages per broadcast, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to ask their questions live by calling into the radio programmes, texting the radio hotline or Whatsapp messaging service. The project website, project dedicated email address, phone numbers and fax line were provided to listeners to comment after the broadcasts. Again, this exceeds the relevant requirements. A newspaper advertisement was placed in both the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be found, the contact details of ERM and its sub consultants for registering comments as well as the closure of the commenting period on the 25th of January 2021. For all of the above, comments have been collected and captured in the Comments and Responses Report, which will be appended to the final ESIA's. Non-Technical Summary Reports have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These are physically available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA	Stakeholder Engagement Process
I need to register my unhappiness with the delay in starting this webinar. Many of us are giving up a significant amount of time on a voluntary basis and this is simply disrespectful and unprofessional. It speaks volumes of their attitude and credibility.	Marie-Louise Kellett	Gravity Adventures Save the Zambezi	02-Dec-20	Email	Your unhappiness is registered. ERM apologies for the delayed start to the meeting, and no disrespect was intended.	Stakeholder Engagement Process
We have done our best to follow the webinar but signal out here is pretty inconsistent and we would still like to know more. We are 28 years in tourism based in Livingstone. Question: What would the impact be to NOT build a dam but to utilize other more refined and innovative and less impactful power generating resources	Gail Kleinschmidt	Chundukwa River Lodge | Ride Zambezi Horse Trails. Livingstone, Zambia	02-Dec-20	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
Question: If it is a matter of power supply and demand why are initiatives such as solar on every roof top not being utilized instead?	Gail Kleinschmidt	Chundukwa River Lodge | Ride Zambezi Horse Trails. Livingstone, Zambia	02-Dec-20	Email	Both governments are seeking to grow the country's economy through several industrial sectors, including the promotion of the renewable energies sector. The Government of the Republic of Zambia/Zimbabwe are equally investing in other Renewable Energy Technologies, including solar to supplement hydropower plants. Solar Power is an intermittent form of energy, which is not available during the evenings and night. Hydropower is base load that is required to stabilise power systems. Further, solar power and other renewable sources will assist in further conserving water in the reservoirs during the day. Long term strategy is to have an energy mix of hydropower, solar, wind, biomass, and thermal technologies because they shall all complement each other. ZESA is considering to incorporate roof-top solar projects to the existing project portfolio. A pilot project is under consideration for implementation at ZESA Head Office in Harare. This includes promotion and introduction net metering system as part of renewable energy penetration. Overall, the two implementing Countries for the project have energy development programs that includes a varied energy source mix that includes solar and hydro power at identified locations.	Project Alternatives
I have been led to understand the recording from yesterday's webinar would be available on your project website, however can't seem to locate it. Please would you kindly advise me on how I might otherwise access as may need to refer to content for tomorrow's "BGHES ESIA Disclosure: Special Interest Focus Group Discussion".	Neil Deacon Ph.D.	Consultant Biologist	03-Dec-20	Email	I am working with our editing team to get the webinar uploaded today, but in the meantime, I have loaded it onto OneDrive and you can access it here: BGHES Disclosure Webinar	Stakeholder Engagement Process
Please could you send me the video link for yesterday's Webinar? I missed about 30 mins of it near the end and so did not hear the answer to one of my questions in the Q&A session. I'd appreciate getting it asap as I'd like to have it before the session tomorrow morning.	Sue Liell-Cock	International Rafting Federation-Secretary General	03-Dec-20	Email	The webinar hasn't been uploaded yet and I am working with our editing team to get it up today. But in the meantime, I have loaded it onto OneDrive and you can access it here: BGHES Disclosure Webinar	Stakeholder Engagement Process
It has come to our attention that you are engaging with all stakeholders that are affected by the building of the Batoka dam up to 11 December. I would like to please ask you to please contact us as we are directly affected by the building of the dam. We, Taita Falcon Lodge, are situated above Rapid 17 and the building of the dam will directly affect us as it will change the view of the Gorge in front of our Lodge drastically and might also affect us geologically once the water comes up and causes rock falls and possible tremors. Issues that needs to be discussed - 1. Will we be compensated for any damage to our property because of any rock falls or tremors in the Gorge once the water moves up into all the cracks.	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	The scheme has been designed as a baseload plant on a runoff river regime with limited capacity for peaking for environment compliance. The reservoir associated with the scheme will be relatively small (over 100 times smaller than the size of the Kariba) and contained within the gorge. The preliminary reservoir slope stability assessment carried out by ZRA's independent Engineering Consultants indicate that the reservoir rim is stable. Further, additional site investigations are currently being carried out by the Developer. Further, it is not expected that the water will significantly rise at your location. Through the on-going public disclosure process, river user concerns are being recorded and incorporated into the ESIA process. As part of the ESIA process, a Resettlement Policy Framework (RPF) was developed. The RPF provides the framework for physical and economic displacement impacts that will be associated with development of Project components. The RPF is operationalized through development of specific Resettlement Action Plans (RAP). RAPs specific to the compensation of river users are yet to be developed, as filling of reservoir will only take place around 2027. The Authority will develop the said RAP's in full consultation with the affected persons and other key governmental and community stakeholders.	Stakeholder Engagement Process
2. How high will the water be rising in the Gorge in front of our Lodge	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	The Maximum full supply level for the scheme is 757m asl, which is still within the Gorge, and about 93m below the highest point at the dam site. With an altitude of about 880m asl at your location, the water level is expected to rise to about 123m below the top surface, which is still confined to the gorge.	Stakeholder Engagement Process
3. As the view in front of our Lodge, the whole ambience as well as ethos of our Lodge will be changing, will we be compensated for new photos, marketing material etc. that will be needed with the "new" view - as it is not a beautiful gorge anymore but something between a dam and a nearly "gorge"? We have no idea what is going to be.	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	Refer to response to question 1	Stakeholder Engagement Process

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
4. As our name suggest -we have from time to time Taita Falcons breading in the Gorge as well Black Eagles, Peregrine Falcons etc. What are the plans to mitigate the affect on all birdlife and game in the Gorge.	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	A reconnaissance survey to assess the status of Taita Falcon was undertaken in the Batoka Gorge by the Wildlife Departments of Zambia and Zimbabwe in 2018. The upper 25 km stretch of the gorge was surveyed for the presence of Taita Falcon; however, a large part of the Batoka Gorge that will be impacted by the BGHES remain unassessed – this limitation was acknowledged in the survey. The impact of creating a reservoir on the Taita Falcon population is unknown, and key baseline gaps in the ecological understanding continue to exist. This said, the ZRA are committed to an action plan that outlines approaches to have species specialists thoroughly assess the entire Batoka Gorge to determine the occurrence and status of Taita Falcons; workshopping with all species specialists to pool available knowledge, raise the level of confidence on potential threats and impacts, and identify if mitigation to address threats is feasible; and develop an appropriate Biodiversity Action Plan to address the risks.	Stakeholder Engagement Process
5. We have a multi day hiking trail for international school groups in the gorge running from Rapid 14 to Rapid 21. This brings us a very good income each year. How are we going to be compensated for the loss of this income?	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	Refer to response to question 1	Stakeholder Engagement Process
6. We are losing our beaches down in the Gorge which we used for picnics and overnights for our clients	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	Refer to response to question 1	Stakeholder Engagement Process
These are but a few of the questions we have that needs to be discussed. We have been asking , for many years now, for someone involved with the building of the dam to come and see us personally without any result. Please make sure to come and see us within your period of engaging with stakeholders. Please let know when this would be possible. We expect a reply from you asap.	Anmarie- (Director and owner of Taita Falcon Lodge)	(Director and owner of Taita Falcon Lodge)	04-Dec-20	Email	If you feel that, following this email and virtual engagement you still require a one on one engagement, efforts will be made for a call or virtual meeting with the ZRA and ERM.	Stakeholder Engagement Process
I was unable to connect to the internet. The challenges we face. I so wanted to be part of this. I had communities and the Councilor come and see me with regards to the development with their concerns and I will listen to the meeting and give you my feed back. Just some concerns raised by the community in the area we work which is from Victoria Falls to past the Batoka Dam site:	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	We are beginning to consolidate comments and responses report for the BGHES ESIA. Please note that responses to your questions will be provided in that report. I also wanted to know if you have any further questions. I will also forward your details to the Zambezi River Authority, as the Project progresses they will be looking for partners to work with to ensure the success of future stakeholder engagement and livelihood restoration programmes. The your questions are addressed below.	Stakeholder Engagement Process
1. Displacement of people in the area	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	No physical resettlement will be required as a result of the inundation of the dam as the water is contained entirely in the gorge, which is deep enough to carry the water capacity. Further, those who will have their livelihoods or structures affected by the staff villages and the access roads will be compensated as per the requirements of IFC Performance Standard 5, that requires people receive the same or superior living/livelihood standards following displacement. Please refer to the Cultural Heritage Study (Annex L and M, the Resettlement Framework Policy (Annex P), the Livelihood Restoration Plan (Annex P) for detailed studies relating to economic and physical displacement	Potential Economic or Physical Displacement
2. What benefits are the community getting and how is this going to be done. For example, we are an organisation that works on the ground with communities so we could very easily facilitate a process.	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	Thank you for your offer to support the project tin community development. The Project will include Community Development Project during operations, and there may be potential to assist schools and hospitals with viable and sustainable power solutions through these projects. A Community Development Framework has been prepared for the Project, and more detailed community development plans, which could include school electrification, irrigation schemes, improved infrastructure for clinics etc., will be prepared in consultation with communities as the project transitions from construction to operations.	Community Development and Benefits
3. What Community based programs are happening?	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	Physical infrastructure will be developed as part of the Project that may benefit the local communities. This could include the access roads and social infrastructure in the permanent staff townships. The Authority is seeking to have a positive impact on the communities in the project area of influence. The ESIA is key in this intention, helping to identify the potential benefits that may result from the Project and has developed measures that can be put in place to help enhance such benefits. The Authority has developed a community outreach framework for the Project that identifies community needs in the Project and provides a framework for supporting community outreach. As the Project moves into the construction phase, this framework will be further developed into a detailed Community Outreach Plan in consultation with affected communities. The Outreach Programme will then be implemented by the Authority.	Community Development and Benefits
4. What is going to happen with the road. When the road is tarred it is going to bring about a lot of accidents. The community utilise the main road using donkeys what is going to happen to this. We have a large programme in the area with bicycles and children and now communities have bicycles who use the road. What is going to happen to this. We have a large programme in the area with bicycles and children and now communities have bicycles who use the road. What is going to happen to this.	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	As per the ESIA, impacts relating to traffic will be managed in the following ways: • Alignment of roads to avoid homesteads and schools. • Development of a Traffic Management Method Statement covering vehicle safety, driver and passenger behavior, use of drugs and alcohol, hours of operation, rest periods and accident reporting and investigations etc. • Enforcement of rules on speed limits and road usage for all company vehicles and contractor vehicles using access roads. Any violators may be subject to dismissal. Tracking technology (GPS, speed-logging equipment, etc.) will be installed to review driver performance, and to identify drivers with a history of unsafe behavior. • Implement the Grievance Redress Mechanism. Implement and disseminate information regarding the grievance redress mechanism that has been developed for the Project (refer to Annex E of the ESIA report). Stakeholders will be made aware of the key guiding principles of the mechanism, as well as how and where they can submit any grievances. Any individuals affected by safety hazards associated with Project related traffic will be able to lodge grievances using this grievance redress mechanism.	ESIA Process, Project Description and Mitigation
5. Real engagement with the community has not happened. Possibly the engagement has happened at leadership level such as with the Chiefs but often this does not filter down to the communities who are the ones going to be impacted.	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process are documented in Chapter 7 of the ESIA. ERM recognize that in-person engagement for the disclosure of the BGHES ESIA would have been preferable, as was our intention in March and April 2020. We altered our approach to engagement due to the unprecedented circumstances associated with COVID-19 pandemic. In planning engagement activities for the ESIA Disclosure, ERM drew on guidance from the Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context Of Covid-19 (2020), we consulted with National Environmental Authorities (EMA and ZEMA), consulted with a number of stakeholders from national to local authorities and other stakeholders on our database, and prepared an engagement program that would be suitable under the restrictions of the COVID-19 pandemic. As part of the ESIA disclosure phase the following has been undertaken: • ERM and the ZRA hosted four separate webinars. • ZRA together with our local ESIA partners undertook limited in-person meetings with District and traditional authorities/ leaders in small groups of no more than 15 people – in line with COVID precautions. • ERM and the ZRA presented six radio broadcasts on local radio stations (in local languages) to further share EISA findings with communities in the Project Area. Listeners were able to submit questions via phone and WhatsApp. A Stakeholder Engagement Plan, Annex B of the ESIA, has been prepared for the Project. This provides an approach for ongoing stakeholder engagement with communities in the Project Area. Further stakeholder engagement will also take place as the Project moves forward with Livelihood Restoration Planning associated with economic displacement as a result of the Project.	Stakeholder Engagement Process
We suggest that a side road be done for donkeys and movement of cattle and people. Training needs to be done to all the school children along the road who utilise the road. We do not want the children to have accidents. The road is a concern as it passes right through the middle of community.	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	In Zimbabwe the ESIA recommended against developing the proposed Victoria Falls - Jabula School Trunk B. This road would pass through the grounds of Jabula School and thus the likelihood of collisions between children and vehicles would be greater. Communities use the area for grazing of livestock thus vehicle collisions with animals could also occur. In Zambia, a similar recommendation is made concerning road access in relation to Mukuni village. Upgrading an existing path which circumvents Mukuni, rather than passes directly through the village is recommended. Additionally, A programme of stakeholder engagement with communities (in particular schools), including those located in close proximity to access roads prior to the commencement of construction activities in their area will be undertaken. At engagements, road safety, potential impacts and risks and Project-related road usage will be discussed.	ESIA Process, Project Description and Mitigation
We have a community centre that is in the rural area based within the impact area of the project and we are very happy to work with you on any implementation plans that will take place.	Charlene Hewat	Passionate about Conservation & Communities, Victoria Falls	08-Dec-20	Email	Thank you for this, it is noted by the Authority	Stakeholder Engagement Process
What are the possibilities of lowering peak flow levels of dam in the dry season from August through to Jan so we're able to rafting to no.19 so at last we're able to a Full day? This will be essential for seasonal variability as non of the operators will survive with 136 days on a half day Rafting. At least we could operate a full day and be partly viable. What would the dam level need to be dropped in order for rafting to achieve this?	Clive Bradford	Southern Waters, Cape Town	08-Dec-20	Email	The dam impoundment area was initially proposed to inundate rapids from the dam wall to middle of 3rd Gorge, with discernible increase in water levels and reduction in flow velocities extending (but incrementally reducing) as far as 2nd Gorge; however, based on outcomes of the ESIA and associated studies (and engagement with the Authority and Project Engineers) and initial engagement with stakeholders, this is now being revised. With a new revised FSL of 757 masl, inundation will be from the dam wall to the top of the 4th Gorge, with discernible increase in water levels and reduction in flow velocities extending (but incrementally reducing) into 4th Gorge. However, with the proposed FSL being reduced to 730 masl in the dry season (in rafting terms, from August to January), inundation will be from the dam wall to the top of Songwe Gorge, with discernible increase in water levels and reduction in flow velocities extending (but incrementally reducing) into 5th Gorge, around Rapid 9/10. Operating below 730masl is not viable for the scheme.	ESIA Process, Project Description and Mitigation
1. I see that there are still two level options in the planning these will bring water levels to exactly how far from the Face of the Falls – A by river and B by line of site	Robin Brown, Victoria Falls		02-Dec-20	Email	the FSL is 757masl and the there will not be any effect on Victoria falls . Victoria Falls to tail water at 757masl is at rapid 4 & 5 (extent of the river to be affected is approximately 46km leaving 2.7km from the face of the falls to the tail waters of BGHES Dam) and at 730masl at rapid 8 (extent of the river to be affected is 43km leaving 5.7km from the face of the falls to the tail waters of BGHES Dam). The backwaters will therefore not affect Victoria falls.	ESIA Process, Project Description and Mitigation
2. Will the level be more or less constant or will the level be fluctuating within a short period of time – this would obviously effect the viability of the nature trying to live in this band between peak and low flow in the short fluctuation period.	Robin Brown, Victoria Falls		02-Dec-20	Email	The BGHES will be operated as a run off river as such not much fluctuation is expected during normal operation within a season. However, seasonal fluctuation will be experienced as a variable operating regime will be adopted whereby during the wet months the FSL will be 757masl and during dry months it will be 730masl. Small reduction in the habitat reduction/lost, with approximately 3km of the upper reaches of the riparian vegetation preserved; there is a possibility of an increase of shallow-water fish species.	Potential Effects on Biodiversity
3. Have we got written input from the UNESCO as to whether the proposed levels and resulting proximity of the stagnant water to the Falls and within the Park could result in the loss of World Heritage status or reduce the chance of the Falls remaining as one of the seven natural wonders of the world according to their levels of status allocation.	Robin Brown, Victoria Falls		02-Dec-20	Email	Please note that based on revisions made to the Project design, inundation will not actually reach the Victoria Falls. Inundation will be from the dam wall to the top of the 4th Gorge, with discernible increase in water levels and reduction in flow velocities extending (but incrementally reducing) into 4th Gorge during the wet season and into 5th Gorge during dry season. UNESCO are aware of the Project and associated ESIA and they have confirmed that the State Parties are responsible for submitting the ESIA for review. In aligning with existing protocol, the Zambezi River Authority is engaging the State Parties to ensure the ESIAs are provided to and reviewed by UNESCO.	Stakeholder Engagement Process
There are many, many financial reasons why this dam project makes no sense. A tremendous amount of destruction will result, the dam is likely to start falling apart by the time it is 50 years old and the likely negative fallout of disease, flooding and an unrealistic burden for the future will result. This is not a time in our history as a people, to take action based on assumptions that appeared to be right 100 years ago. It is a time to re-assess, learn from what we know now and take action based on a renewed understanding of the value of nature with which we are all interdependent. To base this level of action on unexamined assumptions is irresponsible and destructive. And dare I mention the inherent value of a river system such as Batoka Gorge for so many vital reasons. There are better ways to look at the issue of electricity than this one. I am horrified that a large agency like the ESIA can still be so far behind what the public knows and what any individual involved probably knows too about how we see our habitat and how we must change, listen to direct evidence and adapt to reality.	Ruth Danziger		25-Nov-20	Email	The Rational for the Project is presented in Chapter 3 of the ESIA. Investment in energy is a prerequisite to achieving commercial and industrial development in Zambia and Zimbabwe. The use of solar power is favourable in providing rural and urban areas with access to power; however, if both countries are to achieve those targets and goals detailed in their Vision 2030 and Vision 2040, and other complimentary plans (such as the System Development Plans), these countries will require private sector investment in energy technology that is efficient, sustainable and reliable. The generation of energy through hydropower is a proven technology that is sustainable and which is actively being promoted at a national level in both Zambia and Zimbabwe. The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
Sorry I can't find the presentation. Please can you share the presentation used in the 09:30 focus group webinar?, I also did request to see the list of stakeholders that were invited to the webinar. Tori said she would share that as well.	Paula Vrdoljak	Lower Zambezi Tourism Association	04-Dec-20	Email	The presentations will be uploaded to the project website, but I understand they are not there as of today, so I have attached a copy. Below please find a list of webinar attendees from Friday morning's focus group discussion* (*List can be found in Annex C6.4)	Stakeholder Engagement Process
I am from the Lower Zambezi Tourism Association, although it would be very misleading for you to name us as a consulted stakeholder. I joined that webinar after it already started because I was sent a link on social media by a concerned citizen who felt that the process was not inclusive and was trying to get people to take part. I have checked with the various committees and noted that Tourism Council of Zambia and Ecotourism Association of Zambia were not invited to this webinar nor included as stakeholders in your stakeholder discussions in deciding the impact of this project. Also noted that the list below is not a list of invited stakeholders, which was what I requested, but rather a list of attendees to this webinar. I can see at least 10 names, like myself, that joined the webinar because they were made aware of it by concerned citizens on social media and not by your organization, they, therefore cannot be considered "consulted or invited stakeholders" either.	Paula Vrdoljak	Lower Zambezi Tourism Association	08-Dec-20	Email	The purpose of the Stakeholder Database is to serve as a list of stakeholders to whom we provide communications and updates about the ESIA process. It will be included as an Annex to the ESIA, however, we do not include any contact details, in line with national regulations. If you are not comfortable being included, I do not have to add your name and details, please let me know your preference. With regard to invitees for the focus group discussion, we intentionally invited a small, very specific, group of about 40 stakeholders who were associated with companies directly linked to stretch of the Zambezi between the base of the falls and the proposed dam site, such as whitewater outfitters and jet-boat operators, to participate in the webinar so that we could share more information about the ESIA specialist studies, potential displacement, hear comments and concerns, and provide responses. We note that Tourism Council of Zambia and Ecotourism Association of Zambia were not on our stakeholder database. Throughout the ESIA process, have made concerted efforts to identify and include stakeholders, and the process is ongoing. The ESIA comment period remains open until 25 January 2021, please refer to Project website https://www.erm.com/bghes-esia to access the ESIAs and non-technical summaries, presentations and recordings from the webinars, and please do submit any further comments and concerns to us.	Stakeholder Engagement Process
The list of stakeholders I would like you to share, please, is the list of organizations who were originally invited to attend these focus group discussions by your organization. I'm sure your exhaustive and inclusive stakeholder engagements would have included more stakeholders than those listed below. In short, a list of webinar attendees is not a list of invited stakeholders, when many of the attendees who logged in weren't actually invited by the hosts.	Paula Vrdoljak	Lower Zambezi Tourism Association	08-Dec-20	Email	With regard to invitees for the focus group discussion, we intentionally invited a small, very specific, group of about 40 stakeholders who were associated with companies directly linked to stretch of the Zambezi between the base of the falls and the proposed dam site, such as whitewater outfitters and jet-boat operators, to participate in the webinar so that we could share more information about the ESIA specialist studies, potential displacement, hear comments and concerns, and provide responses.	Stakeholder Engagement Process
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Scott Tiley	PRG	25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are	Scott Tiley	PRG	25-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Scott Tiley	PRG	25-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Scott Tiley	PRG	25-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Tamara Keays		25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. 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6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Tamara Keays		25-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Ashley Mead	Consultant	25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Ashley Mead	Consultant	25-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Ashley Mead	Consultant	25-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Ashley Mead	Consultant	25-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Ashley Mead	Consultant	25-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Ashley Mead	Consultant	25-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Alison Orr	Chundukwa River Lodge ,Simalaha Horse Safaris Livingstone, Zambia	25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process

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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Alison Orr	Chundukwa River Lodge ,Simalaha Horse Safaris Livingstone, Zambia	25-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Alison Orr	Chundukwa River Lodge ,Simalaha Horse Safaris Livingstone, Zambia	25-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Alison Orr	Chundukwa River Lodge ,Simalaha Horse Safaris Livingstone, Zambia	25-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Alison Orr	Chundukwa River Lodge ,Simalaha Horse Safaris Livingstone, Zambia	25-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Amy Baumhoff	BSC Conservation Biology and Geography	25-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Amy Baumhoff	BSC Conservation Biology and Geography	25-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Amy Baumhoff	BSC Conservation Biology and Geography	25-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. 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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. 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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Trevor Fordyce		24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. 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This applies equally to the communities who consider the Gorge culturally significant.	Trevor Fordyce		24-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. 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Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Trevor Fordyce		24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Trevor Fordyce		24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Trevor Fordyce		24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Trevor Fordyce		24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Grace Drummond		24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Grace Drummond		24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Grace Drummond		24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Grace Drummond		24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Brayden Raw		24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Brayden Raw		24-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Brayden Raw		24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
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6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Brayden Raw		24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Christina		24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. 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This applies equally to the communities who consider the Gorge culturally significant.	Christina		24-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Christina		24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Christina		24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Christina		24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Christina		24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
I am writing to you as I am gravely concerned at the impacts this planned dam will have on a local and global scale. On a personal level this is a part of the world I have been dreaming of visiting and if this dam goes ahead you will be denying me and so many others like me the chance to experience this beautiful river.	Greg Healy				Your objection is acknowledged. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project and monitored by both the ZRA and relevant environmental authorities.	
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Greg Healy		24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Greg Healy		24-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process

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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Greg Healy		24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Greg Healy		24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Greg Healy		24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Greg Healy		24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Greg Healy	• BSC Conservation Biology and Geography • Adventure Gravity	24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Greg Healy	• BSC Conservation Biology and Geography • Adventure Gravity	24-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Greg Healy	• BSC Conservation Biology and Geography • Adventure Gravity	24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Greg Healy	• BSC Conservation Biology and Geography • Adventure Gravity	24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Greg Healy	• BSC Conservation Biology and Geography • Adventure Gravity	24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Greg Healy	• BSC Conservation Biology and Geography • Adventure Gravity	24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Matej Sottner		24-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Matej Sottner		24-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. 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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Matej Sottner		24-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Matej Sottner		24-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Matej Sottner		24-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Matthew clarkson	Save the Zambezi	23-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Matthew clarkson	Save the Zambezi	23-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process

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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Matthew clarkson	Save the Zambezi	23-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. 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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	James Griesedieck		23-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	James Griesedieck		23-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	James Griesedieck		23-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	James Griesedieck		23-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	James Griesedieck		23-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Richard Maggs		23-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. 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Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). 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If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Richard Maggs		23-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Richard Maggs		23-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Richard Maggs		23-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62·67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Heather Buckingham	Outdoor Education Teacher Vancouver Island, BC, Canada	23-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process
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This applies equally to the communities who consider the Gorge culturally significant.	Heather Buckingham	Outdoor Education Teacher Vancouver Island, BC, Canada	23-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process

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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Heather Buckingham	Outdoor Education Teacher Vancouver Island, BC, Canada	23-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Heather Buckingham	Outdoor Education Teacher Vancouver Island, BC, Canada	23-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
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Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Garrett Quinn	Teacher, British Columbia, Canada	23-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricty generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Garrett Quinn	Teacher, British Columbia, Canada	23-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Garrett Quinn	Teacher, British Columbia, Canada	23-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Garrett Quinn	Teacher, British Columbia, Canada	23-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation

Comment/Question	Commentator	Organization	Date	Source	Response	Topic
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Aidan Fulcher		23-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	Stakeholder Engagement Process
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Aidan Fulcher		23-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	Stakeholder Engagement Process
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Aidan Fulcher		23-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Aidan Fulcher		23-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Aidan Fulcher		23-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Aidan Fulcher		23-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Richard Addison		23-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. 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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Richard Addison		23-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	Project Alternatives
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Richard Addison		23-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	Potential Effects of Climate Change on the Project
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Richard Addison		23-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	Potential Effects on Biodiversity
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Richard Addison		23-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Lindsey Davis		22-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Lindsey Davis		22-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Lindsey Davis		22-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	

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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. 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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Courtney Burton		22-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	
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This applies equally to the communities who consider the Gorge culturally significant.	Courtney Burton		22-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Courtney Burton		22-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). 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If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	

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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Richard Andrews		22-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. 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Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	

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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Richard Andrews		22-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Sam Helliwell		22-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Sam Helliwell		22-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. 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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Eric David		22-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. 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Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. 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More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Eric David		22-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Eric David		22-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Eric David		22-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Makenna Cavarzan		22-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Makenna Cavarzan		22-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Makenna Cavarzan		22-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Piers Oliphant		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. 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The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Piers Oliphant		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Piers Oliphant		21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). 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More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Piers Oliphant		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Piers Oliphant		21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Piers Oliphant		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Timothy K. Phiri		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Timothy K. Phiri		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. 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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Matthew Lotz		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. 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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Matthew Lotz		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Matthew Lotz		21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Matthew Lotz		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	

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If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Matthew Lotz		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Matthew Lotz		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Loretta Archer		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. 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This applies equally to the communities who consider the Gorge culturally significant.	Loretta Archer		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	

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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Loretta Archer		21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). 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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Loretta Archer		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Loretta Archer		21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Loretta Archer		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	

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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Ian Perks		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Ian Perks		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. 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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Kate Hughes		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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This applies equally to the communities who consider the Gorge culturally significant.	Kate Hughes		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	

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3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Kate Hughes		21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Kate Hughes		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Kate Hughes		21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Kate Hughes		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
I had the luck to visit the Zambezi nearly 20 years ago and I still remeber what an amazing feeling that was, therefore I have to object against the Batoka Dam which would change this river forever.	Marc Joeris		21-Jan-21	Email	Your objection is acknowledged. The effects that Project may have on the biophysical and social environment have been considered through a number of specialists studies undertaken by ERM as part of the ESIAs, including a biodiversity study, avifauna study, socio-economic study, and tourism study. The potential impacts are presented in Chapters 10 and 11 of the ESIAs, while cumulative impacts are addressed in Chapter 12. A key outcome of the ESIA process is the preparation of Environmental and Social Management Plans for Construction and Operation that will be implemented by the Project and monitored by both the ZRA and relevant environmental authorities.	ESIA Process, Project Description and Mitigation
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Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Marc Joeris		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Marc Joeris		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	

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1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Gareth Lake	AMIChemE	21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	
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This applies equally to the communities who consider the Gorge culturally significant.	Gareth Lake	AMIChemE	21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Gareth Lake	AMIChemE	21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). 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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Sophie Portier		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. 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Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	

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More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Sophie Portier		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Sophie Portier		21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Sophie Portier		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Thomas Smith		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the EISA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Thomas Smith		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. 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Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). 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If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Thomas Smith		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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(please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Yango James John	Save the Zambezi	21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	
2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Yango James John	Save the Zambezi	21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Yango James John	Save the Zambezi	21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Yango James John	Save the Zambezi	21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Yango James John	Save the Zambezi	21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Yango James John	Save the Zambezi	21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
I'm writing to you from New Zealand As a raft guide, kayaker, conservationist and someone who cares. I've never been to the Zambezi river but I have heard so much about it from friends, I'd like to go there and experience the people, the place and the river. All of which will be lost if you dam the river. There will be no international tourism, no money coming in from outside. I know right now covid has ruined tourism but it will be back. All of my reasons are selfish, but you have to think about all of the people and communities, YOUR people who will be absolutely fucked if you dam the Zambezi. The value of your people, culture and the landscape is far higher than whatever economic gains you will have from a dam.	Greg Lee		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	ESIA Process, Project Description and Mitigation
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That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Greg Lee		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
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PEOPLE IN ZIMBABWE AND ZAMBIA ARE NOT AWARE OF THE IMPACTS THE PROJECT IS GOING TO HAVE ON THEIR LIVES. MOST ARE TOO BUSY TRYING TO JUST SURVIVE. So let me speak up on their behalf: 1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Usch Pilz		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. 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These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	

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2. Economic Impact study is flawed; a. Impact on the rafting sector is classed as 'moderate' after mitigation. The mitigation measures suggested are not based on any market research or undertakings by the developer. They are completely untested and are therefore unlikely to fill the gap caused by the construction of the dam. Similar products (sunset cruises) already exist above the falls, so the market is probably already saturated. The steep sided lake produced by the dam is not conducive to the construction of lodges or campsites. The classification of 'medium' is therefore inaccurate and should remain at "High". b. Questions were raised during the stakeholder engagement around the accuracy of the calculations. The revised calculations have not yet been provided and should be included in the SEIA and circulated to all stakeholders. c. Impact on accommodation overlooking the Gorge is classified as 'moderate' after mitigation. The mitigation measures are again, completely untested and not based on any market research. There is no indication that guests would be interested in staying at a lodge overlooking an artificial lake with few fish, unattractive banks with dead vegetation caused by fluctuating water levels and much reduced bird life and biodiversity. This classification should remain "High", even after mitigation. This applies equally to the residual impacts. d. In addition to the direct economic impacts, there needs to be compensation provided for the spiritual and emotional impacts of destroying this habitat. The owners of these lodges and rafting operations chose these businesses for many reasons – making a living is just one of these reasons. They will need to be compensated for the trauma not only of losing their livelihoods and those of their employees and others in the tourism ecosystem, but also for the trauma of witnessing the destruction of am irreplaceable natural resource. This applies equally to the communities who consider the Gorge culturally significant.	Usch Pilz		21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. Given the position of the lodges being towards the 'tail-end' of the Dam with inundation levels remaining relatively low at these parts of the gorge it is expected that the views will not be lost completely and that the quality of the accommodation will continue to attract visitors. As such, the impact post-mitigation remains as MODERATE. However, as stated in the ESIA we recommend monitoring tourist numbers over time and ensuring adequate compensation as necessary if revenues decrease. d) The loss of sense of place and impacts to broader society (option and existence value) would be very significant and invaluable. It is almost impossible to estimate this value, and these concerns are noted in the Tourism assessment as follows: "Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES". "Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
3. Alternatives to the dam have not been adequately studied. Given the global climate and ecological crisis, any project as damaging as the Batoka Dam project, which has permanent and irreversible negative impacts on an area of extreme biodiversity value, as well as major socio-economic impacts, can only go ahead if there is no other option. In this case, potential alternative options have not been adequately considered. Technology is developing rapidly and many newer technologies have not been considered by the government of Zimbabwe and Zambia at all. The ESIA does not even mention which alternatives were considered or how recently. A specialist and regionally integrated power planning study needs to be done to ascertain if this dam really is the best option, especially given the result of the Climate Risk Review.	Usch Pilz		21-Jan-21	Email	The ESIA report includes a standalone chapter (Chapter 6), which presents an analysis of Project alternatives. More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
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Given the above, we believe that the project should be put on hold until the pandemic has passed.	Juanette Cremin	La Grande, Oregon U.S.A.	21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. 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This applies equally to the communities who consider the Gorge culturally significant.	Juanette Cremin	La Grande, Oregon U.S.A.	21-Jan-21	Email	The economic assessment is based on data collected directly from tourism businesses in Victoria Falls and Livingstone through detailed face-to-face interviews. While not all businesses could be interviewed, all of the white-water rafting businesses were, and they provided detailed data on their business operations as well as extensive information on the rafting industry. Every effort was made to ensure that the data collected was comprehensive and representative. Responses to your questions are provided below. a) Based on feedback received during ESIA Disclosure, the economic impact and displacement of river-based tourism activities has been amended and remains as a MAJOR impact post-mitigation (the scale of the impact remains large), given that mitigation options are very limited and the loss of full day rafting will result in significant job losses, decreased revenues and a multitude of knock-on impacts to local tourism and associated industries. b) These calculations were based on information shared by the WWR businesses on the number of trips sold during the low-water season and also on whether they thought they would be able to continue selling and operating half day trips. However, we recognise that the assumptions around how rafting would change under the proposed BGHES scenario were optimistic. Therefore, we have amended the ESIA and have provided a range to indicate the lower and upper bounds of this, to show that the loss in revenue could be as low as the lower bound or as high as the upper bound. The lower bound equates to the loss of two thirds of revenue as a result of the loss of full day trips. We have requested that these changes be made to the ESIA accordingly. "Using the proportion of activity sales during the low-water season provided by businesses, Victoria Falls and Livingstone WWR businesses would likely receive between 32.5-62.5% of the average annual number of rafters, with the total value generated by rafting declining by between 37.5% and 67.6%." c) The rating of the impact on accommodation establishments over looking the Gorge is difficult as there is no way of knowing how changes in the view will impact on whether tourists choose to stay at the lodge. 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Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	
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More specifically, Section 6.2.1 of this Chapter provides a comparative analysis of hydropower as the preferred renewable alternative versus alternative power options. Apart from thermal coal, which has a generation cost significantly higher than that of the proposed Batoka Gorge Hydro-electric Scheme (BGHES) (and which is not favorable from a climate change perspective, nor from a myriad of other environmental impacts such as acid leachate generation, coal dust etc.), other generation alternatives considered as part of the ESIA process include the use of wind and solar power. With regards to wind, Zimbabwean meteorological records show that wind power in some areas would be feasible for isolated local / small scale uses, but by in large, winds are irregular, both by season and by area, and vary widely diurnally. In Zambia, wind energy potential is lower. Wind data collected has demonstrated that average wind regimes are below 2.5 m/s, which is not suitable for electricity generation. That said, there is a specific area in the Western Province of Zambia where wind speeds are said to be as high as 6 m/s. The Zambian Department of Energy is currently exploring the potential for wind power in this area. Another point to note is that, currently, wind energy cannot produce anywhere near 2,400MW. (One of the biggest wind farms currently on the African continent produces ~310 MW). In reality, to meet 2030 development goals, Zambia and Zimbabwe need wind, solar and hydropower in their energy mix. With regards to solar, Zimbabwe has enormous solar energy potential, and there has been an increasing interest from IPPs to invest in solar power. Moreover, it is acknowledged that the capital cost per kWh for solar PV has decreased by 82% between 2010 and 2019, with a capital cost of USD 0.068 / kWh in 2019 (compared to USD 0.045 / kWh for hydropower projects) (IRENA, 2019). Although the capital cost of solar PV has decreased significantly since 2010, it is still ~33% more expensive than hydropower. In both countries, the solar PV market is currently dominated by small scale donor funded projects, Government, NGOs and mission institutions for schools, clinics, related staff housing and water supply. Solar projects too, cannot produce anywhere near what hydropower is capable of generating, and the BGHES in particular; a large solar farm is able to produce up to 80MW of electricity. Further the land take associated with commercial solar power facilities ranges between 5 and 10 acres of flat land per MW (excluding transmissions lines). Using a conservative estimate of 5 acres per MW, the land take required for a solar facility that matches the output of the BGHES would be 12,000 acres of land, or an area approximately the size of Livingstone, which would be transformed from whatever current state (natural vegetation, grazing land, crops) to make way for the installation of solar panels. The power deficit in the Southern African Power Pool (SAPP) is such that generation from wind and solar alone would not be feasible. The proposed BGHES will generate 2,400MW. As a way of comparison the largest wind and solar PV projects in Africa include Lake Turkana Wind Power Project in Kenya & Grand Bara Solar Power Project in Djibouti. These Projects each generate approximately 300MW – i.e. – 13% of the capacity that BGHES is proposed to generate. According to the South Africa Department of Energy (2019), South Africa alone needs over 40,000 MW of new generation capacity by 2025. If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	

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4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Juanette Cremin	La Grande, Oregon U.S.A.	21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Juanette Cremin	La Grande, Oregon U.S.A.	21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Juanette Cremin	La Grande, Oregon U.S.A.	21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
1. Public Participation process is inadequate and unacceptable: A project 62:67of this nature, impacting as it does on rural and under resourced communities, needs to be have a lot more depth than the 'tick the boxes' exercise that you have undertaken. It does not meet the requirements of "free, prior and informed consent" as set out by the OHCHR - the https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf. (please see document 4) • There is no indication that the community structures you consulted have passed the information on to the people on the ground • The information provided is too technical for much of the target audience • There is not enough information on viable and less damaging alternative such as river turbines, combined with solar etc. • Based on our interactions with people in the adventure tourism community, they feel that they have not been made aware enough of the project or that they have the right to reject it • Based on documented human rights abuses, particularly in Zimbabwe, by the Zimbabwean authorities, we do not believe that 'free' consent is even possible. • The region, particularly Zimbabwe, is currently enduring a serious and devastating resurgence of Covid19 and no further consultations or decision should be made until the situation is back under control and the pandemic is over. Given the above, we believe that the project should be put on hold until the pandemic has passed.	Josef I. Stocker		21-Jan-21	Email	A record of the stakeholder engagement activities undertaken as part of the ESIA process is documented in Chapter 7 of the ESIA. In planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by Zambia and Zimbabwe Legislation, and the IFC Performance Standards. As a result of the COVID-19 pandemic, the IFC released Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19, which ERM has applied since the emergence of the pandemic in sub-Saharan Africa in the first quarter of 2020. Free Prior and Informed Consent (FPIC) as per the IFC and the OHCHR as referenced here is a unique mechanism applicable to those stakeholders who are classified as indigenous peoples and does not apply to communities or ethnicities at large. As per the International Finance Corporation and World Bank definition, indigenous peoples are defined as "a distinct social and cultural group processing the following characteristics in varying degrees: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and • An indigenous language, often different from the official language of the country or region". Based on the definition above, there are no indigenous groups native to or know to be present in the Project area. As such, FPIC is not applicable to this Project. ERM did not only rely on consultation with community structures to disseminate Project information and disclosure ESIA findings. The following has been undertaken and is described in further detail in Chapter 7 of the ESIA: • Prior to the outbreak of COVID-19, ERMs in country sub-consultants placed copies of the Draft ESIA Reports and Non-Technical Summaries at central localities within the Project Area (see Chapter 7 for locations). • ERM's in-country partners distributed comment sheets to affected communities so that information reached as many stakeholders as possible and that they were able to comment on the Project. By sharing the contact details (particularly in country consultant and the ERM phone numbers with community leaders and community members) we have been able to receive and respond to community stakeholders despite constraints presented by the COVID-19 pandemic. • ERM and the ZRA presented six radio broadcasts on local radio stations, targeted at listeners in the Project Area, between 14 and 18th December 2020. Broadcasts were undertaken in the local languages, including Tonga, Nyanja, Ndebele and English. Listeners were encouraged to call in and ask their questions live, or via text and WhatsApp services. The project website, project email address, phone numbers were provided to listeners to comment after the broadcasts. • A newspaper advertisement was placed in the Sunday Mail (13 December 2020) and the Daily Nation (Sunday 6 December 2020) detailing where the Draft ESIAs and Non-Technical Summaries could be accessed, contact details of ERM and local partners for registering comments as well as the closure of the commenting period on the 25th of January 2021. Non-Technical Summaries have been written in non-scientific language, to allow readers to understand and then share that understanding of the project and its associated impacts easily. These were available as per the table above and on the ERM Project Website: www.erm.com/BGHES-ESIA As noted above, in planning and executing stakeholder engagement activities for the BGHES ESIA, ERM has been guided by National Legislation, and the IFC Performance Standards – which require that ESIA process include Informed Consultation and Participation (ICP), not Free, Prior and Informed Consent (FPIC). Throughout the ESIA, stakeholders have been made aware of their right to comment on the Project and the ESIA (from 2014 to 2021), ask questions and raise concerns. Further, ERM has sought two-way consultation in all engagements, even during the alternative engagement activities undertaken during the COVID-19 pandemic. While we are confident that our process has been inclusive and culturally appropriate, we recognise that there may	
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Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all". "At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by	

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If you combine this with the needs of the remaining countries in the SAPP, it is clear that large scale renewable projects such as the BGHES are warranted. The increased use of solar power specifically in both Zimbabwe and Zambia, and to a lesser extent wind, should be explored; however, this should be done in addition to hydropower. Implementation of wind and solar PV projects alone would not meet the current SAPP generation gap. In addition, these projects all contribute to lessening South Africa's (in particular) over-reliance on coal fired power plants (which presently contributes over 93% of the generation capacity in South Africa currently).	
4. The Climate Risk Review indicates that this project should not go ahead. Given the finding of the Climate Change Risk review – that the Zambezi River Valley is classified as 'worst' in terms of climate change impacts and that increased variability of rainfall, increased drought and increasing dryness overall are likely, this project should not go ahead, given the destruction that it will cause to biodiversity, livelihoods etc. balanced against the possibility that the entire project will be non-viable.	Josef I. Stocker		21-Jan-21	Email	Regarding the Climate Risk Review, results of the analysis indicate that the basin yield from the Batoka catchment could fall by between 0.9% and 3.5% per decade in the next 40 to 50 years. This is driven largely by a predicted decline in precipitation in the river basin (coupled with increased temperature and evaporation losses). Moreover, the analysis also predicts a shortening of the rainfall season, including a reduction in rainfall during the peak months and a consequent delay in the onset of the peak flood season each year. Having an installed power of 2,400MW, according to Studio Pietrangeli (the Project Feasibility Engineers) (2018) around 23% of the flows would be lost for spillages during the wet season. The reduction of peak flows, caused by climate change, during the wet season would therefore reduce these spilled flows, not affecting the power production. As such, and according to SP (2018), even adopting the worst-case scenario for climate change, the reduction of energy production, and hence the feasibility of the scheme, during the operational life of the plant would be small (a few percentage points only) and would not alter the findings of the optimum installed power analysis. In addition, other potential impacts of climate change on the Project could include an increase in extreme flood peaks due to higher rainfall intensities in the upper catchment, and an associated enhanced sediment runoff from the river basin into the reservoir. However, none of the literature reviewed for the study has specifically predicted or quantified these effects for the Upper Zambezi, and it is likely that they would be significantly dampened by the regulating effect of the Barotse Plain and Chobe Swamps that drain the main sub-basins in the upper catchment. The climate change study also benefited from close to 100 years of river flow data, which has helped to reduce any reliance on stochastic data (often used in these studies) and increases the confidence in the predictions of the feasibility of the scheme under different climate induced flow alterations.	
5. Biodiversity impacts have not yet been adequately studied. The gaps in the knowledge base around the true impacts on the biodiversity of the area have been acknowledged in the ESIA, particularly for birds and fish species and their role in the local and regional ecosystem. Until this has been studied properly, it is impossible to make any decision about the true impact the destruction of this biodiversity will have, nor how to offset this loss (or if it is even possible.)	Josef I. Stocker		21-Jan-21	Email	The ESIA presents an objective and independent assessment of the impact of the development of the proposed hydropower scheme. In this assessment the ESIA does highlight data gaps in the ecological knowledge that need to be addressed, and the client has committed to address these.	
6. The Existence and Option costs are globally significant and unacceptably high. This gorge is one of our planet's irreplaceable treasures and its destruction should not be allowed. Instead, it should be protected for future generations and for the health of our planet.	Josef I. Stocker		21-Jan-21	Email	The ESIAs for the BGHES identify and assess the potential adverse and positive impacts associated the Project. In both Zambia and Zimbabwe, a number of new power generation options are either being planned or commissioned. The proposed BGHES would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives. The proposed BGHES does also come at a potential cost, with impacts to both the regional and local economic, social and biophysical environments, as elaborated in the ESIA report. Mitigation measures that align to Good International Industry Practice (GIIP) have identified through the ESIA process and have been incorporated into an ESMP that will be implemented by the Project. It is noted that some impacts cannot be mitigated and these have been identified in our ESIAs to have a post-mitigation significance rating of MAJOR Negative, including: • Direct Loss of Habitat through Filling of the Reservoir and Development of Infrastructure during Construction and Operation • Economic Impact and Displacement of River Based Tourism Activities during Operation • Economic Impact and Displacement of Non-river Based Tourism Activities during Operation • Impacts associated with Greenhouse Gas Emissions during Construction and Operation The importance of the BGHES to the economies and growth of both Zambia and Zimbabwe is recognised; however, the significant challenges with balancing the needs of environmental protection with the economic and developmental needs of both countries are also recognised. In the conclusion of the ESIA, ERM recommends that the decision makers consider both the benefits and the sensitivities associated with the BGHES, so that an informed decision is made in this regard.	
ESIA Disclosure: Comments from Radio Broadcasts						
Namianga FM 15/12/2020- Zambia 7pm						
Are you going to employ builders? When are you going to start accepting applications for jobs?			15-Dec-20	Namianga Radio FM-Zambia	Yes. There are vacancies for builders. We have engaged a contractor who has been advised to ensure that priority be granted to locals on merit. Pre-commencement activities have started at the proposed dam site and am sure the contractor has started engaging the needed manpower for now.	
What type of builders are you going to be employing	Innocent		15-Dec-20	Namianga Radio FM-Zambia	Builders will be employed depending on the need. The contractor will ensure that the right builders are employed. As for what type of builders, the contractor will make that determination.	
Will you be charging application fee for those who will be seeking employment?	Nchimunya		15-Dec-20	Namianga Radio FM-Zambia	There is no application fee for these jobs. Please ensure that those that will be purporting to represent ZRA and charge you for job applications are reported to police.	
What qualifications will you be seeking, certificates or just skills?	Napongo-		15-Dec-20	Namianga Radio FM-Zambia	Since we will need both skilled and unskilled labour, the qualification level will depend on what type of job one is applying for. So unskilled labour, e.g. land clearing, loaders/off-loaders, may require mere experience. Some jobs may require some training and this we will provide.	
What type of people will be accepted for jobs?			15-Dec-20	Namianga Radio FM-Zambia	There will be no exclusion criteria applied, everyone is encouraged to take part. We however encourage women to take part so that we are gender sensitive. There will be both skilled and unskilled labour requirements. We will need a lot of diverse skills. We will liaise with the contractor and advise that at least 20% of the contracts remain in Zambia/Zimbabwe. We will set up labour camps in various places to help locals access these job.	
Wont this new dam affect the water levels of the Kariba dam?			15-Dec-20	Namianga Radio FM-Zambia	This will be a 'run-of-river' type of dam. This means that there will be continuous flow of water to feed the Kariba dam.	
Is the contractor an NGO or not? Why cant you disclose who the contractor is so that we can know him/her	Kennel		15-Dec-20	Namianga Radio FM-Zambia	We have engaged a Chinese contractor who is working together with General Electric to build the dam.	
What good part is there for those that will be affected by the construction of the transmission line? We had this issue before and no one received any compensation or benefit since 1948! Other poles are already there but no benefit! Assure us that this time displaced people will be compensated.	Headman Sindowe:		15-Dec-20	Namianga Radio FM-Zambia	Unfortunately we won't be able to comment on the past occurrence. However, it is worth noting that today such big projects are monitored by a number of world and local organisations to ensure that both people and the environment are not harmed. There will be compensation to those that will be directly negatively affected. There are jobs available but they are fewer, we will try our best to ensure that all villages/chiefdoms benefit from these jobs. The current power lines are not big enough to carry the power that will be generated.	
Are jobs only reserved for those that will be affected by the construction of the transmission lines?	Presenter-		15-Dec-20	Namianga Radio FM-Zambia	No. But we encourage the locals to take advantage of this project for them to benefit and appreciate the project. We will employ on merit. Those that will be directly affected/displaced will be compensated accordingly.	
How long will this project take					Six (6) years.	
Breeze FM-16/12/202-Zimbabwe 1pm						
When is the project expected to commence?			16-Dec-20	Breeze FM-Zimbabwe	Last quarter of 2021 and construction period is 5 years	ESIA Process, Project Description and Mitigation
What is the project cost?			16-Dec-20	Breeze FM-Zimbabwe	Us$5 billion using a Build, Operate and Transfer model	ESIA Process, Project Description and Mitigation
Who are the contractors?			16-Dec-20	Breeze FM-Zimbabwe	Power China and General Electric	ESIA Process, Project Description and Mitigation
What are the project impacts?			16-Dec-20	Breeze FM-Zimbabwe	**Positive•** Social benefits e.g. employment creation, procurement of goods and services, community development Economic development through power generation and electrification **Negative** o Economic displacement o Disturbances to livelihoods and tourism o Health and safety risks	ESIA Process, Project Description and Mitigation
How will local employment be enhanced?			16-Dec-20	Breeze FM-Zimbabwe	Through stakeholder engagement and policies/programmes such as Local Employment Programme involving working with local traditional leaders. Employment will also be national and regional. The Authority will develop a Local Employment Program for the Project. Targets will be set to maximise the number of Zambian and Zimbabwean nationals, local, female, unskilled, skilled and highly skilled employees from the Project Area. The local employment targets will be written into all Contractor agreements. The Authority will develop and implement a procurement policy and method statement. The main objective of the method statement will be to maximise local purchasing where possible in line with national legislation and tendering requirements, by directly working with local enterprises and by incentivizing the Project's contractors to contract locally. The Authority will develop and maintain a database of all relevant local businesses that could be used as potential suppliers.	Potential Employment Opportunities
Zambezi FM-16/12/2020- Zambia 7pm						

Annex C (8.2)

Tonga Non- Technical Summary Report

Nkomiso wo ka wu nga ri wa Xithekiniki

Nkambelo wa Ntshikelelo wa Mbangu na Vanhu (ESIA) wa Xikimi xa Mati na Gezi xa Gova ra Batoka lexi Ringanyetiweke (Zambia na Zimbabwe) eka Nambu wa Zambezi

10 Nyenyenyani 2020

Nomboro ya Phurojeke.: 0239269

The business of sustainability

ERM

Vuxokoxoko bya tsalwa	
Vito ra tsalwa	Nkomiso wo ka wu nga ri wa Xithekiniki
Nhlokomhaka yo koma ya tsalwa	Nkambelo wa Ntshikelelo wa Mbangu na Vanhu (ESIA) wa Xikimi xa Mati na Gezi xa Gova ra Batoka lexi Ringanyetiweke (Zambia na Zimbabwe) eka Nambu wa Zambezi
Nomboro ya phurojeke	0239269
Siku	10 Nyenyenyani 2020
Nkandziyiso	2.0
Mutsari	Victoria Braham
Vito ra tlilayente	Mpfumelelo wa Nambu wa Zambezi (ZRA)

Matimu ya tsalwa

				Mpfumelelo wo humesa wa ERM		
Nkandziyiso	Mpfuxeto	Mutsari	Ri kambisisiwilehi	Vito	Siku	Swibumabumelo
Mpfapfarhuto	1.0	Victoria Braham	Dieter Rodewald & Lindsey Bungartz	Mike Everett	05.02.2020	Mpfapfarhuto lowunga ta Kambisisiwa/Pfumeleriwa hi Tlilayente
Wo hetelela	2.1	Victoria Braham	Dieter Rodewald	Mike Everett	10.02.2020	Tsalwa ro Hetelela

Pheji ra Nsayino

110 Nyenyenyani 2020

Nkomiso wo ka wu nga ri wa Xithekiniki

Nkambelo wa Ntshikelelo wa Mbangu na Vanhu (ESIA) wa Xikimi xa Mati na Gezi xa Gova ra Batoka lexi Ringanyetiweke (Zambia na Zimbabwe) eka Nambu wa Zambezi

Mike Everett
Mutirhisani

Mafambiselo ya Swipfuno swa Mbangu (ERM) eDzongeni wa Afrika (Pty) Ltd.

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Xiseketelo	Muako lowu akeriweke ku seketela tlhelo ra phuphu leri nga na ntikelo
Ndhawu yo veka swilo hi mitlawa	Ndhawu leyi vekeiweke etlhelo ku va yi tirhisiwa ku endla khonkhiriti
Vuvabyi byo Tlulela	Vuvabyi lebyi tlulelaka ku suka eka munhu wun'wana ku ya eka wun'wana hi ku hlangana ka ngati kumbe mati ya le mirini, ku hefemula, hi xitsongwatsongwana lexi fambaka emoyeni; kumbe ku lumiwa hi xitsotswana
EMA	Ejensi ya Mafambiselo ya Mbangu ya le Zimbabwe. EMA yi nyikiwe matimba yo lulamisela mafambiselo ya swipfuno swa ntumbuluko lama yisekaka emahlweni no sirhelela mbangu
ERM	Mafambiselo ya Swipfuno swa Mbangu eDzongeni wa Afrika (Pty) Ltd. (ERM) i murhangeri eka vutsundzuxi bya Mbangu na Vanhu la fambisaka endlelo ra Nkambelo wa Ntshikelelo wa Mbangu na Vanhu (ESIA) wa ZRA
Nkanelo wa ntlawa wo Kongomisa	Nkanelo wa Ntalwa wo Kongoma (FGD) i nhlengeletano ya vanhu lava sukaka eka swiyimo swo fana kumbe mitokoto (xik. Vantshwa, vavasati) lava hlanganaka ku kanela nhlokomhaka yo karhi leyi va yi tsakelaka
Mphakelo wa Levhele Heleleke	Mphakele wa Levhele leyi heleleke (FSL) i levhele ya mati loko ndhawu yo hlayisa mati yi ri leyieka levhele ya le henhla ya matirhiselo loko yi nga khumbiwanga hi ku taleriwa
Ndlela yo Vilela	Xitirho lexi munhu, vatirhi, vaaki na/kumbe nhlangano wa vaaki va nga humesaka swivilelo swa vona kumbe mbuyelo wa kahle hi ntshikelelo lowu fambelanaka na phurojeke
Ku humesa mati kul ya gezi	Ku humesiwa ka mati ku endlela ku tlakusa vutumbuluxi bya gezi emadan'wini ku kota ku engetela matimbafikelela swilaveko swa gezi hi nkarhi wa siku lowu gezi ri tirhisiwaka ngopfu
Matimba ya mati	Matimba ya mati kumbe gezi ra mati i ku cinciwa ka matimba ya mati lama khulukaka ya va gezi
Ndlela yo tihanyisa	I ndlela yo kuma swilaveko swa vutomi

Matshalatshala yo Hunguta Ntshikelelo	Swi vula ku sivela, ku hunguta kumbe ku lawula ntshikelelo wa phurojeke wo ka wu nga ri kahle eka Mbangu kumbe ikhonomi ya vanhu
Yindlu ya gezi	Muako lowu switirho swo tumbuluxa gezi swi vekiwaka kona no tirhisiwa
Xiyimo xa Ikholoji xa Nkarhi wolowo ya (PES)	Xiyimo xa nkarhi wolowo xa rihanyu kumbe ku tshembeka ka swihlawulekisi swa dyondzo ntivorihanyu ya nambu wo karhi
Lokixi ra Phurojeke	Ndhawu yo tshama ya vatirhi vo aka na va mitirho yin'wana va BGHES
Damu leri khevhaka ri lala ri mafambelo ya ra RCC	Damu ra khonkhiriti yo rholiwa leyi tiyisiweke leri khevhaka ku hambana na nkhuluko wa lawulamati eka khevhe yo khuma leyi lawulaka matimba ya mati ehenhla ka makhumbi ya maribye matiya magova, leswi nyikaka matimba lama lavekaka ku ringanisela damu
Xilawula nkhuluko	Nchumu lowu tirhisiwaka ku lawula ku humesiwa ka nkhuluko ku suka laha mati ma hlayisiwaka kona ku ya eka ndhawu leyi mati ma khulukaka ma ya kona
Ndhawu ya Malakatsa	Ndhawu leyi ku cheriwaka misava, thyaka na malakatsa loko ku ri karhi ku ceriwa
Ku kota ku tihanyisa	Levhele ya muholo leyi nyikaka mali/swakudya swo ringana ku kuma swilaveko swo tihanyisa ntsena
Jarata ra switirho	Ndhawu leyi pfaleriweke leyi hlayisaka swo tirha haswona (ku nga, michini yo tirha)
Mavabyi lama Hangalasiwaka swilo swo Hanya hi ku Dyeleta	Mavabyi ya vanhu lama vangiwaka hi swilo swo hanya hi ku dyeleta, switsongwatsongwana hina swiborisi lama hangalasiwaka hi swihari na switsotswana
ZEMA	Ejensi ya Mafambiselo ya Mbangu ya le Zambian (ZEMA). ZEMA yi nyikiwe ntirho wo sindzisa ku landzelela swinawana na mipimo eka swiyimo hinkwaswo swa mbangu ku katsa vulawuri bya Maendlelo ya Nkambelo wa Mbangu

1. MANGHENELO

1.1 Xana Tsalwa leri i yini?

Mpfumelelo wa Nambu wa Zambezi (ZRA) wu le ka endlelo ro heta nkambisiso wo tirheka ka xikimi lexintshwa xa mati na gezi enambyeni wa Zambezi eka matlhelo hamambirhi ya Gova ra Batoka ku nga ra le Zimbabwe na ra le Zambia. Phurojeke leyi yi vitaniwa Xikimi xa Mati na Gezi xa Gova ra Batoka (BGHES kumbe Phurojeke). Tanihi xiphemu xa swilaveko swa nawu wa Phurojeke eZimbabwe na le Zambia, Vufambisi bya Swipfuno swa Mbangu eDzongeni wa Afrika (Pty) Ltd byi endlile milavisiso hi vuenti (ERM) exikarhi ka 2014 na 2019 ku endlela ku twisisa no hunguta mitshikelelo ya BGHES leyi nga va ka kona eka vanhu na le ka mbangu, naswona hi nkarhi lowu ERM yi tirhisanile na Tininjhiniyara to Dizayina eka BGHES, Studio Pietrangeli (SP). Nakambe milavisiso leyi yi endliwile ku enetisa swilaveko swa Nhlangano wo nyika Tihakelo wa Matiko ya Tinxaka (IFC) / Bangi ya Misava na tibangi tin'wana ta matiko ya tinxaka leti nga na ku tsakela ku hakelela BGHES. Hi ku katsakanya, milavisiso yo hambanahambana yi teke nkarhi wo hundza malembe ya tsevu naswona yi tumbuluxe Swiviko swa Nkambelo wa Ntshikelelo wa Mbangu na Vanhu (ESIA) na matsalwa lama fambelanaka na wona. Swiviko swo hambana swa ESIA swi Lulamisiwile eka 1) khumbi ra damu na ndhawu yo veka leswi nga tekiwa, ku katsa xilawula nkhuluko; tindlu ta gezi ta le hansi, yin'we eka tlhelo rin'wana na rin'wana ra nambu; na malokixi ya tiphurojeke (hinkwako eZambia na le Zimbabwe) na switirhisiwankulu swin'wana swo engetela (tanihi tikhwari, ndhawu ya malakatsa na ndhawu yo veka swilo hi mitlawa); 2) magondzo yo fikelela eZambia na le Zimbabwe; na 3) tilayini to hangalasa eZambia na le Zimbabwe.

Matsalwa ya nyika Nkomiso wo ka wu nga ri wa Xithekiniki (NTS) eka Swiviko leswi swa ESIA. Matsalwa ya nkoka la ma katsiweke eka Swiviko swa ESIA ma katsa –

- **Tipulani ta Vufambisi bya Mbangu na Vanhu (tiESMP),** leti hlamuselaka ku tiboha ka ZRA ti ta tekelela ku sivela, ku hunguta no lawula ntshikelelo wo ka wu nga ri kahle no antswisa

mitshikelelo ya kahle leyi vangiweke hi BGHES na switirhisiwankulu leswi khumbekaka (vuhangalasa na mogondzo yo fikelela).

- **Mrimba ya Pholisi yo Tshamisekisa Vanhu (tiRPF),** lama andlaka minsinya yo letela na mafambiselo lama nga ta landzeleriwa ku fambisa mitshikelelo yo kuma misava ya BGHE e Zambia na le Zimbawe
- **Tipulani to Vuyelerisa Ndlela yo Tihanyisa (tiLRP)**, leti hlamuselaka ndlela leyi ntshikelelo eka ndlela yo tihanyisa wu nga ta lawuriwa, hikwalaho ka ku susiwa ka swa ikhonomi eka malokixi ya vatirhi na magondzo yo fikelela.
- **Kungu ro Tihlanganisa na Vatekaxiave (SEP)**, leri hlamuselaka ndlela na laha ZRA yi nga ta tihlanganisa na vanhu, na ndlela leyi vanhu lava nga na ku tsakela va nga vutisaka swivutiso kumbe swibumabumelo/swivilelo eka ZRA hi mayelana na Phurojeke.

1.2 Laha ku nga Kumekaka Mahungu hi Xitalo

Xikongomrelo xa ZRA i ku endla leswaku swi olova ku va vanhu va tiva hi Phurojeke hi ku hetiseka, no rhamba vanhu ku yisa mavonelo ya vona na swibumabumelo (swa kahle kumbe swo ka swi nga ri kahle) mayelana na Phurojeke.

Ku yisa swivutiso swihi kumbe swihi, swivelelo kumbe ku khumbeka hi mayelana na endlelo ra ESIA kumbe Phurojeke ya BGHES hi ku angarhela, kumbe ku kuma mahungu hi xitalo, tihlanganisi na **ERM** hi tinomboro to tihlangannisa leti boxiweke laha hansi.

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+260 97 407 4384 (Zambia)

Webusayiti ya Phurojeke: www.erm.com/BGHES-ESIA

1.3 Xana hi xihi Xiyimo xa ESIA na endlelo ro nyika Mpfumelelo?

Mikandziyiso ya mpfapfarhuto ya Swiviko swa ESIA ya 2019 na matsalwa lama fambelanaka na wona ma humesiwile ku va ma kambisisiwa hi vanhu no nyika swibumabumelo eka nkarhi wo ringana 35 wa masiku (ku sukela exikarhi ka Nyenyenyani na le xikarhi ka Nyenyannkulu 2019). Nakambe, Swiviko swa ESIA ya mpfapfarhuto swi nga kumeka hi ndlela ya elekitironiki eka https://www.erm.com/bghes-esia/.Swiviko swo Hetelela swa ESIA naswona swi ta vakona eka vanhu.

2. NHLAMUSELO YA PHUROJEKE

2.1 Nkatsakanyo hi ku Angarhela – Hikokwalahokayini BGHES yi Laveka?

Vuvekisi eka eniji i bya nkoka eka ku fikelela Nhluvukiso wa mabindzu na vumaki eZambia na le Zimbabwe. Loko matiko lamambirhi ma ta kota ku fikelela swikongomiwa swoleswo na swikongomelo leswi leswi xaxametiweke eka Xivono xa Zambia 2030 na xa Zimbabwe xa 2040, na tipulani tin'wana to engetela, ku ta laveka vuvekisi bya xiyenge xo ka xi nga ri xa mfumo eka thekinoloji yo tirheka, yo kota ku yiseka emahlweni no tshembeka. Ku timbuluxiwa loku ka eneji hi ku tirhisa Matimba ya mati i thekinooloji leyi nga kamberiwa ku kumeka leswaku ya tirha, naswona yi le ku tlakusiweni hi mfumo wa le xikarhi eZambia na le Zimbabwe. Hi ku koteka ka le henhla ka eneji, ya matimba ya mati ma tekiwa ma ri xilangiwa lexi kotekaka no twisiseka xo tumbuluxa gezi eka matiko lamambirhi.

BGHES yi lava ku pfuna matiko lamambirhi eka:

- Ku kota ku tirhisa BGHES leyi ringanyetiweke na Ndahwu ya Kariba hi nkarhi wun'we;
- Ku hunguta nxavo wa gezi hi ku hetiseka eZambia na le Zimbabwe;
- Ku engetela vuswikoti byo tumbuluxa gezi eZambia na le Zimbabwe;
- Ku hunguta ku kayivela ka gezi lo ku ga kona eka nkarhi wa sweswi ematikweni hamambirhi;
- Ku hunguta ku timeka ka gezi; na
- Ku hunguta ku tshembela eka switici swa gezi leswi tirhisaka malahla.

Loko yi ta va yi herile, BGHES leyi ringanyetiweke yi ta hoxa xandla hi ndlela ya nkoka eka mphakelo wa gezi eka matiko lama mbirhi, no tlhela yi tirha ku hangalasa gezi eka matiko ya le Dzongeni wa Afrika ehansi ka vuhlanganisi bya Xihlovonkulu xa Gezi eDzongeni wa Afrika (SAPP), lexi nga na xikongomelo xo tlakusa mimpimo yo hundzisa hi vuhlanganiselo bya le mindzilekanini.

2.2 Ndhawu leyi BGHES yi kumekaka kona

BGHES leyi ringanyetiweke yi ta va yi ri eka xiphemu xa le xikarhi ka ndhawu ya misava leyi celekeke mati ya nghena hayona enambyeni wa Zambezi, naswona yi ta ndlandlamuka yi tsemakanya eZambia na le Zimbabwe. Yi ta kumeka eka ndhawu yo hambana na nkhuluko wa mati eka xikimi lexi nga kona xa mati na gezi xa leka Damu ra Kariba eNambyeni wa Zambezi na ku ringana 47 km tlhelo leri mati ma khulukaka ma ya kona e Victoria Falls.

EZimbabwe, BGHES leyi ringanyetiweke yi wela ehansi ka xifundzankulu xa Matabeleland North na le ka Xifundza xa Hwange.Yi katsa tiwadi ta Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sizinda, Mashala na Simangani. Vurhangeri bya ndhavuko eka tindhawu ta ntshikelelo eZimbabwe byi katsa Hosi Shana, Bishop Matata Sibanda (loyi a nga khomela Hosi Mvutu, loyi a ha ku hundzaka emisaveni) na Hosi Hwange.

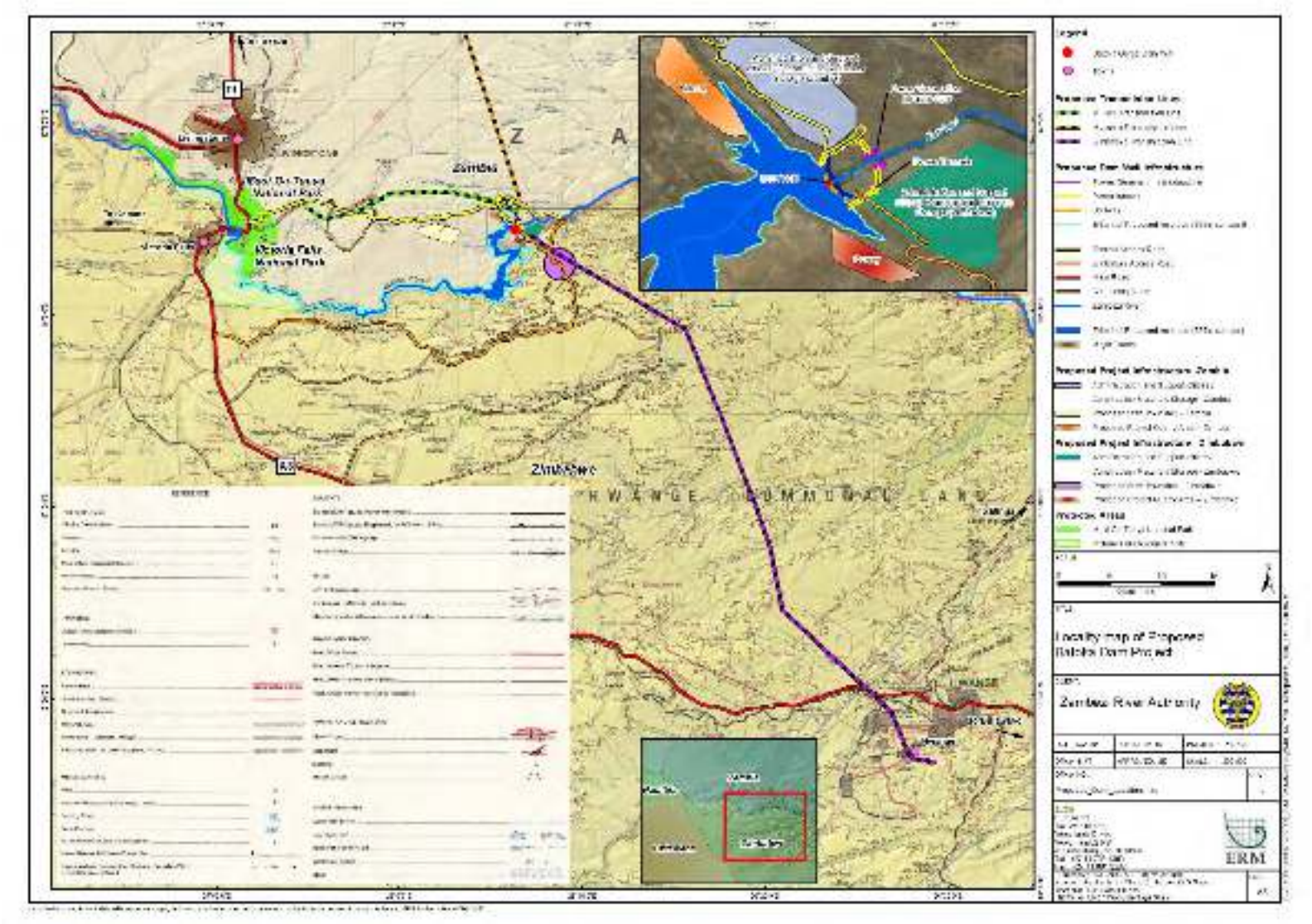
eZambia, BGHES leyi ringanyetieke yi wela ehansi ka Southern Province eka Xifundza xa Kazungula, yi talele ngopfu eka tiwadi ta Mukuni na Wadi ya Katapazi, leyi welaka ehansi ka vufambisi bya Hosi Mukuni. Hambiswiritano, ntshikelelo lowu nga vaka kona wu nga khumba na Xifundza xa Livingstone, Xifundza xa Zimba na Xifundza xa Choma na mitshikelelo ya laha mati ma khulukaka ma ya kona yi nga ha fikelela na le ka Xifundza xa Kalomo. Mbalango wa ndhawu ya Phurojeke wu kombiwile eka *Xifaniso* xa *Xifaniso* xa 2.1.

2.3 Nhlamuselo ya BG1HES ya Xithekiniki

BGHES leyi ringanyetiweke yi vumbiwe hi swiphemu leswi landzelaka:

- Khumbi ra damu na ko veka leswi nga tekiwa (ku nga, – vuhlayiselo / laha ku nga hlengeletekaka mati), ku katsa na xilawula nkhuluko;
- Tindlu ta gezi ta le rivaleni, yin'we eka tlhelo rin'wana na rin'wana ra nambu (ku nga, – eZambia na le Zimbabwe);
- Tilayini to hangalasa eZambia na le Zimbabwe;
- Magondzo yo fikelela (na buloho ra Batoka) eZambia na le Zimbabwe; na
- Malokixi ya Vatirhi (hinkwako eZambia na le Zimbabwe) na switirhisiwankulu swin'wana swo engetela (tanihi tikhwari, ndhawu ya malakatsa na ndhawu yo veka swilo hi mitlawa).

Leswi swi kaneriwile hi vuxokoxoko eka swiyengentsongo leswi nga laha hansi.



Xifaniso xa 2.1 Ndhawu na laha BGHES yi Fikaka kona

2.3.1 Damu

Swihlawulekisi swa mitirhonkulu ya xiphemu xa damu xa BGHES swi katsa:

- **Damu ra Khonkhiriti yo Rholiwa leyi Tiyisiweke (RCC) na khumbi ra damu leri khevhaka ri lala ri lawula mafambelo ya mati**: Khumbi leri ringanyetiweke ra damu leri khevhaka rilala ri lawula mafambelo ya mati ra RCC ri ta va ra vulehi bya 177 m, na vuhenhla byo ringana 720 m.
- **Xilawula nkhuluko**: Xilawula nkhuluko a xi nga hambanyisiwi na khumbi ra damu, kambe xi ta pfuleriwa ku va xihlovonkulu xa mati lexi humesaka mati hi matimba hi ku tirhisa tibeyi leti nga na tigede ta nkombo, yinw'ana na yin'wana yi tlakusiwa hi xilebe xa 743.5 m.
- **Tindlela ta mati ya matimba, leti kumekaka eka swiseketelo:** Tilayini timbirhi ta tindlela ta mati ya matimba ti languteriwile ku va kona eka ribuwa rin'wana na rin'wana, ku katsa swiakiwa swa le ka thanele.
- **Tindlu timbirhi ta gezi ta le rivaleni, yin'we eka tlhelo rin'wana na rin'wana ra nambu, leti kumekaka eka swiseketelo:** Mavekelo lama ma katsa tindlu timbirhi ta gezi ta le rivaleni, yin'wana na yin'wana ya vulehi byo ringana 175 m, yin'we eka ribuwa rin'wana na rin'wana, laha mati ma khulukaka ma ya kona eka xihlovonkulu lexi humesaka mati hi matimba. Tindlu timbirhi ta gezi to fana naswona yin'wana na yin'wana ya tona yi katsa:
  - TiFrancis Turbine ta tsevu, yin'wana na yin'wana ya vundzeni byo ringana 200 MW;
  - Tijenereta ta tsevu leti nga na vholuteji ya 15 kV;
  - Tikhireyininkulu na leto pfuneta, tigete ta machupu to ya emathlelo yo hambana, switirho swo pfuneta;
  - Beyi yin'we yo akela eka yona; na
  - Tithiransifoma to tlakusa vholuteji leti yisaka ndzilo eka tilayini leti taka hile henhla ti kongomisiwa eka majarata ya switirho.
- **Majarata mabirhi ya switirho** ya kumeka eka ribuwa rin'wana na rin'wana ra nambu, kwala mati ma khulukaka ma ya kona eka swiseketelo swa damu ehenhla ka 800 m, laha misava yi ringananaka naswona ma nga tshamaka kahle.
- **Ndhawu yo veka leswi nga tekiwa (kumbe vuhlayiselo):** levhele ya mphakelo lowu heleleke (FSL) ya damu yi vekiwe eka 757 m ku suka emisaveni. Endzhaku ka ndhawu yo veka leswi nga tekiwa ku ya eka FSL, rivala ra vuhlayiselo ri ta teka ku ringana 23 km² (*Xifaniso xa 2.1*). Hikwalaho ka ndhawu yintsongo yo veka swilo ya damu leri pulaniweke (~1,392 Mm3 eka FSL), leswi fambelanaka na manghenelo ya mati, BGHES leyi ringanyetiweke yi ta pfumelela ntsena malawulelo ya mati lama nghenaka hi siku kumbe vhiki (eka swiyimo swo karhi). Hikwalaho ke, BGHES leyi ringanyetiweke yi ta tirhisiwa tanihi lodi ya le hansi leyi pulanti yi nga ta yi phakela eka nambu wa rivilo ra le henhla lowu nga na vuswikoti bya le hansi hi nkarhi wa matirhelo ya le henhla. FSL ya 757 m yi hlawuriwile ku endlela ku tiyisisa leswaku mati lama tlhelelaka endzhaku ku suka eka ndhawu yo veka leswi nga tekiwa a ma fiki eka masungulo ya Victoria Falls kumbe swindledyana swo humesa mati kumbe ku taleriwa ka swindledyana swo suka eka Xitici xa Gezi xa Victoria Falls, hi nkarhi wa mikhuluko ya le henhla.

2.3.2 Tilayini to Hangalasa

Tindlela ta tilayini tinharhu to hangalasa ti ringanyetiwile tanihi xiphemu xa Phurojeke ya BGHES (yelanisa na *Xifaniso xa 2.1*), ku katsa:

- Layini yo Hangalasa ya le Zimbabwe ya 400 kV, leyi nga ta va kwalomu ka vulehi byo ringana 67 km (ku suka eka xiticintsongo xa BGHES leyi ringanyetiweke lexi kumekaka eribuweni ra le dzongeni no helela eka xiticintsongo lexi ringanyetiweke xa Hwange xa 400/330kV).

- Layini yo Hlanganisa ya Mukuni ya 330 kV ya le Zambia, leyi nga ta va na kwalomu ka vulehi byo ringana 22 km (ku suka eka xiticintsongo xa BGHES lexi ringanyetiweke lexi kumekaka eribuweni ra le n'walungu no helela eka xiticintsongo xa Mukuni ZESCO lexi nga na 330kV, lexa ha ku akiwaka eLivingstone).
- Layini yo Hangalasa ya le Muzuma ya 330 kV ya le Zambia, leyi nga ta va na vulehi byo ringana 152 km (ku suka eka xiticintsongo xa BGHES lexi ringanyetiweke lexi kumekaka eribuweni ra le n'walungu no heleleka eka xiticintsongo xa le Muzuma eChoma).

2.3.3 Magondzo yo Fikelela

Ku pfuxetiwa ka mogondzo lama nga kona no akiwa ka magondzo lamantshwa yo fikelela ribuwa rin'wana na rin'wana ku suka eka magondzonkulu lama hlanganisaka Livingstone na Lusaka (Zambia) na Victoria Falls na Bulawayo (Zimbabwe) swi ta laveka. Xikongomelo i ku papalata ku aka magondzo lamantshwa kambe ku pfuxetiwa lama nga kona hilaha swi kotekaka hakona.

EZambia, netiweke yi sungula ePalmgrove, yi hundza hi le tlhelo ka gondzo leri se ri nga kona ku ya eXitandini xa Mukuni (8.3 km). Ku suka eXitandini xa Mukuni, gondzo ri ya emahlweni ku longoloka na gondzo leri nga kona leri nga phevhiwa ku ya Munwana, na ku ya emhlweni ku ya eChibule ku longoloka na gondzo leri nga kona ra girachele. Gondzo lerintshwa ra 9.9 km ku longoloka no ringaninisa na gondzo lerintshwa ri ta sungula ku suka eka ndhawu leyi ku ya fika eka ndhawu ya le dan'wini ra Batoka. Vulehi byo fikelela hi ku angarhela etlhelo ra le Zambia i 29 km (*Xifaniso xa 2.1*).

EZimbabwe, gondzo ra Sizinda ri ta tisa mimovha eka 5 km Evuhumadyambu bya Xikolo xa Jabula (Victoria Falls – Xikolo xa Jabula, Trunk A na Trunk B), laha ku nga na gondzo ra vumbirhi leri yaka eXitandini xa Kasikiri (Xikolo xa Jabula – Xitandi xa Kasikiri), na ku ya e Xiticini xa Vuhahisi xa Batoka naswona ku suka kwalaho ri ya endhawini ya damu ra le BGHES (Xitandi xa Kasikiri – Xitici xa Vuhahisi xa Batoka). Ku ringananisa lo ku heleleke eZimbabwe ku ta khavhara vulehi byo ringana 59.9 km. Ku ringananisa lo ku ringanyetiweke ku lava gondzo lerintshwa ro hlanganisa (ro leha 3.6 km) exikarhi ka lokixi ra vatirhi leri ringanyetiweke eZimbabwe na gondzonkulu ro fikelela ku ya eka ndhawu ya le dan'wini (ku nga, Lokixi – Xitici xa Vuhahisi xa Batoka) (yelanisa na *Xifaniso xa 2.1*).

2.3.4 Malokixi ya Vatirhi

Malokixi ya Vatirhi ya ta kumeka ematlhelo hinkwawo ya nambu. Tindhawu leti nga ta va na Malokixi ya Vatirhi eZambia na le Zimbabwe ti kombisiwile eka *Xifaniso xa 2.1*.

Loko ku ri karhi ku akiwa (nkarhi wo ringana malembe ya kaye), malokixi ya vatirhi ya ta va na kwalomu ka 8,000 wa vatirhi loko va helerile (ku katsa na varindzi na vatirhi vo seketela), kambe leswi swi va tano endzhaku ka malembe mambirhi yo sungula, laha ekusunguleni vatirhi vo aka va 2,000 va ta khumbeka eku akeni ka magondzo yo fikelela, switirhisiwankulu na tikampa. Ku engetela, tindhawu leti nga ta tirhiseriwa vulawuri no veka matheriyali wo aka hi karhi wa feyisi yo aka ti kombisiwile eka *Xifaniso xa 2.1*.

Hi nkarhi wo tirha no hlayisa, vatirhi vo aka va ta siviwa hi vatirhi va matirhelo (kunga, vo hlayisa, maphorisa, mitirho yo lawula mindzelekano, vativinkulu va dyondzo, vatirhi va le ka pulanti, swirho swa mfumo na van'wana na van'wana). Nkambisio wo koteka wa 1993 wu kombe leswaku ku ta laveka kwalomu ka 1,500 wa vatirhi va matirhelo.

Ku engetela eka mitirho leyi na swivevukisi, malokixi ya vatirhi na wona ya ta va na swivevukisi swo fana na tibangi, mavhengele, tihofisi to ka ti nga ri ta mfumo na swin'wana na swin'wana.

2.3.5 Swirhisiwankulu Swin'wana swo Engetela

Tindhawi ta malakatsa, ku aka na tikampa to veka swilo hi mitlawa naswona swi ta laveka eZambia na le Zimbabwe. Tindhaw ta xiviri laha tindhawu leti ti nga ta va kona ti ta tiyisisiwa hi nkarhi wa vuxokoxoko bya dizayini, hambileswi ESIA yi nga kuma tizoni leti nga mintlhaveko laha migingiriko yo tano yi nga ta aleriwa *Xifaniso xa 2.1*.

2.4 Feyisi yo Aka

Feyisi yo aka yi languteriwe ku teka kwalomu ka malembe ma kaye. Yi ta vanyisiwa hi switeji swimbirhi: xiteji xo sungula ku ta va laha ku nga ta akiwa magondzo yo fikelela na tikampa to sungula ta nkarhi hinkwawo. Ku languteriwa leswaku feyisis leyi yi ta teka lembe ku ya eka mambirhi. Feyisi ya vumbirhi yi ta khumba ku akiwa ka damu, tilayini to hangalasa na tipulanti; leswi swi ta teka malembe ma tsevu ku ya eka nkombo. Ku languteriwe leswaku ku ta va na swivandla swa mitirho swo ringana 8,000 eka Phurojeke hayoxe hi nkarhi lowu ku aka swi nga ta va swi laveka swinene.

Ku va kona ka vatirhi va mitirho yo aka ya BGHES swi ta ya hi loko mimfumo yo nyika mipfumelelo leyi faneleke, na ku endliwa ka tihakelo leti faneleke.

2.5 Feyisi ya Matirhelo

Feyisi ya matirhelo yi ta ya emahlweni nkarhi hinkwawo lowu BGHES yi nga ta va yi ri kona. Feyisi leyi yi ta humesa swivandla swa mitirho swo ringana 1,500.

3. NHLAMUSELO YA NDHAWU YA PHUROJEKE

3.1 Maendlelo ya Dyondzo ya Ntivorihanyu

- Ndhawu ya Misava leyi Celekeke mati ya nghena hayona enambyeni wa Zambezi yi le ka xiyimo xa maxelo lama ncincacincaka ngopfu eka ndhawunkulu tihi kumbe tihi ta misava leyi celekeke mati ya nghena hayona enambyeni emisaveni hinkwayo, leyi nga na swiyimo swo tika swinene eka tindhawu to khoma mati hi ku famba ka nkarhi. Maxelo ya tala ku va lamo hisa ya ri na nkahelo hi ximumu na ku titimelelanyana hi xixika na nguva yo oma ku sukela hi Khotavuxika ku fikela hi Mhawuri, na nguva ya mpfula ku sukela hi N'wendzamhala ku fikela Nyenyenyani.
- Ku cincacinca ka ntumbuluko ka makhulukelo ya Nambu wa Zambezi ya cinciwa hi madamu lamakulu, ngopfu madamu ya Kariba na Cahora Bassa laha mati ma khulukaka ma ya kona eka BGHES leyi ringanyetiweke.
- Ku taleriwa hile ka Ndhawu ya Misava leyi celekeke mati ya nghena ha yona swi va kona kwalomu ka nkarhi wa khume ra malembe man'wana na man'wana. Madyandza ya malembe yo landzelelana na wona ya va kona eka Ndhawu ya Misava leyi Celekeke mati ya nghena hayona, leswi vangaka ku tikeriwa ka makhulukelo ya nambu na ku va kona ka Matimba ya mati.
- Swimila eka ndhawu ya Phurojeke swi tala ku va swa ntumbuluko, ngopfu misinya ya Mixanatsi na ya Kirkia. Tindhawu to tshama ta ntumbuluko ti hlamuseriwe ku va ti ri tindhawu ta rimunywana leri nga katsina na misinya ya matluka yo phamarhala, tindhawu ta le tibuweni ta milambu (Gova ra Batoka na magova ya lomu matlhelo), misinya ya le ka swinambyanantsongo na tindhawu to Oma to va na sava. Tindhawu to tshama leti cinciweke ti na tindhawu to rima, madoroba, timayini na tindhawu ta vumaki.
- Tindhawu ta le henhla ta Gova ra Batoka ti wela ehansi ka Tindhawu ta Ndzhaka ta Misava Hinkwayo na tiphaka ta Mosi-oa-Tunya na Victoria Falls. Gova ra Batoka i Ndhawu ya Nkoka ya Tinyeynyana (IBA) hikwalaho ka nkoka wa yona wo tswala ka tinyeyayana to hlota. Xa nkoka hi tindhawu to tshama tinyenyana to hlota i vukona bya rixaka ro kala ra Taita Falcon eka Gova ra Batoka.
- Gova ra Batoka ra fikelela ku va ndhawu yo tshama ya nkoka hikwalaho ko va yi nga fani na tin'wana loko swita eka ikhosisiteme (nhlawuleko wa iv), Leswi seketeriwaka hi IBA ya ndhawu leyi na Swiyimo swa Ndzhaka swa Misava Hinkwayo. Leswi kokaka rinoko ra tinxaka ta swilo swo tala swi katsa nsinya wa Taita Falcon, lowu nga kona eka na ndhawu leyi ya Gova ra Batoka.

3.2 Ku Tirhisa Misava na Mingingiriko ya Ikhonomi

Vaaki lava nga eka ndhawu ya Phurojeke ya le ka tindhawu hatimbirhi ta Zambia na Zimbabwe hi xitalo i varimi vo rimela ku kota ku tihanyisa, kutani va xavisa swirin'wa leswi salaka emakete ku kuma muholo. Ku fuwa tihomu swi tolovelekile naswona ku va na ku popela ko leha swinene loko ku xavisiwa swilo swa nkoka wo hlawuleka ku endlela ku kuma muholo wo engetela. Tindlela tin'wana to tihanyisa ti katsa ku xaviselana, ku tshova no xavisa tihunyi, byanyi na mihandzu ya mirhibeyila na tisitroberi, ku endla fenichara, ku foroma switina, ku hlota, ku rhiya tinhlampfi, kumbe mitirho ya tiphisijopo na migingiriko leyi fambelanaka na vupfhumba.

Vukona bya Victoria Falls na tiphaka ta rixaka swi hoxe xandla eka ku va xifundzankulu xa Matabeleland North eZimbabwe na Xifundza xa Southern eZambia swi tiviwa tanihi tindhawu leti endzeriwaka swinene hi vapfhumba ematikweni lamambirhi. Ntlangu wo khandziya swikwewetsu eka tindhawu leti mati ma khulukaka hi matimba (ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba) enambyeni wa Zambezi naswona swi koka rinoko ra vanhu vo tala vo suka emisaveni hinkwayo. Swirho swin'wana swa vaaki va le migangeni swa khumbeka eka bindzu ra vupfhumba xik. Ku tirha tani hi valeteri va ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba no rhwalela vapfhumba tinhundzu etihotela na tindhawu tin'wana ta vupfhumba, kumbe ku xavisa swilo swa nkoka wo hlawuleka.

Ku na tikhamphani ta 10 to fambisa swikwekwetsu laha mati ma khulukakaka hi matimba leti tirhaka eNambyeni wa Zambezi naswona kwalomu ka 250 - 500 wa vanhu va thoriwile eka ntirho lowu hi ndlela yo karhi, ku nga va ku ri tanihi valeteri va le nambyeni, ku rhwalela nhundzu, vachayeri, vatirhi vo pfuneta, xikan'we na lava tirhisanaka na tikhamphani leti tirhaka ku khandziyisa swikwekwetsu laha mati ma khulukaka hi matimba, tanihi tikhamphani to hangalasa mahungu leti tekaka tifilimi ta marendzo yo khandziya swikwekwetsu ya siku na siku no teka swifaniso. Vo tala va vona va tirha swa xinkarhana kumbe vatirhi va tiphisijopo, naswona vo tala va vatirhi lava va suka eka tindhawu ta leka miganga yoleyo.

Ku khandziya swikwekwetsu laha mati ma khulukaka hi matimba xikan'we na ku khandziya tikhenu ematini swi endla mali yo ringana US $ 3 340 000 hi lembe. I nghingirko lowu rhandziwaka ngopfu no va lowu hoxaka xandla swinene eka nkoka wa vupfhumba laha mati ma khulukaka ma ya eka tiFalls.

3.3 Vanhu

Eka ndhawu ya Phurojeke ya le Zambia, yo tala ya mindyangu yi wela eka rixaka ra Toka Leya naswona va vulavula Leya, ririn'wana ra Tonga, tanihi ririmi ra le kaya. Hambiswiritano, ku na nhlayo ya le hansi ya Vatonga, Valozi na Vangoni.

Eka ndhawu ya Phurojeke ya le Zimbabwe, Ndebele hi rona rixaka leri nga tala, ku landzela Nambiya na Tonga. Leti hi tona tindzimi leti vulavuriwaka endhawini leyi, ti landzelelana ku ya hi Ndlela leyi ti nga xaxamela hayona.

3.4 Vukorhokeri na Switirhisiwankulu

Swifambo swa mani na mani swi kala ku fana naloko swi nga ri kona naswona votala va vanhu va famba hi milenge, tibasikiri kumbe va tirhisa mathekisi ya phurayivete na tilifiti. Mati yo nwa ma tala ku kumeka eswihlobyeni / mati yo borhiwa lama nga na tipompo ta mavoko. Nkoka wa mati wu kumiwe ku va wu ri kahle; hambiswiritano, makumeka ku tika hi nkarhi wa tinguva to pfumala mpfula. Mati ma le Henhla ka Misava ma tirhisiwa emakaya na le ka vurimi eZimba, Choma na le ka miganga leyi hanyaka egoveni ra Nambu wa Zambezi eka matlhelo hinkwawo ya Phurojeke.

Tihunyi hi tona leti tirhisiwaka ngopfu ku kuma ndzilo wo sweka, hambileswi eZimbabwe, mindyangu yi tirhisaka na pharafini. Makala na wona ma tirhisiwa ngopfu ku kuma ndzilo eka ndhawu ya Phurojeke. Vulongo byo oma, tijenereta, tithoci, tiphanele ta sola na makhandhlela ma tirhisiwa ku layita, ku hisa na hi xikongomelo xo kufumela.

Mindyangu yintsongo yi na swihambukelo, ngopfu eZambia naswona vanhu va tirhisa nhova tanihi swihambukelo.

3.5 Ndzhaka ya Mfuwo

Tindhawu to ringana 170 ti kumekile ematlhelo hinkwawo ya Nambu wa Zambezi. To tala ta tindhawu leti a hi ta nkoka wa ndzhaka wa xiyimo xa le henhla handle ka ndhawu yin'we leyi ku nga tshuneriweki ekusuhi na yona etlhelo ra Zimbabwe (Chemapato Hill) leyi nga na nkoka wa le xikarhi ku ya ehenhla.

4. ESIA YI ENDLIWE NJHANI

4.1 Endlelo ra ESIA hi ku Angarhela

Endlelo ra ESIA ri bvumba no hlamusela mitshikelelo ya mbangu na vanhu (E&S) leyi ku languteriweke ku va yi va kona eka tifeyisi to hambanahambana ta BGHES; ku ya hi nkambelo lowu mitlawa ya migingiriko leyi faneleke yi hlamuseriwile ku va yi pfuna ku papalata kumbe ku hunguta ntshikelelo. Ku landzela swona, nongonoko wo langutela ku pima wa tirhisiwa ku kambela ku pfuna ka matshalatshala yo hunguta ntshikelelo.

ESIA ya BGHES yi endliwile hi ku tirhisa maendlelo yo hambanahambana ya sayense ku landzelela swilaveko swa Zambia na Zimbabwe na swilaveko swa matirhelo ma kahle ma matiko ya tinxaka. Magoza ma ESIA ma hlamuseriwile laha hansi.

4.2 Ku Hlanganisa no Kambisisa Mahungu ya le ku Sunguleni

Goza ro sungula ra endlelo ra ESIA ri katsa nkambisiso wa matsalwa la ma faneleke mayelana na ndhawu ya Phurojeke ya BGHES. Mahungu yo tala yo tivisa ma Phurojeke ma kumiwile eka ZRA, lama katsaka ku ta na miehleketo ya Phurojeke, tipulani, ku vikiwa ka Phurojeke xikan'we na mikambisiso ya Mbangu na Vanhu leyi nga kona, nhlamuselo ya xikombiso xa kahle na mikambelo yin'wana. Ku engetela, xifundza lexi faneleke na tiphurofayili ta swifundza ti tirhisiwile tanihi swihlovo swo kuma data na mahungu lama hlamuselaka swiyimo swa xikombiso xa kahle.

4.3 Ku Tihlanganisa na Vatekaxiave

Ku tihlanganisa na vatekaxiave – swi vula ku kanela na vatekaxiave lava khumbekaka eka xivandla (vulawuri bya mfumo), vatshami va le kusuhi, vanhu lava khumbekaka na vanhu van'wana lava nga na ntsakelo – swi endliwile (no ya emahlweni swi endliwa) eka endlelo hinkwaro ra ESIA ku hlengeleta mahungu, ku tivsa vanhu lava khumbekaka hi phurojeke no hlengeleta swivilelo swa vona leswi va swi ehleketaka hi mayelana na Phurojeke.

Pulani yo Tihlanganisa na Vatekaxiave (SEP) yi lulamisiwile vevukisa ku tihanganisa na vatekaxiave na leswi humesiriwaka erivaleni eka Phurojeke. SEP yi tlhele yi tirhisiwa tanihi xitirho xo endla leswaku ZRA yi yelanisiwa na matirhelo ya kahle yo tihlanganisa na vatekaxiave eka misava ya tinxaka no tiyisisa leswaku leswi swi endliwile ku ya hi maendlelo ma mfuwo lama amukelekaka. SEP yi katsa ku Kuma Vatekaxiave, Nxopaxopo wa Vatekaxiave, Mapulanelo ya Ndlela yo Tihlanganisa, na Nhluvukiso wa Qhinga ra Vuhlanganisi. Mahungu ya endlelo ro Tihlanganisa ma nyikiwile hi xitalo eka *Xiyenge xa 5 eka* NTS leyi.

4.4 Mahlengeletelo ya Data no Xiyaxiya

Swivutiso na Mimbalago yi antswisiwile hi ku ya xiyaxiya hi xiviri ku kuma swiyimo eka tindhawu leti Phurojeke yi hundzaka hakona. Vativinkulu va Swihari na Swimila, vakamberi va vanhu na mbangu na vativinkulu va mapimelo na tihakelo ta ndziriso va tekile marendzo yo hlaya yo ya endla vulavisisi eka tindhawu ta Phurojeke eZimbabwe na le Zambia.

Ku endla vulavisisi swi katsa mikambelo yo ya hi xiviri, mikambelo ya xiyimo xa ikhonomi ya vanhu, ku tiyisisiwa ka mahungu lama kumiweke eka vanhu van'wana, no tihlanganisa ku endlela ku hlengeleta mahungu ya swiyenge swa vanhu hi xiviri, swa rihanyu, mfuwo na swa ikhonomi ya vanhu swa BGHES hi ku hlawula, ku fambafamba eka tindhawu no tihlanganisa na vatekaxiave va le ka muganga. Vativi vo vuyiseriwa ka ndlela yo tihanyisa va endle mikambelo yo ya hi xiviri eka mihlangano leyi khumbiwaka hi Phurojeke no tirhisa misava.

4.5 NKambelo wa Ntshikelelo

Nkambelo wa ntshikelelo wu tirhisa migingiriko ya Phurojeke leyi ringanyetiweke eka xikombiso xa kahle xa mbangu na swiyimo swa ikhonomi ya vanhu va le ka ndhawu ya Phurojeke. Mbuyelo i ku kumiwa ka laha ku ngava ka na ntshikelelo wa mbangu na vanhu wa BGHES leyi ringanyetiweke.

Mayelana na mhaka leyi, tindlela to hambanahambana le ti nga tirhisiwaka eka Phurojeke ti langutiwile, ku katsa leyo ka Phurojeke yi nga endliwi. Leswi kumiweke eka nkambelo wa ntikelo swi hundziseriwile eka Tiinjhiniyara ta Phurojeke (SP) leswaku va antswisa dizayini ku papalata ntshikelelo wo ka wu nga ri kahle lo wu nga vaka kona hi nkarhi wo aka na le ka feyisi yo tirhisa no antswisa mitshikelelo ya kahle. Ku tirhisana exikarhi ka ZRA, ntlawa wa ESIA na SP hi yin'wana ya tindhawu ta nkoka leti endlelo ra ESIA ri nga hlohlotela ndlela leyi BGHES yi nga hluvuka hayona. Mapulanelo ya Phurojeke, ku teka xiboho na ku pfuxetiwa ka nhlamuselo ya Phurojeke swi ya emahlweni eka nkarhi hinkwawo wa ESIA ku ri ku hlamula eka mitshikelelo leyi kumiweke, na swivilelo swa vatekaxiave. ESIA yi hlohotele dizayini ya Phurojeke hi ndlela leyi landzelaka:

- Hi ku tirhisa wekixopo yo hlanganeriwa exikarhi ka ZRA, ERM (ku katsa na vativinkulu va makhulukelo ya mbangu va Southern Waters) na SP, mimbonakiso leyi kombaka timhaka leti yelanaka na ku kumiwa na ntshikelelo wa matimba ya mati laha mati ma khulukaka ma ya eka ikhosisiteme ya nambu swi endliwile no xopaxopiwa. Hi nkarhi wa wekixopo leyi ndlela ya mbangu na vuinjhiniyara na milawu ya matirhelo leyi nga landzela swona yi pfumelelaniwile. Milawu leyi ya matirhelo yi fikelela ku ringanana exikarhi ko hunguta mitshikelelo ya mbangu laha mati ma nambu ma khulukaka ma ya kona no ndlandlamuxa ku humesiwa ka gezi eka BGHES, ngopfu ku tumbuluxia ka gezi hi minkarhi leri ri tirhisiwa swinene.
- Ku tekiwe xiboho hi ku kanerisana na ZRA, ERM na SP xa leswaku tilevhele ta matirhelo ya damu ti ta tshamela ku cinciwa nguva yin'wana na yin'wana. Hi nguva leyi nga riki ya mpfula (hi ku ya hi makhandziyelo ya swikwekwetsu, ku sukela hi Mhawuri ku fika Sunguti) tilevhele ta matirhelo ti ta hungutiwa ku suka eka 757 masl ku ya eka 730 masl, leswi tisaka ntshuxeko wo va nambu wu fikeleleka ku endla ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba hi nkarhi lowu wo ka wu nga ri na timpfula (nkhuluko wa le hansi) nkarhi lowu sukelaka kwale henhla ka Falls laha mati ma khulukaka kwalomu ka rivilo ra xihatla xa 9 na 10, lowu nga mpimo wa nkarhi wa sweswi wa marendzo ya hafu ya ntlangu wo khandziya swikwekwetsu enambyeni. Hi nkarhi wa nguva ya nkhuluko wa le henhla levhele ya matirhelo yi ta tlakuka wu tlhelela eka 757 masl (eka swiyimo swa nkhuluko wa ntolovelo), na 762 masl ehansi ka swiyimo swa nkhuluko wa le henhla, lowu hlamuseriwaka tanihi nkhuluko lowu Xitici xa Gezi xa Victoria Falls xi talaka ku sungula ku taleriwa. Ku vuyeriwa lo ku nga vaka kona hi matirhelo lamo kota ku cinceka hi ku olova ku ta va ku yisa ehenhla ku tumbuluxiwa ka gezi hi nkarhi wa nguva ya nkhuluko wa le henhla loko swi ri karhi swi vevukisa marendzo ya hafu ya siku yo helela ya ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba enambyeni eka nkarhi wo tala wa nguva leyi ya mitlangu yo khandziya swikwekwetsu laha mati ma khulukaka hi matimba, no hunguta (no kota ku papalata) ku ya ehenhla ko onha ka ku taleriwa eka Xitici xa Gezi xa Victoria Falls.
- ERM yi tirhe kun'we na SP ku hlamusela tindhawu leti nga ngheniwiki leti nga ta va na switirhisiwankulu swa Phurojeke leti nga se hlamuseriwaka (tanihi tindhawu cukumeta kona swilo).

4.6 Makumelo ya Mtshalatshala yo Hunguta Ntshikelelo

Tipulani ta Mafambiselo ya Mbangu na Vanhu (tiESMP) ti hluvukiseriwe swiphemu swo hambana swa Phurojeke ku kota ku tirhisiwa hi nkarhi wo aka na tifeyisi ya matirhelo ya BGHES. TiESMP leti ti nyika vuxokoxoko bya mbangu na migingiriko ya vanhu (ku hunguta ntshikelelo na magoza ya vulanguteri) ku yisa ehansi mitshikelelo leyi nga va ka kona leyi kumiweke hi nkarhi wa ESIA. Mahungu yo engetela mayelana na vufambisi na vulanguteri bya ntshikelelo wa Phurojeke ya nyikiwile eka *Xiyenge xa 6* xa NTS leyi.

Ku Landzelelana ka Tindlela to Hunguta Ntshikelelo:

Matshalatshala yo hunguta ntshikelelo ya hlawuriwa ku ya hi "Ku Landzelelana ka Tindlela to Hunguta Ntshikelelo". Leswi swi vula leswaku xihlawuriwa xo sungula i ku kuma dizayini kumbe maendlelo yo papalata/sivela ntshikelelo (xik. Ku tirhisa tikhemikali leti nga riki ta nghozi); xhlawuriwa lexi landzelaka i ku tirhisa magoza yo hunguta nxungeto wa ntshikelelo (xik. Swisirhelelo swa nsimbhi ku rhendzeleka na xitirho lexi fambafambaka), ku landzela switirho swo tisirhelela (xik swidloko swo tsindziyela, tidlilavhu ku hunguta ku onha ka ntshikelelo). Ntsena laha mandlelo hinkwawo ya nga ringanangiki ku nga tirhisiwaka tindlela tin'wana leto ka ti nga ringanelangiki hi ku hetiseka.

5. XANA KUTIHLANGANISIWE NJHANI NA VATEKAXIAVE?

5.1 Manghenelo

Theme "vatekaxiave" ri vula vanhu lava tshamaka emugangeni, mavandla ya mfumo, mihlangano leyi nga riki ya mfumo na vanhu vahi na vahi lava khumbiwaka hi Phurojeke (hi ndlela ya kahle kumbe yo ka yi nga ri kahle) kumbe va ri na ku tsakela eka phurojeke.

Ku tihlanganisa na vatekaxiave, tanihi xiphemu xa endlelo ra ESIA, i Ndlela yo tihlanganisa matlhelo hinkwawo ku hundzisela mahungu mayelana na phurojeke eka vatekaxiave no kuma mbuyiselo ku suka eka vatekaxiave mayelana na mavonelo ya vona ya Phurojeke, ku katsa swibumabumelo swihi kumbe swihi, swiringanyeto, swivutiso kumbe swivilelo. Mbuyiselo wa vatekaxiave wu tirhisiwa ku twisisa nkambelo wa ntshikelelo wa Phurojeke, no hluvukisa magoza ya mafambiselo lama tirhekaka, ku ringanela xikongomelo. Swibumabumelo hinkwaswo leswi amukeriweke hi ku tirhisa endlelo ra ESIA ro tihlanganisa na vatekaxiave, xikan'we na nhlamulo yo suka eka ntlawa wa Phurojeke swi ta katsiwa eka swibumabumelo leswi nga ta ya eka Vulawuri bya EMA eZimbabwe na ZEMA eZambia.

Mihlangano ya vatekaxiavenkulu lava kumiweke eka nkambisiso wa ESIA yi katsa vanhu lava khumbiwaka hi Phurojeke hi ku kongoma, tindzawulo ta mfumo, tindzawulo kumbe tiejensi ta rixaka, swifundza na ti levhele ta muganga, tikhamphani to ka ti nga ri ta mfumo, minhlangano yo ka yi nga ri ya mfumo/ya vaaki (tiNGO), minhlangano leyi simekiweke etindhawini ta vaaki na mintlawa ya vatirhisi, tanihi vaphakeri va tinhundzu na vukorhokeri.

5.2 Kungu ro Tihlanganisa na Vatekaxiave

SEP i tsalwa leri tiyimeleke ri ri roxe leri hlamuselaka tindlela leti vaaki, vanhu, mavandla na vatekaxiave van'wana va tivisiwaka hi Phurojeke no nyika nkarhi wo nyika swibumabumelo na mavonelo eka nhluvukiso wa Phurojeke. SEP yi hlamusela ku tihlanganisa lo ku nga endliwa eka nkarhi lowu nga hunza, xikan'we na tinhlengeletano na mitirho yin'wana leyi kunguhateriweke nkarhi lowutaka.

SEP yi khavhara tifeyisi ta Phurojeke ta loko ku nga se akiwa na loko se ku akiwile. SEP yi khavhara:

- Ku tihlanganisa ko kombisa leswi lavaka ku endliwa na leswi faneleke ku endliwa ku kota ku swi fikelela (Ndzati 2014 ku fikela Sunguti 2015);
- Ku tihlanganisa koka ku nga ri ka ESIA (Dzivamusoko 2017 Ku fikela Mawuwani 2019);

- Ku tihlanganisa ka Xinkarhana (ku tivisa vatekaxiave leswi nga fikeleriwa eka endlelo ra ESIA) (Hukuri ku fikela N'wendamhala 2018);
- Migingiriko yo tihlanganisa ya feyisi yo vuyelerisa ndlela yo tihanyisa (ngopfu eka mindyangu leyi tshembeleke eka ku kota ku tihanyisa hi vurimi) (28 Khotavuxika ku fikela 10 Mawuwani 2019);
- Ku boxa phakeji ya Phurojeke ya ESIAs (a wi se endliwa); na
- Ku tihlanganisa hi nkarhi wo aka Phurojeke (a swi se endliwa).

SEP i *'tsalwa leri hanyaka'* naswona ri ta tshamela ku tivisa leswi nga fikeleriwa loko Phurojeke yi ri karhi yi ya emahlweni.

Xiphemu xa nkoka xa SEP i "Ndlela yo Vilela", leyi nyikaka munhu un'wana na un'wana loyi a khumbwaka hi BGHES ndlela yo olova yo yisa swibumabumelo swa yena, swivutiso kumbe swivilelo eka vafambisi va Phurojeke lava faneleke ku va muhluvukisi wa Phurojeke. Ehansi ka Ndlela yo Vilela, swivilelo hinkwaswo leswi yisiweke swa landzelerisiwa naswona swi fanele ku hlamuriwa eka nkarhi wa masiku ya 30 hi ku angarhela. Vuxokoxoko bya mahungu ya Ndlela yo Vilela na hilaha vatekaxiave va nga yi tirhisaka hakona swi ta tivisiwa hi nkarhi wa ESIA wo tihlanganisa ko humesela erivaleni exikarhi ka Nyenyankulu na Dzivamusoko 2020.

5.3 Migingiriko yo Tihlanganisa na Vatekaxiave leyi Endliweke ku fika Sweswi

Ku tihlanganisa na vatekaxiave swi endliwile hi nkarhi wo lulamisa Swiviko swa ESIA ku sukea 2014 ku fikela 2019 hi nkarhi wa ku tihlanganisa ko kombisa leswi lavaka ku endliwa na leswi faneleke ku endliwa ku kota ku swi fikelela, ku tihlanganisa ka xinkarhana na migingiriko yo tihlanganisa ka feyisi yo vuyelerisa ndlela yo tihanyisa naswona swi katsile migingiriko leyi landzelaka:

- **Tinhlengeletano to Tihlanganisa** na Vulawuri bya Xifundza xa Xifundzantsongo na Tikhamphani ta Mpfumo; na
- **Ku tihlanganisa na Vanhu** hi ku tirhisa:
  - Tinhlengeletano na Vaaki;
  - Kutihlanganisa na Vanhu eSwitandini;
  - Mikanelo ya Mitlawa yo Kongomisa (FGDs), ku katsa varhangeri va ndhavuko (tindhuna ta xinuna/ta xisati), Vavasati, Vntshwa, varhangeri na vanhu vo hambanahambana lava tshembeleke eka ndlela yo tihanyisa na mitlawa (xik. lava endlaka swilo swa nkoka wo hlawuleka, na lava tlangaka ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba)
  - Swivutiso swa mindyangu (swa lava khumbiwaka hi magondzo etlhelo ra le Zimbabwe ntsena).

5.3.1 Tinhlengeletano to Tihlanganisa

Hi nkarhi wa ku tihlanganisa ko kombisa leswi lavaka ku endliwa na leswi faneleke ku endliwa ku kota ku swi fikelela, ku tihlanganisa ka xinkarhana na migingiriko yo tihlanganisa ya feyisi yo vuyelerisa ndlela yo tihanyisa, tinhlengeletano ti khomiwile na Swifundzankulu hinkwaswo, Swifundza, Tiwadi na Vuhosi lebyi khumbiweke hi ntshikelelo wa BGHES, leswi katsaka leswi landzelaka:

- Zambia:
  - Matsalana wa Nkarhi hinkwawo wa Southern Province;
  - Huvo ya Dorobankulu ra Livingstone;
  - Huvo ya Xifundza xa Kazungula;
  - Huvo ya Xifundza xa Zimba;

- Huvo ya Xifundza xa Choma;
- Huvo ya Xifundza xa Kalomo;
- HRH Hosi Mukuni;
- Hosi Simwatachela; na
- Hosi Sipatunyana.

■ Zimbabwe:

- DA Agritex;
- Muhlanganisi wa Nhluvukiso wa Xifundza xa Hwange;
- Huvo ya Xifundza xa Hwange;
- Vakhanselara va Tiwadi ku suka eka Wadi ya Chidobe na Wadi ya Mbizha;
- Hosi Shana.

5.3.2 Ku Tihlanganisa na Vanhu

Xikongomelonkulu xa endlelo ro tihlanganisa i ku tivisa vatekaxiave hi Phurojeke, ku rhekhoda no hlamula wivutiso na swibumabumelo, no katsa mavonelo ya vatekaxiave eka dizayini ya matshalatshala yo hunguta ntshikelelo, tiESMP na tiLRP

5.3.2.1 Tinhlengeletano na Vaaki – Vanhu va le Switandini na Tindhuna ta xinuna/ta xisati ta Switandi

Tinhlengeletano to tivisa leswi fikeleriweke swa ESIA ti khomiwile na vaaki lava khumbekeke naswona ti katse vanhu va le switandini na tindhuna ta xinuna/ta xisati ta switandi exikarh ka 28 Khotavuxika na 10 Mawuwani 2019. Ku tihlanganiswile na tindhawu leti landzelaka hi ku tirhisa swivutiso leswi pfalekeke swo kongoma eka mhaka yo karhi na Mikanelo ya Ntlawa wo Kongomisa:

■ **Zambia**: Katapazi (ku katsa switandi swa 17), Syabasimbi, Simachila (Kasizi), Syambala, Imanga, Chifuwe, Lugobo, Munakanyemba, Sikabondo, Luyala, Kambulu, Syachongwe, Syamwamvwa, Syamoon, Mutana, Syaboya, Syamazila, Nasilele, Shunta, Chingobe, Syambula, Chikusu, Simbayi, Sindowe, Lifalale, Syandwezi, Muntumuswana, Chibule, N'gandu, Munwana, Mukalahani, Siachuma, Chilizya, Zangala, Namatosgo, Siachalisa, Sichilobe, Siamatete naTembo.

Vatirhisi va le switandini swa laha mati ma khulukaka ma ya kona etlhelo ra le Zambia ra Phurojeke a va kumekanga hi nkarhi wo tihlanganisa, hikwalaho ke, ku khomiwe nhlengeletano na Hosi Sipatunyana na tindhuna ta yena to suka eswitandini swa Mulola, Madyongo, Sikatali, Simanyonge, Posani na Siampondo ku tiyisisa leswaku switandi leswi swi ve na lava swi yimelaka.

■ **Zimbabwe**: Kasikiri, Sidakeni, Jambezi, Mununa, Kasibo, Sizinda, Chisuma, Jabula, Bhiss, Batoka, Monde, Jemwe, Milonga na Sidakeni.

Tinhlengeletano ti kongomise eka xikombiso xa kahle xa ikhonomi ya vanhu lexi nga kona endhawini na xilaveko xo kuma mitlawa ya vanhu lava nga khumbiwaka hi Phurojeke ya BGHES hi Ndlela yo vava. Mikanelo yi tise nkarhi wa kahle wo tivisa phurojeke eka varhangeri na le ka vanhu va le switandini no kuma vanhu lava nga na mahungu loko ku yiwa eka feyisi ya Phurojeke yo humesela mahungu erivaleni.

Xifaniso xa 5.1 Ku Tihlanganisa na Vanhu / Vaaki lava Khumbiwaka hi Phurojeke

Tinhlokomhakankulu leti vuriweke hi vaaki mayelana na BGHES ti katse:

- Ku tekeriwa Misava na tihakelo to rilisa;
- Nhlayiseko wa vanhu;
- Swivandla swa mitirho;
- Swiphiqo swa mahanyelo ya vanhu leswi nga vangiwaka hi vukona bya kontiraka (vuvabyi byo tlulela hi swa timhaka ta masangu, ku xavisa miri na vugevenga);
- Ku susiwa ka switirhisiwankulu na masimu la ma nga eka Mfanelo ya Ndlela (RoW) ya layini yo hangalasa; na
- Ku nyikiwa ka switirhisiwankulu swa vukorhokeri eka vaaki lava tshikelelekeke.

5.3.2.2 Mikanelo ya Ntlawa wo kongomisa

TiFGD ti khomiwile na mitlawa ya vavasati, vantshwa na mitlawa ya ndlela yo tihanyisa (xikombiso vupfhumba) ku tivisa leswi fikeleriweke hi ESIA na Tipulani to Vuyisela Ndlela yo Tihanyisa exikarhi ka 28 Khotavuxika na 10 Mawuwani 2019.

Xifaniso xa 5.2 FGD na vavasati vo huma Chibule na le Xitandini xa Ngandu

5.3.3 Nkomiso wo Tihlanganisa na Vanhu leswi Endliweke eka Xiteji xin'wana na xin'wana xa Phurojeke ku fika Sweswi

5.3.3.1 Ku Tihlanganisa ko Kombisa leswi Lavaka ku Endliwa na leswi Faneleke ku Endliwa ku kota ku swi Fikelela

Ku tihlanganisa ko kombisa leswi lavaka ku endliwa na leswi faneleke ku endliwa ku kota ku swi fikelela swi endliwile hi nkarhi wa Ndzati 2014 ku fikela 2015. Xikongomelo xa feyisi leyi yo tihlanganisa a ku ri ku nyika mbuyelo wo Kombisa Leswi Lavaka ku Endliwa na leswi Faneleke ku Endliwa ku kota ku swi fikelela, leswaku timhaka leti kumiweke ku fikela sweswi ti ta tiyisisiwa no engetela eka tona, swi katse migingiriko leyi landzelaka yo tihlanganisa:

- Ku kuma vatekaxiave;
- Ku hangalasa papila ro tivisa Phurojeke leri ringanyetiweke na Tsalwa ra Mahungu yo Tivisa (BID);
- Ku veketela switiviso swa vuhanglasi bya mahungu;
- Ku hangalasa switiviso swa ndhawu na tifulaya ta tinhlengeletano ta vaaki;
- Tinhlengeletano ta vaaki:
  - Masiku ya Vanhu Hinkwavo;
  - Tinhlengeletano ta Vulawuri na Xifundza na Vulawuri bya Ndhavuko;
  - Tinhlengelatano ta Vaaki; na
  - Tinhlengeletano to Avelana Mahungu.

5.3.3.2 Ku Tihlanganisa ka Xinkarhana

Hikwalaho ka nkarhi lowu se wu nga hundza exikarhi ka ku tihlanganisa ko kombisa leswi lavaka ku endliwa na leswi faneleke ku endliwa ku kota ku swi fikelela (ku ya eku heleni ka 2015), no sungula nakambe ka endlelo ra ESIA ku ya eku heleni ka 2018, Ku tekiwile goza ra xinkarhana ro tihlanganisa na vatekaxiave. Leswi swi katse ku pfuxeta databeyisi ya vatekaxiave xikan'we na xitiviso xo sungula ka ESIA nakambe. Ku tivisa swi endliwile hi ku tirhisa imeyili, SMS, poso na tinhlengelatano to hlaya na xifundza na vulawuri bya ndhavuko.

5.3.3.3 Ku Tihlanganisa ko Vuyelerisa Ndlela yo Tihanyisa

Mutivinkulu wo tshamisekisa lava susiweke etindhawini ta vona eka tlhelo rin'wana na rin'wana ra Phurojeke u rhendzelekile na ndhawu ya Phurojeke ku vona laha ndlela yo tihanyisa yi nga ta tshikeleleka kona hi gondzo ro fikelela (etlhelo ra le Zimbabwe), malokixi ya vatirhi na tilayini to hangalasa. Ku tihlanganisa na mindyangu leyi tshikelelekeke swi katse komiti ya nkarhinyana na swivutiso leswi pfalekeke kantsongo ku kongoma eka mhaka yo karhi exikarhi ka 28 Khotavuxika na 10 Mawuwani 2019. Mimbuyelo yo tihlanganisa loku yi nyikiwile eka Tsalwa ro Vuyelerisa Ndlela yo Tihanyisa ra BGHES.

5.3.3.4 Ku Tihlanganisa ka Nkambisiso wa Vupfhumba

Mbalango wa bindzu ra vupfhuba wu endliwile eLivingstone eZambia na le Victoria Falls eZimbabwe hi Nyeynyenyani 2015 na Mawuwani / Mhawuri 2019. Mbalango wu tlhele wu vuyeleriwa hi 2019 tanihileswi nkambelo wa ntshikelelo a wu yimisiwile ku landzela ku fika emakumu nkambisio wa ntshikelelo wa ikhonomi ya vanhu wa le kusunguleni hi 2015.

Vatekaxiave a va rhambiwile ku buka mikarhi yo vutisiwa swivutiso eka tinhlengeletano ta vatekaxiave leti a ti khomeriwe eLivingstone na le Victoria Falls hi Sunguti 2015, leti nga va na mbuyelo wo bukiwa ka mikarhi yo tala ya swivutiso na tinhlamulo. Swivutiso swin'wana swo engetela swi lulamisiwile hi ku tihlanganisa na mabindzu hinkwawo ya vupfhumba ma le ndhawini lama tivekaka lama a ma sele, hi ku tirhisa riqingho kumbe hi imeyili. Mabindzu yo hlaya ya vupfhumba, ngopfu tindhawu to rhurhela vanhu eVictoria Falls, a ti hlamulanga tiemeyili kumbe tiqingho ta le ku sunguleni kumbe ti nga pfumeli ku vutisiwa swivutiso. Eka leti nga pfumela, tindhawu timbirhi a ti tanga hi siku leri a ri vekiwile ra swivutiso. Mabindzu ya vupfhumba lama vutiseriweke hi 2015 ma tlhele ma rhambiwa nakambe hi 2019 naswona mo tala ya wona ma vekeriwile nkarhi wa swivutiso, xikan'we na mabindzu lama nga sungula ku tirha ku sukela hi 2015.

Ntsengo wo ringana 15 wa swiloto swa swivutiso swi khomiwile eVictoria Falls na le Livingstone hi 2015 naswona 80% wa swona swi tlhele swi vuyeleriwa nakambe hi 2019.

6. SWIKUMIWANKULU SWA MAENLDLEO YA ESIA

6.1 Nkomiso wa leswi Kumiweke

Endlelo ra ESIA ri kumile no kambela mitshikelelo leyi nga va ka kona (ya kahle na yo ka yi nga ri kahle, *Tafula ra 6.1*) eka swilo swo khomeka, swa ntumbuluko na mimbangu ya ikhonomi ya vanhu. Ku endlela ku papalata, ku hunguta no yisa ehansi mitshikelelo yo ka yi nga ri kahle, no tiyisisa leswaku mikateko yo antswisa mitshikelelo ya kahle i swibumabumelo leswi fikeleriwaka na leswaku magoza yo hunguta ntshikelelo/vufambisi ya ringanyetiwa, ku landzela swona nkoka wa ntshikelelo lowu salaka wa ha ri kona (ku nga – endzhaku ko hungutiwa ka ntshikelelo) wa kamberiwa.

Xiyenge lexi (ngopfungopfu *Tafula ra 6.1*) xi xaxameta mitshikelelo hinkwayo leyi nga vaka kona (ya kahle na yo ka yi nga ri kahle) leyi kumiweke no kamberiwa hi nkarhi wa endlelo ra ESIA, na mikomiso ya mitshikelelonkulu leyi nga tala yi nyikiwile.

Tafula ra 6.1 Mivuyeriso na Mitshikelelo yo ka yi nga ri Kahle ya Phurojeke

Ku vuyeriwa ka Mbangu na Ikhonomi ya Vanhu	Mitshikelelo yo ka yi nga ri Kahle ya Mbangu na Ikhonomi ya Vanhu – loko YI NGA hungutiwi hi ku hetiseka…
■ Ku vuyeriwa hi swa ikhonomi eka ikhonomi ya rixaka ■ Nkateko wa swivandla swa mitirho eka muganga ■ Ku Kumiwa ka Tinhundzu na Vukorhokeri eka Muganga ■ Mikateko ya Nhluvukiso wa Muganga ■ Nkateko wo hangalasa gezi ematikweni ya le dzongeni wa afrika ehansi ka vuhlanganisi bya SAPP.	■ Ku humesa Moya lowu Fambisaka ku Hisa endzeni ka Misava ■ Ku hunguta ntalo wa mati eka nkhuluko wa mafambelo yo hambana na nkhuluko wa mati, nkhuluko na rivilo ■ Ku cinca ka swiyimo swa laha mati ma khulukaka ma ya kona ■ Ku lahlekeriwa/onhaka ka ndhawu yo tshama eka yona ya ntumbuluko ■ Ntshikelelo eka swihari hi ku tlumbiwa emagondzweni no hlotiwa hi van'watikontiraka ■ Ku lahlekeriwa hi tindhawu to tshikelela kona ta tinyenyana ■ Rifu/ku vaviseka ka tinyenyana hikwalaho ko hahela eka tilayini to hangalasa gezi ■ Ku cinca tindhawu to tshama eka tona (ku cinca ka tinxaka ta tinyenyayana) ■ Ku khukhuriwa ka misava yo nona yi ya emilambyeni no tala ka nhova emilambyeni ■ Ku kavanyetiwa ka tindlela to tihanyisa hi ku tirhisa misava ■ Ku kavanyetiwa ka migingiriko ya tinhlampfi ■ Ku susiwa eka tindhawu to tshama ■ Ku susiwa eka swa ikhonomi ka vatirhisi va nambu va laha mati ma khulukaka ma ya kona ■ Ntshikelelo wa Ikhonomi no Susiwa ka Vupfhumba lebyi Endleriwaka emilambyeni (xik. ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba, ku khandziya swikepe, vurhurhelo bya vanhu) ■ Ntshikelelo wa Ikhonomi no Susiwa ka Vupfhumba lebyi nga endleriweki emilambyeni (xik. Ku vona tinyenyana, no khandziya tintshava) ■ Ntshikelelo eka ikhonomi ya muganga (vupfhumba) ■ Ku engeteleka ka nxungeto wa tinghozi ta swifambo ■ Ku kavanyeteka hi Ritshuri, Huwa na ku Ninginika

Ku vuyeriwa ka Mbangu na Ikhonomi ya Vanhu	Mitshikelelo yo ka yi nga ri Kahle ya Mbangu na Ikhonomi ya Vanhu – loko YI NGA hungutiwi hi ku hetiseka…
	■ Nhlundzuko wa Vaaki na ku Langutela loku nga Fikeleriwangiki ■ Mtshikelelo leyi fambelanaka na ku rhurha ka vanhu endzeni ka tiko ■ Ku Tlakuka ka Mavabyi yo Tlulela ■ Ku tlakuka ka Malariya na Mavabyi man'wana lama Hangalasiwaka hi swilo swo Hanya hi ku Dyeleta ■ Mitshikelelo eka nhlayiseko wa vanhu ■ Mitshikelelo ya rihanyu na nhlayseko wa vatirhi ■ Ntshikelelo eka ku Hanya na le ka Ndzhaka ya Mfuwo lowu Khomekaka

6.2 Xana hi yihi mitshikekelelo ya Kahle?

BGHES leyi ringanyetiweke yi ta va na ku koteka ka mitshikelelo ya kahle yo hlaya na ku vuyeriwa, ngopfu eka vaaki va muganga, ikhonomi ya muganga na ikhonomi ya rixaka na SAPP, tanihilaha swi kombisiweke hakona eka *Tafula ra 6.1*. Matshalatshala yo hunguta ntshikelelo eka Swiviko swa ESIA na tiESMP ma kongomisiwe eka ku antswisa ku vuyeriwa loku / mitshikelelo ya kahle. Xikombiso, mitirho leyi pimanyetiweke ya 8,000 yi ta va kona hi nkarhi wo aka na wo tirhisa. Mitirho yin'wana ya le tlhelo na miholo yi nga fikeleriwa – ngopfu ya vanhu lava nga riki na swikili/swikili swa le hansi – hi ku tlakusa ku tirhisiwa ka vaphakeri va vukorhokeri va laha mugangeni tanihi vachayeri, vabasisi, vahlayisi na swin'wana na swin'wana.

6.3 Xana hi yihi ***Mitshikekelonkulu*** yo ka yi nga ri Kahle

6.3.1 Ku Humesa Moya lowu Fambisaka ku Hisa endzeni ka Misava (GHG)

Ku khomiwa ka moya wo hisa ku suka eka dyambu endzeni ka misava swi humelela emisaveni hinkwayo naswona xivangelo xo hlawuleka xa ku humesiwa ka GHG swi nge yelanisiwi na xivangelo xin'we hi ku kongoma, tanihi BGHES, na mitshikelelo yo karhi eka ndhawu leyikulu. Loko ku ri hava milawu ya rixaka mayelana na ku kula ka ku humesiwa ka GHG ku suka eka mihluvukiso ya tiphurojeke, endlelo ra Phurojeke ya ESIA yi tirhisile mipimo ya matiko ya tinxaka (tanihi Mipimo ya IFC na Bangi ya Yuropo ya Nhluvukiso wo Aka (EBRD) ku langutisisa ku humesiwa ka moya eka Phurojeke.

Mpimo wa Matirhelo ya 3 wa IFC wu nhlamusela mavikelo ya masungulo ya ku humesiwa ka GHG ka lembe ka 25,000 wa titonne to ringana na CO_2 (tCO2e) naswona, tanihi laha swi vuriweke eka *Xiyenge xa 1.3.3*, yi lava leswaku titlilayente ti "…*langutisisa tindlela tin'wana no tirhisa swilangiwa leswi tirhekaka hi swa xithekiniki na swa timali no ka swi nga durhi to hunguta ku humesiwa ka GHG loku fambelanaka na phurojeke hi nkarhi wo dizayina na wo tirhisiwa ka phurojeke*".

Rimba ra Vufambisi bya Nxungeto ri lava leswaku tiphurojeke hinkwato, eka tindhawu hinkwato, ti endla nxopaxopo wun'wana ku kambela tindlela tin'wana to va na GHG ya le hansi loko ku katsiwa ku humesiwa ka nkarhi wo tirha ko katsa Xikopu xa 1 na xa 2 ku languteriwa ku va ehenhla ka 100,000 tCO_2e hi lembe. Ku engetela, Rimba ra Vufambisi bya Nxungeto ri lava leswaku "*tlilayente (yi fanele) yi vikela vanhu hinkwavo hi tilevhele ta ku humesiwa ka GHG lembe na lembe (mahumeselo ya Swikopu swa 1 na 2 swi katsanile) hi nkarhi wa feyisi yo tirhisa eka Tiphurojeke leti humesaka ehenhla ka 100,000 wa titonne to ringana na CO_2 lembe na lembe. Titlilayente ti ta khutaziwa ku vikela vanhu hinkwavo hi Tiphurojeke leti humesaka ehenhla ka ku hundza 25,000 wa titonne*."

Xihlovonkulu xa nkoka xo humesa GHG hi nkarhi wo aka BGHES xi fambisana na ku cinca ka ku tirhisiwa ka misava ku suka eka kusukela eka ku basisa swimila ku kuma tindhawu to aka (ntsengo hinkwawo wa ku humesiwa loku bvumbiweke i 304.594 tCOze.

Hinkarhi wo tirhisa, xihlovonkulu xa nkoka xo humesa GHG ku suka eka BGHES xi yelanisiwa na ku bola ka ntiko wa leswi swi nga dzikela endzeni ka tiva ra BGHE (ntsengo hinkwawo wa ku humesiwa loku bvumbiweke i 304,594 tCO_2e)

Mayelana na ku akiwa ka magondzo yo fikelela, ku nga va na mitshikelelo leyi fambelanaka na ku humesiwa ka ritshuri leri nga ta vangiwa hi swifambo swo aka, michini yo famba leyi nga tirhisiki magondzo, na migingiriko ya ku ninginika ka misava. Hikwalaho ka swiyimo swa maxelo swa le kusuhi na magondzo yo fikelela, ritshuri leri hahisiwaka hi moya wa ntumbuluko ri ngava xivangelonkulu. Hikwalaho ke, swi languteriwile leswaku ku ta va ku ri na ku tiyiseriwa ka xiyimo xa le henhla ka ritshuri ekusuhi na tindlela leti nga ta tirhisiwa.

Ku hunguta ntshikelelo leswi ringanyetiweke ku ota hunguta swivangelonkulu swo humesa GHG swi katsa ku tirhisiwa ka swimila leswi susiweke (timhandzi) swi tirhisiwa ku va mapulanga lama xavisiwaka no tirhisiwa hi vaaki ku va tihunyi ku nga ri ku swi hisa hi ndzilo hi nkarhi wo aka, no hunguta masalela la ma nga bola loko tiva ra BGHES ri nga se taleriwa.

6.3.2 Mitshikelelo ya Mafambelo yo hambana na nkhuluko wa mati

Ku ta va na ku cinca ka swiyimo swa Nambu wa Zambezi (levhele ya mati na rivilo) tlhelo ra tiva ra mafambelo yo hambana na nkhuluko wa mati, ku katsa na ku khumbeka ka xitici xa gezi xa Victoria Falls na vatirhisi va nambu egoveni.

Matshalatshala yo hunguta ntshikelelo ma katsa ku hunguta tilevhele ta matirhiselo ku ya eka 730 masl hi nguva leyi nga riki na mpfula (hi ku ya hi makhandziyelo ya swikwekwetsu, ku sukela hi Mhawuri ku fikela hi Sunguti), leswi tisaka ntshuxeko wo va nambu wu fikeleleka ku endla ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba hi nkarhi lowu engetelekaka ku suka laha mati ma khulukaka ma ya kona eka Falls ku ya kwalomu ka rivilo ra 9 na 10, lowu nga mpimo wa nkarhi wa sweswi wa marendzo ya hafu ya siku yo khandziya swikwekwetsu laha mati ma khulukaka hi matimba enambyeni; no tlakusa FSL hi nkarhi wa nguva ya nkhuluko wa le henhla ku ya eka 757 masl ehansi ka swiyimo swa nkhuluko wa ntolovelo enambyeni.

6.3.3 Ku Cinca ka Swiyimo swa laha Mati ma Khulukaka ma ya kona

Ku ta na va ntshikelelo mayelana na nkhuluko na siyimo swa nkoka wa mati laha mati ma nambu ma khulukaka ma ya kona eka BGHES hi nkarhi wa matirhelo ya damu. Leswi swi vangiwa hi nkoka wa le henhla wa ikholoji ya swiyenge swa nambu hi le ka Gova ra le Hansi na vukona bya vatirhisi van'wana va mati ku ya emahlweni laha mati ma khulukaka ma ya kona, swi katsa na ku khumbeka lo ku nga vaka kona lo ku fambelanaka na matirhelo ya damu, ngopfu hi nkarhi wa matirhelo ya le henhla ya mati.

BGHES leyi ringanyetiweke tanihi xikimi xo humesa mati ku engetela matimba yo tumbuluxa gezi hi nkarhi wa nguva ya mpfula (Nyenyenyani ku fikelaN'wendzamhala) hi ku landza milawu ya matirhelo leyi vekiweke exikarhi ka ZRA, ERM (ku katsa na vativinkulu va makhulukelo ya mbangu va Southern Waters) na SP. Milawu leyi ya matirhelo (leyi vuriwakka AddPM04) yi katsa ku hlayisa mikhuluko ya xikombiso xa kahle (leyi nga halatiki swidziki) hi nkarhi wa nguva leyi nga riki na mpfula (Ndzati ku fikela Sunguti), na ku tekeleriwa ka nkhuluko wa nkarhi wa matirhisele ya le hansi ya Qmin hi nguva ya mpfula. Milawu leyi ya matirhelo yi fikelela ku ringanana exikarhi ko hunguta mitshikelelo ya mbangu laha mati ma khulukaka ma ya kona enambyeni no tlakusa gezi leri tumbuluxiwaka ku suka eka BGHES, ngopfu hi ku endla gezi hi minkarhi leyi ri tirhisiwaka swinene.

6.3.4 Ku Lahlekeriwa/ku Onhaka ka Tindhawu to Tshama eka tona ta Ntumbuluko

Migingirikonkulu leyi vangaka ku lahlekeriwa hi tindhawu to tshama i ku akiwa ka khumbi ra damu (na switirhisiwankulu leswi fambelanaka na rona) ku ringana 50 km laha mati ma khulukaka ma ya eka Victoria Falls na leswi vangaka ku taleriwa ka Gova ra Batoka ehenhla ka ndhawu yoleyo. Lava swi amukelaka hi ndlela yo tlhaveka ngopfu i vanhu lava tshamaka eka Gova ra Batoka, na Ndhawu ya

Ndzhaka ya Misava Hinkwayo, leswi katsaka ku andlaleka ka le henhla ka Gova ra Batoka ra 17. Gova ra Batoka ri tekiwa tanihi Ndhawu leyi nga ya Nkoka.

Matshalatshala yo hlaya yo hunguta ntshikelelo ya ringanyetiwile, ku katsa ku siviwa ka mitshikelelo eka ndhawu ya nkoka yo tshama eka yona eka Gova ra Batoka na Ndhawu ya Ndzhaka ya Misava Hinkwayo. Ku siva swi lava ku ololoxiwa hi ku tirhisa Pulani yo Siva. Ku koteka ko fikelela pulani yoleyo yo siva ku herisa ntshikelelo wa masalela ya swilo swa nkoka swi fanele ku langutisiwa kambe swi wela ehandle ka ndhawu yo tirha ya endlelo leri ra ESIA.

6.3.5 Ntshikelelo eka Tinyeyenyana

Ku na tinyenyana to tala leti tshamaka eka Gova Batoka, ku katsa Taita Falcons, falcon leyintsongo leyi nga xihloti xo kala lexi tshama erigiyagiyeni, naswona Gova ra Batoka i khale ri tiviwa tanihi hi leri tshamaka nhlayo ya tona yo tala yiri yoxe leyi nga kona.Handle ka Taita Falcons leti hlamuseriweke laha henhla, Rock Pratincoles, Verreaux's Eagle, Crowned Eagle, Peregrine Falcon, Lanner Falcon, Bat Hawks na Augur Buzzards na tona ta kumeka naswona ti ta lahlekeriwa hi ndhawu yo tshama loko ku va na ku taleriwa egoveni.

Mbalango wo kambela xiyimo xa Taita Falcon wu endliwile eka Gova ra Batoka hi Tindzawulo ta Swihari na Swimila swa le Nhoveni ta le Zambia na le Zimbabwe hi 2018. Vuandlalo bya le henhla bya 25 km egoveni byi valangiwile ku kamba vukona bya Taita Falcon; hambiswirtano, xiphemu lexikulu xa Gova ra Batoka lexi nga ta tshikeleleka hi GHES a xi se kamberiwa – nkayivelo lowu wu amukeriwile eka mbalango. Ntshikelelo wo endla tiva eka rixaka ra Taita Falcon a wu tiveki, naswona mavangwa lamakulu eka matwisiselo ya ikholoji ma ha ri kona. Nkambelo wo tshembeka wa Ntshikelelo wu nga ka wu nga fikisiwi emakumu ku fikela loko mavangwa yo karhi ya ololoxiwile, leswi ZRA yi nga tiboha ku swi endla. Pulani ya xendlo leyi nga ta andlala endlelo ro kambela vukona bya Taita Falcons hi ku hetiseka yi ta laveka, yi ta kuma lavhele leyi antswisiweke yo tshembeka ka xiyimo xa rixaka leri na mixungeto leyi nga va ka kona, no kuma tindlela to hunguta ntshikelelo leti faneleke le ti nga ta amukeriwa hi vativinkulu va matiko ya tinxaka.

Ntirhisano na vativinkulu va dyondzo ya tinyenyana to hlota tanihi ZFC, BirdWatch Zambia (vatirhisani va Vutomi bya Tinyenyana va Matiko ya Tinxaka) vativinkulu va Taita Falcon eAfrikaDzonga va ta laveka ku kambela ku koteka ko ololoxa mavangwa na leswi nga laha henhla swa migingiriko ya vulanguteri na vufambisi

Tilayini to hangalasa ti tekiwa tanihi tin'wana ta swivangelonkulu swa rifu ra tinyenyana eka matiko ya tinxaka. Tilayini to hangalasa ti tisa nxungeto eka tinyenyana hi tindlela timbirhi: (i) Tinyenyana leti hahaka ti tala ku ka ti nga voni tintambhu to lala kutani ti tlumbana na tona leswi endlaka leswaku ti vaviseka no fa, (ii) tinyenyana ti kokiwa rinoko hi swilo swo leha ku va ti tiseketela, ku tshama no endla swisaka (laha ku tlakukeke). Tinyenyana letikulu ti na timpiku leti tlharamukaka tikula leti nga khumbaka tintambu le ti nga na matimba na leti nga ethiwa hi nkarhi wun'we leswi endlaka leswaku ti hisiwa hi gezi. Tinyenyana tin'wana a ti sirhelelekanga eka ntshikelelo wa tilayini to hangalasa. Ku hisiwa hi gezi ka tinyenyana to hlota na tinyenyana tin'wana letikulu swi nga vanga ku tsemiwa ka gezi no tshembeka. Tilayini to hangalasa leti nga na vuswkoti bya le xikarhi ka 220 ku ya eka 400 kV ti ta laveka ku kota ku susa gezi eka Xitici xa Gezi xa BGHES. Tilayini leti ti ta va na ntshikelelo wo ka wu nga ri kahle eka tinyenyana tin'wana to hlota letikulu to hambanahambana, leti nga tala eka ndhawu leyi.

6.3.6 Ku Cinca ka Tinhlampfi no Tirhisiwa ka tona

Ku akiwa ka BGHES (ngopfu tiva) swi ta tisa ku cinca eka tindhawu to tshama ta le kusuhi na mati hikwalaho ko cincacinca ka tilevhele ta mati. Ku cinca lokukulu ka tindhawu to tshama leswi nga ta vangiwaka hi tiva ra BGHES swi ta lava leswaku ku sunguriwa tinxaka tintshwa ta tinhlampfi.

Tinxaka timbirhi ta tinhlampfi tinga ha sunguriwa etiveni, ku nga Kapenta leyi lavaka vuvekisi bya mali yo tala. Ku sunguriwa ka muxaka lowu hi ku hetiseka swi languteriwa ku va swi ta tisa muxaka lowu hanyeke kahle wa Tiger Fish etiveni loko nkoka wa mati wu hlayisiwa.

Ntlangu wo njovela Tiger Fish wu nga hluvuka wu va vumaki bya nkoka lebyi seketelaka tiikhonomi ta le mugangeni naswona wu ta langutisiwa eka vufambisi bya tinhlampfi. Vulanguteri bya rixaka ro karhi ra tinhlampfi na ku sunguriwa lo ku nga kotekaka swi ta endliwa

6.3.7 Ku Onhaka ka Ndhawu yo Tshama ya Ntumbuluko leswi Vangiwaka hi ku Cinca ka Makhulukelo ya Ntolovelo

Tiphetheni leti ta nkhuluko to suka eka BGHES ti ta va na nkucetelo wo hundzisa ntolovelo eka Xiyimo xa Ikholoji xa Nkarhi wa Sweswi (PES) xa Nambu xa laha mati ma khumbi ra damu ma khulukaka ma ya kona.

Mimbuyelo ya nkambelo wa nkhuluko wa mbangu yi komba leswaku matirhelo ya le henhla ma languteriwa ku va na ntshikelelo wo ka wu nga ri kahle eka vutshembeki bya ikhosisiteme ya Nambu wa Zambezi ya laha mati ma khulukaka ma ya kona; hi ndlela yoleyo, ku humesiwa ka gezi hi nkarhi wa matirhiselo ya le henhla swi ta papalatiwa hilaha swi kotekaka hakona eka BGHES. BGHES yi ta tirhisiwa tanihi xikimi xa matirhiselo ya le henhla hi nkahri wa nguva ya mpfula ntsena (Nyenyenyani ku fikela Mhawuri) hi ku landza milawu ya matirhiselo leyi sunguriweke hi mbonakiso wa AddPM04 (tanihilaha swi hlamuseriweke eka *Xiyenge xa* ***Error! Reference source not found.***), leswi ga fikelela maendlelo ya mbangu hamambirhi yo ka ku nga yiwi ehansi ku hunza 1.5 eka vutshembeki bya ikhosisitem no ka ku nga yiwi ehansi ka 25% to hunguta ku tala ka 90% wa tinxaka ta tinhlampfi leti ku vuriweke ku va ti ri kona hi nkarhi wo nyika xikombiso xa nkhuluko wa mbangu.

Ehenhla ka leswi, nongonoko wo twisiseka wa vulanguteri bya ikholoji wu ta laveka ku va wu kambela ntshikelelo ya BGHES eka vuandlalo bya laha mati ma khulukaka ma ya eka Nambu wa Zambezi.

6.4 Hi yihi Mitshikelelonkulu yo ka yi nga ri Kahle

6.4.1 Ntshikelelo eka Ikhonomi no Kavanyeta Tindlela to Tirhisa Misava ku Tihanyisa

Ku akiwa ka Phurojeke na migingirko ya matirhelo swi ta tisa ku lahlekeriwa ko karhi ko fikelela misava eka mindyangu leyi tsembeleke eka migingiriko ya swipfuno swa ntumbuluko swa ndlela yo tihanyisa. Ku lahlekeriwa hi misava leyi tirhiseriwaka swikongomelo swa ikhonomi a swi nga ha vi kona emalokixini ya vatirhi, malokixi ya nkarhi hinkwawo na switirhisiwankulu leswi fambelanaka na wona, tikhwari ta matheriyali wo aka damu, magondzo yo fikelela na tilayini to hangalasa.

Ku fikelela tindhawu ta swipfuno swa ntumbuluko swi ta tlhela swi sunguriwa no tlakusiwa (laha swi kotekaka) loko ku nga se akiwa.

Vaaki va ta nghenelela eka ku kumiwa ka swipfuno loko ku nga se akiwa tanihi xiphemu xa migingiriko yo basisa.

ZRA yi ta tirha na vaaki lava khumbiweke hi Phurojeke na vulawuri bya muganga ku pfuneta ku sirhelela swipfuno leswi kumekaka emisaveni. Leswi swi ta katsa ku nyikiwa ka dyondzo eka tiejensi ta muganga na mixungeto leyi fambelanaka na vaaki ku ya eka swilo swa nkoka ku suka eka migingiriko ya vanhu na ntshovelo lowu yisekaka emahlweni na madyelo ya swipfuno swa ntumbuluko.

Ematshan'wini yo sungula ndlela yintshwa ya 17km ta le ku sunguleni ta Layini yo Hangalasa ya Muzuma, swi ta tsakeriwa ku suka eka mavonelo ya vumunhu leswaku Layini yo Hangalasa ya Muzuma yi sungula eka xiticintsongo lexi ringanyetiweke xa ZESCO xa 330 kV eLivingstone, tanihilaha a swi kunguhatiwile hakona ekusunguleni. Kambe leswi swi ta endla leswaku ku va na ku akiwa kun'wana ko engetela ka layini yo hangalasa ya ~ 8km (~ 152 km loko ti pimanyisiwa na ~ 160 km).

6.4.2 Ntshikelelo eka Ikhonomi no Cinca Migingiriko ya Vupfhumba leyi Endleriwaka eMilabyeni

Damu leri endliweke hi BGHES ri ta tlakusa levhele ya mati ya Nambu wa Zambezi lama nga tata Tindhawu to khuluka hi matimba ta 10 ku ya eka 24. Leswi swi ta khumba ku tirheka ka migingiriko ya le mati tanihi ntlangu wo khandziya swikwekwetsu laha mati ma khulukaka hi matimba na wa jet extreme boating.

Tipulani ta Xendlo xo Rhurisa Vanhu ku Hambana (tiRAP) na tiLRP ti ta endliwa hi ZRA eka swiphemu swa Phurojeke leswi nga ehandle ka ndhawu yo tirha ya ERM ya nkarhi wa sweswi, ku katsa (kambe ku nga ri swona ntsena) ku susiwa na hi xiviri na ku suka eka ndhawu ya ikhonomi ka vatirhisi va mati lava nga eka tindhawu to hambana na nkhuluko wa nambu / na lava nga eka leti mati ma khulukaka ma ya kona. tiRAP/tiLRP ta vatirhisi lava nga eka tindhawu leti to hambana na nkhuluko wa nambu (ngopfu vatirhi va swa vupfhumba), swi ta endliwa endzhaku ka nkarhi, tanihi leswi ku taleriwa ka Gova ra Batoka (ku tata tiva ra BGHES) swi ringanyetiwe ku va hi 2027 / 2028. tiRAP/tiLRP leto hambana leti endliweke hi ZRA ti ta endliwa ku ya hi swilaveko swa swiletelo swa Zambia na Zimbabwe, na swilaveko swa IFC PS5 na WB ESS5.

6.4.3 Ntshikelelo eka Ikhonomi no Cinca Migingiriko ya Vupfhumba leyi nga Endleriweki emilambyeni

Ku taleriwa ka tindhawu to khuluka hi matimba na ku lahlekeriwa hi ndhawu yo tshama ka switsotsotswana leswi fambaka na mati swi ta hunguta tinyenyana leti dyaka switsotswana na vamangadyana eka Gova leswi nga ta vanga ku hunguteka ka nkateko wo hlalela tinyenyana. Ku engeteleka ka tilevhele ta mati eka Gova swi ta susa tindhawu letikulu to endlela swisaka ku longoloka na rigiyagiya leri yaka ehenhla.

Vakhandziyi va tintshava a va nga ha swi koti ku khandziya ku longoloka na rigiyagiya ra le hansi naswona, ku khandziya nivusiku na marendzo yo khempa a ma nga ha endleki hikwalahoka ku tlakuka ka tilevhele ta mati eka Gova.

Tipulani ta Xendlo xo Rhurisa Vanhu ku Hambana (tiRAP) na tiLRP ti ta endliwa hi ZRA eka swiphemu swa Phurojeke leswi nga ehandle ka ndhawu yo tirha ya ERM ya nkarhi wa sweswi, ku katsa (kambe ku nga ri swona ntsena) ku susiwa hi xiviri na ku suka eka ndhawu ya ikhonomi ka vatirhisi va mati lava nga eka tindhawu to hambana na nkhuluko wa mati / na lava nga eka leti mati ma khulukaka ma ya kona. tiRAP/tiLRP ta vatirhisi lava nga eka tidhawu leti to hambana na nkhuluko wa mati (ngopfu vatirhi va swa vupfhumba), swi ta endliwa endzhaku ka nkarhi, tanihi leswi ku taleriwa ka Gova ra Batoka (ku tata tiva ra BGHES) swi ringanyetiwe ku va hi 2027 / 2028. tiRAP/tiLRP leti to hambana leti endliweke hi ZRA ti ta endliwa ku ya hi swilaveko swa swiletelo swa Zambia na Zimbabwe, na swilaveko swa IFC PS5 na WB ESS5.

6.4.4 Ntshikelelo eka Ikhonomi ya Muganga

Ku onha ka Phurojeke eka migingiriko ya vupfhumba bya le nambyeni na byo ka byi nga ri bya le nambyeni swi nga hunguta vaendzi va le Livingstone na va le Victoria Falls. Hambiswiritano, vupfhumba a byi tshembelanga eka migingiriko ya le ka Gova ntsena. Victoria Falls a yi nga tshikeleleki hi Phurojeke, kambe tin'wana ta tiphaka ta Victoria Falls National Park na Mosi-oa-Tunya National Park ti ta tshikeleleka hikwalaho ka ku tlakuka ka tilevhele ta mati ta Nambu Zambezi.

Ku tihlanganisa ku yisa emahlweni na vatekaxiave ku kuma migingiriko yin'wana yo amukeleka na migingirko ya ndlela yo tihanyisa swi ta endliwa. Nakambe, timali to rilisa leti nga ta fanela ku hakeriwa mabindzu lama nga ta pfala hikwalaho ka ku akiwa ka damu kumbe lama nga ta hlongola vatirhi ti ta fanele ku pimiwa tanihi xiphemu xa endlelo ra RAP.

6.4.5 Mitshikelelo leyi Fambelanaka no Rhurha ka Vanhu Endzeni ka Tiko

Feyisi yo aka hi ntolovelo hi loko nxungeto wa ku rhurha ka vanhu endzeni ka tiko leswi vangiwaka hi Phurojeke swi ri ehenhla, tanihileswi vanhu va nga fambaka va ya eka ndhawu va ya lavana na mikateko ya swivandla swa ntirho. Ku langutela mayelana na ku rhurhusiwa na mali yo rilisa swi nga endla leswaku vanhu va rhurhela eka ndhawu leyi. Vuhlanganisi lebyi antswisiweke bya swifambo lebyi fambelanaka na Phurojeke swi nga vevukisa mafambelo yo tano.

Pulani ya Mafambiselo ya ku rhurha ka Vanhu Endzeni ka Tiko leswi vangiwaka hi Phurojeke (PIIM) yi ta hluvukisiwa no tirhisiwa.

6.4.6 Ku Tlakuka ka Mavabyi Yo Tlulela

Rivilo ra ku famba ka mavabyi ri nga tlakuka eka tindhawu tin'wana hikwalaho ka Phurojeke, ngopfu hi nkarhi wo aka loko vatirhi va ta laveka swinene na loko ku rhurha ka vanhu endzeni ka tiko swi humelela swinene.

Vuleteri byo lemukisa hi rihanyu eka vatirhi hinkwavo no kamberiwa loko ku nga se thoriwa swi ta va kona eka vatirhi. Vanhu lava kumekaka va karhatiwa hi mavabyi yo tlulela va ta nyikiwa vutshunguri loko va nga se yisiwa endhawini yo tirhela. Vusirheleri bya Xihatla, Tipulani to Tilulamisela no Hlamula ti ta hhluvukisiwa.

6.4.7 Ku Tlakuka ka Malariya na Mavabyi man'wana lama Hangalasiwaka hi swilo swo Hanya hi ku Dyeleta

Malaria i Vuvabyi byi ri byoxe lebyi Hangalasiwaka hi swilo swo Hanya hi ku Dyeleta eka vaaki va le ka muganga eka nkarhi wa sweswi. Ku na ku vilela ka leswaku malariya ma nga tlakuka hikwalaho ka Phurojeke. Hambisiritano, ku na nxungeto wa leswaku mavabyi man'wana, tanihi dari, dengue fever kumbe lymphatic filariasis, by ma nga tumbuluka hikwalaho ka ku endla leswaku tinsuna ti va na tindhawu to tshikela hi ku olova leswi nga tisaka tinxaka to hambana ta tinsuna endhawini leyi.

Nongonoko lowu Hlanganeriweke wo Lawula Malariya, ku Sivela, no Tshungula wu ta hluvukisiwa no tirhisiwa.

6.4.8 Ntshikelelo eka ku Hanya na le ka Ndzhaka ya Mfuwo lowu Khomekaka

Migingiriko yo aka yi nga ha tisa ntshikelelo eka tindhawu ta ndzhaka yo hanya (tanihi tindhawu to hlawuleka na Nambu wa Zambezi ha woxe) na ndzhaka ya mfuwo wo khomeka, ku katsa na tindhawu ta dyondzo ya matimu ya vanhu hi ku cela tindhawu na dyondzo ya masalela ya swihari na swimila, swiakiwa swa matimu na mfuwo wa mayimekelo ya tindhawu).

Laha swi kotekaka, tidizayini to aka ti ta tekeleriwa ku papalata ntshikelelo wo ka wu nga fanelanga eka tindhawu ta nkoka wo khomeka na lowo ka wu nga khomeki. Maendlelo yo Kuma Chansi ma ta tirhisiwa.

6.4.9 Ku Engeteleka ka Nxungeto wa Tinghozi ta Swifambo

Swifambo leswi fambelanaka na Phurojeke swi nga vanga tinghozi ta swifambo leswi nga vangaka ku vaviseka kumbe rifu ra vatirhisi van'wana va magondzo, va swikanyakanya, vafambi hi milenge kumbe swifuwo. Tindlela to hetelela ta magondzo yo fikelela ti ta tekela enhlokweni tindhawu leti nga taleriwa hi vanhu na tindhawu ta switirhisiwankulu swa vanhu (ku nga, swikolo), leswi nga engetelaka ku va kona ko tlumbana, tanihileswi vaaki va nga tolovelangiki khuluko wa le henhla wa swifambo. Magondzo ya ta va na tiphevhimente ta vafambi hi milenge ta 1.5m ematlhelo hinkwawo hi xikongomelo xo hunguta nxungeto wa tinghozi eka tindhawu leti nga taleriwa hi vanhu.

Pulani ya Mafambiselo ya Swifambo yi ta hluvukisiwa. Pulani leyi yi ta khavhara nhayiseko wa mimovha, muchayeri na vakhandziyi, matikhomele ya muchayeri na mukhandziyi, ku tirhisa swidzidziharisi na xihoko, tiawara to tirha, minkarhi yo wisa no vika tinghozi na vulavisisi na swin'wana na swin'wana.

7. MAGOZA LAMA NGA TA LANDZELAKA

Ku landzela ku tivisiwa ka tiESIA eka vatekaxiave, tiESIAs na matsalwa la ma fambelanaka na tona ti ta yisiwa eka EMA eXimbabwe na le ka ZEMA eZambia ku va ti kambisisiwa no langutisisiwa. Swiboho swa mpfumelelo wa swa mbangu leswi tekiweke hi EMA (Zimbabwe) na ZEMA (Zambia) swi ta navetisiwa eka vuhangalasi bya mahungu naswona vatekaxiave hinkwavo lava tsarisiweke va ta tivisiwa xiboho xa mpfumelelo hi imeyili/ku yisiwa hi voko/ poso/ sms.

8. MAHETELELO

BGHES leyi ringanyetiweke i xikimi lexi kotekaka eka swa timali. Nakambe, Phurojeke yi nga kota ku tisa mivuyeriso ya vanhu eka tilevhele ta rixaka, xifundza na muganga hi mikateko ya swivandla swa mitirho na ku kumiwa ka tinhundzu na vukorhokeri bya le ka muganga. TiBGHES leti ringanyeiweke ti ta tlhela ti va na switandzhaku, na mitshikelelo eka ikhonomi ya xifundza na ya le ka muganga, mimbangu ya vanhu na ya dyondzo ya ntivorihanyu, tanihilaha swi hlamuseriweke hakona eka Swiviko swa ESIA ya mpfapfarhuto na NTS leyi. Leswi swi lava ku pimiwa xikan'we na ku pfuna ka kahle lo ku BGHES yi nga nyika eka matiko lamambirhi.

Nkoka wa BGHES eka ku kula ka tiikhonomi ta Zambia na Zimbabwe swi tekeriwa enhlokweni; kambe mitlhontlto ya nkoka eka ku ringanisa swilaveko swo sirhelela mbangu na swilaveko swa ikhonomi na nhluvukiso wa matiko lamambirhi na swona swi tekeriwa enhlokweni.

Phurojeke ya khumbiwa hi mitlhotlho leyi. Hikwalahoke tiESIA ti ringetile ku hlamusela haswimbirhi mivuyeriso ya Phurojeke xikan'we na mitlhaveko ya swa mbangu na vanhu leyi fambelanaka na Phurojeke. Laha mitlhontlho yi kumiwaka, vuxokoxoko bya matshalatshala yo hunguta nkoka wa mitshikelelo yoleyo byi hlamuseriwile; nakambe, laha mitshikelelo yi nga ta ka yi nga hunguteki, leswi naswona swi hlamuseriwile. Laha ku nga na mitshikelelo ya kahle, ku nyikiwile matshalatshala yo antswisa mitshikelelo yoleyo ya kahle.

ERM yi bumabumela leswaku lava tekaka xiboho va tekela enhlokweni mimvuyeriso hinkwayo na mitlhaveko leyi fambelanaka na BGHES, ku endlela ku teka xiboho xo twisiseka mayela na mhaka leyi.

ERM yi na ku hundza 160 wa tihofisi ematikweni lama landzelaka na tindhawu emisaveni hinkwayo

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Poland
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Annex C (8.3)

Ndebele Non- Technical Summary Report

UMTLAMO – *Non Technical Summary*

Ukuhlola isithintela sezeBhoduluko nezokuHlalisana (ESIA), sehlelo elihlongoziweko legezi esuselwa emanzini yeBatoka – Gorge (Zambia neZimbabwe) emlamjeni iZambezi.

25 kuMhlolanja 2020

Inomboro yePhrojekthi: 0239269

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Imininingwana yomtlolo lo	
Isihloko sencwadi	i-Non Technical Summary – UMTLAMO
Isihlokwana sencwadi	Ukuhlola isithintela sezeBhoduluko nezokuHlalisana (ESIA), sehlelo elihlongoziweko legezi esuselwa emanzini yeBatoka – Gorge (Zambia neZimbabwe) emlamjeni iZambezi.
Inomboro yePhrojekthi.	0239269
Ilanga	25 kuMhlolanja 2020
Ubujamo ngokombono	1.0
Umtloli	Victoria Braham
Ibizo lomthengi	Zambezi River Authority (ZRA)

Umlando wencwadi

				ERM approval to issue		
Ubujamo ngokombono	Ibuyekezo	Umtloli	Ibuyekezwengu	Ibizo	Ilanga	Imibono
Umtlamo	1.0	Victoria Braham	Dieter Rodewald & Lindsey Bungartz	Mike Everett	05.02.2020	Umtlamo womthengi ukuyekezwa / ukwamukelwa

Ikhasi lokutlikitla

25 kuMhlolanja 2020

i-Non Technical Summary – UMTLAMO

Ukuhlola isithintela sezeBhoduluko nezokuHlalisana (ESIA), sehlelo elihlongoziweko legezi esuselwa emanzini yeBatoka – Gorge (Zambia neZimbabwe) emlamjeni iZambezi.

Mike Everett
Umlingani

Environmental Resources Management (ERM) Southern Africa (Pty) Ltd.

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Irhelo elinikela ihlathululo yamagama (idlhozari)

I-abhathimenti	Umakhiwo osekela ihlangothi lomakhiwo osandulungu
Indawo esiqubutho	Indawo lapha kwenziwa khona ihlabathi yekhonkhrithi
Izifo ezithathelanako	Sisifo esisabalala kusuka komunye siye komunye ngokuthintana kwegazi namkha amanzi womzimba; ukuphefumulelana; namkha ulunywe inunwana
EMA	The Environmental Management Agency of Zimbabwe. I- EMA ibizelwe ukunikela ilawulo elijamileko leentlabagelo zemvelo nokubulunga imvelo
ERM	Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) ngekhamba phambili kezebhoduluko nezokuhlalisana ekulawuleni ihlelo lokubonisana le - Environmental and Social Impact Assessment (ESIA) process for the ZRA
Focus Group Discussion	i- Focus Group Discussion (FGD) ukuhlanganisa abantu abanelwazi elifanako epilweni (Isib.itja, abomma) baboke ukucocisana ngesihloko esithize
Full Supply Level	I-Full Supply Level (FSL) ileveli yamanzi wangaphandle lokha isimumathi samanzi sisebenza ngeleveli ephakemeko nakunganazikhukhula
Indlela yokunghonghoyila	Le Indlela yokunghonghoyila elisetjenziswa basebenzi, miphakathi, iinhlangano zomphakathi bangaveza ngayo ukukhathazeka kwabo nemibono Kanye nemibiko emihle esithintela seProjekthi.
i-Hydropeaking	Umkhuba wokukhupha amanzi ukungezelela umkhiqizo wamandla wegezi esamanzi emadamini ukuhlangabezana neendingo zegezi zangamalanga
Igezi esamanzi	Amandla wegezi esamanzi kutjho ukutjhugululwa kwegezi ekugelezeni kwamanzi ibe ligezi
Ukuhlalisana	Indlela yokubulunga izinto zokuphila
Iindlela zokuvimbela	Iindlela zokuvimbela, ukunciphisa nokulawula ibhoduluko nomkha ezokuhlalisana nomnotho okunomthintela kwiProjekthi.
Indlu yamandla	Indlu lapho kubulungwa khona izinto ezisetsenziswako nalapho igezi iphehlwa khona
Present Ecological State (PES)	Ipilo ekhona nesidima sokwenza komuntu emlanjeni
Idorobha yeProjekthi	Indawo yabasebenzi bekontraga nabasebenzi be-BGHES
RCC arch-gravity dam	Idamu eligedekako lekhonkhrithi eligobanako emlanjeni ongaphezulu belinabe elidlulisa amandla wamanzi ngemithangaleni yamatje ngeGorge, anikela amandla atlhogekako ukucindezela idamu
Indlela ekghaphakako	Umakhiwo owenziwe ukulawula ukukhululeka kokugeleza kwamanzi kusuka kumthathamanzi ehlela emlanjeni namkha emseleni ongenzasi
Indawo yokulahla izibi	Indawo lapho kulahlwa khona isila, ihlabathi nako koke ukungcola okuvela lokha nakugujwako
Ukuphila ngokuthengisa	Imali eyanele kwaphela ukudla neendingo zangekhaya
i-Switchyard	Indawo evalekile enegere etjhentjako (Isib. Iindlela zokusebenza)
Vector Born Disease	Sisifo esibangwa kulunywa ziinunwana, ivariyasi nebhakthiriya edluliswa ziinlwananeenunwana
ZEMA	The Zambian Environmental Management Agency (ZEMA). I-ZEMA inikezwe umsebenzi wokuqinisa imithetho nemigomo kiko koke okuphathelene nezebhoduluko kufaka hlangana ukuphatha kwehlelo lokuhlola ezebhoduluko

1. ISINGENISO

1.1 Uyini umtlolo lo?

I-Zambezi River Authority (ZRA) isendleleni yokuqelela ihlelo lokuhlola elitjha lamanzi wegezi ngeMlanjeni weZambezi emahlangothini womabili weZimbabwe neZambia eBatoka Gorge. iProjekthi le ibizwa nge*Batoka Gorge Hydro-Electric Scheme (BGHES namkha iProjekthi*). Njengengcenye yomthetho evumela iProjekthi eZimbabwe neZambia, kwenziwe irhubhululo elikhulu ngabakwa-*Environmental Resources Management Southern Africa (Pty) Ltd. (ERM)* phakathi komnyaka we- 2014 ne-2019 ukuzwisisa nokunciphisa imithintela engabakhona ye- *BGHES* ebantwini nasebhodulukweni, ngalesisikhathi i-*ERM* isebenzisene nabosolwazi be-*Design Engineers* ye- *BGHES, Studio Pietrangeli (SP*). Irhubhululeli lenziwe ukwenelisa okutlhogwa yi-*International Financing Corporation (IFC) / World Bank* namanye amabhanga avelele womhlaba angaba netjisakalo yokunikela i-BGHES ngemali. Ngaphezu kwakho koke, irhubhululo elihlukileko elenziwe lithethe iminyaka esithandathu lagcina ngomphumela wemibiko ehlukeneko we-***Environmental and Social Impact Assessment (ESIA)*** nezinye iUMTLOLO -1) Imiphumela ehlukeneko ye-ESIA ilungiselwe ko- 1)umthangala wedamu, ofaka hlangana indlela ekghaphakako namkha ephalalako; izindlu zamandla zaphasi, yinye ehlangothini ngalinye; neprojekthi yemadorobheni (e-Zambia neZimbabwe) neminye imakhiwo engezelelweko (njengamakhwari, iindawo ezifeyila neziziinqubutho); 2) iindlela ezifinyelela eZambia neZimbabwe; kwe-3) imida edlulisakho namkha yokurhatjha eZambia neZimbabwe.

Umtlolo lo wethula i-Non-Technical Summary (NTS) yemiphumela ye-ESIA. IUMTLOLO eziqakathekileko zifaka hlangana imiphumela ye-ESIA–

- I- **Environmental and Social Management Plans (ESMPs),** ahlathulula ukuzimisela nokuzibophela okuzakuthathwa yi-ZRA ukuvikela, ukunciphisa nokulawula imithintela emikhulu begodu ingeze imithintela emihle edalwa yi-BGHES nemakhiwo ebandakanyako (imida yokurhatjha neendlela ezifinyelelako).
- I-**Livelihood Restoration Plans (LRPs)**, ezihlathulula bona imithintela yepilo izakulawulwa njani, ngonobangela wokususa ukurhweba ngemadorobheni neendleni.
- I-**Stakeholder Engagement Plan (SEP)**, ehlathulula ukuthi njani/kuphi lapho i-ZRA izakukhulumisana khona nomphakathi, nanokuthi abantu abanetjisakalo bangabuza bunjani imibuzo begodu bafake nemibono ku-ZRA ngePhrojekthi.

1.2 Singalifunyana kuphi ilwazi elizeleko

Umnqopho we-ZRA kukwenza izinto zibelula ukwenzela bona umphakathi ube nelwazi ngePhrojekthi nokumema umphakathi ukuthi ufake imibono yawo (emihle namkha emimbi) ngePhrojekthi.

Nange unemibuzo, ukungeneliseki namkha imibono ngehlelelo le-ESIAF namkha ngePhrojekthi ye-BGHES namkha ukuthula ilwazi elizeleko, sibawa uthintane ne-**ERM** kilezi zinomboro ngenzasi.

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1.3 Bunjani ubuJamo be-ESIA neHlelo eliVumako?

Umtlamo we-ESIA nemitlolo ekhambisana nawo sele aqedelelwe begodu akhutjhiwe ukobana umphakathi uveze imibono yawo namkha amazizwo wawo.

Ubujamo ngokombono wemiphumela woMtlamo womnyaka we-2019 nemitlolo ekhambisana nawo ikhutjhiwe abona umphakathi uyibuyekeze begodu uveze imibono yawo isikhathi esingamalanga ama-

35 (ukusukela phakathi koMhlolanja kufikela phakathi kukaNtaka we-2019).. Ngaphezulu, imiphumela yemiTlamo ye-ESIA ingatholakala ngendlela ebu-elekthroni kile-*website* elandelako www.erm.com/BGHES-ESIA. Imiphumela yokugcina ye-ESIA nayo izakwenziwa bona itholakale emphakathini.

2. IHLATHULULO LEPROJEKTHI

2.1 Ihlathululo elifitjhazana – Kuba yini i-BGHES itlhogeka?

Ukufakwa kwemali emandleni wegezi kuqakatheke khulu ekuphumeleliseni ituthuko yezamarhwebo namabubulo ezZambia neZimbabwe. Nange zombili iinarhesi zingafinyelela emqophweni nakilokho ezikuhlosile ngokuya kwe *Zambia's Vision 2030* kunye ne *Zimbabwe's Vision 2040*, kunye namanye amahlelo akhambisana nawo, ukufakwa kweemali mabubulo azijamele, agcinekileko namandla wegezi asebenzisa itheknoloji kuzakutlhogakala. Ukuphehlwa kwegezi ngokusebenzisa igezi esamanzi kuyitheknoloji egcinekileke ebonakale iliqiniso begodu ephakamiswako enarheni zombelele yeZambia neZimbabwe. ngokubonakala kwamathuba wegezi esamanzi, igezi esamanzi le iqaleka ngiyo indlela engasebenza begodu ezwakalako kizo iinarha zombili lezi.

i-BGHES ifuna ukurhelebha iinarha zombili lezi ngalokhu:

- Zikghone ukusebenzisa i-BGHES ne Kariba Complex ehlongoziweko sikhathi sinye;
- Ukunciphisa intengo yegezi eZambia neZimbabwe;
- Ukuthuthukisa ukuphehlwa kwamandla wegezi eZambia neZimbabwe;
- Ukunciphisa ukutlhayela kwamandla wegezi okukhona kizo zombili iinarha lezi;
- Ukunciphisa ukungabikho kwegezi;
- Nokwehlisa ukuthembela eentetjhini zegezi ezisebenzisa amalahle.

Nasele iphelile, i-BGHES ehlongoziweko le izakusiza khulu ekunikeleni igezi kizo zombili iinarhezi, begodu iseze ukwaba Amandla wegezi eenarheni ezingesewula ye-Afrika ngaphasi kwhlangano ye-Southern African Power Pool (SAPP), ehlose ukwengeza imikhawulo edluliswako ngokuhlanganisa imingcele.

2.2 Indawo ye-BGHES

i- BGHES ehlongoziweko le izakutholakala ngengcenye engaphakathi kwe-Zambezi River Basin, izakulula ifike eZambia neZimbabwe. Izakutholakala godu ngaphezulu kwehelo eselikhona vele legezi esamanzi leKariba Dam, ngokutjhidelana neVictoria Falls ngamakhilomitha ama-47 ukwehlela emlanjeni.

e-Zimbabwe, i-BGHES ehlongoziweko le ingapasi kwesifunda se-Matabeleland North e-Hwange District. Sifaka amawadi wange- Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sidinda, Mashala ne Simangani. Abasemagunyeni bendabuko kilendawo abanomthintela kilendawo

bafaka hlangana ikosi u-Chief Shana, Bishop Matata Sibanda (umjaphethe endaweni ka- Chief Mvutu, osele walala) no-Chief Hwange.

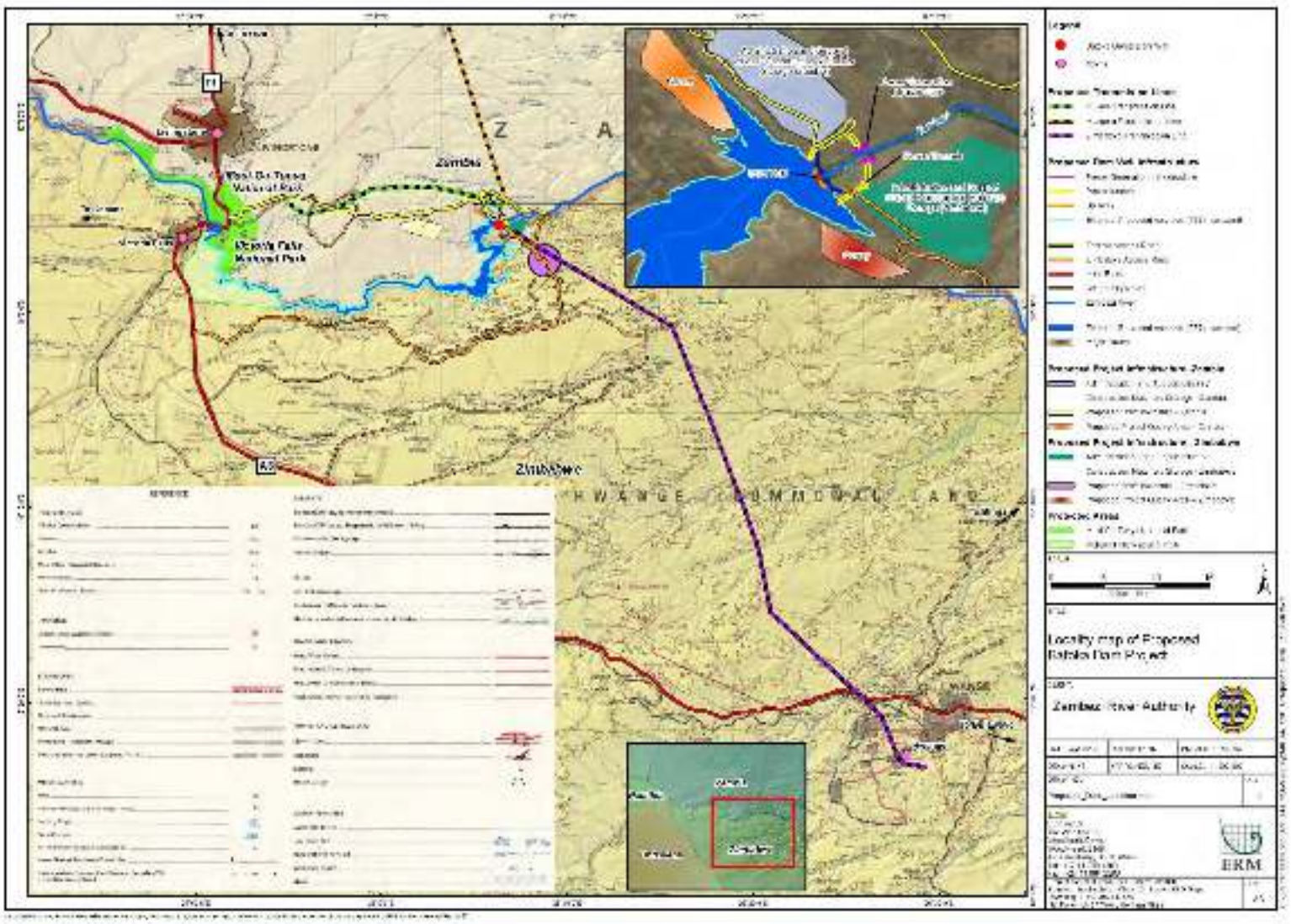
eZambia, i-BGHES ehlongoziweko iwela ngaphasi kwesifunda esingeSewula seKazungula District, khulu khulu emawadini wangeMukuni neKatapazi ewela ngaphasi kwekosi u-Chief Mukuni. Nanoma kunjalo ke,imithintela engaba khona ingazwakala eLivingstone District, eZimba District neChoma District begodu umthintela womsele owehlako ungezwakala e-District of Kalomo. Ihlathululo elifitjhazana lendawo yeProjekthi litjengisiwe ku-*Isithombe 2.1*.

2.3 Ihlathululo lomsebenzi we-BGHES

i-BGHES ehlongoziweko yakhiwe nganazi izingcenye:

- Umthangala wedamu nedamu elenziweDam (isib. – umlanjana / amanzi), faka hlangana umsele;
- Izindlu zamandla zangaphandle, yinye ehlangothini ngalinye lomlanjana(isib. – ngeZambia neZimbabwe);
- Imida ekhambisa igezi ngeZambia ne Zimbabwe;
- Iindlela ezifinyelelako (Batoka Bridge) ngeZambia neZimbabwe;
- Ngemadorobheni ahlala abantu (eZambia neZimbabwe) neminywe imakhiwo engezelelako (njengekghwari, iindawo ezifeyila neendawo ezisiqubuthu).

Lokhu kuyahlathululwa khudlwana eengabeni ezilandelako.



Isithombe 2.1 Location and the Extent of the BGHES

2.3.1 Idamu

Imikghwa yomsebenzi omkhulu wedamu yeBGHES ifaka hlangana:

- **A Roller Compacted Concrete (RCC) arch-gravity dam wall**: Umthangala wedamu elinamandla adosela phasi elinobujamo obugobeneko le-RCC lizakuba mamitha ama- 175 ngokuphakama, libe nobude obungaba mamaitha angaba ma-720 m. Ilingaphezulu layo ngaphakathi linomsele ohlukaniseke ngemisele namkha amaforo alikhomba. Umsebenzi wangaphandle ufakiwe emzimbeni wedamu ngokuthatha ebusweni bomlambo ngaphezulu.
- **Umsele**:Umsele ngeze wahlukaniswa nomthangala wedamu, kodwana uzakukhutjhelwa esizibeni ngamahege alikhomba, linye liphakame ngamamitha ama-743.5 m.
- **Iindlela zamanzi zamandla, ezisezivalweni:** imida emibili yeendlela zamanzi ezinamandla zihlosiwe edongeni ngalinye, kufaka hlangana nemigodi.
- **Izindlu ezimbili ezingaphandle zamandla wegezi ,yinye ehlangothini ngalinye lemlanjeni ngesivalweni:** ihlelo leli lifaka hlangana izindlu ezimbili zamandla wegezi ezingapandle, yinye engaba mamitha ama-175 m ngobude, yinye edongeni ngalinye, ukwehlela ngenzasi kwesiziba. Izindlu ezimbili zamandla wegezi lezi zifana ncamatjhi, begodu yinye inalokhu:
  - *Ama-Six Francis Turbines*, yinye engaba namandla ama-200 MW womthamo ofakiweko;
  - Amajeneretha asithandathu ayivoltheji eli-15 kV;
  - Amaphayiphi wekrani adlulisela igezi, amahege asalithumbu nezinye iinsetjenziswa ezingezelelako.
  - Ibheyi linye elakhiweko;nama
  - Neensetjenziswa ezimatransfoma ezinikelela imida ekhamba phezulu aya eenkunobheni.
- **Iinkunubhe ezimbili** zifakwe edongeni ngalinye emlanjeni, emseleni owehlako edongeni liphakeme ngamamithi ama-800m, phasi kusipara begodu kufikeka lula.
- **Idamu namkha umthathamanzi (umthathamanzi):** i-*The full supply level* (FSL) yedamu ibekwe ngaphezulu kwelwandle ngamamitha ama -757 m. ngemva kokwakha idamu ye-FSL, umthathamanzi uzakuthatha indawo engaba ma-23.0 km² (*Isithombe 2.1*). ngebanga lomthamo wesimumathi omncani wedamu elihloliwe (~1,392 Mm3 at FSL), elikhambisana nkungena kwamanzi, i-BGHES ehlongoziweko izakuvumela kwaphela ukungena kwamanzi ngamalanga, ngeveke (ngaphasi kwezimo ezithize). Ngalokho, i-BGHES ehlongoziweko izakusetjenziswa njengeisusela seplanti emlanjeni ogijimako ngomthamo olingeneko ukuphakama. I-FSL emamitha ama-757 m ikhethiwe ukuqinisekisa bona amanzi abuyela emva avela edamini esele likhona awafinyeleli esisuseni se-Victoria Falls namkha azale amaphayiphi akhona we-Victoria Falls Power Station, lokha nakageleza khulu.

2.3.2 Imida edlulisa igezi

Iindlela ezintathu zemida edlulisa igezi zihlongoziwe njengengcenye ye-BGHES (qala ku-*Isithombe 2.1*), kufaka hlangana:

- I-*Zimbabwe 400 kV Transmission Line*, ezakulinganisela amakhilomitha ama- 67 km ngobude (ukusukela esitetjhini se-BGHES ehlongoziweko esitholakala edongeni elingesewula beliphelele esitetjhini se-Hwange 400/330kV esihlongoziwe).
- I-*Mukuni 330 kV Transmission Line in Zambia*,ezakulunganisela citjhe amakhilomitha ama-22 km ngobude (ukusukela esitetjhini se-BGHES ehlongoziweko esitholakala edongeni elingetlhagwini beliphelele esitetjhini esisanda kkwakhiwa esitjha esima-330 kV Mukuni ZESCO nge- Livingstone).

- *I-Muzuma 330 kV Transmission Line yeZambia*, engalinganiselwa amakhilomitha ali-152 km ngobude (ukusukela esitetjhini i-BGHES ehlongoziweko etholakala edongeni elingetlhagwini beyiphelele esitetjhini seMuzuma ngeChoma).

2.3.3 Iindlela zokukhamba ezifinyelelako

Ukuthuthukiswa kweendlela ezikhona nokwakhiwa kweendlela ezitja ukufinyelela idonga ngalinye ukusuka eendleleni ezikulu ezihlanganisa i-Livingstone kufikela e- Lusaka (Zambia) and Victoria Falls kufikela kwaBulawayo (Zimbabwe) zizakutlhogakala. Umnqopho ngukuvimbela ukwakhiwa kweendlela ezitja kodwana kulingiswe lezi ezikhona ngokukghonakalako.

Nge-Zambia, ithungelelwano lokuthintana lithoma ePalmgrove, lidlule ngendleleni yepheyivemente ekhona ngeMukuni Village (8.3 km). Ukusuka eMukuni Village, indlela iraga iye phambili eqadi nendlela yepheyivemente ekhona edlula eMunwana, irage njalo itjhinge eChibule ngendlela yehlabathi. Indlela etja e- 9.9 km ubude izakuthoma izakuthoma kileli tlobo beyifinyelele edamini leBatoka. Ubude behlangothi leZambia nabupheleleko bungaba ma- 29 km (*Isithombe 2.1*).

Nge-Zimbabwe, indlela *iSizinda Road* izakuletha iimodere kusuka ema- 5km ngePumalanga yeJabula School. (Victoria Falls - Jabula School, Trunk A ne Trunk B), lokha iindlela ezivele zikhona ezirhelebhako namkha ezincane itjhinga ngeKasikiri Village qanzi(Jabula School – Kasikiri Village), kwesibili eBatoka Airstrip bese, ngemva kwalokho, iye ngedamini le-BGHES dam (Kasikiri Village – Batoka Airstrip). Ukuhlanganiswa okupheleleko kuzakuthatha okungasenani isilinganiso sobude obuma- 59.9 km. Ukuhlanganiswa okuhlongozwako lokhu kutlhoga ukuhlanganisa indlela etja (3.6 km ubude) phakathi kwabasebenzi bangedorobheni eZimbabwe nendlela ekulu eya ngedamini. (Isib. idorobha – Batoka Airstrip) (qala ku-*Isithombe 2.1*).

2.3.4 Amadorobha lapho kuzakuhlala khona abasebenzi (iindawo zabasebenzi)

Iindawo zabasebenzi zizakuba ehlangothini ngalinye lemlanjeni. Iindawo zabasebenzi eZambia neZimbabwe zitjengisiweku-*Isithombe 2.1*.

Nakwakhiwako (isikhathi esingaba minyaka elithoba), iindawo zabasebenzi zizakuhlalisa abantu abalinganiselwa ezi- 8,000 ngokuphelelekostaff (faka hlangana abonogada nabasebenzi abasizako), kodwana lokhu kuzakuba ngemva kweminyaka emibili, ekuthomeni abasebenzi abazi-2,000 bazakusebenza ukwakha iindlela ezifinyelelako abazakukhamba kizo, umakhiwo namakampu. Ngaphezu kwalokho, iindawo ezizakusetjenziswa njengendawo yokuphatha umsebenzi neyokubeka izinto zokusebenza ngesikhathi sokwakha kutjengisiwe ku-*Isithombe 2.1*.

Ngesikhathi sokusebenza, abasebenzi abakhako bazakujamelwa ngilabo abakhambisa umsebenzi (Isib., abalungisako, amapholisa, abamukela ipahla, obosiyazi bezefundo, abalawula iplanti, abasebenzi bakarhulumende njll.). Irhubhululo elenziwa ngomnyaka we-1993 labonakalisa ukuthi kuzakutlhogeka abasenzi aba-1,500.

Ngaphezu kwaleyo misebenzi, iindawo zabasebenzi zizakuba neendawo ezifana namabhange, iintolo, ama-ofisi wangeqadi njll.

2.3.5 Eminye imakhiwo engezelelako

Indawo zokulahla iinzibi, ukwakha namakampa weenqubuthu azakutlhogeka eZambia neZimbabwe. iindawo ekungizona zona zeendawo zokwakha zizakuqinisekiswa ngesikhathi somtlamo esizeleko, noma i-ESIA ikhombe iindawo ezizwelako ezingenza imisebenzi le iphelelwe mamandla. - *Isithombe 2.1*.

2.4 Isikhathi sokwakha

Isikhathi sokwakha silindeleke bona sithathe iminyaka elithoba. Sizakuhlukaniswa izikhathi ezimbili namkha iinteji ezimbili: isiteji sokuthoma sizakuba lokha kwakhiwa iindlela ezifinyelelako namakampu

wokuthoma wasafuthi. Kulindeleke bona isiteji sokuthoma lesi sithathe unyaka owodwa ukuya kwemibili. Isteji sesibili sizakuba kukwakhiwa kwedamu, imida edlulisa umlayezo namaplanti; lokhu kungathatha iminyaka esithandathu kuya kweyikhomba. Kulindeleke bona kuzakuvuleka amathuba wemisebenzi anqophileko angaba zi-8,000 iProjekthi nayithuthukako.

Ukuthoma komsebenzi wokwakha we-BGHES kuncike ektheni imvume iyatholakala kurhulumende begodu nemali etlhogakalako iyatholakala.

2.5 Isikhathi sokusebenza

Isikhathi sokusebenza sizakuraga ngesikhathi i-BGHES isesekhona. Ngalesisikhathi kuzakuvuleka amathuba anqophileko wemisebenzi engalinganiselwa i-1,500.

3. IHLATHULULO LENDAWO YE-PROJEKTHI

3.1 Umlando ngendawo

- I-*Zambezi River Basin* ineklayimethi (ubujamo bezulu) etjhugutjhugululako kineminye imilambo ephasini, itjengisa izimo ezingaphezulu ezidluleleko. Iklayimethi kungatjhiwo bona ibuthrophikhali (*sub tropical*), kunesimo sezulu esomileko kusukela kuMgwengweni ukuya kuRhoboyi, nesimo sezulu esimanzi kusukela kuNobayeni bekufike uMhlolanja.
- Ukugeleza kwemvelo okutjhugulukako kweZambezi River kwenziwa khulu madamu amakhulu, khulu khulu amadamu womsele owehlako yeBGHES ehlongoziweko.
- Iinkhukhula zenzeka citjhe njalo ngethumi leminyaka. Izomiso zeminyaka eminengana nazo ziyabonakala edamini, zinomthelela wokugelaza komfula nomkhiqizo wegezi esamanzi.
- Iimila ezikhona eendaweni zeProjekthi ngezemvelo, imithi eminegi ngeyeMopane neKirkia. Iindawo zemvelo zihlathululwe njengehlabathi yebasalti evanganiswe nemithi yemvelo, iripariyani (Batoka Gorge ne- side gorges), igatja lomuthi elingaphezulu nesanta yemvelo yeKalahari. Iindawo zemvelo ezilungisiweko zineemila, iindawo eziphathelene namadorobha, iimayini neziphathelene namabubulo.
- Iingcenye ezingaphezulu zeBatoka Gorge zingaphasi kwe-World Heritage Site ne Mosi-oa-Tunya kunye neVictoria Falls National Parks. i-Batoka Gorge iyindawo yeenyoni eqakathekileko ebizwa nge- Important Bird Area (IBA) ngenobangela lokuveza iinyoni ezizingelako. Into eqakatheke khulu ngenyoni ezingelako buncani be-Taita Falcon ngaphakathi kwe-Batoka Gorge.
- I-Batoka Gorge ifuze bona ibe yindawo yemvelo eqakatheke khulu ngenobangela yendawo yayo ekhethekileko (indlela iv), ethekghwe sisimo sayo se-IBA ne World Heritage. Okuvusa namkha okuthinta iinyoni kufaka hlangana i-Taita Falcon, ekhambisana bunqopha ne-Batoka Gorge.

3.2 Ukusetjenziswa kweNarha neMisebenzi yezaMabubulo

Imiphakathi endaweni yeProjekthi le eZambia neZimbabwe balimi bemakhaya, bathengisa lokho abakuvunako ukwenza imadlana. Ukufuya ngikho okukhamba phambili begodu kukhona nokuhlanganyela ngokuthengisa ukwenza imali encane. Okunye okwwenziwa emphakathini kufaka ukuthengisa, ukutheza nokuthengisa iinkuni, iinthelo zetjanini nehlathini, ukwenza ifenitjhara,ukwenza iintina, ukuzuma iinyamazana, ukuthiya iimfesi, namkha ukusebenza nje nokuphathelene nezokuvakatjha.

Ukuba khona kweVictoria Falls namapaka wenarha ahlukahlukeneko kube nomthelela omkhulu esifundeni i- Matabeleland North eZimbabwe nesifunda esingeSewula e-Zambia bonyana ziqalwe njeendawo ezikulu ezibiza abavakatjhi eenarheni zabo. Ukusunduzwa kwamanzi amhlophe ngeZambezi River nakho kubiza abantu ephasini loke jikelele bona bavakatjhe. Amanye amalungu womphakathi azibandakanya nebubulo lezokuvakatjha, Isib. Basebenza njengabaholi babasunduzi

namkha bathwala izinto, emahotela nakezinye iindawo zokuvakatjha namkha ukuthengisa izinto ezingakajayeleki.

Kunamakhampani wabasunduzi ali-10 asebenza eZambezi River begodu kunabantu abangalinganiselwa ema-250 - 500 abaqatjhiwe ngandlela thize, kungaba njengabahlahli bendlela eya emlanjeni, abathwalipahla, abatjhayeli, abasizako, nalabo abasebenzela amanye amakhampani abambisene nabasunduzi, njengalabo abathengisa amaphepha aqopha amakhambo wabasunduzi ngamalanga nokuthatha iinthombe. Abanengi babo basebenza amalanga begodu ngobunengibavela emphakathini wakilendawo.

Ukusunduzwa kwamanzi amhlophe, kukhambisana ne-kayakingi kungenisa isilinganiso semali esingaba ma-US $ 3 340 000 ngonyaka. Le ngenye yezinto ezenziwako begodu ezinomthelela kwezokuvatjha eFalls.

3.3 Abantu

Endaweni yeProjekthi le eZambia, inengi labantu namkha bemizi ngabesitjhaba seTonga Leya, bakhuluma ilimi lesigodi iTonga, njengelimi labo lokuthoma. Kodwana akhona amaTonga, amaLozi namaNgoni amancane.

Endaweni yeProjekthi yangeZimbabwe, amaNdebele ngiso isizwe esikhulu, balandelwe maNambiya namaTonga. Kanjalo, ngiwo amalimi akhulunywako.

3.4 Iinsetjenziswa nomakhiwo

Azikho iinthuthi zomphakathi, abantu abanengi bakhamba ngeenyawo, amabhayisigiri, namkha amateksi aqathwa ngasese namkha babawe amalefte. Amanzi aselwako athathwa emithonjeni namkha adoswa phasi ngesandla. Wona amanzi gade aqleka amahle; kodwake, ubukhona bawo buyatjhugutjhuguluka lokha nakusikhathi somnyaaka esomileko. Amanzi wangaphandle asetjenziswa emakhaya neentjalweni eZimba, eChoma nakweminye imiphakathi ehlala esigodini seZambezi River kwelinye ihlangothi leProjekthi.

LInkuni ngizo ezisetjenziselwa khulu ukupheka, noma eZimbabwe imizi eminengi isebenzisa iparafini godu. Itjhakholi nayo isetjenziswa khulu endaweni yePhrojekthi le. Ubulongo, amajeneretha, amatotjhi, amasola-phaneli namakeresi asetjenziselwa ukukhanyisa nokufuthumeza.

Imizi embadlwana inamathoyilede ngaphandle, khulu khulu eZambia besele abantu abanengi bazithumela ehlathini.

3.5 Amagugu naMasiko

Inani leendawo ezi-170 zikhethiwe emaqadi weZambezi River. Iindawo lezi ngobunengi bazo azinabo ubungako bamafa namkha amagugu ngaphandle kwendawo yinye eZimbabwe (Chemapato Hill) enokuqakatheka okumaphakathi kuya phezulu.

4. I-ESIA YENZIWA BUNJANI

4.1 Indlela yekambiso ye-ESIA ngokuvamileko

Indlela yekambiso ye-ESIA iveza begodu ihlathulula umthintela wezendabuko nezokuhlalisana (E&S) ezilindeleke bona zenzeke ezikhathini ezihlukeneko ze-BGHES; ngokuya kokuhlolwa lokhu izehlakalo ezahlukileko zihlathululiwe ukuvimba namkha ukunciphisa umthintela. Ngokulandelako, ihlelo lokulandelela nokuhlola liyenziwa ukuhlola ukusebenza kweendlela zokuvimbela.

I-ESIA ye- BGHES yenziwa kusetjenziswa iindlela zesayensi ezihlukeneko ukukhambisana neemfuneko zeZambia neZimbabwe begodu neemfuneko zokwenza imikghwa emihle yenarha zombelele. Amagadango we-ESIA ahlathululwe ngaphasi.

4.2 Irhubhululo ledeski lokuthoma

Igadango lokuthoma ekambisweni ye-ESIA ifake ibuyelelo lomtlolo ophathelene ne-BGHES nendawo yeProjekthi. Ilwazi lesendlalelo seProjekthi sabuthelelwa e-ZRA, esefaka ukuthoma kweProjekthi, amahlelo, ukuthi iProjekthi ikuphi nerhubhululo esele likhona le-E&S, ihlathululo elisisusa nokuhlolwa okunye. Ngaphezu kwalokho, idistrigi efaneleko nelwazi lwesigodi kwasetjenziswa njengedatha nelwazi elihlathulula imibandela esisusa.

4.3 Ukuzibandakanya kwabalingani

Ukuzibandakanya kwabalingani – okutjho ukucocisana neminyango yangaphandle (abasemagunyeni kurhulumende), abahlali abasemaduze, abantu abathintekako nabanetjisakalo - selokhu (futhi kuraga kuba ngikho-) kuyindlela ye-ESIA ukubuthelela ilwazi, ukuveza nokwethula iProjekthj ebantwini abathintekako, nokuthola abakukhathalelako noma amazizo wabo aphathelene neProjekthi.

I-Stakeholder Engagement Plan (SEP) ihlelelwe ukuhlanganisa ukuzibandakanya kwabalingani nokwethula iProjekthi. I-SEP le godu isetjenziswa njengethulusi elenza i-ZRA bona ikhambisane nemikghwa emihle yenarheni ukubandakanya abalingani nokuqinisekisa bona lokhu kwenziwa ngendlela efanele ekhambisana namasiko.i-SEP ifaka hlangana i-Stakeholder Identification, Stakeholder Analysis, Engagement Planning, kunye ne- Development of a Communication Strategy. Ilwazi elizeleko ngehlelo leStakeholder Engagement linikelwe nga-*5* kwe-NTS.

4.4 Ukubuthelela idatha nokuqalisisa

Ukucocisana nokuhlola okwenziwako kusizwa ukuqalisisa ukukhetha izinto ezizakuba mtlhala wenyawo weProjekthi le. Izazi zeFauna neflora, abahloli bezokuhlalisana nezebhoduluko, abosiyazi besezimali nokulilisana bakhambele imizi benza umsebenzi wangaphandle eendaweni yeProjekthi ngeZimbabwe neZambia.

Umsebenzi wangaphandle lo ufake ukuhlola, ukuhlola indlela yokuhlalisana nezeemali, ukuhlolisisa ilwazi elingezelelako nokubonisana ukwenzela ukuthula ilwazi ngezinto ezithintekako,eziphathelene nebhayoloji namkha isayensi yokuphilako, eziphathelene namasiko nokuhlalisana nesimo somnotho se-BGHES ngokukhetha, nokuzibandakanya nabalingani bendawo. Izazi zendawo zenze ihlolo lomzimba zezinto zeProjekthi ezithinta umakhiwo nokusetjenziswa kwenarha.

4.5 Umthintela wokuhlola

Umthintela wokuhlola usebenzisa imisebenzi yeProjekthi ehlongoziweko ebujameni obusisusa sebhoduluko nezamahlalo nomnotho endaweni yeProjekthi. Umphumela utjengisa umthintela ongaba khona kwezebhoduluko nezokuhlalisana ze-BGHES ehlongoziweko.

Ngaleyo ndlela, amaprojekthi amanengana ahlukileko nawo aqaliwe, kufaka hlangana ukungayenzi iProjekthi le. Okutholakele nakwenziwa umthintela wokuhlola kudluliselwe ku-Project Engineers (SP) bazokwazi ukuthuthukisa umtlamo ukuvimbela umthintela ongasimuhle lokha nakuyisikhathi sokwakha nesokusebenza nokungezelela umsebenzi omuhle. Ukuhlangana kweenqhema ze-ZRA, ne-ESIA kunye ne- SP, kingenye yenzindawo eziqakathekileko ezenza ikambiso ye-ESIA bona ibe nomthelela ekuthuthukiseni i-BGHES. Ukutlama iProjekthi, ukuthatha isinqumo nokulungisa kuhle ihlathululo leProjekthi kuragela phambili ngekambiso ye-ESIAukuphendula imithintela ekhethiweko, namazizo wabalingani. I- ESIA has iibe nomthelela omuhle kuProjekthi ngalendlela:

- Ngokwenaza isifundobandulo phakathi kwe-ZRA, ERM (faka hlangana abosiyazi bezebhoduluko beSouthern Waters) neSP, iinthombe eziveza iindaba eziphathelene nokukhiqizwa kwegezi esamanzi inomthintela emseleni womlambo owehlela phasi ezintweni eziphilako ezingemlanjeni zakhiwe bezahlolwa.kilesi sifundobandulo kuvunyelwene ngendlela yezebhoduluko nobunjiniyera begodu nemithetho yokusebenza. Imithetho yokusebenza le athola ukulingana phakathi kokwehlisa umthintela wezebhoduluko emseleni owehlako womlambo nokukhulisa amandla we-

BGHES, khulu khulu lokha nakukhutjwa amandla wegezi ngesikhathi lapho atlhogakala khona khulu.

- Kuvunyelenwe lokha nakucocisanwa ne-ZRA, ERM ne- SP ukuthi amazing wokusebenza kwedamu azakulinganiswa ngokuya kwesikhathi somnyaka. Ngesikhathi sonyaka esomileko sesomiso (ngezikhathi zokusunduza, kusukela ngoRhoboyi kuya kuTjhigweni) ileveli yokusebenza izakwehliswa kusuka ema-757 masl kufika ema- 730 masl, lokho kutjho ukutjhaphulula umfula indawo ende ukwenzela ukusunduza ngesikhathi lesi sesomiso (ukwehla okuphasi) esilula indlela yoke kusukela emseleni weFalls aze abe ngamandla nge-9 ne10, okungumkhawulo wanje welanga elihafu labasunduzi emlanjeni. Ngesikhathi sokugeleza khulu, ileveli yokusebenza izakungezelelwa godu ibuyele ema-757 masl (ngesikhathi sokugeleza esijayelekile), nangama-762 masl ngesikhathi sokugeleza esiphezulu, ihlathululwe njengokugeleza ngaphezulu lapho isitetjhi seVictoria Falls sithoma khona ukuzala. Amathuba lokuzuza kilomsebenzi otjhugulukako ngukukhulisa ukukhutjhwa kwamandla wegezi ngesikhathi sonyaka lapho kunokugeleza okukhulu nakwenziwa ilanga elihafu lokusunduza elipheleleko emlanjeni esikhathini esiningi ngesikhathi sokusunduza, nokwehlisa (nethuba lokuvimba) eminye imithelela enobungozi edalwa zikhukhula zeVictoria Falls Power Station.
- I-ERM isebenzisane ne-SP ukuhlathulula iindawo ekungakhanjelwa kizo zeendawo zomakhiwo weProjekthi ezingakabi ukuhlathululwa. (njengeendawo zokulahla izibi).

4.6 Ukukhomba iindlela zokuvimbela

i-Environmental and Social Management Plans (ESMPs) yenzelwe iingcenye zeProjekthi ezihlukileko zeBGHES nakwakhiwako nalokha nakusetjenzwako. Amahlelo la we-ESMPs ahlathulula izenzo zebhoduluko nezokuhlalisana (iindlela zokuvimbela nokutjheja) ukunciphisa amathuba womthintela akhonjiweko ngesikhathi seESIA. Ilwazi elizeleko malungana nokulawula nokutjheja imithintela yeProjekthi liyatholakala ku - *Isigaba 6* we- NTS.

Irherho lokuVimba:

Iindlela zokuvimba zikhethwe ngokuya “kweRhelo lokuVimba” . Lokho kutjho ukuthi okokuthoma ngukuthola umtlamo namkha indlela yokwenza ukuvimbela umthintela (Isib. Ukusebenzisa amakhemikhali anganabo ubungozi); okulandelako ukusebenzisa iindlela zokunciphisa umthintela ongabanobungozi (Isib. Izinto ezisasimbi lapho kuneensetjenziswa ezikhambako) ilandelwe ziinsetjenziswa zokwembatha zokuzivikela (Isib. abomakarapa, amahasikune ukuvimbela imithintela onobungozi). Kwaphela nange zoke iindlela azanelanga kungaqalwa ezinye.

5. UKUBANDAKANYEKA KWABABAMBICHAZA KWENZIWE BUNJANI?

5.1 Isingeniso

Igama elithi “ababambichaza” litjho abahlali bendawo, iminyango yomphakathi, iinhlangano zangeqadi nabanye abantu abangathinteka (kuhle namkha kumbi) yiProjekthi le namkha abangaba netjisakalo kileProjekthi.

Ukuzibandakanya kwababambichaza, njengengcenye yehlelo le-ESIA, liyindlela yokubonisana ekhamba kabili ukudlulisa iwazi ngeProjekthi kubabambichaza bese kutholakala umbiko obuyako ovela kibo ababambichaza ngemibono yabo ngeProjekthi, kufaka hlangana imibono, imibuzo namazizo. Umbiko obuyako ovela kubabambichaza usetjenziswa ukutjheja ukuhlola umthintela weProjekthi, ukwakha iindlela ezilungele ukulawula ihloso yeProjekthi. Yoke imibono etholakale ekubandakanyeni ihlelo lababambichaza be-ESIA nependulo evela esiqhemeni seProjekthi kuzakufakwa ekunikeleni kwamaswaphela kwe-ESIA BANIKELA limphathi mandla ze-EMA ne-ZEMA.

Ababambichaza abakhulu batjheje bona irhubhululu le-ESIA lifaka abantu abathinteka bunqopha yiProjekthi, iminyango karhulumende, iminyango kazweloke, amadistrigi neyesigodi, amakhampani

azijameleko, iinhlangano ekingasizo zakarhulumende/nezomphakathi (NGOs) iinhlangano eziphathelene nomphakathi nezinye iinqhema njepahla nabanikela ngeensetjenziswa.

5.2 Ihlelo lokuzibandakanya lababambichaza

i-SEP imtlolo ohlukeneko ohlathulula iindlela imiphakathi, abantu, iinhlangano nabanye ababambichaza batjeliwe ngeprojekthi begodu banikeziwe ithuba lokuveza imibono ekuthuthukiseni iProjekthi. I-SEP ihlathulula ukuzibandakanya okwenziwe esikhathini esidlulille, nemihlangano Kanye namahlelo ahlelelwe esikhathini esizako.

i-SEP ifaka iinkhathi zangaphambi kokwakha nalokha sekwakhiwa.I- SEP ifaka:

- Isikhathi sokulinganisa bona umsebenzi uthomaphi uphelelephi (Khukhulamungu 2014 kuya kuTjhirhweni 2015);
- Ukuzibandakanya okuphathelene ne-Non-ESIA (Nobayeni 2017 kuya kuVelabahlinze 2019);
- Ukuzibandakanya kwasikhatjhana (ihlelo le-ESIA lokunikela ilwazi kubababambichaza) (uSinyikhaba kuya kuNobayeni 2018);
- Imisebenzi yokuzibandakaya yesikhathi sokubuyisela ipilo (khulu khulu kilawo makhaya athembele ekufuyeni emakhaya) (28 kuMgwengweni kuya ku- 10 kuVelabahlinze 2019);
- Ukukhutjwa kwe- Project ESIAs Package (kujanyisiwe);
- Nokuzibandakanya ngesikhathi sokwakha (kujanyisiwe).

I- SEP *'Mtlolo ophilako'* izakwenziwa ikhambisane nesikhathi njalonjalo iProjekthi nayiragela phambili.

Ingcenye eqakatheke khulu ye-SEP "Yindlela yokufaka isililo", enikela indlela elula kilowo nalowo muntu othintwa yi-BGHES ukufaka imibono yabo, imibuzo namkha iinghonghoyilo ebaphathini abafaneleko beProjekthi. Ngaphasi kweNdlela yokufaka isililo, zonke iinlilo namkha iinghonghoyilo ziyalandelelwa begodu kufanelwe ziphendulwe kungakapheli amalanga ama-30. Ilwazi elizeleko ngeNdlela yokufaka iinlilo nanokuthi ababambichaza abangayisebenzisa izakunikelwa ngesikhathi sokukhutjwa kokuzibandakanya kwe-ESIA phakathi kukaNtaka no Sihlabantakana 2020.

5.3 Umsebenzi wokuzibandakanya wababambichaza osewenziwe kuze kube manje

Ukuzibandakanya kwababambicaza kwenziwe ngesikhathi sokulungiselela imibiko ye-*ESIA Report*s kusukela ngomnyaka we- 2014 kufika kumnyaka we-2019 ngesikhathi sokulinganisa bona umsebenzi uthomaphi begodu uphelelephi, ukuzibandakanya kwesikhatjhana nokuzibandakanya nemisebenzi yomkhaya namkha yokubuyisela kwafaka nakhu okulandelako:

- **Imihlangano yokubonisana** nabasemagunyeni bedistrigi yesigodi (Regional District Authorities) namakhampani wezemisebenzi (Utilities Companies);
- **Ukuzibandakanya nomphakathi** nge:
  - Imihlangano neMiphakathi;
  - Ukubonisana nabahlali besigodini/bemakhaya;
  - Ama-Focus Group Discussions (FGDs), afaka abaholi bendabuko/iinyanga (amadoda/abafazi abaholako), abafazi, itja, abadala nabantu bemakhaya abathembakalako neenqhema (Isib. Abenza izinto zakudala/ abanelwazi lendabuko, abasunduzi bemlanjeni omhlophe)
  - Imibuzo eyenzelwe ukubuzwa emakhaya (kilabo abathintekako ziindlela ngehlangothini leZimbabwe kwaphela).

5.3.1 Imihlangano Yokubonisana

Ngesikhathi sokulinganisa bona ithomaphi begodu iphelelaphi, ukuzibandakanya kwesikhatjhana nesikhathi sokuzibandakanya kubuyiselwa imisebenzi yemakhaya, imihlangano yabanjwa nazo zoke iziFunda, amaDistrigi, amaWadi noBukhuosi okwenziwe yi-BGHES okufake hlangana lokhu:

- Zambia:
  - Southern Province Secretary;
  - Livingstone City Council;
  - Kazungula District Council;
  - Zimba District Council;
  - Choma District Council;
  - Kalomo District Council;
  - HRH Chief Mukuni;
  - Chief Simwatachela; and
  - Chief Sipatunyama.
- Zimbabwe:
  - DA Agritex;
  - Hwange District Administration;
  - Hwange District Council;
  - Ward Councillors we- Chidobe Ward ne- Mbizha Ward; kunye ne
  - Chief Shana.

5.3.2 Ukuzibandakanya komphakathi

Ihloso ekulu yehlelo lokuzibandakanya ngukwazisa ababambichaza ngeProjekthi, ukurekhoda nokuphendula imibuzo nemibono nokuhlanganisa imibono yabababambichaza ekwenzeni iindlela zokuvimbela imiraro, ama- ESMPs nama- LRPs.

5.3.2.1 Imihlangano nemiphakathi – abahlali bemakhaya nabarholi bamadoda/babafazi

Imihlangana eveza ukuthi i-ESIA sele ikhambe kangangani yabanjwa nemiphakathi ethintekako faka hlangana abarholi bamadoda nebabafazi phakathi komhla ka 28 kuMgwengweni no-10 kuVelabahlinze. Iindawo ezilandelako kuhlangenwe nazo ukwenza imihlangano yokubonisana kusetjenziswa amaphepha wemibuzo ahlelekile nokucocisana kwamabuthelelo anqophileko:

- **Zambia**: Katapazi (faka hlangana iingodi e- 17), Syabasimbi, Simachila (Kasizi), Syambala, Imanga, Chifuwe, Lugobo, Munakanyemba, Sikabondo, Luyala, Kambulu, Syachongwe, Syamwamvwa, Syamoon, Mutana, Syaboya, Syamazila, Nasilele, Shunta, Chingobe, Syambula, Chikusu, Simbayi, Sindowe, Lifalale, Syandwezi, Muntumuswana, Chibule, N'gandu, Munwana, Mukalahani, Siachuma, Chilizya, Zangala, Namatosgo, Siachalisa, Sichilobe, Siamatete and Tembo.

  Abahlali bangemseleni womlambo ngeqadi le Zambia khenge bathlakale ngesikhathi kucociswana ye ke umhlangano nekosi u- Chief Sipatunyama neenduna zakhe kilezi zigodi ze - Mulola, Madyongo, Sikatali, Simanyonge, Posan ne Siampondowabanjwa ukuqinisekisa ukuthi zoke iingodi zinabajameli.

- **Zimbabwe**: Kasikiri, Sidakeni, Jambezi, Mununa, Kasibo, Sizinda, Chisuma, Jabula, Bhiss, Batoka, Monde, Jemwe, Milonga ne Sidakeni.

Imihlangano le iqale isisusa eivele sikhona esiphathelene nokuhlalisana nezomnotho endaweni begodu nokubona abantu abangahle bathinteke khulu ngaleProjekthi yeBGHES. Ukucocisana kunikele ithuba lokwethula iProjekthi kubarholi nabahlali nokukhetha abazakungena ngesikhathi sokwethula i-Projekthi ye-ESIA.

Isithombe 5.1 Ukubonisana nomphakathi / Imiphakathi ethintekileko

Iinhloko ezikhamba phambili ezivezwe miphakathi maqondana ne-BGHES kufake:

- Ukuthatha inarha nokubhadelwa namkha ukubonelelwa;
- Ukuphepha komhlabathi;
- Amathuba womsebenzi;
- Ukungazibathi kuhle kwabasebenzi bamakontraga (izifo zomseme ezithathelanako, ukuthengisa ngomzimba nobulelesi);
- Ukususwa komakhiwo nebala lokudlala ngaphakathi kwemida yokudlulisa, i-Right of Way (RoW);
- Ukunakekela imakhiwo emiphakathini ethintekako.

5.3.2.2 Ukucocisana kwamabuthelelo anqophileko

Ama-FGDs abanjiwe neenqhema zabomma, itja, neenqhema zomphakathi (njengezokuvakatjha) ukuveza amahlelo we-ESIA ukuthi sele ikhambe kangangani ne-Livelihood Restoration Plans phakathi komhla ka- 28 kuMgwengweni na-10 kuVelabahlinze 2019.

Isithombe 5.2 i-FGD nabomma be- Chibule ne- Ngandu Village

5.3.3 Isirhunyezo sokuzibandakanya esenziwe esitejini seProjekthi ngayinye kuze kube manje.

5.3.3.1 Ukuzibandakanya ngesikhathi sokulinganisa bona ithomaphi begodu iphelelaphi

Ukuzibandakanya ngesikhathi sokulinganisa bona ithomaphi begodu iphelelaphi senziwa ngesikhathi sikaKhukhulamungu 2014 ukuya kuTjhigweni 2015. Umqopho walesisikhathi sokuzibandakanya bekungukunikela umbiko obuyako ngemiphumela yesikhathi sokulinganisa bona ithomephi begodu sele ikuphi (Scoping Phase), ukwenzela bona izinto eziveziweko ziqinisekiswe begodu zikhuliswe emihlanganweni elandelako:

- Ukukhetha ababambichaza ;
- Ukusabalaliswa kwencwadi yesimemezelo yeProjekthi ehlongoziweko le, nomtlolo onikela ilwazi langaphambili i- Background Information Document (BID);
- Ukubekwa kwezaziso zeembikindaba;
- Ukusabalalisa izaziso ngeendawo zokwakha namaphetjhana ngemihlangano yomphakathi;
- Imihlangano yababambichaza:
  - Amalanga avulelwe umphakathi ;
  - Imihlangano yabasemagunyeni nabasemagunyeni weDistrigi nabaRholi bendabuko/ iinyanga;
  - Imihlangano yomphakathi;
  - Nemihlangano yokwaba ngelwazi

5.3.3.2 Ukuzibandakanya kwesikhatjhana

Nasiqale isikhathi eside esesiphelile sokulinganisa bona ithomephi begodu ikuphi engagement (ekupheleni komnyaka we- 2015), nesikhathi sokuthoma godu ihlelo le-ESIA ekupheleni komnyaka we- 2018, kwaba khona ukuzibandakanya kwasikhatjhana kwababambichaza.lokho kwafaka hlangana ukulungisa ngobutjha imininingwane yababambichaza begodu nesaziso sokuthi izokuthoma nini futhi i-ESIA. Isaziso lesi senziwa ngokusenzisa ama-imeyili, ama-SMS, ngeposo nangemihlangano emilandelande nabasemagunyeni ngedistrigi neenyanga.

5.3.3.3 Ukuzibandakanya kokubuyiselwa komphakathi

Abosiyazi bokuhlalisa be- ERM emahlangothini woke weProjekthi bathathe ikhambo batjhinga eendaweni yeProjekthi ukubona bona amakhaya azakuphazamiseka ngakuphi ngendlela le (ngehlangothini leZimbabwe), amadorobha wabasebenzi nemida edlulisako. Ukuhlangana nokuzibandakanya namakhaya kufake hlangana ukucocisana okungakahlelwa nokuhleliwe citjhe phakathi kwama-28 kuMgwengweni ne-10 kuVelabahlinze 2019. Imiphumela yemihlangano le iyatholakala emtlolweni i- Livelihood Restoration Documents ye- BGHES.

5.3.3.4 Ukuzibandakanya ngerhubhuluo lezokuvakatjha

Ukuhlola kwezamabubulo wezokuvakatjha kwenziwe eLivingstone, eZambia ne Victoria Falls, Zimbabwe ngoMhlolanja 2015 nangoVelabahlinze / uRhoboyi 2019. Ihlolo libuyelelwe ngomnyaka we-2019 njengombana ukuhlolwa komthintela kade kujanyisiwe kulandela ukupheleliswa kwerhubhululo lomthintela ophathene nezokuhlalisana nezomnotho olwenziwe ngomnyaka we- 2015.

Ababambichaza bamenywa bona babawe isikhathi sokucocisana emihlanganweni yababambichazaogade ubanjwe eLivingstone ne Victoria Falls ngoTjhigweni 2015, okwagcina ngokuthi kube khona ukucocisana okuhlukileko okuceliwe. Okhunye ukucocisana kwahlelwa ngokuthinta amabubulo woke aseleko endaweni ngomrhala nama imeyili. Amanengi amabubulo wezokuvakatjha, khulu khulu beendawo zokuhlala ngeVictoria Falls azange baphendule ama-imeyili namkha imirhala nomkha bangavumi ukucocisana. Kilabo abaphendulileko, babili khenge bavele ngelanga elihleeliwe lokucocisana. Amabubulo wezokuvakatjha ekucocisenwe nawo ngomnyaka we-2015, bathintiwe godu ngomnyaka we-2019, ukucocisana kwahlelwa nabanengi babo, nokuthoma kokusebenza kwamabubulo kusukela ngomnyaka we-2015.

Ngokupheleleko kubanjwe iinkulumiswano ezi-15 eVictoria Falls ne Livingstone ngo- 2015 begodu ama- 80% wabo, bacocisene nabo godu ngomnyaka we-2019.

6. IMIPHUMELA YEHLELO LE-ESIA

6.1 Imiphumela ngokurhunyeziweko

Ihlelo le-ESIA libone begodu lahlola umthintela ongenzeka (okuhle nokumbi, *iIThebula 6.1*) eendaweni ngokomzimba, ngemvelo nangokuhlalisana nezomnotho.ukukhandela, nokunciphisa umthintela ongasimuhle, nokuqinisekisa ukuthi amathuba wokuthithukisa umthintela omuhle ayatholakala, isiphakamiso nendlela yokuvimbela/lawula ihlongoziweto the physical, natural and socio-economic environments. In order to avoid, minimise and reduce negative impacts, and to ensure that opportunities for the enhancement of positive impacts are realised recommendations and mitigation/management measures are proposed, okulandelako ngukuhlola umthintela oseleko oqakathekileko. (Isib. – ukuvimbela okungemva).

Isigabesi (khulu khulu *iIThebula 6.1*) listjengisa woke umthintela onamandla ongaba khona (omuhle nomumbi) obanakele bewahlolwa ngesikhathi sehlelo le-ESIA, nerhunyezo lomthintela omkhulo onikeziweko.

IThebula 6.1 Inzuzo nomthintela omumbi weProjekthi

Inzuzo yezebhoduluko nezokuhlalisana nezomnotho	Umthintela wezebhoduluko nezokuhlalisana – Nazingakavinjelwa kuhle…
■ Inzuzo yezomnotho wenarha zombelele ■ Amathuba wezemisebenzi ■ Ukuthengwa kwepahla neensetjenziswa ■ Amathuba wokuthuthukiswa komphakathi ■ Ithuba lokusabalalisa Amandla wegezi eenarheni zesewula ye-Afrika ngaphasi kwemibandela ye-SAPP.	■ Ukukhutjhwa kwerhasi ye-Greenhouse Gas ■ Ukwehlisa ubungako bokugeleza nebelo lamanzi womlamjana ogaphezulu ■ Ukutjhuguluka kobujamo bomlanjana owehlako ■ Ukulahlekelwa/nokwehla kwamandla wezinto zemvelo/zendabuko ■ Umthintela wokubulawa kweenlwane zendle endleleni nangokuzuma basebenzi bekontraga. ■ Ukusweleka kweendawo zeenyoni zokuzala. ■ Ukufa kweenyoni/ukulimala kwazo naziphaphako zithinta imida yokudlulisa imilayezo. ■ Itjhugululo lendawo yokuhlala kweenlwanyana (ukutjhugulula imiphakathi yeemfesi) ■ Ukuzala kweemila nekhula ngemanzini ■ Ukuthikamezeka kwenarha yamakhaya ■ Ukuthikamizeka kwemisebenzi epathelene nokuthiya iimfesi ■ Ukususwa ngokomzimba ■ Ukususwa kwezomnotho ngabasebenzisa umlanjana ongenzasi ■ Umthintela wezomnotho nokususwa kwezokufakatjha okuphathelene nemlanjeni (Isib. ukusunduza, ukukhamba ngeenkebhe, nendawo yokuhlala) ■ Umthintela wezomnotho nokususwa kwezokuvakatjha okungasi kwemlanjeni, okuphathelene neenyoni Displacement of Non-river Based Tourism (Isib.ukuqala iinyoni, nokukhuphuka intaba) ■ Umthintela wezomnotho emnothweni wangekhaya (ezokuvakatjha) ■ Ukukhula kweengozi eendleleni ■ Ukuthikameziseka ngonobangela lethuli, itjhada nokuvevezela ■ Itukuthelo yomphakathi ngenobangela lokungahlangabezwa kweendingo zomphakathi ■ Umthintela odalwa kufuduka ■ Ukwanda kwezehlakalo zezifo ezithathelanako

	■ Ukwanda kwezehlakalo zezifo ezinjengemalariya nezamathambo. ■ Umthintela wezokuphepha komphakathi ■ Umtintela wezepilo nokuphepha kwabasebenzi ■ Umthintela ngezinto ezikhona neziphilako zamagugu namasiko

6.2 Iyini imithelela emihle?

I-BGHES ehlongoziwe izakuba nemithelela eminengi emihle nenzuzo, khulukazi emiphakathini yekhaya, umnotho wangekhaya nenarheeni yoke kunye ne-SAPP njengokurhunyezwa kwayo ku*Thebula 6.1*. Iindlela zokuvimbela ezisembikweni we-ESIA ne-ESMP ihlongoze ukuthuthukisa inzuzo/umthintela omuhle. Isibonelo, kulinganiselwe amathuba wemisebenzi angaba zi-8,000 ngesikhathi sokwakha nokusebenza. Kuzothalakala imisebenzi nomnotho – khulu khulu ebantwini abangenalwazi namakghono womsebenzi – ngokuthuthukisa ukusetjenziswa kwabanikela ngomsebenzi njengabatjhayeli, abahlwengako, abaphekako njll.

6.3 Ngimiphi imithintela emikhulu embi

6.3.1 Ukukhushwa kwerhasi i-Greenhouse Gas (GHG)

Umthombo oqakatheke khulu yokukhutjhwa kwerhasi i- greenhouse gas ngesikhathi sokwakhiwa kwe-BGHES kuphathelene nokusetjenziswa kwenarha ukutjhuguluka kusukela ekupheliswen kweemila namkha iintshalo kobana kube ziindawo zokwakha.

Mayelana nokwakheka kweendlela zokufinyelela, kunemithintela ephathelene nokuzala kwethuli okungadalwa ukwakhiwa, imitjhini ekingesiyo yendleleni, nokusetjenzwa komhlaba. Ngenobangela wesimo sezulu ngeendleleni ezifinyelelako, ithuli elenziwa mumoya wemvelo ungaba yinto ejayelekileko. Ye-ke kulindeleke bona kuzakuba nethuli elinengi ngakilezo zindlela.

Ngesikhathi somsebenzi, umthombo oqakathekile wokukhutjwa kwerhasi i-GHG ihlangene nokupheliswa kwebhayomasi eseleko eminzele ngaphakathi kwendawo yamanzi i-BGHES.

Ukuvikela okuhlongoziwe ukunciphisa ukuzala komthombo werhasi i-GHG kufaka hlangana ukusetjenziswa kweemila ezisusiwe (iingodo) ukuzithengisa kunokuthi zithungelwe ngomlilo ngesikhathi sokwakha nokunciphisa ileveli yebhayomasi ekhona iphele ngaphambi kobana umthathamanzi i-BGHES uzale ngeenkhukhula.

6.3.2 Umthintela womlanjana ongaphezulu

Kuzakuba khona ukutjhuguluka kwemibandela yeZambezi River (ileveli yamanzi nebelo) emlanjeni ongaphezulu yomthathamanzi, faka hlangana imiphumela enamandla esitetjhini samandla wegezi seVictoria Falls power station nalaba abasebenzisa umlambo ngeGorge.

Iindlela zokuvikela namkha zokuvimbela zifaka hlangana ukunciphisa ileveli yomsebenzi uye ku-730 masl ngesikhathi sesomiso (ngesikhathi sokusunduza, kusuka kuRhoboyi kuya kuTjhigweni), ngalokho kukhululeke umlanjana khulu ukwenzela ukusunduza, isikhathesi singezeleleke ukusuka emlanjeni owehlako weFallsngebelo le-9 ne -10, okungumkhawulo welanga eli-hafu lokukhamba emlanjeni; nokungezelela iFSL ngesikhathi sokugeleza okukhulu ukufika ku-757 masl nakusikhathi sokugeleza esijayelekile.

6.3.3 Ukutjhuguluka kwemibandela yomlambo yomsele ongenzasi

Kuzakuba khona imithintela ephathelene nokugeleza nobungako bemibandela yamanzi emlanjeniongenzasi weBGHES ngesikhathi sokusebenza kwedamu. Lokhu kungonobangela wegugu lemvelo lomfula Isigaba esidlula eLower Gorge nokubakhona kwabanye abasebenzisa amanzi emlanjaneni ongenzasi, kuhlanganiswe nomphumela ohlangene nokusebenza kwedamu, khulu khulu ngaphasi kwesikhathi lapho amanzi aphezulu.

i-BGHES ehlongoziweko izakusetjenziswa kwaphela njengehlelo elisamanzi eliphezulu ngesikhathi somnyaka esimanzi (uMhlolanja ukuya kuRhoboyi) ngokuya kwemigomo yokusebenza eyenziwe phakathi kwe-ZRA, ERM (faka hlangana abosiyazi bokugeleza kwezebhoduluko ngeSouthern Waters) ne-SP. Imigomo esebenzako le (ebuye yaziwe nge-AddPM04) ifaka ukulungiswa kokugeleza okusisusa (kunganazinto eziminzako zihlale phasi emanzini) ngesikhathi sesomiso (kuKhukhulamungu kuya kuTjhigweni), nokuthathwa kwesimo sokugeleza okuphasi seQmin ngesikhathi somnyaka esimanzi. Imigomo le ithoola ukulingana phakathi kokwehlisa imithintela yezebhoduluko emlanjeni ongenzasi nokukhulisa ukukhutjwa kwamandla ku-BGHES, khulukazi ngesikhathi sokuphehla igezi ngesikhathi nayitlhogakala khulu.

6.3.4 ukulahlekelwa/ukuphela kwemvelo

Izinto ezingunobangela namkha ezidala khulu ukuphela kwemvelo ukwakhiwa komthangala wedamu (nomakhiwo ohlangene nawo) ukulinganisela ama-50 km emlanjeni owehlako weVictoria Falls nokuzala kweBatoka Gorge ngaphezulu. Imvelo yeBatoka Gorge ngiyo ethinteka khulu, neWorld Heritage Site, ehlanganisa ngaphezulu ama-17 km ukufika eBatoka Gorge. iBatoka Gorge iqaleke njengendawo yezemvelo - Key Biodiversity Area.

Iindlela zokuvimbela ezinengi zihlongoziwe, kufaka hlangana ukulinganisa imithintela yendawo yemvelo eqakathekileko yeBatoka Gorge ne World Heritage Site. Ukulinganiswa kutlhoga ukuba kukhulunywe ngakho ehlelweni le-Offset Plan. Ikghono lokuthola ihlelo leli ukususa ibhayodavesithi eseleko kodwana kungaphandle komsebenzi wehlelo le-ESIA.

6.3.5 Umthintela emphakathini weenyoni

Kunomphakathi weenyoni omkhulu ohlala ngeBatoka Gorge faka hlangana i-Taita Falcons, inyoni encani engakajayeleki ezumako, begodu i-Batoka Gorge ithathwe isikhathi eside njengendawo ebulunga iinyonezi eziphilako. Ngaphandle kwe-Taita Falcons ehlathululwe ngaphezulu, i-Rock Pratincoles, Verreaux's Eagle, Crowned Eagle, Peregrine Falcon, Lanner Falcon, Bat Hawks ne Augur Buzzards nazo ziyatholakala begodu zizakulahlekelwa yindawo yazo ngokuzala kweGorge.

Irhubhululo elihlosisako lokuhlola ubujamo beTaita Falcon eBatoka Gorge mnyango weenlwana zendle eZambia neZimbabwe lenziwa. Ihlolo lakamva nje lenziwa lathatha ama-25km ukufika eGorge, lithathelwa ukuhlola ukuba khona kweTaita Falcons; kodwana ingcenye ekulu yeBatoka Gorge ezakuba nomthintela weBGHES isajame ingakahlolwa - lokhu kukhandeleka kuveziwe erhubhululweni. Umthintela wokwakha umthathamanzi endaweni ye-Taita Falcon ayikaziwa begodu kusesekhona okungatholakali kuhle, kuneenkhala ezikhona ezinqophileko. Umthintela wokuhlola othembekile awukwazi bona ungapheleliswa kungakalungiswa bekwavalwa iinkhala ezinqopjileko, okungukuthi i-ZRA ithembise bona izokwenza. Kuzakutlhogakala ihlelo elizakuveza indlela yokuhlolisisa kuhle ukuba khona kweTaita Falcons, ukuthuthukisa ileveli yokuzethemba ngobujamo beenyoni nalokhu okungaba

nobungozi, nokukhomba indlela yokuvimbela ezakwamukelwa bosiyazi zomphakathi wenarha zombelele.

Ukubambisana nabosiyazi beenyoni zemvelo ezizumako njengeZFC, BirdWatch Zambia (abalingani be-Birdlife International) nabosiyazi be-South Africa Taita Falcon bazakulindeleka ukuhlola indlela yokulungisa nokuvala iinkhala, nangaphezu kokuthuthukisa ukulandela nokulawula umsebenzi.

Imida edlulisa umyalezo ibonakala njengeenzathu ezibulala iinyoni zombelele. Zinobungozi eenyonini ngeendlela ezimbili: (i) iinyoni eziphaphako kanengi aziboni amadrada bese zitjhayisana nazo izinto ezibulalako lezi, (ii) iinyoni zikariswa ngizo zoke izinto birds are attracted to tall structures to ukwakha, ukuphumula nokubekela (emibhoshongweni). Iinyoni ezikulu zinamaphiko anagkghona ukuthinta iintambo zegozi ezitjhisanako ngasikhathi sinye kudale bona kube nomlilo, zitjhe. Ezinye iinyoni zizwelela khulu nazithinta imida edlulisa umyalezo. Ukutjha kweenyoni ezikulu nalezi ezizumako kungadala ukuthikameziseka kwegezi nokuthembela. Imida enomthamo wamandla asuka ema – 220 kufikela ema-400 kV izakutlhogakala nakususwa amandla e-BGHES Power Station. Imida le izokuba nomthintela omumbi enyoonini ezihlukile ezizumako ezikulu, ezijayelekile kilendawo.

6.3.6 Ukutjhuguluka kwemiphakathi yeemfesi nokusetjenziswa kwayo

Ukwakhiwa kwe-BGHES (khulu khulu umthathimanzi) kuzakudala itjhuguluko ngemanzini ngenombangela lamaleveli wamanzi atjhugulukako. Ukutjhuguluka okuqakathekile kwendawo kubangwa umthathamanzi we -BGHES kuzakutlhogakala enye indawo yeemfesi.

Kungaba khona imihlobo emibili yeemfesi kumthathamanzi, i-*capital intensive Kapenta*. Ukwakhiwa ngepumelelo umhlobo lo, kuzakurhola umphakathi omuhle weemfesi ze-Tiger Fish kumthathamanzi kwaphela nangabe ubujamo bamanzi buyanakekelwa.

Umdlalo wokubamba iimfesi zeTiger Fish zingakhula zibe yibubulo elinegugu elithekgha umnotho wekhaya begodu uthole ukubonelelwa ekulawuleni iimfesi. Ukulawulwa kwehlobo lweemfesi nokwethulwa nako kuzakwenziwa.

6.3.7 Ukuphela kwemvelo okwenziwa kulawulwa okutjhentjako okuhlukile.

Amaphetheni wokugeleza e-BGHESkuzakuba nomthelela ku-Present Ecological State (PES) yemlanjeni ogelezako weZambezi yomthangala wedamu.

Imiphumela yokuhlolwa kwebhoduluko kutjengisa bona iinkathi zokusebenza eziphezulu zilindeleke bona zibe nomthintela oqakathekile kodwana omumbi eemlileni zemlanjeni wemseleni ongaphasi Zambezi River; ngokunjalo, ukukhutjhwa kwamandla wegezi ngesikhathi esiphezulu kuzakukhandelwa ngokukghonekako eBGHES. I-BGHES izakusetjenziswa njengehlelo eliphezulu kwaphela ngesikhathi somnyaka esimanzi (ngoMhlolanja ukufika kuRhoboyi) ngokuya kwemithetho elawulako yokusebenza eyenziwe yisithombe se-AddPM04 (njenokuhlathululwa ku- *Isigaba* ***Error! Reference source not found.***), okuzakuhlangabezana neendlela zombili zebhoduluko ezingadluli ngaphezulu ithosi eli-1.5 sekuhlangene koke okuphilako begodu kungadluli ngaphezulu ama-25% wokwehliswa ngokuchichimako imihlobo yeemfesi ezima- 90% ezijanyelwe ngesikhathi sokutjengiswa kwebhoduluko eligelezako.

Ngale kwalokho , ihlelo lokutjheja elipheleleko lezinto eziphilako lizakutlhogakala ukuhlola imithintela yeBGHES emlanjeni ongenzasi owehlela eZambezi River.

6.4 Khuyini imithintela yokuhlala emimbi

6.4.1 Umthintela wezomnotho nokuthikamezeka kwamakhaya endaweni

Ukwakhiwa kweProjekthi nemisebenzi kuzakudala ukulahlekelwa umhlaba makhaya athembele emisebenzini yemvelo. Ukulahlekelwa mhlaba ngenobangela yezomnotho, amadorobha wafuthi nomakhiwo ophathelene nawo, ikgwari yemathiriyali yokwakha idamu, iindlela ezifinyelelako nemida yokudlulisa umyalez.

Ukukwazi ukufinyelela iindawo ezineentlabagelo zemvelo kuzakuvuselelwa godu bekuthuthukiswe (lapho kukghoneka khona) ngemva kokwakhiwa.

Imiphakathi izibandakanya ekuvuneni iintlabagelo ngaphambi kokwakha njengencenye yokutjhidisa nokususa.

I-ZRA izakusebenza nemiphakathi ethintekileko nabaphathi abasemagunyeni bekhaya ukuvikela iintlabagelo eziphathelene nomhlaba. Lokhu kuzakufa ukufundiswa kwabahloli bangekhaya nemiphakathi ngokuphathelene nobungozi eentweni zemvelo kusukela kilokhu okwenziwa babantu nokudla iintlabagelo zemvelo.

Kunokwakha iphatjhisi ema-17 km ye-Muzuma Transmission Line, kuzakuba ngcono ngokuya kombono wezokuhlalisana bona i- Muzuma Transmission Line ithome ngesitetjhi segezi esitjha esi- 330 kV ZESCO esihlongoziweko ngeLivingstone, njengombana bekuhleliwe nekuthomeni. Lokho kuzokutjho bona kungezelelwe ukwakhiwa ngama- ~ 8km womuda odlulisa umlayezo. (~ 152 km nawumadanisa na ~ 160 km).

6.4.2 Umthintela wezomnotho nokususwa kwemisebenzi yezokuvakatjha ephathelene nomlambo/nomfula

Idamu elakhiwe yi-BGHES lizakuphamisa ileveli yamanzi yeZambezi River ngebelo elikhulako le-10 ukuya ema-24. Lokhu kuzakuba nomthelela ekwenziweni imisebenzi ephathelene nomfula njengokusunduza amanzi amhlophe nokukhamba ngeenkebhe okurhabako begodu okuthusako.

I-Separate Resettlement Action Plans (RAPs) ne- LRPs zizakukhutjwa yi- ZRA kilezo zinto ezingaphandle kwehlelo le- ERM, kufaka hlangana(kodwana kungavinjelwa) ukususwa kokusetjenziswa kwamanzi wemlanjeni ongaphezulu/nangaphasi gokomzimba nangezomnotho. I-RAP/LRP yabasebenzisa amanzi wemlanjeni ongaphezulu (khulu khulu abasebenza ngezokuvakatjha), kuzakwenziwa ngemva kwesikhathi, njengokuzala kwe-Batoka Gorge (izalisa umthathimanzi we- BGHES) kuhlongozwe ngo- 2027 / 2028. I-RAPs/LRPs ezihlukeneko lezi zizakukhutjwa yi- ZRA zizakwenziwa ngokuya kwemigomo elawulako yeZambia neZimbabwe, begodu nemigomo ye-IFC PS5 ne WB ESS5.

6.4.3 Umthintela wezomnotho nokususwa kwemisebenzi yokuvakatjha ekungesiyo ephathelene nomfula

Ukuzala ngebelo nokulahlekelwa zizinunwana ezihlala ngemanzini kuzakwehlisa isibalo sezinyoni ezidla iinunwana namalulwani ngeGorge okuzakudala ukuncipha amathuba wokuqala iinyoni. Ileveli yamanzi eyandako ngeGorge izakususa iinyoni ezibekelako ematjeni.

Abakhweli bentaba ngeze bakwazi ukukhwela ngenzasi yeGorge, nokukwela intaba ubusuku boke nokukhempa ngeze kusasebenza kuhle ngonobangela weleveli yamanzi andango ngeGorge.

I-Separate Resettlement Action Plans (RAPs) ne- LRPs zizakukhutjwa yi- ZRA kilezo zinto ezingaphandle kwehlelo le- ERM, kufaka hlangana(kodwana kungavinjelwa) ukususwa kokusetjenziswa kwamanzi wemlanjeni ongaphezulu/nangaphasi gokomzimba nangezomnotho. I-RAP/LRP yabasebenzisa amanzi wemlanjeni ongaphezulu (khulu khulu abasebenza ngezokuvakatjha), kuzakwenziwa ngemva kwesikhathi, njengokuzala kwe-Batoka Gorge (izalisa umthathimanzi we- BGHES) kuhlongozwe ngo- 2027 / 2028. I-RAPs/LRPs ezihlukeneko lezi zizakukhutjwa yi- ZRA zizakwenziwa ngokuya kwemigomo elawulako yeZambia neZimbabwe, begodu nemigomo ye-IFC PS5 ne WB ESS5.

6.4.4 Imithintela yomnotho wangekhaya

Umthelela weProjekthi le emisebenzini yezokuvakatjha ephathelene nengaphathelananga nomfula kungehlisa isibalo sabavakatjhi e-Livingstone ne Victoria Falls. Ezokuvakatjha azikanciki kwaphela emisebenzini yezokuvakatjha ngeGorge. I- The Victoria Falls ngeze yaba nomthintela ngaleProjekthi, kodwana enye i- Victoria Falls National Park ne Mosi-oa-Tunya National Park zizakuthinteka ngenca yeleveli yamanzi akhulako ngeZambezi River.

Ukubambisana okuragako nababambichaza ukuthola izinto ezahlukileko nemisebenzi yomkhaya kuzakwenziwa. Ngaphezu kwalokho, ukubonelela okusincephezelo okuzakubhadelwa abosomabubulo okuzakungena ebubulweni ngonabangela wokwakhiwa kwedamu namkha ukwehliswa kwabasebenzi emsebenzini baqatjhi kuzakuhlolwa njengengcenye yehlelo I -RAP.

6.4.5 Imithintela ephathelene nokufuduka

Isikhathi sokwakha sidala izinga elikhulu lokufuduka kwabantu abezako bazokufuna amathuba womsebenzi endaweni. Okulindelekileko kwezokuhlala nokubonelelwa okusasincephezelo nakho kudala bona abantu bazokuhlala kileyo ndawo.Ukuthuthukiswa kweenthuthi okukhambisa neProjekthi nakho kungunobangela wakho lokhu.

i-Project Induced In-migration (PIIM) Management Plan izakuthuthukiswa beyisetjenziswe.

6.4.6 Ukwanda kwezifo ezithathelanako

Izinga lokudluliselana kwezifo ezithathelanako lingakhula ngonobangela weProjekthi, khulukazi ngesikhathi sokwakha lokha abasebenzi kungibona abafuduka khulu beze bazokuhlala.

Indlela yokubandula abasebenzi ngetlhogomelo lezepilo neendlela zokuhlola abasebenzi ngaphambi kokuthoma ukusebenza izakwenziwa. Labo abazakufunyaneka bona banokugula okithathelanako bazokuthola isizo ngaphambi kokuthoma umsebenzi. Ama-Emergency Prevention, Preparedness neResponse Plans azakwenziwa.

6.4.7 Ukwanda kwezehlakalo zeMalariya nezinye izifo zamathambo

Imalariya ngiso isifo samathambo kwanjesi ekhathaza umphakathi. Kunokukhathalela kunokukhuphuka kokuvinjelwa kwemalariya ngonobongela weProjekthi. Kodwana kunobungozi bokuthi nokhunye ukugu

okufana nomalaeveva nesifo samathambo zingaba khona ngonobangela wonoompompoloza abazalako endaweni.

Ihlelo le-Integrated Malaria Control, Prevention and Treatment Programme lizakwenziwa belisetjenziswe.

6.4.8 Umthintela wokuphilako nezinto ezimagugu namasiko ezikhona

Ukwakha okukhona kunendlela yokuba nomthintela eendaweni ezibulunga amagugu namasiko (njengeendawo ezikhethkileko nayo i- Zambezi River ngokwayo) namagugu namasiko akhona, kufaka hlangana iindawo lapho kubulungwe khona okuphathelene nomlando nalapho kubulungwe izinto zakade ezakhe zaphila, imakhiwo yomlando nokwakheka kwendawo kwemvelo.

Lapho kukghoneka khona, imitlamo yokwakha izakuthuthukiswa ukwenzela bona kungabi khona umthintela ongatlhogakali ezintweni eziphathekako nezingaphatheki. Ihlelo le-Chance Find Procedure lizakusetjenziswa.

6.4.9 Ukungezeka kweengozi zendlela

Iinthuthi ezisebenza kileProjekthi zingadala iingozi zendleleni ezingabanga ukulimala nokufa kwabanye abasebenzisa indlela, abakhamba ngamabhayisigiri, ngeenyawo nefuyo. Iindlela zokukhamba kuzofanele bona zikhathalele iindawo ezinabantu abanengi neendawo ezinemakhiwo yomphakathi (njengeenkole) okungangeza ukutjhayisana, ngombana imiphakathi ayikajwayeli ukugcwala okungaka endleleni. Iindlela zizakuba nepheyivementi yabakhamba ngeenyawo e-1.5 m ngemaqadi ngehloso yokwehlisa iingozi kilezoondawo.

Ihlelo I -Traffic Management Plan lizakwenziwa. Ihlelo leli lizakufaka ukuphepha kwesithuthi, komtjhayeli nokusetjenziswa kweendakamizwa, isikhathi sokusebenza, isikhathi sokuphumula nendlela yokubika iingozi nokuhlola njll.

7. AMAGADANGO ALANDELAKO

Okulandela ukwethulwa kwe -ESIAs kubabambichaza, ama- ESIA nemitlolo ekhambisana nayo azakufakwa ku- EMA ne ZEMA ukubuyelelwa nokukhathalela. Iinqunto zebhoduluko ezithathwe yi-EMA (Zimbabwe) ne ZEMA (Zambia) kuzakuvezwa embikweni weendaba nakubo boke ababambichaza abatlolisileko bazokwaziswa nge-imeyili/ifeksi,iposo yesandla/iposi nange-sms ngesiqunto esithathiweko sebhoduluko.

8. ISIPHETHO

I-BGHES ehlongoziweko lihlelo lemali elisebenzako. Ngaphezu kwalokho, iProjekthi le inekghono yokuletha inzuzo yezokuhlalisana emaleveleni wenarheni zombelele,ngesigodini nekhaya ngamathuba wemisebenzi nokuthengwa kwepahla yangekhaya kunye neensetjenziswa. I-BGHES ehlongoziweko le iza nokubiza, nomthintela wezomnotho zesigodi nangekhaya, iindawo zokuhlalisana nezinto eziphilako,

njengokuhlathululwa kombiko we-Draft ESIA Reports nale-NTS. Lokhu kutlhogakale bona kulinganiswe nokuhle okulethwe yiBGHES kizo zombili iinarha lez.

Ukuqakatheka kweBGHES emnothweni nekhuleni kweZambia ne Zimbabwe kuyabonakala; kodwana, iinselele eziqakathekileko mayelana nokulinganisa iindingo zokubulungwa kwebhoduluko ngezomnotho neendingo zokuthuthukiswa kwazo zombili iinarha lezi nazo ziyabonakala.

Iprojekthi le nayo inazo iinselele. Ama- ESIA alinge ukuhlathulula iinzuzo zeProjekthi kunye nobungozi bokuthinteka kwezebhoduluko nezokuhlalisana okukhambisana nayo. Lapho umthintela utjengiswe khona, iindlela zokuwuvimbela ukunciphisa umthintela lowo nazo zihlathululiwe; nalapho kungenzeka ukuthi imithintela ayikavinjelwa, nalokho nakho kuhlathululiwe. Endaweni lapho kunemithintela emihle, iindlela zokuthuthukisa imithintela emihle leyo nayo inikeliwe.

I-ERM iphakamisa ukuthi abathatha iinqunto bakhathalela iinzuzo nokuthinteka okuzwelako okuphathelene ne- BGHES, kwenzela bona kuthathwe isiqunto esifaneleko.

I-ERM inamahovisi angaphezu kwe-160 kilezi narha ezilandelako nephasini loke

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Annex C (8.4)

Notification and Invitation of Virtual Engagement

Annex 8.4.1

Invitation to Open House Engagement

From: Lindsey Bungartz on behalf of ERM South Africa Cape Town IAP Project Batoka Gorge HES

To: ERM South Africa Cape Town IAP Project Batoka Gorge HES

Bcc: fewdayschanka@gmail.com; chikwenyan@gmail.com; smmbewe@yahoo.com; mwila.daka@mcti.gov.zm; duchi45@yahoo.com; maketo.mulele@mndp.gov.zm; jmukoloba2000@yahoo.com; jmukoloba2000@yahoo.com; kennethnyundu@gmail.com; changanongoi@yahoo.co.uk; zaridirector@zari.gov.zm; pklungu@gmail.com; jmwango60@googlemail.com; sweetkajipaike@yahoo.co.uk; bensonmwenya@hotmail.com; nkumbusiame@yahoo.com; kennedymalama@yahoo.com; arnmils.simwaba806@gmail.com; frachisangano@yahoo.com; jmpishi2001@yahoo.com; everistokasumba2@gmail.com; oscarsilembo@yahoo.com; swilliams@erb.org.zm; florence.chibwesha@hrc.org.zm; lukupulo@gmail.com; lukpulo@yahoo.com; infor@hotmail.com; alexadra@wasaza.org.zm; matthew.ngulube@ncc.org.zm; nrfa@zament.zm; cmuleya@nwasco.org.zm; kchitumbo@nwasco.org.zm; MChisenga@roads.gov.zm; emwape@roads.gov.zm; info@rtsa.org; southernwater@swasco.co.zm; alexadra@wasaza.org.zm; ndakalac@yahoo.com; hmmilumbe@gmil.com; ckaniki@zesco.co.zm; fkmshalwindi@gmail.com; mwaliomba@gmail.com; mwamulowek@netscape.net; mwamsprog@mail.com; ndiyoi@yahoo.co.uk; kanguyaisaac@yahoo.com; s_nyondo@yahoo.com; serahnyondo@yahoo.com; lzulu@mota.gov.zm; lzullu@gmail.com; aggrey.siuluta@moe.gov.zm; aggrey81@yahoo.com; msimabenga@gmail.com; smwiinga@erb.org.zm; jsphthole@gmail.com; luzy.mwale@gmail.com; jonesmasonde@zawa.org.com; jkmasonde@yahoo.co.uk; jonesmasonde@zawa.org.zm; robertchilembo@gmail.com; stembo@zema.org.zm; simon.tembo1@gmail.com; lkalenge@gmail.com; lnundwe@zema.org.zm; lloyd.numdwe@gmail.com; cmateke@gmail.com; oshalwindi@gmail.com; Kairajohn@ymail.com; mulombajk15@yahoo.com; samsonsakala@yahoo.com; samsondsakala@yahoo.com; mutokawatson@gmail.com; minyoyipamela@gmail.com; mhabanji@gmail.com; msimabenga@gmail.com; muvwimigetrude@yahoo.com; gisfordb@yahoo.com; Bnkhata89@gmail.com; mmuyambngo@yahoo.com; livcity@gmail.com; muzyanifranis@gmail.com; trevormulenga2@gmail.com; sirfyu17@gmail.com; kalumbamwaandwe@gmail.com; pasmuso@yahoo.com; kelysonm@yahoo.co.uk; kelysonm@yahoo.co.uk; chrozlyn@gmail.com; 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Subject: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River: Invitation to Webinar
Date: Monday, November 16, 2020 23:35:00
Attachments: image001.png

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Webinar

Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) has been contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls.

On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries.

Given the ongoing level of global uncertainty associated with COVID-19, the Authority and ERM would like to disclose the ESIA findings using alternative methods currently available.

You are invited to attend a ZOOM webinar where the key findings of the ESIA process will be shared with you. The meeting will include a presentation, following which participants will have the opportunity to interact with the project team, ask questions and provide comment.

Meeting Time:
2 December 2020 at 09:30 AM

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_42Y_qB-5QaWX8zpZOkVMKQ

Availability of the Project ESIAs for Review & Comment
As a reminder, the draft ESIAs for the BGHES are available for public comment. Refer to Project website https://www.erm.com/bghes-esia to access the ESIAs and non-technical summaries.
Three separate draft ESIAs have been prepared for the Project as follows:

- ESIA for the dam wall and impoundment, including spillway; surface power houses; the Project townships (in both Zambia and Zimbabwe); and other ancillary infrastructure (such as quarries, spoil areas, batching areas);
- ESIA for Project access roads in both Zambia and Zimbabwe; and
- ESIA for Project Transmission Lines in both Zambia and Zimbabwe.

The comment period, which has remained open since 03 March 2020 will be closing 25 January 2021. Stakeholders are invited to submit all comments on the draft ESIAs to ERM as follows:
Email: batokagorgehes@erm.com | Post: Postnet Suite 90, Private Bag X12, Tokai, 7966
Tel: +27 21 681 5400 (South Africa)
+27 11 798 4300 (South Africa)
+263 77 287 6616 (Zimbabwe)
+260 97 4074384 (Zambia)

Your comments will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to Zimbabwean and the Zambian Environmental Management Agencies (EMA and ZEMA) for consideration. Please ensure that your comments reach ERM on or before 25 January 2021.
For any further queries regarding the content of this letter, please feel free to contact us with the details included above.

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
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Annex C8.4.2

Invitation to Water Users Focus Group Engagement

From:	Lindsey Bungartz on behalf of ERM South Africa Cape Town IAP Project Batoka Gorge HES
To:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
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Subject:	ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River: Invitation to Virtual Focus Group Discussion
Date:	Tuesday, November 17, 2020 21:46:00
Attachments:	image001.png

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Virtual Focus Group Discussion

Further to the invitation to comment on the draft ESIAs and attend the webinar for the Proposed Batoka Gorge Hydro-Electric Scheme (BGHES), ERM would like to invite Zambezi river-users (white water rafting outfitters, jet-boat operators, etc.) to a small virtual focus group meeting to discuss Project impacts specific to businesses operating on the Zambezi River. The focus group discussion will include the findings of the Project ESIAs as well as additional specialist studies undertaken in 2019, and provide stakeholders with an opportunity to engage with the Project team.

Details for the virtual focus group meeting are as follows:

Meeting Time:
Friday 4 December 2020 at 09:30 AM

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_cIItF2F4S6q-4GrpeQJHrQ

As a reminder, the draft ESIAs for the BGHES are available for public comment. Refer to Project website https://www.erm.com/bghes-esia to access the ESIAs and non-technical summaries. The comment period, which has remained open since 03 March 2020 will be closing 25 January 2021.

For any further queries regarding the content of this letter, please feel free to contact us with the

details included below.
Email: batokagorgehes@erm.com | Tel: +27 21 681 5400 (South Africa) or +27 11 798 4300 (South Africa) or +263 77 287 6616 (Zimbabwe) or +260 97 4074384 (Zambia)

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

Annex C8.4.3

Invitation to Special Interest Focus Group Engagement

From:	Lindsey Bungartz
To:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
Bcc:	"roger@vicfallswildlifetrust.org"; "jessica@vicfallswildlifetrust.org"; "ecolynx@zol.co.zw"; "namo@environmentafrica.org"; "edith@environmentafrica.org"; "charlie@environmentafrica.com"; "retepstrebor@yahoo.co.uk"; "charlie@greenlineafrica.org"; "JuliaPierini@birdlifezimbabwe.org"; "ecolynx@zol.co.zw"; "yvonne@routesthrouafrica.com"; "sparrow.alan@gmail.com"; "oliver@environmentafrica.org"; "galorand@mweb.co.zw"; "cat@yoafrica.com"; "info@environmentafrica.org"; "namo@environmentafrica.org"; "galorand@mweb.co.zw"; "andrew_shamu@wvi.org"; "info@painteddog.org"; "elisabethm@intengwe.org"; "sgarikayi@achmonline.org"; "cmuvirimi@wwf.org"; "communications.zw@undp.org"; "gsmaphosa@gmail.com"; "hhsansole@gmail.com"; "mahyde@gmail.com"; "fovf@yoafrica.com"; "ngomap@yahoo.com"; "Frank_jordan_23@yahoo.com"; "ratidzainyazenga@zcbc.co.zw"; "isla.grundy@gmail.com"; "drrobbie@icon.co.za"; "campfir@id.co.zw"; "campfire@internet.co.zw"; "elisabethm@intengwe.org"; "rericswan@aol.com"; "grace1msambachinanda@yahoo.co.uk"; "ncunesco@zamnet.zm"; "catherine.s.loke@gmail.com"; "cmwale@wwfzam.org"; "wwfzambia@wwfzam.org"; "lkatiyo@wwfzam.org"; "lubasi_mungandi@yahoo.com"; "info@oxfam.org.uk"; "mtembo@oxfam.org.uk"; "Sebastian_kunda@wvi.org"; "infor@ms.zm"; "jackiengoma@yahoo.com"; "melpezy88@gmail.com"; "richard.nawa@gmail.com"; "infor@jesuits.org.zm"; "gchiwoneso@yahoo.co.uk"; "cmateke@gmail.com"; "nchongo.zcbnrm@gmail.com"; "info@zec.org.zm"; "info@caritaszambia.org"; "girl2river@yahoo.com"; "bernard.sinyangwe@yahoo.com"; "mwhiteheadzam@gmail.com"; "mckaytjm@unisa.ac.za"; "misomo@zamtel.zm"; "wecsz@microlink.zm"; "birdwatch.zambia@gmail.com"; "info@carezam.org"; "mubianaobert@gmail.com"; "hanampotab@yahoo.co.uk"; "phabeenzu@unicef.org"; "lusaka@unicef.org"; "mail@responsenetwork.org"; "hcmhango@zambia.co.zm"; "mikenawa2014@gmail.com"; "lb@lisabenham.com"; "seandlavin@gmail.com"; "rebeccawildbear@gmail.com"; "ndakalac@yahoo.com"; "hmmilumbe@gmail.com"; "ckaniki@zesco.co.zm"; Dieter Rodewald; Tori Braham; Nombukiso Ntshalintshali; Poppy Milliken; Lindsey Bungartz
Subject:	ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River: Invitation to Virtual Focus Group Discussion
Date:	Tuesday, November 17, 2020 21:56:00
Attachments:	image001.png

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Virtual Focus Group Discussion

Further to the invitation to comment on the draft ESIAs and attend the webinar for the Proposed Batoka Gorge Hydro-Electric Scheme (BGHES), ERM would like to invite NGOs and special interest groups to a small virtual focus group meeting to discuss Project impacts in more detail. The focus group discussion will include the findings of the Project ESIAs as well as additional specialist studies undertaken in 2019, and provide stakeholders with an opportunity to engage with the Project team.

Details for the virtual focus group meeting are as follows:

Meeting Time:
Friday 4 December 2020 at 14:00

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_8p9muSBLQuSMw9DsIG7gIQ

As a reminder, the draft ESIAs for the BGHES are available for public comment. Refer to Project website https://www.erm.com/bghes-esia to access the ESIAs and non-technical summaries. The comment period, which has remained open since 03 March 2020 will be closing 25 January 2021.

For any further queries regarding the content of this letter, please feel free to contact us with the details included below.
Email: batokagorgehes@erm.com | Tel: +27 21 681 5400 (South Africa) or +27 11 798 4300 (South Africa) or +263 77 287 6616 (Zimbabwe) or +260 97 4074384 (Zambia)

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Annex C8.4.4

Invitation to Key Government Stakeholder Engagement

From:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
To:	"ndakalac@yahoo.com"; "hmmilumbe@gmail.com"; "natcomzambia@gmail.com"; "grace1msambachinanda@yahoo.co.uk"; "ncunesco@zamnet.zm"; "zimparis@zimfa.gov.zw"; "zimnatcom3@gmail.com"; "zimnatcom3@gmail.com"
Cc:	Dieter Rodewald; Tori Braham; Nombukiso Ntshalintshali
Subject:	RE: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe)
Date:	Monday, December 7, 2020 15:01:00
Attachments:	image001.png
Importance:	High

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear representatives from the National Commission for UNESCO, and UNESCO Representatives

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Webinar

Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) has been contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls. On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries.

Given the ongoing level of global uncertainty associated with COVID-19, the Authority and ERM would like to disclose the ESIA findings using alternative methods currently available. You are invited to attend a ZOOM webinar for key government stakeholders, where the findings of the ESIA process will be shared with you. The meeting will include a presentation and then participants will have the opportunity to interact with the project team, ask questions and provide comment.

Meeting Time:
11 December 2020 09:30 AM

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_Bi0TjY0JQ9C0OlMyAbfboQ

Availability of the Project ESIAs for Review & Comment
As a reminder, the draft ESIAs for the BGHES are available for public comment. Refer to Project website https://www.erm.com/bghes-esia to access the ESIAs and non-technical summaries. Three separate draft ESIAs have been prepared for the Project as follows:

- ESIA for the dam wall and impoundment, including spillway; surface power houses; the Project townships (in both Zambia and Zimbabwe); and other ancillary infrastructure (such as quarries, spoil areas, batching areas);

- ESIA for Project access roads in both Zambia and Zimbabwe; and
- ESIA for Project Transmission Lines in both Zambia and Zimbabwe.

The comment period, which has remained open since 03 March 2020, will be closing 25 January 2021. Stakeholders are invited to submit all comments on the draft ESIAs to ERM as follows:
Email: batokagorgehes@erm.com | Post: Postnet Suite 90, Private Bag X12, Tokai, 7966
Tel: +27 21 681 5400 (South Africa)
+27 11 798 4300 (South Africa)
+263 77 287 6616 (Zimbabwe)
+260 97 4074384 (Zambia)

Your comments will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to Zimbabwean and the Zambian Environmental Management Agencies (EMA and ZEMA) for consideration. Please ensure that your comments reach ERM on or before 25 January 2021.

For any further queries regarding the content of this letter, please feel free to contact us with the details included above.
We look forward to your participation in this phase of the ESIA.

Kind regards
Lindsey

Lindsey Bungartz
Senior Consultant – Social Performance Specialist

Read ERM's** 2020 Sustainability Report **and** ERM Foundation Annual Review **to find out how we are shaping a sustainable future.

Environmental Resources Management (ERM)
1050 SW 6th Avenue | Suite 1650 | Portland, OR 97204
T +1 503 488 5282 I D +1 971 279 6940
M +1 971 420 9921
E lindsey.bungartz@erm.com I W www.erm.com

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Annex C8.4.5

Invitation to Government and UNESCO Virtual Engagement Feedback Session

Linda Slabber

Subject:	ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe): Virtual Feedback Session
Location:	Microsoft Teams Meeting
Start:	Wed 2021/07/21 16:00
End:	Wed 2021/07/21 17:30
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
Required Attendees:	whkatongo@yahoo.com; Willie.kaputo@mota.gov.zm; Thumbikani15@gmail.com; ndakalac@yahoo.com; mwansabridget32@yahoo.com; willie.kaputo@mata.gov.zm; fkmshalwindi@gmail.com; mwamulowek@netscape.net; mwamsprog@mail.com; ndiyoi@yahoo.co.uk; kanguyaisaac@yahoo.com; adangare@zimparks.org.zw; gmatipano@zimparks.org.zw; rmandisodza@zimparks.org.zw; cmutema@zimparks.org.zw; couragemutema@gmail.com; mkapesa@zimparks.org.zw; avambe@zimparks.org.zw; essamuriwo@yahoo.com; rundoug@yahoo.com; tmundoga@gmail.com; fmchabata@yahoo.com; natmus@utande.co.zw; pastar143@yahoo.com; natmys@utande.co.zw; zimparis@zimfa.gov.zw; zimnatcom3@gmail.com; m.muchena@unesco.org; r.bunhiko@unesco.org; md.ngulube@unesco.org; munyaradzi.munodawafa@zambezira.org; sithembinkosi.mhlanga@zambezira.org; christopher.chisense@zambezira.org; peter.kapinga@zambezira.org; edward.kabwe@zambezira.org; avitol.nkweendenda@zambezira.org; relent.ncube@zambezira.org; stephen.maidza@zambezira.org; phillip.ziduche@zambezira.org; dzimba@zesco.co.zm; bkalundu@zesco.co.zm; vmbewe@zesco.co.zm; emanyau@zpc.co.zw; manyewe@zetdc.co.zw; chivuraiseg@gmail.com; selusiwe.sibanda@zambezira.org; boniface.mfula@zambezira.org; Fitzgerald.Muchindu@zambezira.org; Dieter Rodewald; Lindsey Bungartz; Mike Everett; Nombukiso Ntshalintshali; andrew.cauldwell@bcmss.co.uk

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Virtual Feedback Session

Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) has been contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls.

On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. Given the ongoing level of global uncertainty associated with COVID-19, the Authority

and ERM disclosed the ESIA findings through virtual methods in December 2020. Virtual engagement included a series of ZOOM webinars with key stakeholders and focus group discussions with special interest groups.

Through discussion with the Authority, ERM became aware that the National Commission for UNESCO in Zambia and Zimbabwe requested that the ESIA address comments raised by themselves in 2015, whereby it was requested that the ESIA for the BGHES include a specific assessment of the impact of the BGHES on the Outstanding Universal Value (OUV) of the Victoria Falls World Heritage Site. On 25 June 2021, ERM formally lodged a copy of the requested assessment for review. The impact assessment to OUV has been undertaken in line with the IUCN's World Heritage Advice Note on Environmental Assessment. The OUV Assessment is presented as a standalone report for ease of review, but the report will also be included in the final ESIA to be submitted the Environmental Authorities for decision making.

You are now invited to attend a MS TEAMS virtual feedback session, where we will present these findings and provide an opportunity for you to ask questions and give comment on the findings of the assessment.

Meeting Time:
21 July 2021 at 16:00 PM

To register for the virtual feedback session, please can you formally ACCEPT this invite.

To access the MS TEAMS virtual feedback session on 21 July 2021, please select the LINK at the end of this MS Outlook invite.

Feedback from the virtual feedback session will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to Zimbabwean and the Zambian Environmental Management Agencies (EMA and ZEMA) for consideration.

For any further queries regarding the content of this email, please feel free to contact us with the details included above.

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Microsoft Teams meeting

Join on your computer or mobile app

Click here to join the meeting

Join with a video conferencing device

195471110@teams.bjn.vc

Video Conference ID: 127 516 598 4

Alternate VTC dialing instructions

If you do not have the Teams App please use Chrome or Edge Browser. Right click and copy the Join link and paste if these are not your default browser. NOTE: It will not work with Internet Explorer

Learn More | Meeting options

Annex C8.4.6

Invitation to UNESCO Focus Group Discussion

Linda Slabber

Subject:	Focused Group Discussion on the proposed Batoka Gorge Hydro Electric Scheme (BGHES)
Location:	Microsoft Teams Meeting
Start:	Fri 2021/09/03 15:00
End:	Fri 2021/09/03 16:30
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
Required Attendees:	mwamsprog@gmail.com; pastar143@yahoo.com; zimparisweb@gmail.com; ndakalac@yahoo.com; Fitzgerald.Muchindu@zambezira.org; phillip.ziduche@zambezira.org; stephen.maidza@zambezira.org; relent.ncube@zambezira.org; avitol.nkweendenda@zambezira.org; christopher.chisense@zambezira.org; Dieter Rodewald; Lindsey Bungartz; Nombukiso Ntshalintshali; andrew.cauldwell@bcmss.co.uk; Mike Everett

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Focus Group Discussion (FGD)

Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) has been contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls.

Following the BGHES Virtual Feedback Session held on 21 July 2021, it was agreed between the ZRA and ERM that the best way forward would be to hold a Focus Group Discussion (FGD) with the UNESCO Commissions and other key stakeholders to discuss how best to proceed with the impact assessment of the BGHES on the outstanding universal value (OUV) of the World Heritage Sites. It is proposed that during this FGD, we will consult with UNESCO on the ranking of OUV values and whether UNESCO has a preferred approach / methodology for this. We are of the opinion that this more focused discussion with key stakeholders will add more value to the OUV impact assessment.

You are invited to attend a MS TEAMS FGD, where we will recap on the findings of the assessment and have a focused discussion on how best to proceed with this assessment.

Meeting Date & Time:
Friday 03 September 2021 at 15:00 PM

To register for the FGD session, please can you formally ACCEPT this invite.

To access the MS TEAMS FGD session on 03 September 2021, please select the LINK at the end of this MS Outlook invite.

Feedback from the FGD session will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to Zimbabwean and the Zambian Environmental Management Agencies (EMA and ZEMA) for consideration.

For any further queries regarding the content of this email, please feel free to contact us with the details included above.

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device
195471110@teams.bjn.vc
Video Conference ID: 128 274 952 1
Alternate VTC instructions

ERM

If you do not have the Teams App please use Chrome or Edge Browser. Right click and copy the Join link and paste if these are not your default browser. NOTE: It will not work with Internet Explorer

Learn More | Meeting options

Annex C8.4.7

Zambia Newspaper Advert

Chief demands audit on stalled irrigation scheme in Isoka

By PETER SICHALI

THERE is need for a thorough audit of Kavumo irrigation scheme which has not materialised despite Government releasing funds in 2012, Chief Katyetye of Isoka has demanded.

Chief Katyetye said it was unfortunate that the project which was said to have been fully funded had not recorded any progress since then.

He said Government with support from cooperating partners funded the construction of the irrigation scheme, which had not been completed to date.

"The project started soon after funding in 2012 and a 600-metre furrow was constructed but to our surprise, it immediately stopped and there is no communication.

"We tried to follow up the matter with the Ministry of Agriculture, no one seems to have answers, hence the need for audits, C hief Katyetye said.

Chief Katyetye said the project was aimed at boosting agriculture production and would have benefitted over 1,000 households in the area. The traditional leader said Government should send auditors and project engineers so that perpetrators could be brought to book.

"No one is telling us where the money for the project went and officers from agricultur are not telling us anything," Chief Katyetye said.

The traditional leader said he suspected mismanagement of the project hence the need for an audit.

"There was cement and other building materials but nobody knows where they have been taken too," Chief Katyetye said.

OPEN KALENGWA MINE, GOVT TOLD

By SILUMESI MALUMO

PRESSURE has mounted on Government to reopen Kalengwa Mine in Mufumbwe which has been closed for many years.

Mufumbwe UPND Member of Parliament Elliot Kamondo, said the prolonged closure of the mine had contributed to the high level of unemployment in the district.

Mr Kamondo said that many times people had called upon Government to look into the matter but nothing had been done.

He made the call in Parliament during the Estimates of Revenue and Expenditure including Capital and Constitutional and Statutory Expenditure for the office of the President in North-Western Province.

Mr Kamondo said Kalengwa Mine had remained closed for many years, and this had disadvantaged residents.

He said the district in particular had lagged behind in terms of development because of the closure of the mine.

"We need Kalengwa Mine to be opened so that the unemployment level in Mufumbwe can be resolved. These are the things we have been yearning for so that people in the area can have jobs," he said.

Mr Kamondo also bemoaned the lack of implementation of resettlement schemes by Government.

He said in the 2018 and 2019 budgets, Government promised to establish the resettlement schemes but nothing had been done.

He expressed sadness on the failure to work on feeder roads in many parts of of the province.

Meanwhile, provincial minister, Nathaniel Mubukwanu, said the concerns would be taken on board, but insisted that Government had delivered the road infrastructure development in the region.

The minister said Government had done the best in ensuring that economic roads such as the Solwezi-Chingola road among others were worked on.

He indicated that out of the 67 health posts which were allocated to North-Western Province about 47 were operational.

> We need Kalengwa Mine to be opened so that the unemployment level in Mufumbwe can be resolved. These are the things we have been yearning for so that people in the area can have jobs," he said.

ZAMBEZI RIVER AUTHORITY

ERM

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED BATOKA GORGE HYDRO-ELECTRIC SCHEME (ZAMBIA AND ZIMBABWE) ON THE ZAMBEZI RIVER

The Zambezi River Authority (the Authority), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the BGHES or the Project). The Project will be situated approximately 47 km downstream of the Victoria Falls, on the Zambezi River. In Zimbabwe, the Project falls within the province of Matabeleland North and in the Hwange Rural District; and in Zambia, in the Southern Province, in the Kazungula, Livingstone, Zimba, Kalomo and Choma Districts. The Authority commissioned Environmental Resources Management Southern Africa (Pty) Ltd (ERM) and its local partners in mid-2014 to undertake an Environmental and Social Impact Assessment (ESIA). Prior to the end of 2015, ERM and team had completed the Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies. A Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared and submitted to the ZRA for review in late 2015. Following delays in the overall BGHES Project, the ESIA process recommenced in October 2018. On 03 March 2020, ERM made available the draft ESIAs for public review and comment.

In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all disclosure meetings and keep the comment period open until further notice.

This advertisement serves to inform the public that the comment period for the ESIA will be closing on 25 January 2021.

Draft ESIAs	NTS of draft ESIAs
1. Livingstone City Council	1. Livingstone District Council
2. District Council Offices in Kazungula, Zimba, Kalomo and Choma.	2. Chiefs Palaces (Mukuni, Sipatunyana and Simwatachela)
3. ZRA offices in Lusaka	

Stakeholders are reminded that the draft ESIAs including a Non-technical Summary (NTS) are available on the Project website: www.erm.com/BGHES-ESIA and at the public locations listed below.

If you wish to comment on the drafts ESIA, or submit questions, please make sure your comments reach ERM on or before 25 January 2021. All comments received on the draft ESIAs will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs. The final ESIAs will be submitted to Zambia Environmental Management Agency (ZEMA) for consideration. For any further queries regarding the content of this advert or to comment on the draft ESIAs, contact us with the details included below.

Email: batokagorgehes@erm.com | Tel: +27 11 798 4300 or +260 97 407 4384
Post: Postnet Suite 90, Private Bag X12, Tokal, Cape Town, South Africa, 7966

'Be practical, not facebook noise makers'

By ROGERS KALERO

GOOD politicians should not just make noise on social media, but should identify the needs of the people and proceed to help them so that their lives are improved and lifted to acceptable standards, PF national chairman for mobilisation Richard Musukwa has said

Mr Musukwa said the Patriotic Front leadership has been very supportive to churches and the communities through various donations because it believed that helping the church was investing in the works of God

Mr Musukwa, who is Chililabombwe Member of Parliament and Minister of Mines and Mineral Development was speaking yesterday at the fund raising breakfast for the construction of the new church building at Ndeke United Church of Zambia (UCZ) congregation in Kitwe

Mr Musukwa

Mr Musukwa donated a K100, 000 towards the construction of the new building, a K20, 000 towards the construction of the ablution block and another K30, 000 towards the upkeep of the reverend

He urged the congregants and Christians in general to support the works of the church as doing so was investing in God's work

"Any good leader will not waste time insulting on social media, but will get on the ground to find what is affecting the people and find solutions to those problems and challenges. This is why as Patriotic Front chairman of mobilisation, I thought I should attend this occasion and support the construction of the new church building

And Ndeke UCZ congregation reverend Weston Simwinga said he was grateful for the support the church has been receiving from various political leaders of the ruling party.

Rev Simwinga said the church will always support the government of the day and provide counsel to them in challenging times so that they could provide quality leadership

Set up solar power stations, State told

By OLIVER SAMBOKO

GOVERNMENT should roll out an ambitious programme to construct solar power stations in all provinces to cushion electricity deficit in the country, an energy expert Victor Hazemba has said.

Currently, Zambia has an installed capacity of over 2, 300MW that is mainly produced through hydro-power generation but due to low water levels, the country has been producing less electricity.

Mr Hazemba said in May this year, the state-power utility company Zesco signed contracts worth $548 million with Power China to develop three solar power plants that would have added 600 megawatts (MW) to the national grid, but to date the projects have not kicked off.

He said Government should not only depend on the Kafue Lower Gorge and the planed 2, 400MW Batoka Gorge power scheme by a consortium led by Power Construction Corporation of China (Power China) and General Electric (GE), to end loadshedding in the country but diversify into solar if the country was to be energy power secure.

Mr Hazemba said solar power was the right step towards diversifying renewable energy for Zambia, which relies heavily on hydropower and has faced electricity shortages partly because of droughts.

"The public is aware that the power deficits that resulted from low electricity production forced Government, through Zesco, to spend in excess of US$250 million on emergency power imports from 2015. If this money was spent on setting up solar power plants, the power deficit was going to be minimised," he said.

He said the current power supply deficit of over 810MW since last year, was negatively affecting economic activities and therefore Government should fast-track the construction of solar power generation stations as part of its support towards green energy projects.

Zambia has suffered power cuts due to her heavy reliance on hydropower from plants at the Kariba Dam on the Zambezi River, which water authorities say is running dry fast and only at less than

Annex C8.4.8

Zimbabwe Newspaper Advert

ZIMPOST

REQUEST FOR EXPRESSIONS OF INTEREST (E.O.I) FOR THE SUBDIVISION OF STANDS

ZIMPOST seeks to engage services of qualified and experienced town planners to undertake subdivision works on properties under their ownership. Shortlisted firms will be invited to submit proposals in response to a **Request For Proposal (R.F.P)** to be issued for the purpose.

Interested applicants must provide the following:

1. Zimbabwe Institute of Regional and Urban Planners Membership Certificate
2. Proof of PRAZ registration
3. Current Tax Clearance Certificate
4. References and recommendations (or at least 3 completed works of this same nature)

This E.O.I shall close on 04 January 2021 at 1000 HRS

This Expression of Interest (EOI) must be submitted to the Procurement Management Unit, ZIMPOST, 2nd Floor Home Affairs Head Office Building, Harare. EOI must be enclosed in sealed envelopes clearly marked "**Expression Of Interest for** ....."

NB: this E.O.I is also downloadable on the ZIMPOST website: www.zimposts.co.zw

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Chipinge Rural District Council

Invitation to Tender

Vehicle Tender Number 3 of 2020

Chipinge Rural District Council (hereinafter called the "Council") has approved the purchase of suitable vehicle and invites tenders from suppliers of such vehicles under the following terms and conditions:

Vehicle Description:

1. Single cab pick up
2. Diesel engine
3. Capacity minimum 1 tonne
4. Air Conditioner
5. 4X2 Wheel drive
6. Tinted windows
7. Rubber mats in front

Tender documents are obtainable upon payment of Twenty dollars ($20.00) at the Council offices, Chipinge Rural District Council, 5th Avenue, Chipinge.

Tender documents must be in sealed envelopes marked Vehicle Tender 3 of 2020, addressed to the Chief Executive Officer, to be deposited in the tender box at the offices of Chipinge Rural District Council on or before 29th December 2020.

The Council reserves the right to reject any tender, or part thereof, without giving reasons. Chipinge Rural District Council does not bind itself to accept the lowest or any tender.

The Chief Executive Officer
Chipinge Rural District Council
666 Tafa Street off 5th Avenue
Chipinge

Telephone: (027) 28 341/2/3/4
Cell phone: 0772 [illegible]
E-mail: [illegible]

USAID PEPFAR CRS

NAME:
SCHOOL:
AGE:

MATRIX NUMBER:
SHEDWAY HIGH SCHOOL MAKONI
ID:

Topic: How has the DREAMS program under the Pathways project helped to address issues of Gender Based Violence among girls and young women in your community? What do you think the community should do to support this?

As my eyes blink for a second so much is seen. They say patriotism is a disease of a nation and this statement is non-debatable. In Zimbabwe, our nation, Gender Based Violence has been very high but I would want to appreciate the DREAMS program which has helped the girl child and young women to fight against this huge problem. DREAMS stands for Determined, Resilient, Empowered, AIDS free, Mentored and Safe. The DREAMS initiative is under Pathways Project which is funded by PEPFAR through and is implemented by the Catholic Relief Services in partnership with the Salvation Army in Mazowe district.

Human rights are inherent, inalienable and universal. It is the nation's obligation and duty to fight for these rights. The rights of the girl child and young women have been infringed day in and day out, including the right to be heard and the right to freedom when girls and young women are being exposed to gender-based violence. The DREAMS program is helping the nation to fight for these rights that lead to a violence-free nation.

The DREAMS program has helped to increase the right to education for AGYWs through education assistance. Girls have been victims of abuse when there is no money to pay fees for them. Families would opt for the girl child to drop out of school rather than the boy. Communities prioritise boys rather than girls which has seen more girls dropping out of school which has put them at high risk of gender based violence. When girls are not in school, they are not in their safe place because their safe place is the school. This exposes them to early marriages. The DREAMS program has given the girl child an opportunity to create a brighter future through education. Through education, girls are empowered and know how to make better decisions in life. It (through the DREAMS program) has given girls hope to be resilient and be able to cater for their own needs. Through various DREAMS activities such as savings groups, girls have learnt how to save money and start small income generating projects that have helped them to acquire basic needs such as sanitary wares which has been a challenge for most girls to access due to poverty. By starting income generating projects, girls are able to acquire money that they can use to purchase their own needs which reduces the risk of them getting involved in transactional relationships with men and leads to their abuse and manipulation by these men. This SAYe have contributed in building the resilience of AGYWs by supporting them to start their own savings groups that will help them to access their basic needs.

The Shinoyipo parenting program within the DREAMS program has also helped communities reduce cases of gender based violence through strengthening relationships between parents and their teen girls. Session 3 of the Shinoyipo parenting program speaks of building positive relationships between the caregiver and their teens. This has resulted in AGYWs being able to talk freely with their caregivers about GBV issues. Session 12 of the Shinoyipo program speaks of mapping risk and safe places which has been vital to alert girls of areas that might put them in danger of being abused. Girls have now learnt to spend most of their time in safer places such as schools and churches. This has reduced the number of girls being put at risk of sexual gender based violence.

The community should continue reporting cases of gender based violence to the Police Victim friendly unit so that perpetrators of abuse are apprehended. Authorities in the community should also conduct community meetings and dialogues to sensitize and educate the community on how to STOP gender based violence.

ERM

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED BATOKA GORGE HYDRO-ELECTRIC SCHEME (ZAMBIA AND ZIMBABWE) ON THE ZAMBEZI RIVER

The Zambezi River Authority (the Authority), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the BGHES or the Project). The Project will be situated approximately 47 km downstream of the Victoria Falls, on the Zambezi River, in Zimbabwe, the Project falls within the province of Matabeleland North and in the Hwange Rural District, and in Zambia, in the Southern Province, in the Kazungula, Livingstone, Zimba, Kalomo and Choma Districts. The Authority commissioned Environmental Resources Management Southern Africa (Pty) Ltd (ERM) and its local partners in mid 2014 to undertake an Environmental and Social Impact Assessment (ESIA). Prior to the end of 2015, ERM and team had completed the Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies. A Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared and submitted to the ZRA for review in late 2015. Following delays in the overall BGHES Project, the ESIA process recommenced in October 2018. On 03 March 2020, ERM made available the draft ESIAs for public review and comment.

In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all disclosure meetings and keep the comment period open until further notice.

This advertisement serves to inform the public that the comment period for the ESIA will be closing on 25 January 2021.

Stakeholders are reminded that the draft ESIAs including a Non-technical Summary (NTS) are available on the Project website: www.erm.com/BGHES-ESIA and at the public locations listed below.

Draft ESIAs	NTS of draft ESIAs
1. Hwange District Council 2. Victoria Falls Municipal Offices 3. Black Crystal's Office in Harare	1. Hwange District Council 2. Jambezi Clinic Chisuma Clinic 3. Matabeleland North Provincial Administrators Office

Stakeholders are reminded that the draft ESIAs including a Non-technical Summary (NTS) are available on the Project website: www.erm.com/BGHES-ESIA and at the public locations listed below.

If you wish to comment on the drafts ESIA, or submit questions, please make sure your comments reach ERM on or before 25 January 2021. All comments received on the draft ESIAs will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs. The final ESIAs will be submitted to Environmental Management Agency (EMA) for consideration. For any further queries regarding the content of this advert or to comment on the draft ESIAs, contact us with the details included below.

Email: batokagorge@erm.com | Tel: +27 11 789 4300 or +263 77 267 6616 | Post: Postal Suite 93, Private Bag X12, Tokai, Cape Town, South Africa, 7966

SHOT ON S15 Pro
itel AI CAMERA

Annex C8.4.9

Stakeholder Invitation of I &AP's

From: Lindsey Bungartz on behalf of ERM South Africa Cape Town IAP Project Batoka Gorge HES

Bcc: "kanyandurah@gmail.com"; "permsec@mlg.gov.zw"; "rudo.chitiga@gmail.com"; "bnmush@gmail.com"; "gariranoni@gmail.com"; "kmudereri@gmail.com"; "amarawa@hotmail.com"; "energy@energy.gov.zw"; "power@energy.gov.zw"; "chitsikorj@moa.gov.zw"; "mmunodawafa@environment.gov.zw"; "ommoyo@my.gov.zw"; "ema@ema.co.zw"; "fmangwanya@zimparks.go.zw"; "JongaJk@ddf.gov.zw"; "ddf@ddf.gov.zw"; "Chiwera@ddf.gov.zw"; "ministerofstatematnorth@gmail.com"; "zgshumba@energy.gov.zw"; "dchimhanda@gmail.com"; "patodirectorgeneral@zimparks.gov.zw"; "hilarymadiri@yahoo.com"; "parksres@mweb.co.zw"; "info@ztazim.co.zw"; "ce@ztazim.co.zw"; "ceozct@gmail.com"; "dumienyoni@yahoo.com"; "lungiledhlomo@yahoo.co.uk"; "pmdmatnorth@mines.gov.zw"; "pamatnorth@gmail.com"; "kamutema@transcom.gov.zw"; "emasocha@zinara.co.zw"; "atm4@gmail.com"; "btagwirei@zinwa.co.zw"; "emantoh@yahoo.com"; "nkhcthwe84@yahoo.com"; "masawir@caaz.co.zw"; "sinsamba@caaz.co.zw"; "aaromuna@gmail.com"; "ngwenyabkt@gmail.com"; "ngwenyabrt@gmail.com"; "owenmukombero@yahoo.co.uk"; "tclerkvfm@comone.co.zw"; "info@vfm.co.zw"; "nmoyo@vfm.co.zw"; "tsjura@yahoo.com"; "emakuwe@yahoo.com"; "edmorengosi@yahoo.com"; "faithchirambavf@gmail.com"; "mambom23@gmail.com"; "kmangwiro37@gmail.com"; "lovemorencube21@gmail.com"; "trosen@zinwa.co.zw"; "bvamburetaruvinga@gmail.com"; "dumienyathi@gmail.com"; "edmorengosi@yahoo.com"; "engosi@zimparks.org.zw"; "chizatm@gmail.com"; "cgurure@zimparks.org.zw"; "tngotosa@hotmail.com"; "alfredojijah@gmail.com"; "schomhlanga@gmail.com"; "makeyincube@gmail.com"; "mukomajai@yahoo.com"; "ndunamacebo@yahoo.com"; "mhlanga.timothy314@gmail.com"; "ncubeprevious@gmail.com"; "dahwange@gmail.com"; "nyarandomagoja@gmail.com"; "chrispenchauke@yahoo.com"; "natmus@utande.co.zw"; "ngobilemabhena@gmail.com"; "trymorendolo@gmail.com"; "alicmudenda06@gmail.com"; "paulwphiri@yahoo.com"; "thokokwids@gmail.com"; "smoyofeb@gmail.com"; "dahwange@gmail.com"; "hwangeruraldc@gmail.com"; "robin@cansaf.com"; "racmaasdorp@gmail.com"; "zambezi@mweb.co.zw"; "jonathan@saflodge.co.za"; "cephas@shearwatervf.com"; "skinner@wildhorizons.co.zw"; "clive@wildhorizons.co.zw"; "barbara@wildhorizons.co.zw"; "garya@wildhorizons.co.zw"; "brent@adventurezonevicfalls.com"; "riverops@adventurezonevicfalls.com"; "philani@shockrafting.com"; "nyathimarvel@gmail.com"; "ben@khanondotravil.com"; "raz@dinganetours.com"; "stevej@lionencounter.com"; "tendavies@yahoo.co.uk"; "croccagediving@gmail.com"; "dabula@africaonline.co.zw"; "mike@shearwatervf.com"; "mike@sheawaterct.co.za"; "joan.gibbs@bonisair.com"; "jonathan@saflodge.co.zw"; "rob@imvelosafarilodges.com"; "rob@imvelosafarilodges.com"; "zondo@imvelosafarilodges.com"; "communities@imvelosafarilodges.com"; "gm@victoriafallshotel.com"; "dgm@victoriafallshotel.com"; "hfc@victoriafallshotel.com"; "dkung@legacyafricahotels.com"; "martin@ilalalodge.co.zw"; "gm.rainbowvfa@rtg.co.zw"; "hilda.magaso@rtg.co.zw"; "fungai@heritageexpeditionsafrica.com"; "nmoyo@legacyafricahotels.com"; "kofficer@ehr.africansun.co.zw"; "jonathan@saflodge.co.zw"; "zondo@matupula.co.zw"; "invelo@invilosafarilodges.com"; "imvelo@imvelosafarilodges.com"; "info@ztazim.co.zw"; "marketing@ztazim.co.zw"; "retosa@iafrica.com"; "info@retosa.co.za"; "retepstrebor@yahoo.co.uk"; "joshggm@mweb.co.zw"; "Joshggm@mweb.co.zw"; "cheziyacrocs1@gmail.com"; "editor@victoriafallswonders.com"; "roger@vicfallswildlifetrust.org"; "jessica@vicfallswildlifetrust.org"; "ecolynx@zol.co.zw"; "namo@environmentafrica.org"; "edith@environmentafrica.org"; "charlie@environmentafrica.com"; "charlie@greenlineafrica.org"; "JuliaPierini@birdlifezimbabwe.org"; "ecolynx@zol.co.zw"; "yvonne@routesthrouafrica.com"; "sparrow.alan@gmail.com"; "oliver@environmentafrica.org"; "galorand@mweb.co.zw"; "cat@yoafrica.com"; "info@environmentafrica.org"; "namo@environmentafrica.org"; "galorand@mweb.co.zw"; "andrew_shamu@wvi.org"; "info@painteddog.org"; "lubhouse@yoafrica.com"; "elisabethm@intengwe.org"; "sgarikayi@achmonline.org"; "rudo@internationalrivers.org"; "grace.cc.wu@gmail.com"; "ranjit.deshmukh@berkely.edu"; "cmuvirimi@wwf.org"; "media@internationalrafting.com"; "info@internationalrafting.com"; "andrew@gravity.co.za"; "adventure@gravity.co.za"; "communications.zw@undp.org"; "gsmaphosa@gmail.com"; "hhsansole@gmail.com"; "mahyde@gmail.com"; "manyise@xceldent.com"; "admin@thehealthbridge.com"; "tlanezim@gmail.com"; "efinnity@psmi.co.zw"; "fovf@yoafrica.com"; "ngomap@yahoo.com"; "Frank_jordan_23@yahoo.com"; "engramandi@gmail.com"; "aramandi@zpc.hps.co.zw"; "mmberengwa@zpc.hps.co.zw"; "tncube@zpc.hps.co.zw"; "tchovivofa@zpc.hps.co.zw"; "langtonkhumalo59@gmail.com"; "achuma@hwangecolliery.co.zw"; "hhsansole@gmail.com"; "nmunengami@hwangecolliery.co.zw"; "langtonkhumalo59@gmail.com"; "tsahondo@gmail.com"; "ncubeleon@gmail.com"; "lmumpande@vfm.co.zw"; "nndlovu@vfm.co.zw"; "nncube@vfm.co.zw"; "shsibanda@vfm.co.zw"; "pmabhureni@vfm.co.zw"; "rmosesdanlayston@yahoo.com"; "psndlovu@vfm.co.zw"; "ratidzainyazenga@zcbc.co.zw"; "isla.grundy@gmail.com"; "isla.grundy@gmail.com"; "schenaux-repond@bluewih.ch"; "drrobbie@icon.co.za"; "nick.zimson@gmail.com"; "jchikeya@gmail.com"; "petersrtebo@yahoo.co.uk"; "drtnhiwatiwa@gmail.com"; "mbarson91@gmail.com"; "amend@aka-design.de"; "whileyjean@gmail.com"; "drew@gmail.com"; "bncube2@hotmail.com"; "helencave@xtra.co.nz"; "scottnramsay@gmail.com"; "ockie.strumpher@gayatripaper.co.za"; "steve@askarisafari.com"; "roy033@gmail.com"; "gary@garywockner.com"; "nyika@roseofcharity.org"; "campfir@id.co.zw"; "campfire@internet.co.zw"; "elisabethm@intengwe.org"; "andrew@liveagape.com"; "larry@larrynorton.co.za"; "sara@larrynorton.co.za"; "info@larrynorton.co.za"; "lna@yoafrica.com"; "maya@leopardleap.co.za"; "mcdonalddaniel@gmail.com"; "josh@chezyacrocodiles.co.zw"; "achivurayise@zpc.hps.co.zw"; "ngunip@gmail.com"; "cmunyamana@hwangecolliery.co.zw"; "fmapfuwa@hwangecolliery.co.zw"; "fewdayschanka@gmail.com"; "chikwenyan@gmail.com"; "smmbewe@yahoo.com"; "mwila.daka@mcti.gov.zm"; "duchi45@yahoo.com"; "maketo.mulele@mndp.gov.zm"; "jmukoloba2000@yahoo.com"; "kennethnyundu@gmail.com"; "changanongoi@yahoo.co.uk"; "zaridirector@zari.gov.zm"; "pklungu@gmail.com"; "jmwango60@googlemail.com"; "sweetkajipaike@yahoo.co.uk"; "bensonmwenya@hotmail.com"; "nkumbusiame@yahoo.com"; "kennedymalama@yahoo.com"; "arnmils.simwaba806@gmail.com"; "frachisangano@yahoo.com"; "jmpishi2001@yahoo.com"; "everistokasumba2@gmail.com"; "oscarsilembo@yahoo.com"; "swilliams@erb.org.zm"; "florence.chibwesha@hrc.org.zm"; "lukupulo@gmail.com"; "lukpulo@yahoo.com"; "infor@hotmail.com"; "alexadra@wasaza.org.zm"; "matthew.ngulube@ncc.org.zm"; "nrfa@zament.zm"; "cmuleya@nwasco.org.zm"; "kchitumbo@nwasco.org.zm"; "MChisenga@roads.gov.zm"; "emwape@roads.gov.zm"; "info@rtsa.org"; "southernwater@swasco.co.zm"; "alexadra@wasaza.org.zm"; "ndakalac@yahoo.com"; "hmmilumbe@gmil.com"; "ckaniki@zesco.co.zm"; "fkmshalwindi@gmail.com"; "mwaliomba@gmail.com"; "mwamulowek@netscape.net"; "mwamsprog@mail.com"; "ndiyoi@yahoo.co.uk"; "kanguyaisaac@yahoo.com"; "s_nyondo@yahoo.com"; "serahnyondo@yahoo.com"; "lzulu@mota.gov.zm"; "lzullu@gmail.com"; "aggrey.siuluta@moe.gov.zm"; "aggrey81@yahoo.com"; "msimabenga@gmail.com"; "smwiinga@erb.org.zm"; "jsphthole@gmail.com"; "luzy.mwale@gmail.com"; "jonesmasonde@zawa.org.com"; "jkmasonde@yahoo.co.uk"; "jonesmasonde@zawa.org.zm"; "robertchilembo@gmail.com"; "stembo@zema.org.zm"; "simon.tembo1@gmail.com"; "lkalenge@gmail.com"; "lnundwe@zema.org.zm"; "lloyd.numdwe@gmail.com"; "cmateke@gmail.com"; "oshalwindi@gmail.com"; "Kairajohn@ymail.com"; "mulombajk15@yahoo.com"; "samsonsakala@yahoo.com"; "samsondsakala@yahoo.com"; "mutokawatson@gmail.com"; "minyoyipamela@gmail.com"; "mhabanji@gmail.com"; "msimabenga@gmail.com"; "muvwimigetrude@yahoo.com"; "gisfordb@yahoo.com"; "Bnkhata89@gmail.com"; "mmuyambngo@yahoo.com"; "livcity@gmail.com"; "muzyanifranis@gmail.com"; "trevormulenga2@gmail.com"; "sirfyu17@gmail.com"; "kalumbamwaandwe@gmail.com"; "pasmuso@yahoo.com"; "kelysonm@yahoo.co.uk"; "kelysonm@yahoo.co.uk"; "chrozlyn@gmail.com"; "juliussimfukwe@gmail.com"; "edioyoba@yahoo.com"; "josephkalubila@yahoo.co.uk"; "Ronaldhamaimbo@gmail.com"; "maambolilanda@gmail.com"; "sepiso.k@gmail.com"; "bfyacepa@yahoo.com"; "mchvywanga@gmail.com"; "kutatambewe@gmail.com"; "chiilajosephine@gmail.com"; "elizabethlondwe@yahoo.com"; "preciousmusa69@yahoo.com"; "kingmukuni@yahoo.com"; "bstaleka96@gmail.com"; "rouridhe@adventure-logic.com"; "ruaridh@adventure-logic.com"; "jo@bunduadventures.com"; "jo@bunduadventures.com"; "eumatours@zamnet.zm"; "keith@dunetours.co.za"; "elissa@adventure-africa.com"; "kingsley@limbolodge.com"; "lta@microlink.zm"; "manager@marambariverlodge.com"; "s.j.sikaneta@gmail.com"; "hamida@mukwatravel.co.zm"; "anmariefourie@gmail.com"; "s.j.sikaneta@gmail.com"; "zaminfo@safpar.com"; "spezam@safpar.com"; "zamops@safpar.com"; "zaminfo@safpar.com"; "dgyles@safaritrekafrica.com"; "walks@savannah-southern-safaris.com"; "info@stanleysafaris.com"; "tabonina@yahoo.com"; "taita-falcon@microlink.zm"; "anmariefourie@gmail.com"; "waslodge@zamnet.zm"; "waslodge@yahoo.com"; "office@rafting.at"; "strobl@rafting.at"; "grace1msambachinanda@yahoo.co.uk"; "ncunesco@zamnet.zm"; "catherine.s.loke@gmail.com"; "cmwale@wwfzam.org"; "wwfzambia@wwfzam.org"; "lkatiyo@wwfzam.org"; "rudo@internationalrivers.org"; "lubasi_mungandi@yahoo.com"; "info@oxfam.org.uk"; "mtembo@oxfam.org.uk"; "Sebastian_kunda@wvi.org"; "infor@ms.zm"; "jackiengoma@yahoo.com"; "melpezy88@gmail.com"; "richard.nawa@gmail.com"; "infor@jesuits.org.zm"; "gchiwoneso@yahoo.co.uk"; "rhensonzam@gmail.com"; "cmateke@gmail.com"; "nchongo.zcbnrm@gmail.com"; "info@zec.org.zm"; "info@caritaszambia.org"; "girl2river@yahoo.com"; "bernard.sinyangwe@yahoo.com"; "mwhiteheadzam@gmail.com"; "gill@awindowonzambia.com"; "productions@safpar.com"; "juliusnalishebo@gmail.com"; "arthur@bushbling.com"; "grace.cc.wu@gmail.com"; "ranjit.deshmukh@berkeley.edu"; "mckaytjm@unisa.ac.za"; "misomo@zamtel.zm"; "psda@coppernet.zm"; "livcci@yahoo.com"; "rhensonzam@gmail.com"; "veronicasiachenga@gmail.com"; "evelynpuuka@yahoo.com"; "info@ngocc.org.zm"; "wecsz@microlink.zm"; "emma@thebutterflytree.org.uk"; "birdwatch.zambia@gmail.com"; "info@carezam.org"; "mubianaobert@gmail.com"; "hanampotab@yahoo.co.uk"; "childprotection@plan-international.org"; "zambia.info@savethechildren.org"; "info@africanimpact.com"; "rchiegil@fhi360.org"; "phabeenzu@unicef.org"; "lusaka@unicef.org"; "mail@responsenetwork.org"; "CLippstreu@landolakes.com"; "hcmhango@zambia.co.zm"; "mikenawa2014@gmail.com"; "cfreeman510@gmail.com"; "helencave@xtra.co.nz"; "robert@lebrun.co.za"; "scottnramsay@gmail.com"; "pam@searcherstraining.com"; "fiona@thebuttreys.com"; "erincarey@yahoo.com"; "stone1727@gmail.com"; "mattblue1975@googlemail.com"; "raddison37@gmail.com"; "Sam.Helliwell@niras.com"; "avgphoto@gmail.com"; "verdantvalleyproduce@gmail.com"; Dieter Rodewald; Tori Braham; Lindsey Bungartz

Subject: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme

Date: Tuesday, March 3, 2020 3:01:00 PM
Attachments: image006.png

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Notification of Availability of draft ESIAs and Invitation to Open House Meetings

The Zambezi River Authority (ZRA), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (hereinafter referred to as the BGHES or the Project). The Project will be situated approximately 47 km downstream of the Victoria Falls, on the Zambezi River. In Zambia, the Project falls within the Southern Province, in the Kazungula, Livingstone, Zimba, Kalomo and Choma Districts. In Zimbabwe, it falls in the province of Matabeleland North and in the Hwange Rural District.
The proposed BGHES includes the construction of a proposed 175 m high Roller Compacted Concrete gravity arch dam that would provide a total capacity of 2,400 megawatts (MW) (to be shared equally between Zambia and Zimbabwe), and annual energy production of 10,215 Gigawatt hours per year (GWh/y).

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The Environmental and Social Impact Assessment Process

The Environmental and Social Impact Assessment (ESIA) process is being conducted in accordance with the Environmental Management Act (Act No. 12 of 2011), pursuant to Statutory Instrument No. 28 of 1997 - the Environmental Impact Assessment (EIA) Regulations in Zambia. In Zimbabwe, the process is being conducted in line with the following legislation: the Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002; Statutory Instrument 7 of 2007: Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations; the Environmental Impact Assessment Policy of 1997; as well as the Environmental Impact Assessment Guidelines of 1997.

In addition to the Zambian and Zimbabwean legal requirements, the ESIA conforms to international standards and good practices, in particular the requirements of the World Bank Environmental and Social Framework and the International Finance Corporation (IFC) performance standards. The ESIA also aligns to other international guidelines and standards directly applicable to hydropower projects, such as the World Commission on Dams (WCD) and the International Hydropower Association (IHA).
An ESIA was commissioned in mid-2014, by the ZRA with Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) of South Africa and its local partners (Kaizen Consulting International in Zambia and Black Crystal in Zimbabwe) as the Project Consultants to undertake this work. Prior to the end of 2015, ERM and its team had completed the Scoping Phase of the Project, which entailed extensive stakeholder engagement and the necessary environmental and social baseline studies had been completed in order to inform the content of an ESIA. A Draft ESIA and Environmental and Social Management Plan (ESMP) was prepared and submitted to the ZRA for its review in late 2015. Following delays in the overall BGHES Project, the ESIA process recommenced in October 2018. At this stage, all stakeholders identified in the ESIA process were notified of the recommencement of studies. ERM has subsequently updated the ESIA reports and selected specialist studies.

ESIA Disclosure

-
Availability of the Project ESIAs for Review & Comment

-
The draft ESIAs for the BGHES are available for public comment and the comment period is effective from **3 March to 30 April 2020**. Three separate draft ESIAs have been prepared for the Project as follows:

- ESIA for the dam wall and impoundment, including spillway; surface power houses; the Project townships (in both Zambia and Zimbabwe); and other ancillary infrastructure (such as quarries, spoil areas, batching areas);
- ESIA for Project access roads in both Zambia and Zimbabwe; and
- ESIA for Project Transmission Lines in both Zambia and Zimbabwe.

Stakeholders are invited to submit all comments on the draft ESIAs to ERM. Your comments will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to the Zimbabwe Environmental Management Agency (EMA) and the Zambian Environmental Management Agency (ZEMA) for consideration.
Please ensure that your comments reach ERM on or before 30 April 2020.
Email: batokagorgehes@erm.com | Tel: +27 21 681 5400 or +27 11 798 4300 or +263 77 287 6616
Post: Postnet Suite 90, Private Bag X12, Tokai, 7966

Copies of the draft ESIAs and a Non-technical Summary of the draft ESIAs are available on the Project website www.erm.com/BGHES-ESIA, and at the following locations.

Draft ESIAs	Non-technical Summary of draft ESIAs
Zimbabwe	
■ Victoria Falls Municipal Offices; ■ Environment Africa Office Victoria Falls; and ■ Black Crystal's Office in Harare.	■ Hwange District Council Office; ■ District Administrators Office in Hwange; ■ Jambezi Clinic; ■ Chisuma Clinic; and ■ Matebeleland North Provincial Administrators Office.
Zambia	
■ Livingstone City Council; and ■ Livingstone District Commissioner's Office	■ Kazungula District Council; ■ Kazungula District Commissioner's Office; ■ Lusaka Kaizen Consulting Office; ■ District Commissioners offices in Zimba, Kalomo and Choma; ■ District Council Offices in Zimba, Kalomo and Choma; ■ National Assembly Offices Zimba, Kalomo and Choma; and ■ Chiefs Palaces (Sipatunyana, Simwatachela & Chikanta).

Open House Meetings

You are invited to attend one of the open house meetings listed below where the findings of the draft ESIAs will be shared with stakeholders. The meeting will follow an open house format and the participants will have the opportunity to interact with the project team, ask questions and provide comment, and there will be a structured presentation **at 16:00.**

Date	Location	Venue	Time
17 April 2020	Victoria Falls	The Kingdom Hotel 1 Mallett Drive, Victoria Falls, Zimbabwe	15:00 – 18:00 Presentation at 16:00
18 April 2020	Livingstone	Protea Hotel by Mariott Mosi-o-Tunya Road, Livingstone, Zambia	15:00 – 18:00 Presentation at 16:00
20 April 2020	Lusaka	Radisson Blue Hotel 19029 Great East Road Lusaka, Zambia	15:00 – 18:00 Presentation at 16:00
21 April 2020	Harare	Rainbow Towers Hotel Pennefather Ave, Harare, Zimbabwe	15:00 – 18:00 Presentation at 16:00

Thank you for your participation in the process. Please contact ERM at the undersigned if you have further questions.

Yours sincerely

The ERM Team

batokagorgehes@erm.com

Tel: +27 21 681 5400; +27 11 798 4300; +263 77 287 6616

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Annex C8.4.10

Postponement of the ESIA Disclosure Meetings

ERM

1st Floor | Great Westerford |
240 Main Road | Rondebosch |
7700 | Cape Town | South Africa

Telephone: +27 21 681 5400

www.erm.com

19 March 2020

ERM Ref: 0239269

EMA Ref: 17/1/1/3A

ZEMA Ref: ZEMA/DEPT/101/1/3

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River – Postponement of ESIA Disclosure Meetings

Dear Stakeholder,

As you are aware, Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) is contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls. On 3 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe in April 2020.

In light of the current COVID-19 pandemic, the Authority and ERM have taken the decision to postpone all public disclosure meetings scheduled to take place between 17 and 22 April 2020. This decision is in response to recent government-mandated travel restrictions and bans on gatherings of more than 100 people, which have been imposed within certain southern African countries.

Given the current level of global uncertainty associated with COVID-19, the Authority and ERM are unable to determine at the present time when these meetings may be reasonably rescheduled. The Authority and ERM will provide adequate notification of rearranged dates, once these have been established.

Please note that the review and comment period for the draft ESIAs will remain open until such time that the Authority and ERM are able to hold the ESIA disclosure meetings, or until further notice is given by the Authority and ERM. Your input remains key in the updating and finalisation of the ESIA studies and stakeholders are encouraged to continue reviewing the draft ESIAs and to submit questions and comments to ERM: batokagorgehes@erm.com

Stakeholders can access the draft ESIA reports and Non-Technical Summaries (NTSs) through the project website, www.erm.com/BGHES-ESIA and at the public locations previously communicated.

Please contact ERM should you have any questions.

Yours sincerely

Lindsey Bungartz

Stakeholder Engagement Manager

Mike Everett

BGHES ESIA Director

Linda Slabber

From:	Lindsey Bungartz on behalf of ERM South Africa Cape Town IAP Project Batoka Gorge HES
Sent:	Thursday, 19 March 2020 19:26
To:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
Subject:	ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River – Postponement of ESIA Disclosure Meetings
Attachments:	BGHES_Meeting_Postponement_Letter_19Mar2020.pdf

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River – Postponement of ESIA Disclosure Meetings

Dear Stakeholder,

As you are aware, Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) is contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls. On 3 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe in April 2020.

In light of the current COVID-19 pandemic, the Authority and ERM have taken the decision to postpone all public disclosure meetings scheduled to take place between 17 and 22 April 2020. This decision is in response to recent government-mandated travel restrictions and bans on gatherings of more than 100 people, which have been imposed within certain southern African countries.

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Please note that the review and comment period for the draft ESIAs will remain open until such time that the Authority and ERM are able to hold the ESIA disclosure meetings, or until further notice is given by the Authority and ERM. Your input remains key in the updating and finalisation of the ESIA studies and stakeholders are encouraged to continue reviewing the draft ESIAs and to submit questions and comments to ERM: batokagorgehes@erm.com

Stakeholders can access the draft ESIA reports and Non-Technical Summaries (NTSs) through the project website, www.erm.com/BGHES-ESIA and at the public locations previously communicated.
Please contact ERM should you have any questions.

Yours sincerely,

Lindsey Bungartz Mike Everett
Stakeholder Engagement Manager BGHES ESIA Director

Environmental Resources Management (ERM)
www.erm.com

Annex C (8.5)

Invitation Reminders

Annex C8.5.1

Invitation Reminder to Open House Engagement

Linda Slabber

From: Nombukiso Ntshalintshali
Sent: Friday, 27 November 2020 12:37
Subject: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River: Invitation to Webinar

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Webinar

This is a kind reminder to please register to attend the virtual disclosure of the Environmental Social Impact Assessment (ESIA) for the Batoka George Hydro-Electric Scheme Webinar.

Date: 02 December 2020
Time: 09:30 AM

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_42Y_qB-5QaWX8zpZOkVMKQ

Contact Deatils
Email: batokagorgehes@erm.com | Post: Postnet Suite 90, Private Bag X12, Tokai, 7966
Tel: +27 21 681 5400 (South Africa)
+27 11 798 4300 (South Africa)
+263 77 287 6616 (Zimbabwe)
+260 97 4074384 (Zambia)

Please feel free to contact us with the details included above.

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Annex C8.5.2

Invitation Reminder to Water Users Focus Group Engagement

Linda Slabber

From: Nombukiso Ntshalintshali
Sent: Friday, 27 November 2020 13:02
To: zambezi@mweb.co.zw; cephas@shearwatervf.com; skinner@wildhorizons.co.zw; skinner@wildhorizons.co.zw; clive@wildhorizons.co.zw; barbara@wildhorizons.co.zw; garya@wildhorizons.co.zw; brent@adventurezonevicfalls.com; riverops@adventurezonevicfalls.com; nyathimarvel@gmail.com; ben@khanondotravil.com; rudo@internationalrivers.org; media@internationalrafting.com; info@internationalrafting.com; andrew@gravity.co.za; adventure@gravity.co.za; adventure@gravity.co.za; brent@adventurezonevicfalls.com; clive@wildhorizons.co.zw; steve@askarisafari.com; roy033@gmail.com; rouridhe@adventure-logic.com; ruaridh@adventure-logic.com; jo@bunduadventures.com; jo@bunduadventures.com; lta@microlink.zm; robin@cansaf.com; hamida@mukwatravel.co.zm; zaminfo@safpar.com; productions@safpar.com; spezam@safpar.com; zamops@safpar.com; zaminfo@safpar.com; office@rafting.at; strobl@rafting.at; anmariefourie@gmail.com; rudo@internationalrivers.org; sean.clarke@internationalrafting.com; info@internationalrafting.com; info@jetextremezambia.com; eumatours@zamnet.zm; keith@dunetours.co.za; walks@savannah-southern-safaris.com; info@stanleysafaris.com; raz@dinganetours.com; dabula@africaonline.co.zw; mike@shearwatervf.com; mike@sheawaterct.co.za; savethezam@gmail.com; media@internationalrafting.com; info@internationalrafting.com; rudo@internationalrivers.org; andrew@gravity.co.za; adventure@gravity.co.za; rudo@internationalrivers.org; sean.clarke@internationalrafting.com; evelynpuuka@yahoo.com; info@internationalrafting.com; faracmaasdorp@gmail.com; philanim@yahoo.com; Davisontshuma@mail.com; agrippa@shearwatervf.com; ndlovuskinner@gmail.com; info@maano-adventures.com; rivers@waterbynature.com; info@waterbynature.com
Subject: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River: Invitation to Virtual Focus Group Discussion

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Virtual Focus Group Discussion

This is kind reminder to please register to attend the virtual dosclosure of the Environmental Social Impact Assessment (ESIA) for the Batoka George Hdro-Electric Scheme Webinar.

Meeting Time:
Friday 4 December 2020 at 09:30 AM

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_cIItF2F4S6q-4GrpeQJHrQ

For any further queries regarding the content of this letter, please feel free to contact us with the details included below.
Email: batokagorgehes@erm.com | Tel: +27 21 681 5400 (South Africa) or +27 11 798 4300 (South Africa) or +263 77 287 6616 (Zimbabwe) or +260 97 4074384 (Zambia)

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

Annex C8.5.3

Invitation Reminder to Special Interest Focus Group Engagement

Linda Slabber

From: Lindsey Bungartz
Sent: Friday, 04 December 2020 00:30
To: ERM South Africa Cape Town IAP Project Batoka Gorge HES
Subject: Reminder: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme on the Zambezi River: Invitation to Virtual Focus Group Discussion

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

This email serves as a reminder to please register for the virtual focus group discussion for the for the Proposed Batoka Gorge Hydro-Electric Scheme (BGHES), if you have an interest – the registration details are provided below. The focus group discussion will include the findings of the Project ESIAs as well as additional specialist studies undertaken in 2019, and provide stakeholders with an opportunity to engage with the Project team. We look forward to an interactive discussion with stakeholders around impacts and management measures with a focus on biodiversity and avifauna.

Meeting Time:
Friday 4 December 2020 at 14:00

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_8p9muSBLQuSMw9DslG7gIQ

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Lindsey Bungartz
Senior Consultant – Social Performance Specialist

Read ERM's 2020 Sustainability Report ***and*** ERM Foundation Annual Review ***to find out how we are shaping a sustainable future.***

Environmental Resources Management (ERM)
1050 SW 6th Avenue | Suite 1650 | Portland, OR 97204
T +1 503 488 5282 I D +1 971 279 6940
M +1 971 420 9921
E lindsey.bungartz@erm.com I W www.erm.com

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Annex C8.5.4

Invitation Reminder to Key Government Stakeholder Engagement

Linda Slabber

From: ERM South Africa Cape Town IAP Project Batoka Gorge HES
Sent: Tuesday, 08 December 2020 15:30
To: thesecretary@moha.gov.zw; mohachsec@gmail.com; fmupa2006@gmail.com; info@transcom.gov.zw; moepd@energy.gov.zw; moa@moa.gov.zw; info@environment.org.zw; nkululeko.mathobela@ema.co.zw; phanuel.mangisi@ema.co.zw; rmandisodza@zimparks.org.zw; idube@zetdc.co.zw; gadabrain@gmail.com; kchipunza0@gmail.com; godfreymahachi93@gmail.com; natmus@nmmz.co.zw; kchipunza0@gmail.com; rhumanikwa@zinara.co.zw; coo@ztazim.co.zw; tbczceo@gmail.com; winniemuchanyika@flysaa.com; thesecretary@moha.gov.zw; info@transcom.gov.zw; moepd@energy.gov.zw; moa@moa.gov.zw; info@environment.org.zw; nkululeko.mathobela@ema.co.zw; pkmangisi@gmail.com; rmandisodza@zimparks.org.zw; commencechivanga@gmail.com; cchivanga@zinwa.co.zw
Cc: Lindsey Bungartz; Tori Braham; Dieter Rodewald
Subject: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe)

Importance: High

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Webinar

Following the written invitation you would have received last week from Environmental Resources Management to attend a webinar for the disclosure of the ESIA findings for the Batoka Gorge Hydro-Electric Scheme, we are pleased to provide an electronic copy of the same letter to enable you to click on the link and register Zoom webinar. The webinar will include a presentation of findings and then participants will have the opportunity to interact with the project team, ask questions and provide comment.

Meeting Time:
11 December 2020 09:30 AM

To register for the meeting, click on the link below, complete the registration and you will received a personal invitation to the webinar directly from ZOOM.
https://us02web.zoom.us/webinar/register/WN_Bi0TjY0JQ9C0OlMyAbfboQ

As a reminder, the draft ESIAs for the BGHES are available for public comment. Refer to Project website https://www.erm.com/bghes-esia to access the ESIAs and non-technical summaries.

Kin regards
Lindsey

Lindsey Bungartz
Senior Consultant – Social Performance Specialist

Read ERM's 2020 Sustainability Report ***and*** ERM Foundation Annual Review ***to find out how we are shaping a sustainable future.***

Environmental Resources Management (ERM)
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E lindsey.bungartz@erm.com I W www.erm.com

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Annex C8.5.5

Invitation Reminder to Government and UNESCO Virtual Engagement Feedback Session

Linda Slabber

Subject:	Reminder: ESIA for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe): Virtual Feedback Session
Location:	Microsoft Teams Meeting
Start:	Wed 2021/07/21 15:00
End:	Wed 2021/07/21 16:30
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
Required Attendees:	mwamsprog@gmail.com; kanguyaisaac2@gmail.com; whkatongo@yahoo.com; Willie.kaputo@mota.gov.zm; Thumbikani15@gmail.com; ndakalac@yahoo.com; mwansabridget32@yahoo.com; willie.kaputo@mata.gov.zm; fkmshalwindi@gmail.com; mwamulowek@netscape.net; mwamsprog@mail.com; ndiyoi@yahoo.co.uk; miyanda.hijuwa@yahoo.com; kanguyaisaac@yahoo.com; adangare@zimparks.org.zw; gmatipano@zimparks.org.zw; rmandisodza@zimparks.org.zw; cmutema@zimparks.org.zw; couragemutema@gmail.com; mkapesa@zimparks.org.zw; avambe@zimparks.org.zw; Dieter Rodewald; essamuriwo@yahoo.com; rundoug@yahoo.com; tmundoga@gmail.com; fmchabata@yahoo.com; natmus@utande.co.zw; pastar143@yahoo.com; natmys@utande.co.zw; zimparis@zimfa.gov.zw; zimnatcom3@gmail.com; m.muchena@unesco.org; r.bunhiko@unesco.org; md.ngulube@unesco.org; munyaradzi.munodawafa@zambezira.org; sithembinkosi.mhlanga@zambezira.org; christopher.chisense@zambezira.org; peter.kapinga@zambezira.org; edward.kabwe@zambezira.org; avitol.nkweendenda@zambezira.org; relent.ncube@zambezira.org; stephen.maidza@zambezira.org; phillip.ziduche@zambezira.org; dzimba@zesco.co.zm; bkalundu@zesco.co.zm; vmbewe@zesco.co.zm; emanyau@zpc.co.zw; manyewe@zetdc.co.zw; chivuraiseg@gmail.com; selusiwe.sibanda@zambezira.org; boniface.mfula@zambezira.org; Fitzgerald.Muchindu@zambezira.org; egandiwa@zimparks.org.zw; Lindsey Bungartz; Mike Everett; andrew.cauldwell@bcmss.co.uk; Nombukiso Ntshalintshali; JMunthali@zesco.co.zm; SKauti@zesco.co.zm

This serves a final reminder for tomorrow's meeting Wednesday 21 July at 3pm.

Kindly accept if you have not responded yet!

Thanks to those who have responded!

ERM Ref: 0239269 *EMA Ref: 17/1/1/3A* *ZEMA Ref: ZEMA/DEPT/101/1/3*

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Virtual Feedback Session

Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) has been contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls.

On 03 March 2020, ERM notified stakeholders of the availability of the draft ESIAs for public review and comment, and invited stakeholders to attend ESIA disclosure meetings in Zambia and Zimbabwe, which were proposed to take place during April 2020. In light of the COVID-19 (Corona Virus Disease 2019) pandemic, the Authority and ERM made the decision to postpone all public disclosure meetings. This decision was in response to government-mandated travel restrictions and bans on gatherings of more than 100 people, which were imposed within certain southern African countries. Given the ongoing level of global uncertainty associated with COVID-19, the Authority and ERM disclosed the ESIA findings through virtual methods in December 2020. Virtual engagement included a series of ZOOM webinars with key stakeholders and focus group discussions with special interest groups.

Through discussion with the Authority, ERM became aware that the National Commission for UNESCO in Zambia and Zimbabwe requested that the ESIA address comments raised by themselves in 2015, whereby it was requested that the ESIA for the BGHES include a specific assessment of the impact of the BGHES on the Outstanding Universal Value (OUV) of the Victoria Falls World Heritage Site. On 25 June 2021, ERM formally lodged a copy of the requested assessment for review. The impact assessment to OUV has been undertaken in line with the IUCN's World Heritage Advice Note on Environmental Assessment. The OUV Assessment is presented as a standalone report for ease of review, but the report will also be included in the final ESIA to be submitted the Environmental Authorities for decision making.

You are now invited to attend a MS TEAMS virtual feedback session, where we will present these findings and provide an opportunity for you to ask questions and give comment on the findings of the assessment.

Meeting Time:
21 July 2021 at 15:00 PM

To register for the virtual feedback session, please can you formally ACCEPT this invite.

To access the MS TEAMS virtual feedback session on 21 July 2021, please select the LINK at the end of this MS Outlook invite.

Feedback from the virtual feedback session will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to Zimbabwean and the Zambian Environmental Management Agencies (EMA and ZEMA) for consideration.

For any further queries regarding the content of this email, please feel free to contact us with the details included above.

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Microsoft Teams meeting

Join on your computer or mobile app

Click here to join the meeting

Join with a video conferencing device

195471110@teams.bjn.vc

Video Conference ID: 127 516 598 4

Alternate VTC dialing instructions

If you do not have the Teams App please use Chrome or Edge Browser. Right click and copy the Join link and paste if these are not your default browser. NOTE: It will not work with Internet Explorer

Learn More | Meeting options

Annex C8.5.6

Invitation Reminder to UNESCO Focus Group Discussion

Linda Slabber

Subject:	Focused Group Discussion on the proposed Batoka Gorge Hydro Electric Scheme (BGHES)
Location:	Microsoft Teams Meeting
Start:	Fri 2021/09/03 15:00
End:	Fri 2021/09/03 16:30
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	ERM South Africa Cape Town IAP Project Batoka Gorge HES
Required Attendees:	mwamsprog@gmail.com; pastar143@yahoo.com; zimparisweb@gmail.com; ndakalac@yahoo.com; Fitzgerald.Muchindu@zambezira.org; phillip.ziduche@zambezira.org; stephen.maidza@zambezira.org; relent.ncube@zambezira.org; avitol.nkweendenda@zambezira.org; christopher.chisense@zambezira.org; Dieter Rodewald; Lindsey Bungartz; Nombukiso Ntshalintshali; andrew.cauldwell@bcmss.co.uk; Mike Everett
Optional Attendees:	Jack Buchi Munthali; David Zimba (SNR-MGR) (BNBHPP); sithembinkosi.mhlanga@zambezira.org.zm

Good Day All,

Thank you to those who have already accepted this meeting invitation. If you have not accepted yet, a kind reminder to please accept the invite for the upcoming focused group discussion.

See meeting details below.

Thanks!

ERM Ref: 0239269 EMA Ref: 17/1/1/3A ZEMA Ref: ZEMA/DEPT/101/1/3

Dear Stakeholder

RE: Environmental and Social Impact Assessment for the Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Invitation to Focus Group Discussion (FGD)

Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) has been contracted by the Zambezi River Authority (the Authority) to undertake the Environmental and Social Impact Assessment (ESIA) study for the development of the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River, 47km downstream of Victoria Falls.

Following the BGHES Virtual Feedback Session held on 21 July 2021, it was agreed between the ZRA and ERM that the best way forward would be to hold a Focus Group Discussion (FGD) with the UNESCO Commissions and other key stakeholders to discuss how best to proceed with the impact assessment of the BGHES on the outstanding universal value (OUV) of the World Heritage Sites. It is proposed that during this FGD, we will consult with UNESCO on the ranking of OUV values and whether UNESCO has a preferred approach / methodology for this. We are of the opinion that this more focused discussion with key stakeholders will add more value to the OUV impact assessment.

You are invited to attend a MS TEAMS FGD, where we will recap on the findings of the assessment and have a focused discussion on how best to proceed with this assessment.

Meeting Date & Time:
Friday 03 September 2021 at 15:00 PM

To register for the FGD session, please can you formally ACCEPT this invite.

To access the MS TEAMS FGD session on 03 September 2021, please select the LINK at the end of this MS Outlook invite.

Feedback from the FGD session will be incorporated into the Project ESIA comments and responses report, which will be included in the final ESIAs submitted to Zimbabwean and the Zambian Environmental Management Agencies (EMA and ZEMA) for consideration.

For any further queries regarding the content of this email, please feel free to contact us with the details included above.

We look forward to your participation in this phase of the ESIA.

Yours sincerely

The ERM Team

Environmental Resources Management (ERM)
batokagorgehes@erm.com
www.erm.com

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Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device
195471110@teams.bjn.vc
Video Conference ID: 128 274 952 1
Alternate VTC instructions

ERM

If you do not have the Teams App please use Chrome or Edge Browser. Right click and copy the Join link and paste if these are not your default browser. NOTE: It will not work with Internet Explorer

Learn More | Meeting options

Annex C (8.6)

Presentations

Annex C8.6.1

Open House Engagement Presentation

BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES) - ZAMBEZI RIVER - ZAMBIA AND ZIMBABWE

Environmental and Social Impact Assessment Disclosure

02 December 2020

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Agenda

1. Introductions
2. Webinar Etiquette
3. ESIA Process and Public Participation Undertaken To Date
4. Project Description and Status
5. Key ESIA Findings and Management Measures
6. Disclosure of Livelihood Restoration Plans for Staff Townships and Access Road
7. Next Steps
8. Question and Answer Session

Webinar Etiquette

- As a participant, you will be muted for the duration of the 60 minute presentation
- During this time, you as participant can use the Q&A function (bottom tool bar of your screen) to pose questions and comments to the speaker. Please do not use it for other topics or internal discussion
- These questions and comments will be addressed during the 60 minute Q&A session, following the presentation
- To ask a question during the Q&A session please raise your hand using the function on your tool bar
- We will record the meeting and share the presentation on the Project website

Introduction

ESIA Process and Public Participation Undertaken To Date

Regulatory Framework

- Three separate draft ESIAs have been prepared for the Project to asses potential **physical**, **biophysical**, and **social impacts** of the Project, and propose measures to mitigate adverse impacts and enhance project benefits
  - ESIA for dam wall and impoundment, including spillway; surface power houses; Project townships in Zambia and Zimbabwe; and other ancillary infrastructure
  - ESIA for Project access roads in Zambia and Zimbabwe
  - ESIA for Project transmission lines in Zambia and Zimbabwe

Zambia
- Zambian Environmental Management Act (EM Act) (Act 12 of 2011)
- Environmental Impact Assessment (EIA) Regulations (Statutory Instrument No. 28 of 1997)
- Environmental Management (Licensing) Regulations (S.I. No. 112 of 2013)

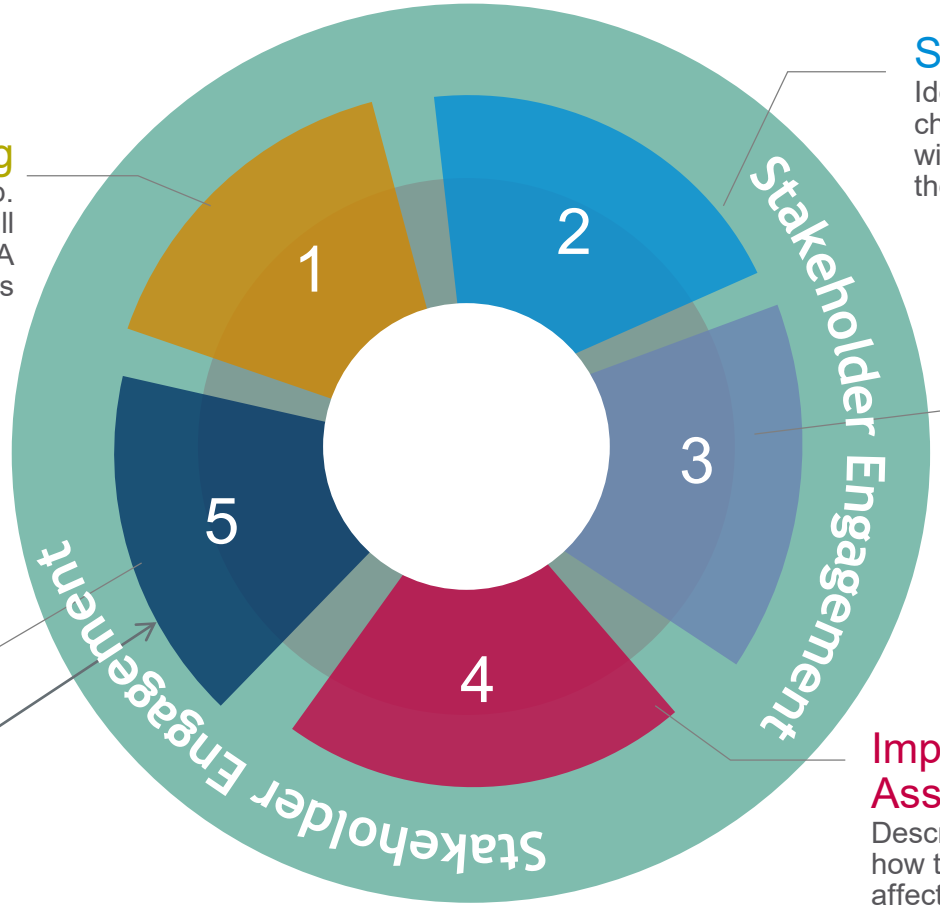
Zimbabwe
- Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002
- Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations, SI 7 of 2007
- Environmental Impact Assessment Policy (1997)

Regulatory Framework Continued

- A number of international environmental and social guidelines and standards applicable to the BGHES
- The environmental and social guidelines and standards considered to guide the ESIA include:

- World Bank Environmental and Social Safeguard Policies
- The International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012) (the IFC Performance Standards)
- IFC Environmental, Health and Safety (EHS) Guidelines (April 2007)
- World Commission on Dams (WCD) Guidelines and Recommendations
- The International Hydropower Association (IHA) Sustainability Guidelines and Sustainability Assessment Protocols
- The Southern African Power Pool (SAPP) Environmental and Social Impact Assessment Guidelines for Hydroelectric Projects and Transmission Infrastructure in the SAPP region

The ESIA Process



Screening
Screening is the first step. It defines what issues will be considered in the ESIA process

Scoping
Identifies the likely changes (impacts) that will happen because of the Project

Baseline Data Collection
Collect information to understand the environment and people in the area before the Project begins

Impact Assessment
Describes and assesses how the Project could affect the local environment and people, both negatively and positively, how significant the changes (impacts) are likely to be, and how the impacts could be managed

Disclosure
ESIA findings and proposed controls are disclosed with all Project stakeholders

We are now in the ESIA Disclosure Phase

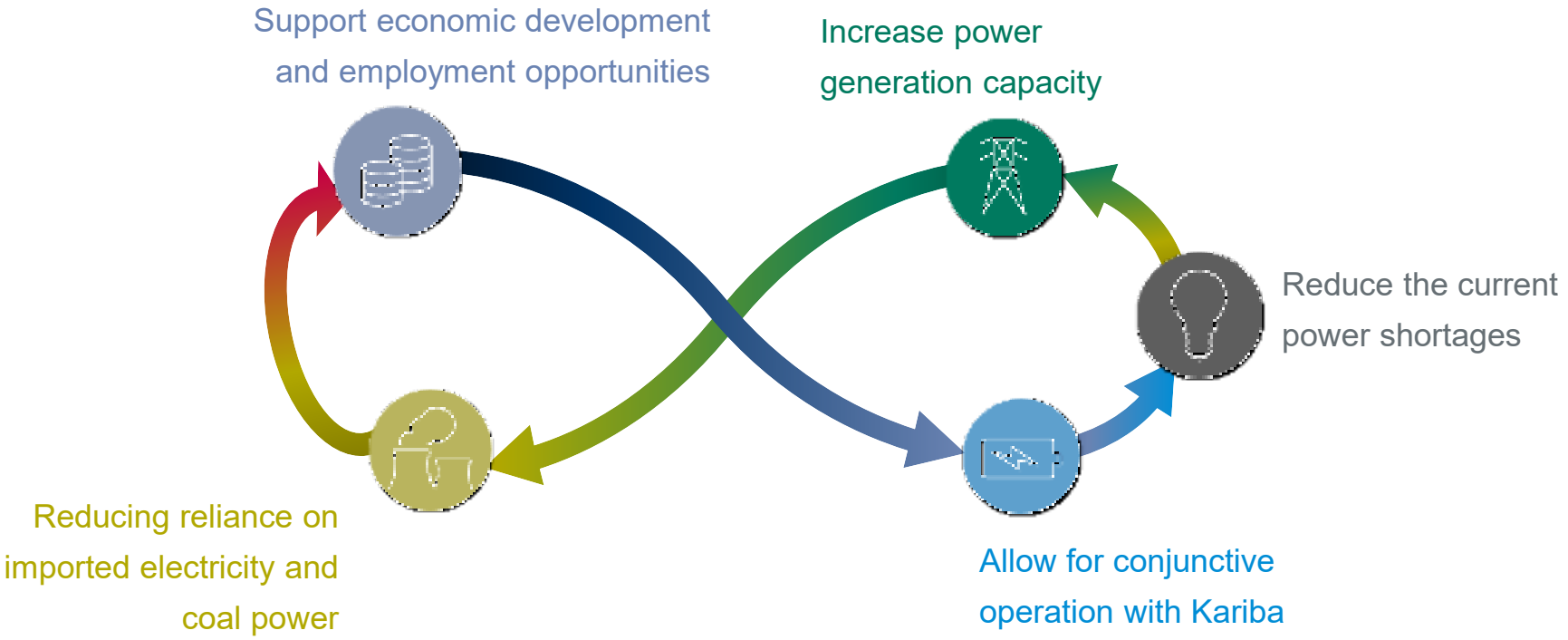
Stakeholder Engagement
Ongoing throughout the ESIA process

Project Description

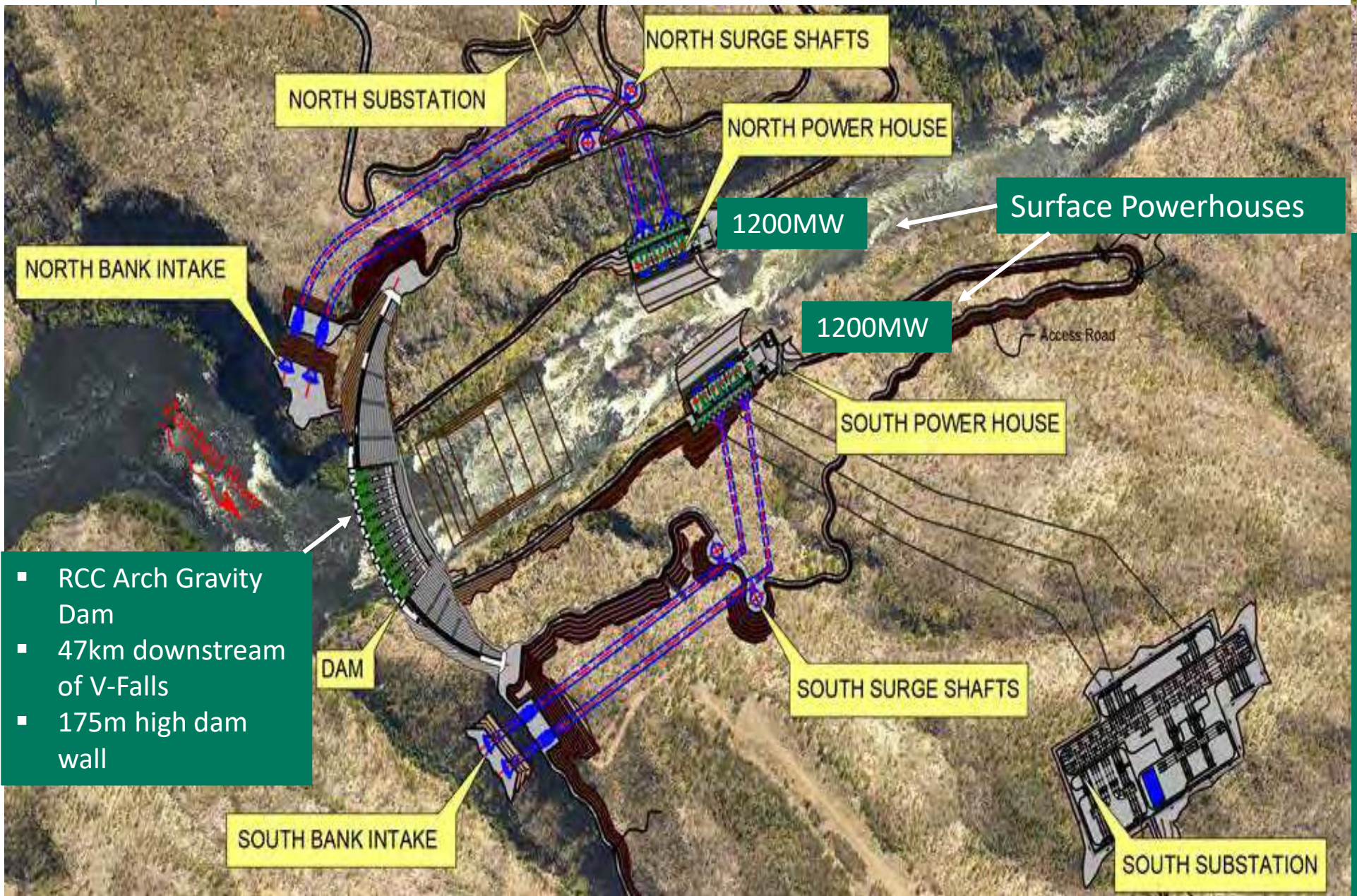
Need for the Project

The Zambezi River has a vast hydropower energy potential. Hydropower is considered the most feasible and reasonable electrification option for both countries

BGHES would contribute significantly to electricity supply of Zambia and Zimbabwe, and to distribute power to southern African countries under the Southern African Power Pool (SAPP). The Project will aim to:



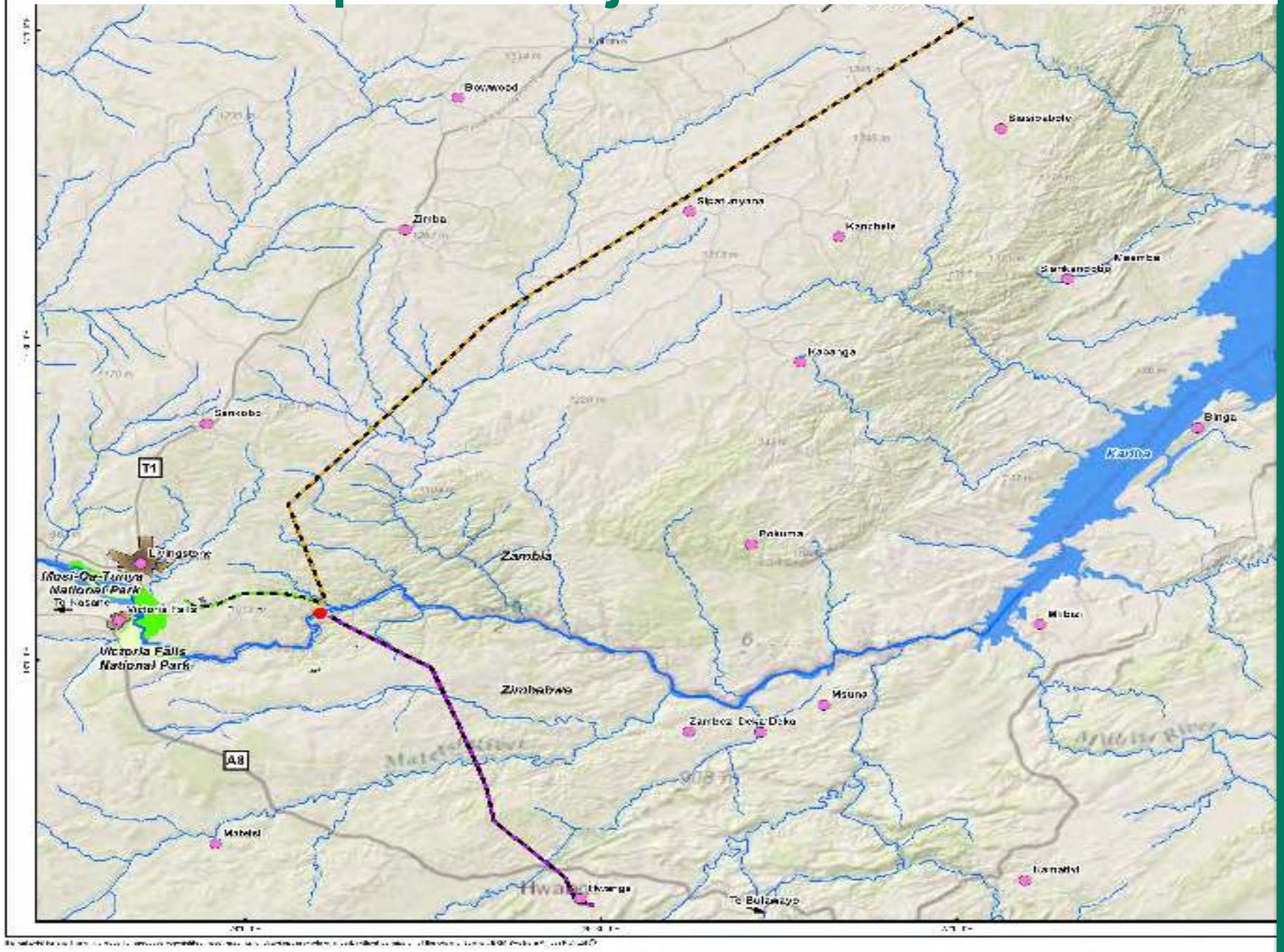
BGHES Proposed Scheme Layout



- RCC Arch Gravity Dam
- 47km downstream of V-Falls
- 175m high dam wall

- Roller Compacted Concrete Arch Gravity Dam Wall and impound area (reservoir)
- Spillway
- Pressure waterways, located in the abutments
- Two surface power houses, one on each side of the river, located on the abutments and two switchyards
- Project townships (in both Zambia and Zimbabwe) and other ancillary infrastructure (such as quarries, spoils area and batching areas)
- Access roads on each side

BGHES Proposed Project Transmission Lines



Three transmission line routes are proposed as part of the BGHES Project:

Zambia

- Mukuni 300 kV transmission line - approximately 22 km (from proposed BGHES substation on north bank to newly constructed 330 kV Mukuni ZESCO substation in Livingstone)
- Muzuma 300 kV transmission line - approximately 152 km (from proposed BGHES substation on north bank to Muzuma substation in Choma)

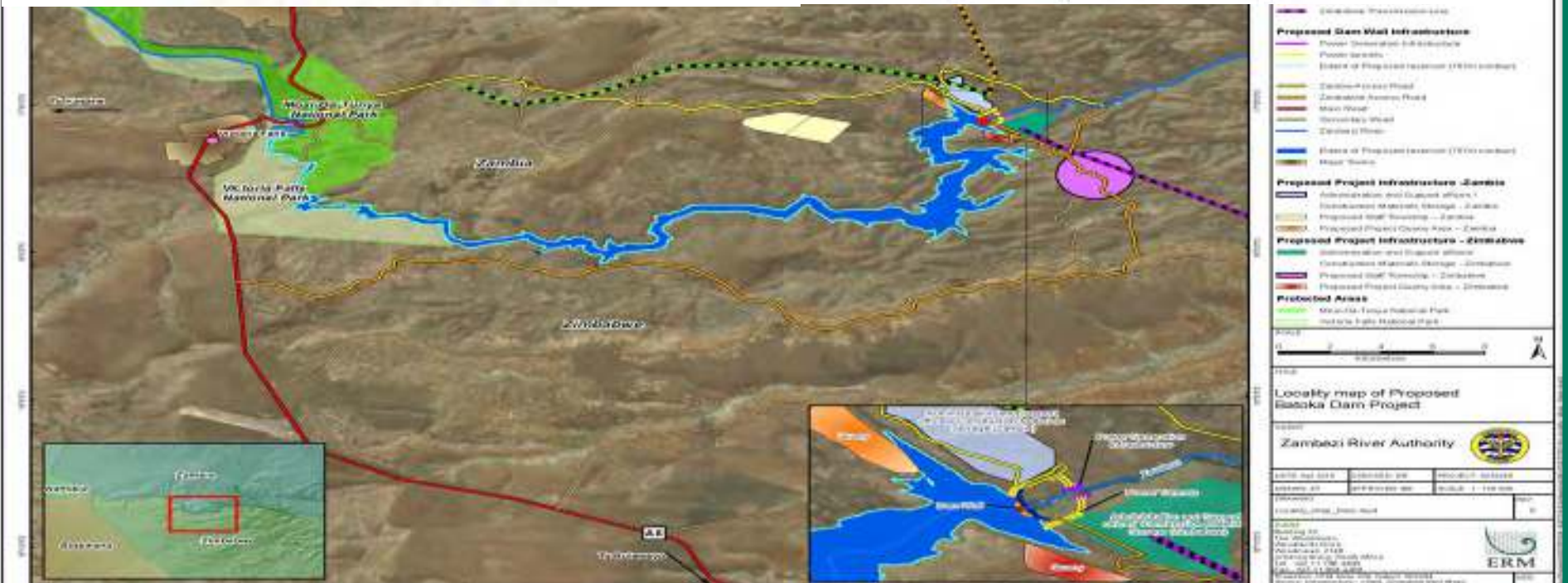
Zimbabwe

- Hwange 400 kV transmission line - approximately 67 km (from the proposed BGHES substation on south bank to the proposed Hwange 400/330kV substation)

BGHES Proposed Access Road & Staff Townships

Figure 5-1: Proposed Northern Township Plan

Figure 5-2: Proposed Southern Township Plan



Access Road

Overall access road length is 35 km on the Zambian side and 53 km on the Zimbabwe side

Staff Townships - There are two proposed Townships on the North bank and South bank

Land Acquisition Progress

Zambia (over 2558Ha allocated for the project)

- All required approvals obtained , pending is numbering of the land parcels to be followed by letters of offer and then title deeds

Zimbabwe (applied for about 3000Ha.)

- Cabinet approved the excision from communal to urban and SI gazetted
- Next steps include preparation of base maps, concept layouts and for submission to Physical planning department

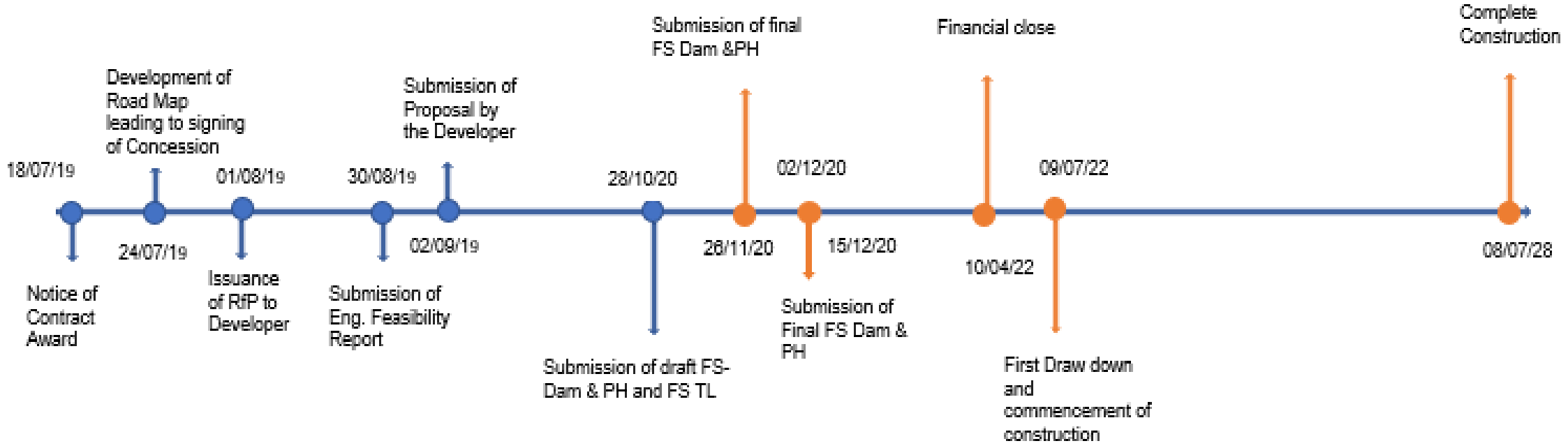
BGHES Project Status

- Engineering Feasibility Studies by Studio Pietrangeli were completed
- Draft ESIA reports completed and placed in the public domain in March 2020, currently ESIA process is at Public Disclosure phase
- The Developer is carrying out predevelopment activities including refining and optimizing the feasibility studies. Developer has since submitted proposal which is currently under Review

Current Pre-Development Activities by the Developer

- Bathymetric Surveys
- Additional Geotechnical Studies
- Aerial Topography Surveys
- Environmental and Social Impact Assessment for Additional Transmission Lines

BGHES Project Timeline

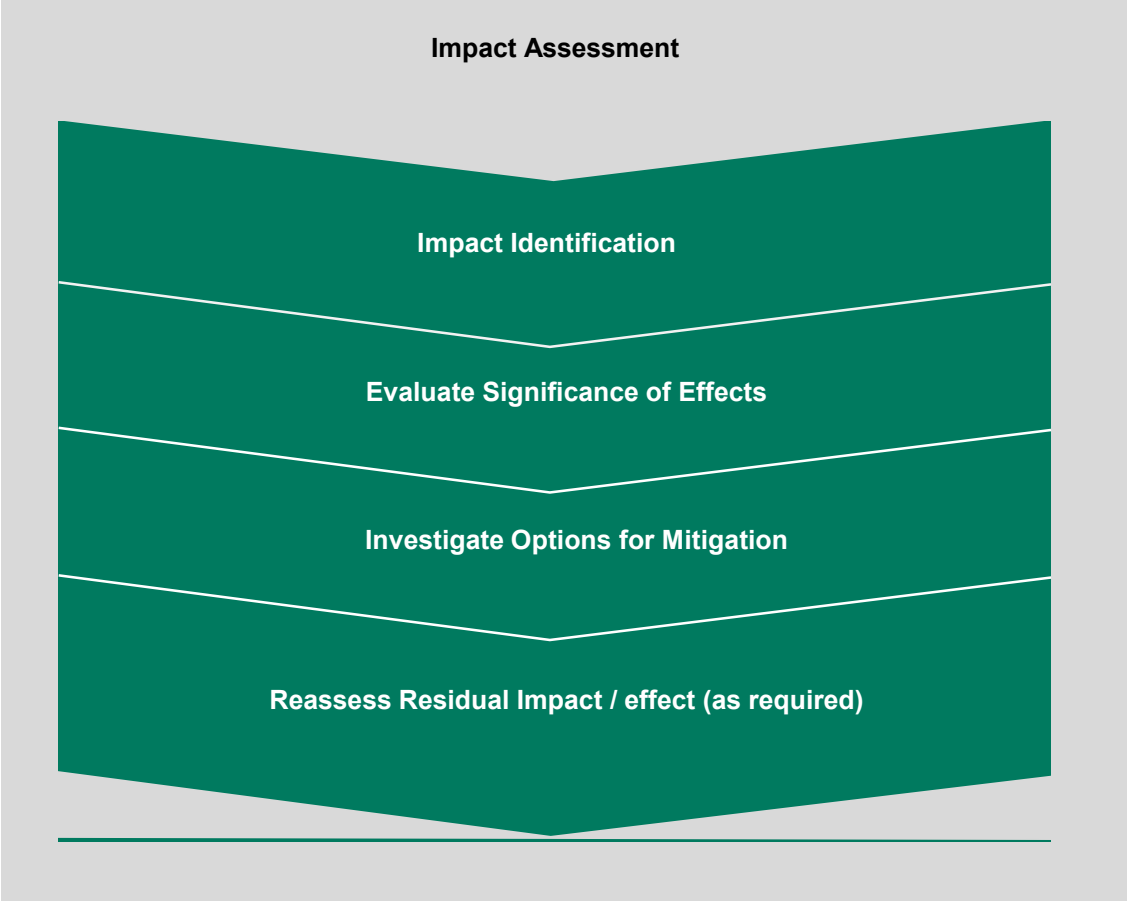


Key ESIA Findings and Management Measures

Specialist Studies Undertaken

- Biodiversity (terrestrial and aquatic) – ERM
  - Avifauna (Taita Falcons) Zimbabwe National Parks and Wildlife Management and Zambian Wildlife Authority
- Climate Change (risk review) – ERM
- Cultural Heritage and Archaeology – Mr. R. Burrett (Zimbabwe) & Mr. Richard Mbewe (Zambia)
- Economic Cost-benefit Analysis – Stratecon
- Greenhouse Gas Emissions Assessment – ERM
- Livelihood Restoration – ERM
- Socio-economic and Health Assessment - ERM
- Tourism – Anchor Environmental
- Water Resource Studies (water quality and environmental flows) – Southern Waters and ERM

Impact Assessment Methodology



Overview of Physical and Biophysical Impacts Assessed

Impact Description	Dam ESIA	Access Road ESIA	Transmission Line ESIA
Physical Environment			
Impacts associated with greenhouse gas emissions	X	X	X
Impacts on air quality	X	X	X
Impacts on noise	X	X	X
Impacts on upstream flow (water level and velocity)	X		
Impacts related to reservoir water quality during filling and operations (including potential eutrophication)	X		
Impacts on downstream flow during filling and operations	X		
Impacts related to changing upstream conditions	X		
Impacts to soils and water resources (accidental spills, sedimentation, etc.)	X	X	X
Biophysical Environment			
Loss of habitat (including critical habitat)	X	X	X
Impacts to avifaunal communities	X		X
Impacts to fauna through road and/or indiscriminate killings		X	
Alteration of fish communities and their utilisation during filling and operations	X		
Impacts to crocodiles and other fauna	X		
Habitat degradation downstream of the dam wall resulting from altered flow regimes during filling and operations	X		
Habitat degradation resulting from increased access and human influx during construction and operations		X	X
Eutrophication and associated floating aquatic weed infestation during filling and operations	X		

Overview of Social Impacts Assessed

Impact Description	Dam ESIA	Access Road ESIA	Transmission Line ESIA
Social Environment			
Economic displacement of land based livelihoods	X	X	X
Economic displacement of livelihoods related to fishing	X		
Economic displacement of downstream river users	X		
Economic displacement of river based tourism activities in Batoka Gorge during filling and operations	X		
Economic displacement of non-river based tourism activities in Batoka Gorge during filling and operations	X		
Positive economic benefits for the national economy	X		
Impact Tourism and the local economy	X		
Social benefits (employment, procurement of goods and services, opportunities for community development)	X	X	X
Community anger and resentment over unmet expectations	X	X	X
Impacts related to in-migration	X	X	X
Impacts related to increased spread of communicable diseases	X	X	X
Impacts related to increased risk of traffic accidents		X	
Impact associated with disturbance due to dust, noise and vibration		X	X
Impacts related to increased incidence of malaria and other vector borne diseases	X		
Impacts to community security	X		
Impacts related to exposure of workforce to health and safety incidents	X	X	X
Impacts associated with unexploded ordnance	X	X	X
Impacts related to destruction of physical cultural heritage during construction of the dam and associated infrastructure	X	X	X
Impacts on living cultural heritage	X	X	X

Most Significant Environmental and Social Impacts

- Impacts associated with Loss of Critical Habitat
- Impacts to Avifaunal Communities
- Impacts associated with Changes to the Downstream River Conditions
- Socio-economic Benefits
- Impacts related to Physical Displacement – Transmission line only
- Economic Impact and Displacement of River Based Tourism Activities
- Economic Impact and Displacement of Non-river Based Tourism Activities

Impacts Associated with Loss of Critical Habitat

Impacts to Avifaunal Communities

Andrew Cauldwell

Impacts to Protected Areas and Loss of Critical Habitat

Baseline

- The Mosi-oa-Tunya (Zambia) and Victoria Falls (Zimbabwe) National Parks are legally protected and recognised as a UNESCO Natural World Heritage Site.
- The whole Batoka Gorge is recognised as an Important Bird Area (IBA) and an IUCN Key Biodiversity Area.
- The Batoka Gorge is a unique ecosystem, which qualifies as a critical habitat as per IFC criteria.

Impact Statement

- Activities causing transformation and loss of habitat are construction of the dam wall, associated infrastructure and inundation of the reservoir.
- Leads to direct loss of critical habitat, legally protected areas and internationally recognised areas, including a UNESCO World Heritage Site (the BGHES reservoir extends into the World Heritage Site).

Key Management Measures

- Avoiding impacts to important areas is not feasible.
- Protecting non-impacted parts of the Batoka Gorge (rim, cliffs, scree slopes) reduces the loss of critical habitat.
- A significant residual impact remains that needs to be offset to align with the IFC Performance Standards.
- Offsetting residual impacts was beyond the scope of this ESIA, and no offset options have been identified.
- Unmitigated impacts to the World Heritage Site present a potential fatal flaw (*as per guidance notes to the IFC Performance Standard 6*).

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact *(potentially of Critical significance)*	**Major Negative Impact**

Avifauna (Bird) Impacts

Baseline

- The Batoka Gorge is an IBA (*as in previous slide*) as it supports the largest known population of Taita Falcons, and is important for other birds (Rock Pratincole, Verreaux's & Crowned Eagle, Peregrine & Lanner Falcon, Bat Hawk, Augur Buzzard).
- Parts of Batoka Gorge remain un-surveyed for Taita Falcons (surveys undertaken for upper 25 km stretch), also their ecology is not sufficiently understood to predict impacts and develop appropriate mitigation.

Impact Statement

- Primary activity that will affect important species will be loss of the Batoka Gorge habitat from inundation of the reservoir.
- Impact to birds from losses of key biodiversity features (swifts, a key prey source for Taita Falcons, may be adversely impacted by the loss of rapids, but there is insufficient evidence of this impact).

Key Management Measures Required

Key baseline gaps remain, and ZRA are committed to an action plan that outlines an approach to:

i. Species specialists to thoroughly assess the entire Batoka Gorge to determine the occurrence and status of Taita Falcons;

ii. Workshopping with all species specialists to pool available knowledge, raise the level of confidence on potential threats and impacts, and identify if mitigation to address threats is feasible;

iii. Develop an appropriate Biodiversity Action Plan to address the risks.

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact (*low confidence*)	**Uncertain due to data deficiency**

Impacts Associated with Changes to the Downstream River Conditions

Alison Joubert

Downstream Flow Impacts – Environmental Flows

Baseline

- Present ecological status of the downstream river is high (Category A/B and B – slightly modified from natural conditions) for most of the gorge
- The Zambezi River ecosystem supports extensive aquatic habitats, riparian vegetation and serves as important ecological corridor and sustains rich floral and faunal diversity and populations of large fauna including hippo and crocodile populations
- There are important water users downstream closer to Lake Kariba - predominantly informal abstractions in support of agricultural activities
- Larger, more intensive water users are associated with Lake Kariba - it was assumed that impacts will not be felt as far downstream as Kariba

Impact Statement

- Impacts relating to flow and sediment conditions in the river downstream of BGHES during dam filling and operation particularly during hydro-peaking; Potential temperature effects in the dry season.
- It was agreed that there could be no more than a 1.5 class drop in Overall Ecosystem Condition in the downstream river, i.e., from A/B to no less than a mid-C category. This represents a drop in ecological category from “near natural” to “moderately modified”, which is still considered a healthy functioning ecosystem

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact	Moderate Negative Impact (if run-of-river in dry season)
	Major Negative Impact (if hydro-peaking in wet and dry seasons)

Key management measures

- Only operated as a hydro-peaking scheme during the wet season (Feb-Aug) as per operating rules established by scenario AddPM04 (dry season = Sep-Jan).
- ZRA will adopt off peak flow condition during wet season of QMin as per flow statistics in ESIA
- During hydro-peaking, rate of change of flow releases (ramping rate) will be restricted so there is a correspondingly gradual change in downstream water levels
- Gradual (smoothed) transition between wet and dry season minimum flow conditions

Socio-economic Impacts

Lindsey Bungartz and Tori Braham

Socio-economic Benefits

Baseline

- Approximately 22% and 41% of populations in Zambia and Zimbabwe have access to electricity - connectivity is lower in rural areas
- Communities are principally subsistence farmers, selling what additional crop they produce to generate small income
- Livestock rearing is common and substantial engagement in curio trade in order to generate additional income
- Other livelihood activities include trading, collection and selling of firewood, grass and forest fruits, furniture making, brickmaking, hunting, fishing, casual labour and tourism related activities

Impact Statement

- Economic benefit for national economy through increase provision of power
- Local employment opportunities
- Local Procurement of goods and services
- Opportunities for community development
- Opportunity to distribute power to southern African countries under coordination of the SAPP

Significance Rating Before Mitigation
Positive Impact

Key management measures

- Mitigation measures in ESIA Reports and ESMPs aim to enhance benefits / positive impacts – Focus on local employment, local procurement, upskilling through on the job training.
- Hiring plans and local content requirements will be applicable to all contractors.
- Estimated 8,000 jobs will be made available during construction and operatio

Impacts related to Physical Displacement

Baseline

- Housing largely traditional and basic (mud walls and thatched or corrugated roofs)
- Few households have electricity and access to waste and sanitation services is poor
- Communities principally rely on subsistence farming for their livelihoods and limited formal employment opportunities exist

Impact Statement

- The transmission lines on the Zambian side is flanked by agricultural and residential land, and some of the residential structures have encroached into the proposed TL servitude and will need to be moved for safety
- Physical displacement as a result of loss of homesteads and potentially business structures, as well as other physical assets owned by households

Magnitude	Significance Rating After Mitigation
Medium Magnitude	**Minor Negative Impact**

Key management measures

- Project infrastructure will be designed to avoid and / or minimise resettlement as far as practicable
- Prepare RAPs (outside of ERM scope)
- Implement the grievance redress mechanism
- Where resettlement is unavoidable, the ZRA will provide required and agreed compensation for loss of physical assets, revenue, and income resulting from both temporary and permanent economic and/or physical displacement

Impact and Displacement of Tourism Activities

Gwyn Letley

Economic Displacement of River-Based Activities

Baseline

- The rafting industry has played a vital role in establishing adventure tourism
- 10 WWR operators in Project Area in 2019
- +/- 250-300 people employed. Difficult to determine exact numbers of part-time/casual staff (fluctuate with each season)
- Almost all employees are from local communities
- WWR largest contributor to tourism value downstream of Falls, US$3.4 million in tourist expenditure annually.

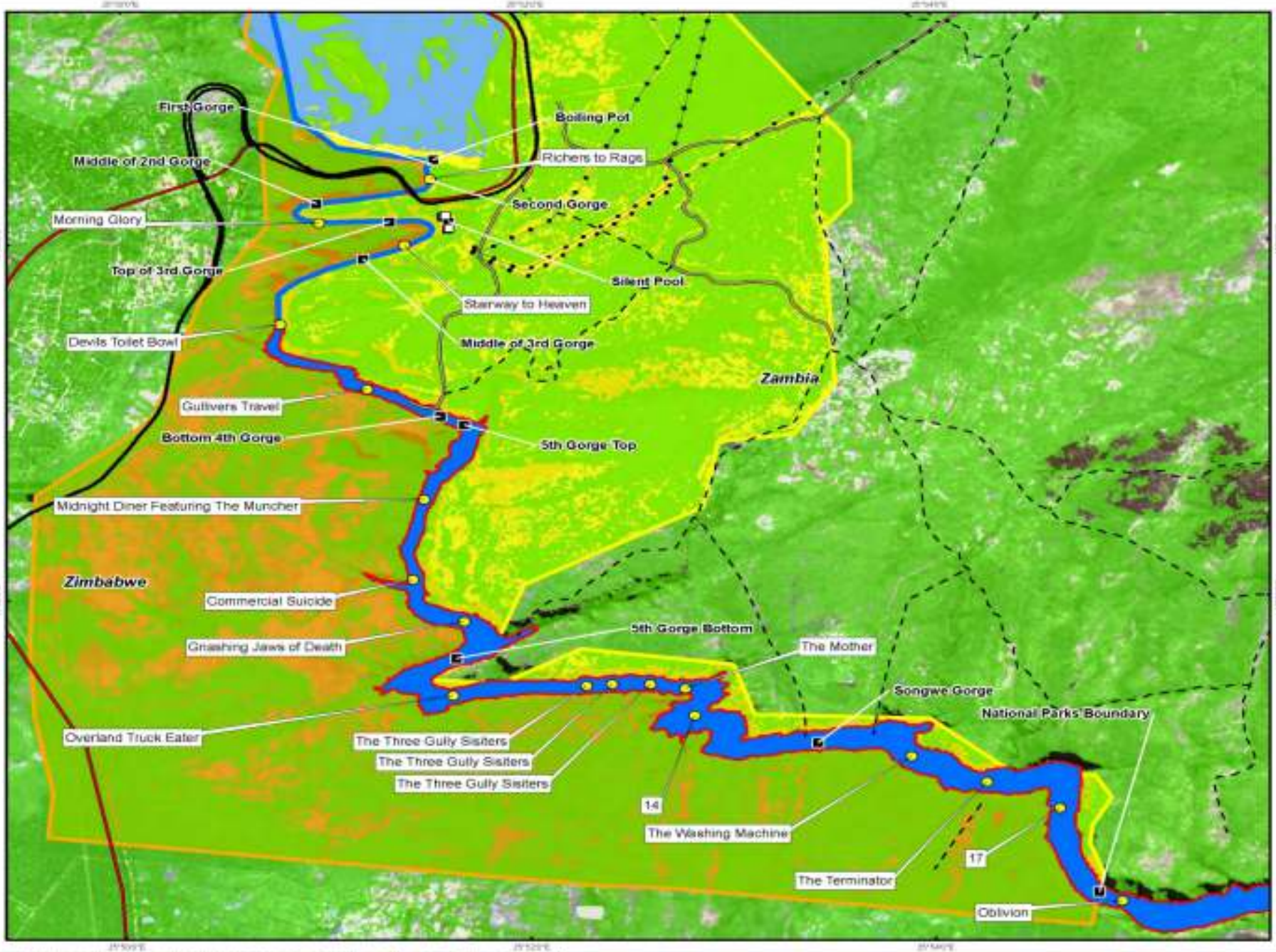
Impact Statement

- BGHES has adopted a variable operating level approach
- Prevents rafting during high-water season (Jan-July): river reach from rapid 10 submerged by reservoir
- Rafting would only operate from rapid 1 to rapid 9/10 during low-water season (Aug-Dec)
- This has changed since 2015, when only FSL 757m ASL was being considered year-round.

Impact Significance Rating Before Mitigation	Significance Rating After Mitigation
Major Negative Impact	Moderate Negative Impact

Key management measures

- Separate RAPs and LRPs will be commissioned by ZRA for those Project components outside of ERM's current scope
- RAPs/LRPs for water users (specifically tourism operators), undertaken at a later stage (inundation proposed in 2027/2028)
- To be undertaken in accordance with the regulatory requirements of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESS5



Legend

- Rapids
- Gorge Point Of Interest
- Vic Falls Power Station Outlets
- Zambezi River
- Existing Transmisson Lines
- New Road
- Main Road
- Secondary Road
- Tracks
- Railway
- FSL 757m Contour
- ndvi

Protected Areas

- Mosi-Oa-Tunya National Park
- Victoria Falls National Park

SCALE

0 500 1 000 1 500 2 000 Meters

N

TITLE

Points of Interest in Relation to Dam Inundation FSL 757m Contour

CLIENT

Zambezi River Authority

DATE: 04.2010	CHECKED: TH	PROJECT: 0200001
DRAWN: AT	APPROVED: MB	SCALE: 1 : 18 000

DRAWING: FSL_757M_RAPIDS_Nov181.mxd

REV: 0

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Projection: UTM Zone 35S. Datum: WGS84
Source: LIDAR Survey/Aster. NDVI - Sentinel 2
Nat Parks: UNEP World Heritage Sites

SIZE: A3

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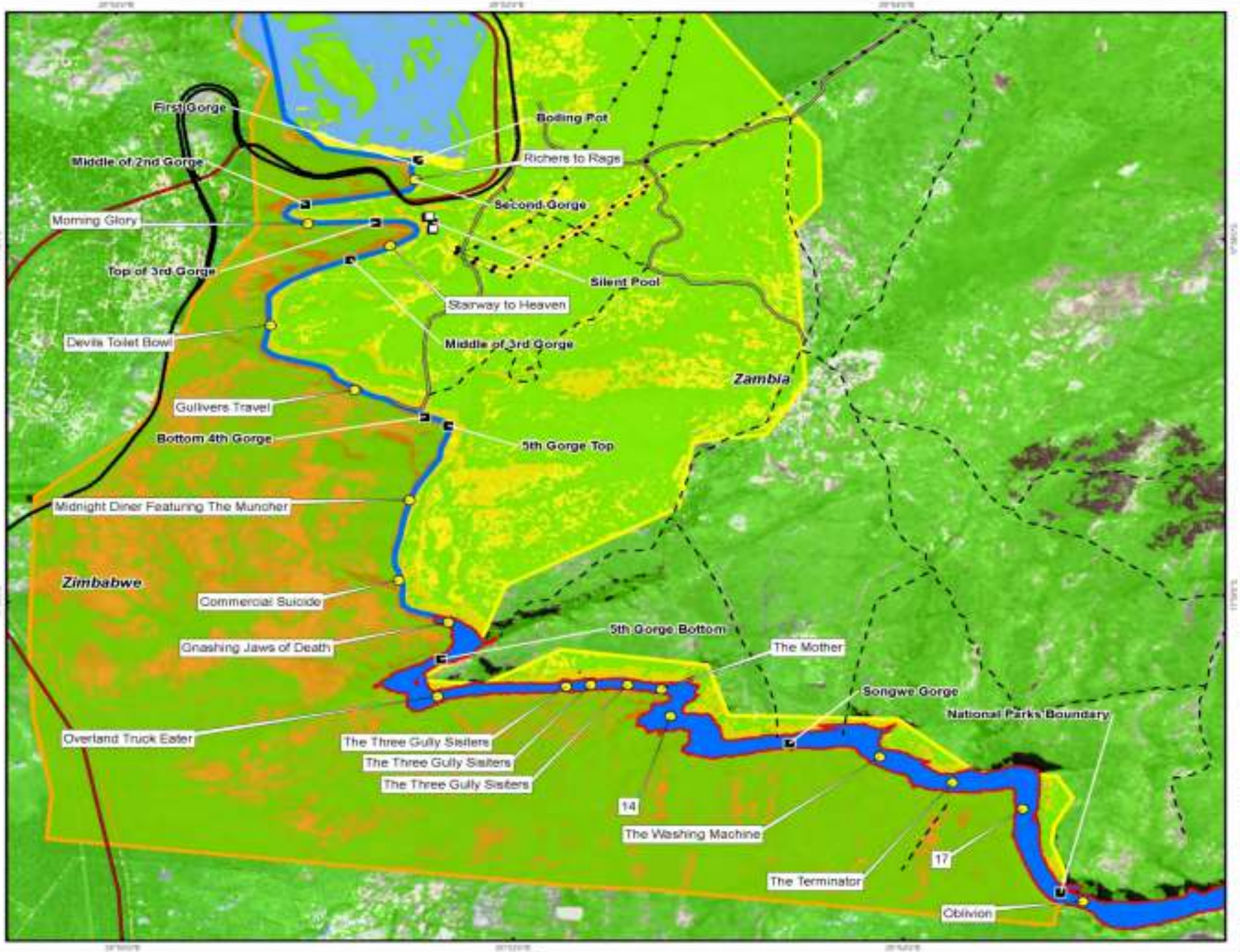

Legend

- Rapids
- Gorge Point Of Interest
- Vic Falls Power Station Outlets
- Zambezi River
- Existing Transmission Lines
- New Road
- Main Road
- Secondary Road
- Tracks
- Railway
- FSL 730m Contour
- ndvi

Protected Areas

- Mosi-Oa-Tunya National Park
- Victoria Falls National Park

SCALE: 0 500 1 000 1 500 2 000 Meters

N

TITLE: Points of Interest in Relation to Dam Inundation FSL 730m Contour

CLIENT: Zambezi River Authority

DATE: Oct 2018 | CHECKED: TR | PROJECT: 0206888

DRAWN: AT | APPROVED: MB | SCALE: 1 : 33 000

DRAWING: FSL_730M_RAPIDS_Nov18.mxd | REV: 0

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ERM

Projection: UTM Zone 35S, Datum: WGS84
Source: LSSAR Survey/Water, NDVI - Sentinel 2
Nat Parks: UNEP World Heritage Sites

SIZE: A3

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Economic Displacement of Non-river Based Tourism Activities

Baseline

- Other tourism activities in the gorge include birding, angling and hiking
- These activities employ fewer people than the rafting industry, but are nonetheless very popular
- Offered by activity providers as well as Lodges situated along the Gorge
- Activities contribute over US$250 000 annually

Impact Statement

- Inundation of rapids and loss of habitat for river borne insects will reduce numbers of birds and bats in the Gorge. Increased water levels in the Gorge will also remove prime nesting habitat
- Hikers will not be able to hike along the bottom of the Gorge and overnight hiking and camping trips will not be feasible to operate as a result of increased water levels

Impact Significance Rating Before Mitigation	Significance Rating After Mitigation
Major Negative Impact	**Major Negative Impact**

Key management measures

- RAPs and LRPs will be commissioned by the ZRA for those Project components outside of ERM's current scope
- RAPs/LRPs for non-river users, only undertaken at a later stage, inundation of Batoka Gorge is proposed in 2027/2028
- These separate RAPs/LRPs commissioned by the ZRA will be undertaken in accordance with the regulatory requirements of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESS5

Environmental and Social Management Plans

BGHES Management Plans

- The following E&S Management Plans (ESMPs) have been developed for the BGHES:
  - Construction ESMP for the Dam
  - Construction ESMP for Access Roads
  - Construction ESMP for Transmission Lines
  - Operational ESMP
- ESMPs detail the required mitigation measures, identifies specific people or organisations to undertake specific tasks to avoid or reduce impacts during all Project phases
- The compilation of ESMPs has been done prior to the implementation of any activities on site and thus falls within the Planning phase of the Project. Further stages of management including doing, checking and acting are required for the implementation of an effective Environmental and Social Management System (ESMS)

Disclosure of Livelihood Restoration Plans for Staff Townships and Access Road

Livelihood Restoration Plan

To manage the impacts resulting from economic displacement for the staff townships in both Zambia and Zimbabwe and the Access road in Zimbabwe, Livelihood Restoration Plans have been developed as per in country laws and International Best Practise.

Zambia Staff Township

- Land take required for Zambian Staff Township: 489 ha
- **Unpopulated, not suitable for farming**
- **No agricultural fields or residential plots affected**
- Communally held and used
- 210 households from six villages travel through the land and periodically gather timber and non-timber forest products
- Pathways to fishing locations and vegetable gardens
- Designated by Chiefdom as Chibule Grazing Lands
- No graves/cultural heritage identified

Zimbabwe Staff Township

- Land take required for Zimbabwean Staff Township: 705 ha
- **Unpopulated, no impact to agricultural fields or residential plots**
- Communal grazing and collecting natural resources
- 35 households in BH55, Sidakeni and Kasikiri Sub-Villages directly affected
- Access points and footpaths used to access the Zambezi River for fishing

As the BGHES components associated with the LRPs do not require any physical displacement and economic displacement related to agricultural land is minimal, the Project components will not result in those with pre-existing vulnerability to be disproportionately affected.

Zimbabwe Access Road

- Land take for Access Road will impact 241 agricultural fields and 7 residential plots occupied by 210 PAHs
- Average area of affected individual property 0.10 hectares, an average of 5% of entire affected field
- Construction activities along access road may temporarily cause restriction of access to agricultural land
- **No residential structures impacted other**
- Chisuma Primary School water tower, perimeter fence and portions of the nutritional garden are the only communal infrastructure impacted
- no graves/cultural heritage sites impacted

Land Acquisition Progress

Zambia

- Over 2558Ha allocated for the project
- All required approvals obtained , pending is numbering of the land parcels to be followed by letters of offer and then title deeds

Zimbabwe

- Estimated 3000Ha.
- Cabinet approved the excision from communal to urban and SI gazetted
- Next steps include preparation of base maps, concept layouts and for submission to Physical planning department

Next Steps

Next Steps: ESIA

- All comments received in this forum will be included in the ESIA Comment and Response Report
- Stakeholder can submit additional comments and questions to ERM until 25 January 2021 when the ESIA comment period will close
- All comments, together with a response from the Project team will be included in the ESIA Comments and Response Report to be submitted to the Authorities
- The final ESIAs and associated documents will be submitted to both the EMA and ZEMA for review and consideration

Next Steps: Economic and Physical Displacement

- Separate RAPs/LRPs will also be commissioned by ZRA for the following:
  - Displacement (physical and economic) of upstream / downstream water users
  - Displacement (physical and economic) of Project affected peoples in footprints associated with BGHES transmissions lines access road in Zambia quarries and other BGHES associated infrastructure
- Resettlement and livelihood restoration will be undertaken in accordance with the regulatory requirements of the Republic of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESF5

Questions and Answer Session

Questions and Answer Session

- Use the Q&A function (bottom tool bar of your screen) to pose questions and comments to the speaker; or
- Raise your hand using the function on your tool bar

Thank you

Please feel free to reach out to ERM via email at:

batokagorgehes@erm.com

Annex C8.6.2

Water Users Focus Group Engagement Presentation

BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES) - ZAMBEZI RIVER - ZAMBIA AND ZIMBABWE

Environmental and Social Impact Assessment Disclosure

04 December 2020

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The business of sustainability

Agenda

1. Introductions
2. Focus Group Discussion Etiquette
3. ESIA Process Undertaken To Date
4. Project Description and Status
5. Impact and Displacement of Tourism Activities
6. Next Steps
7. Focus Group Discussion

Webinar Etiquette

- As a participant, you will be muted for the duration of the presentation
- During this time you as participant can use the Q&A function (bottom tool bar of your screen) to pose questions and comments to the speaker. Please do not use it for other topics or internal discussion
- These questions and comments will be addressed during the discussion session following the presentation
- To ask a question during the Q&A session please raise your hand using the function on your tool bar
- We will record the meeting and share the presentation on the Project website

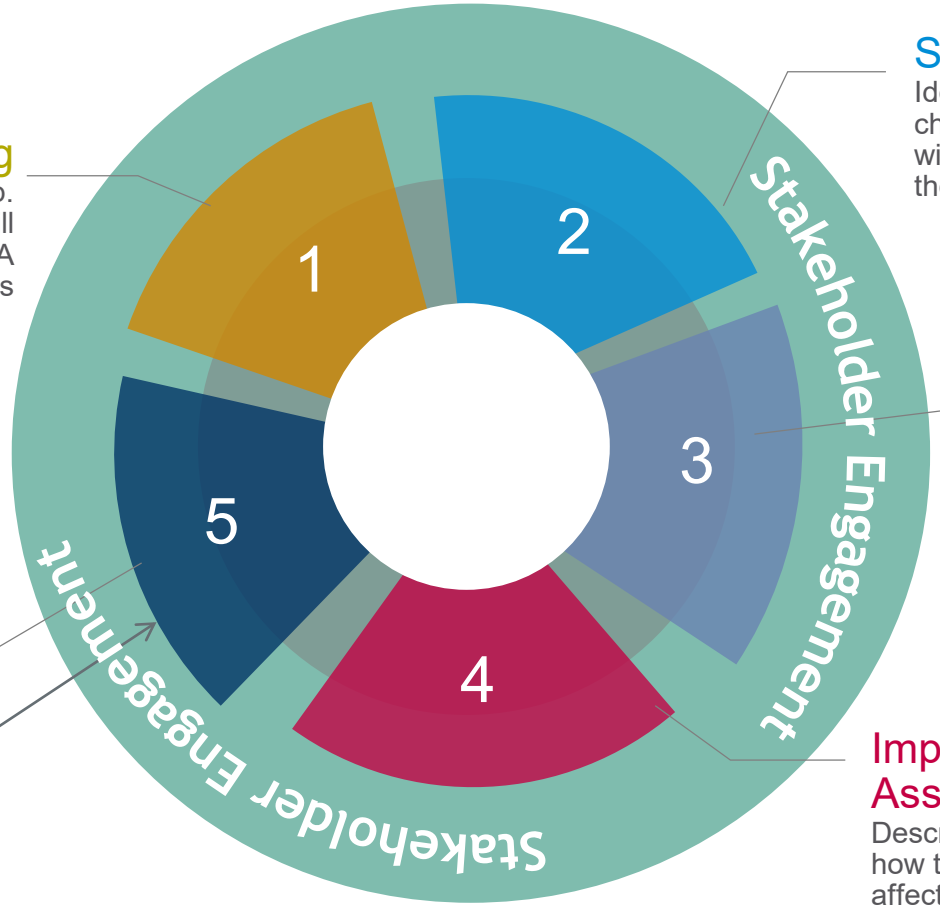
Introduction

ESIA Process To Date

Regulatory Framework

- Three separate draft ESIAs have been prepared for the Project to asses potential **physical**, **biophysical**, and **social impacts** of the Project, and propose measures to mitigate adverse impacts and enhance project benefits
- Three ESIA were prepared under the Zambia and Zimbabwe Environmental Management Acts and associated guidelines
- International environmental and social guidelines and standards applicable to the BGHES, include
  - World Bank Environmental and Social Safeguard Policies
  - The International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012)
  - World Commission on Dams (WCD) Guidelines and Recommendations
  - The International Hydropower Association (IHA) Sustainability Guidelines and Sustainability Assessment Protocols
  - The Southern African Power Pool (SAPP) Environmental and Social Impact Assessment Guidelines for Hydroelectric Projects and Transmission Infrastructure in the SAPP region

The ESIA Process



Screening
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Scoping
Identifies the likely changes (impacts) that will happen because of the Project

Baseline Data Collection
Collect information to understand the environment and people in the area before the Project begins

Impact Assessment
Describes and assesses how the Project could affect the local environment and people, both negatively and positively, how significant the changes (impacts) are likely to be, and how the impacts could be managed

Disclosure
ESIA findings and proposed controls are disclosed with all Project stakeholders

We are now in the ESIA Disclosure Phase

Stakeholder Engagement
Ongoing throughout the ESIA process

Project Description

Need for the Project

The Zambezi River has a vast hydropower energy potential. Hydropower is considered the most feasible and reasonable electrification option for both countries

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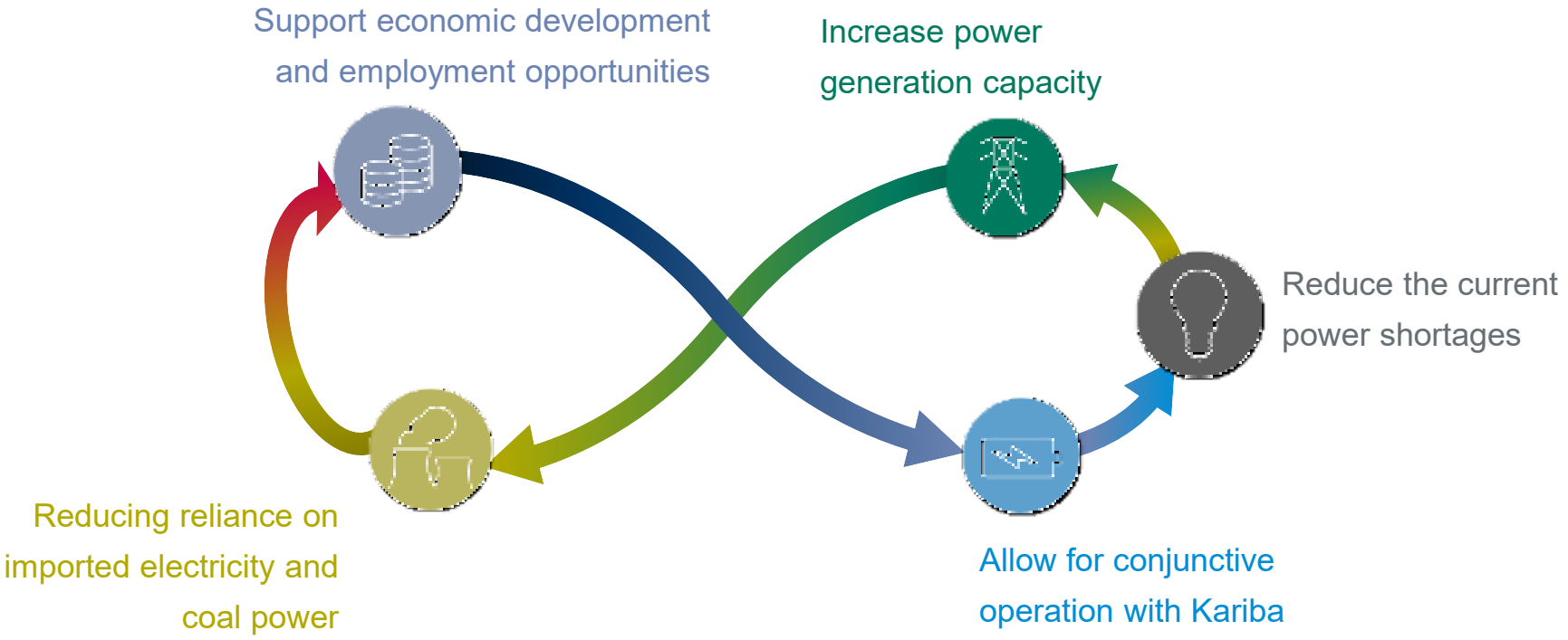
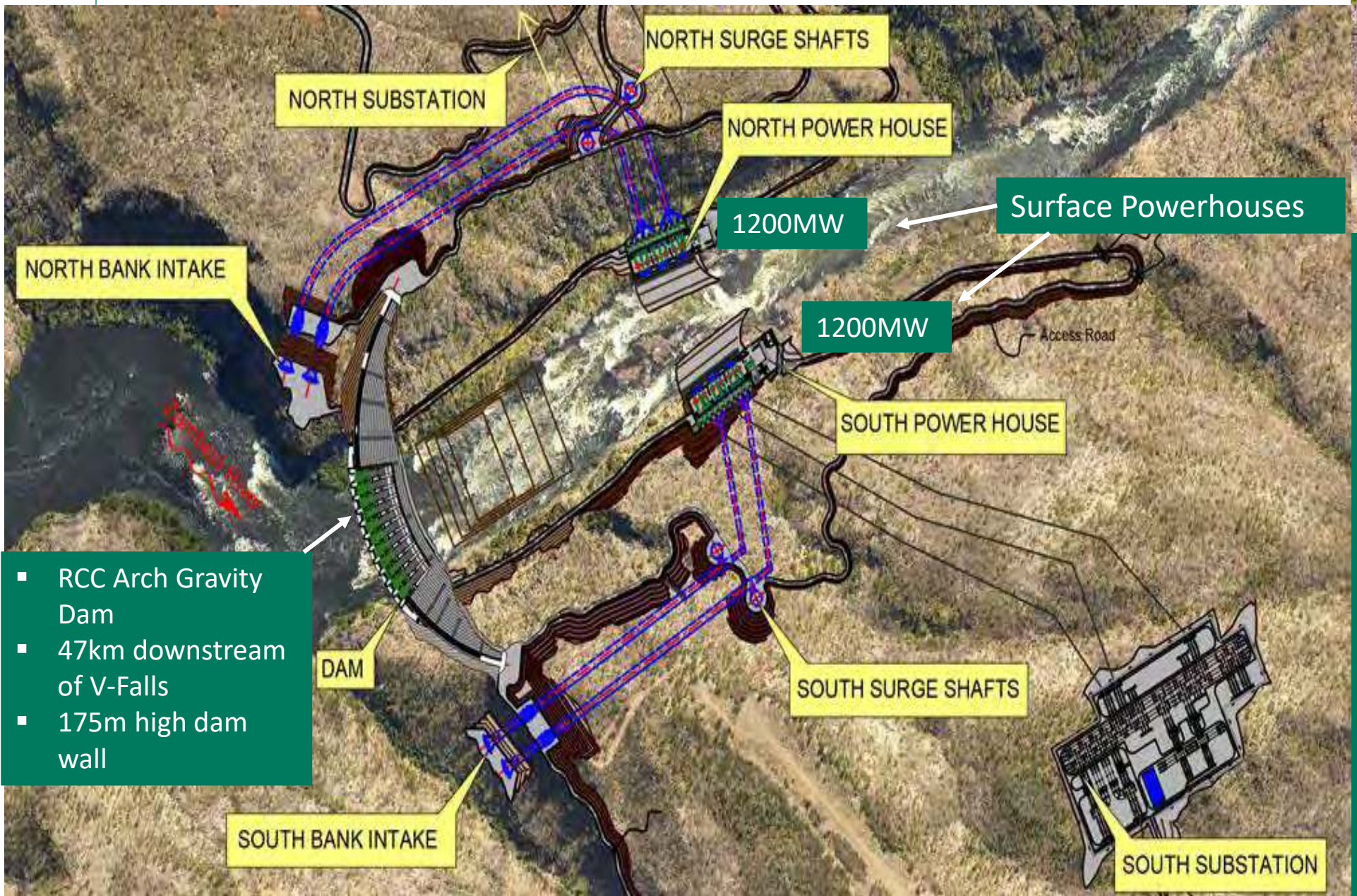


BGHES Proposed Scheme Layout



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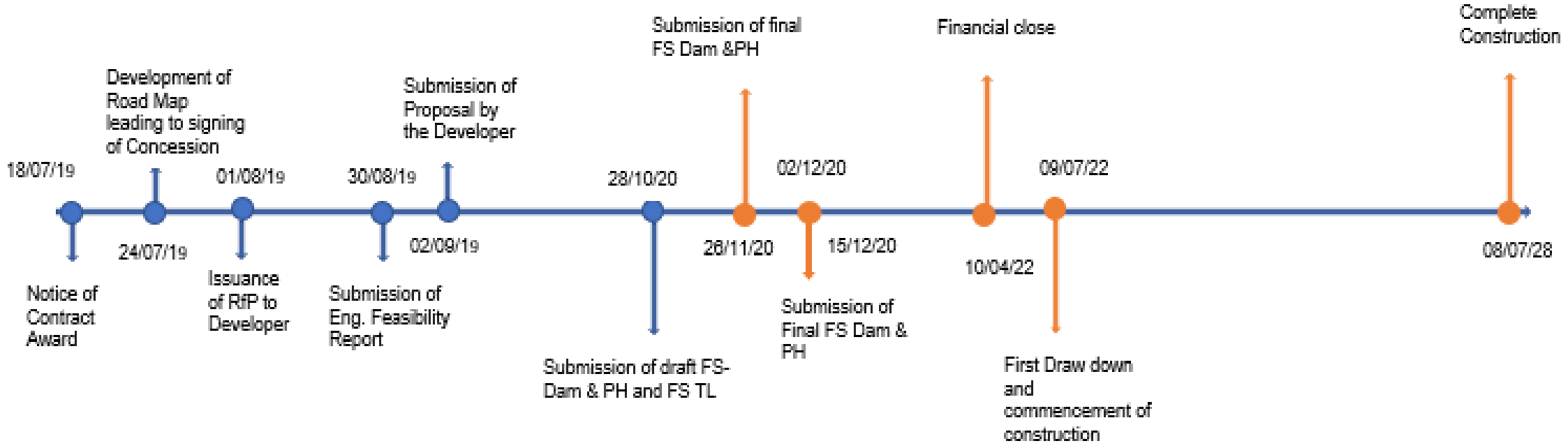
Current Pre-Development Activities by the Developer

- Bathymetric Surveys
- Additional Geotechnical Studies
- Aerial Topography Surveys
- Environmental and Social Impact Assessment for Additional Transmission Lines

BGHES Project Timeline



Impact and Displacement of Tourism Activities

Gwyn Letley

Tourism Economic Assessment - Approach

Study approach

- Existing tourism statistics collected from relevant organisations & government departments
- Tourism business surveys undertaken in Feb 2015 and again in Jul/Aug of 2019
- Focused particularly on tourism activities most likely to be affected by the BGHES

Determining tourism value & economic impacts

- Tourism business survey:
  - Detailed questionnaire
  - Face to face interviews in Livingstone and Victoria Falls
  - Some telephonic interviews
  - Same questionnaire used in 2019, 80% re-interviewed
- From these interviews we estimated:
  - Visitor numbers, activities and expenditure
  - Direct and indirect economic impacts
  - Contribution of Batoka Gorge to tourism value of study area

Tourism questionnaire

1: Description of business	2: Description of clientele
Type of business Services offered Capacity Sales, rates, occupancy Seasonal patterns	Origins Activities undertaken Proportion undertaking affected activities Reasons for visiting

3: Business impact on economy	4: Longer trends
Staff numbers Wages Expenditure Location of spend Turnover	Age of business Planned changes Fluctuations Impacts of BGHES on business

Tourism Economic Assessment - Context

Victoria Falls and Livingstone

- Tourism & associated sectors are the main source of income
- Hotels, safari lodges and activity providers contribute extensively to employment in the study area
- Tourism has fluctuated over the last two decades, but stabilising & increase in numbers more recently
- Improved hotel occupancy rates in 2018 in Vic Falls
- KAZA UNIVISA system has made it affordable and easier for foreign tourists to visit both sides of the Falls
- Any impacts on tourism are felt heavily by the towns and their communities

White water rafting

- Most popular activity downstream of the Falls
- Played a vital role in establishing adventure tourism in study area
- Considered to be one of the best WWR experiences in the world
- Still plays a major role in attracting tourists to the area
- Currently operates 310 days per year:
  - Half-day and full-day, or overnight 2-5 days
  - Estimated 21 000 trips each year

Other tourism activities

- Birding, hiking and angling in the Gorge are also very popular

Tourism Economic Assessment – Key Findings

Overall economic impacts

- Tourism in study area makes significant contribution to GDP
- Accounts for 23% of the value of tourism in Zimbabwe and 10% in Zambia

Tourism value of Batoka Gorge

- Activities linked to the Gorge contribute just under US$5 million in direct tourism expenditure each year
- Additional US$1.4 million from accommodation
- WWR largest contributor, generates about 50% of total expenditure
- 20% of tourists to study area take part in at least one of the gorge activities
- Tourists participating in gorge activities spend about US$74 million each year

Total annual tourism expenditure attributable to the Batoka Gorge

Type	Estimated value (US$)
Accommodation	1 407 805
WWR	3 340 000
Birding & hiking	82 279
Angling	158 300
Scenic flights	1 350 000
Canyoneering	16 000
Subtotal	**6 354 384**
Park fees	506 600
Total	**6 860 984**

Tourism Economic Impact - Economic Displacement of River-Based Tourism

Baseline

- The rafting industry has played a vital role in establishing adventure tourism
- 10 WWR operators in Project Area in 2019
- +/- 250-300 people employed. Difficult to determine exact numbers of part-time/casual staff (fluctuate with each season)
- Almost all employees are from local communities
- WWR largest contributor to tourism value downstream of Falls, US$3.4 million in tourist expenditure annually.

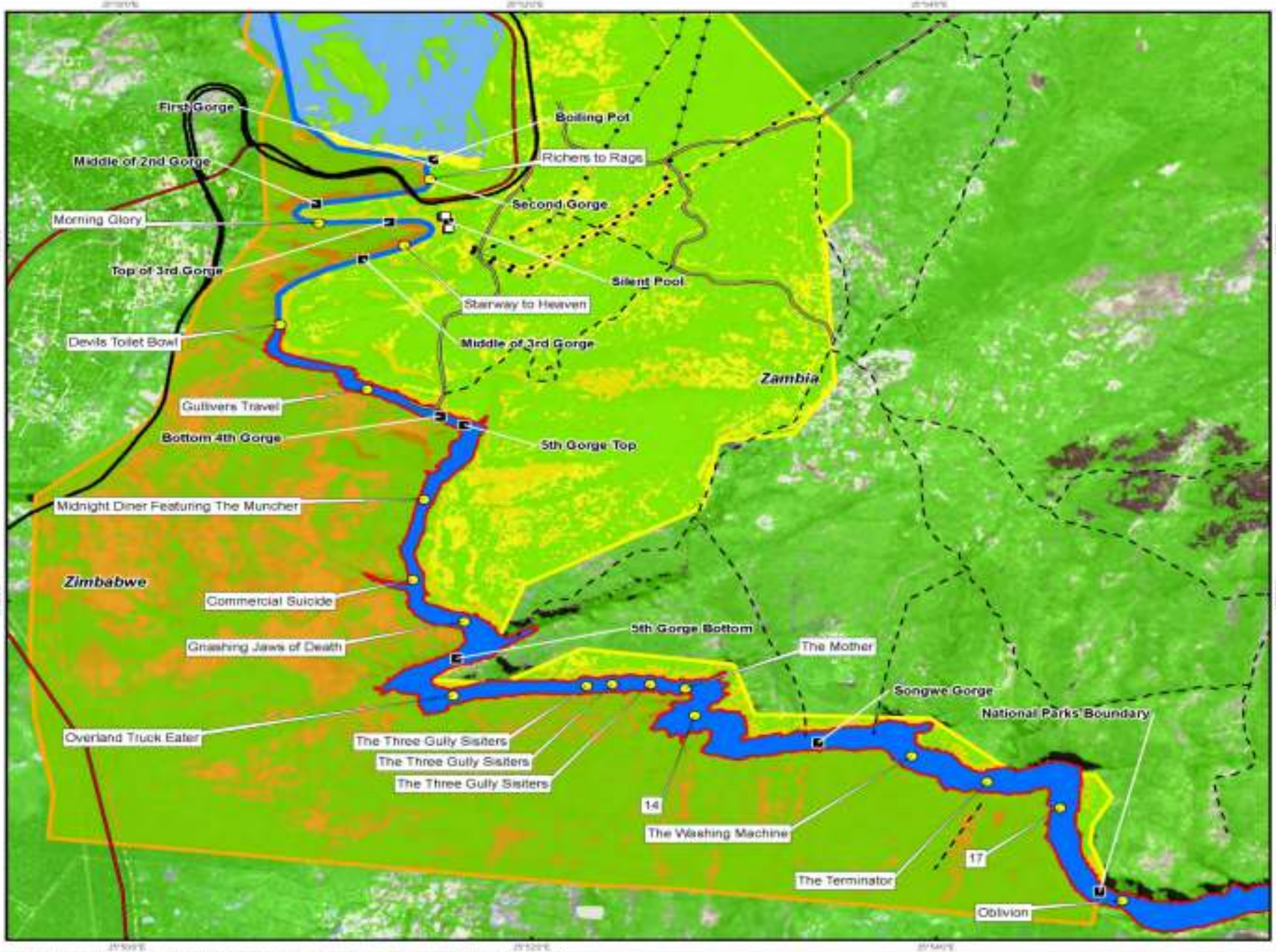
Impact Statement

- BGHES has adopted a variable operating level approach
- Prevents rafting during high-water season (Jan-July): river reach from rapid 10 submerged by reservoir
- Rafting would only operate from rapid 1 to rapid 9/10 during low-water season (Aug-Dec)
- This has changed since 2015, when only FSL 757m ASL was being considered year-round.

Impact Significance Rating Before Mitigation	Significance Rating After Mitigation
Major Negative Impact	**Moderate Negative Impact**

Key management measures

- Separate RAPs and LRPs will be commissioned by ZRA for those Project components outside of ERM's current scope
- RAPs/LRPs for water users (specifically tourism operators), undertaken at a later stage (inundation proposed in 2027/2028)
- To be undertaken in accordance with the regulatory requirements of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESS5



Legend

- Rapids
- Gorge Point Of Interest
- Vic Falls Power Station Outlets
- Zambezi River
- Existing Transmisson Lines
- New Road
- Main Road
- Secondary Road
- Tracks
- Railway
- FSL 757m Contour
- ndvi

Protected Areas

- Mosi-Oa-Tunya National Park
- Victoria Falls National Park

SCALE

0 500 1 000 1 500 2 000 Meters

N

TITLE

Points of Interest in Relation to Dam Inundation FSL 757m Contour

CLIENT

Zambezi River Authority

DATE: 04.2010	CHECKED: TH	PROJECT: 0200001
DRAWN: AT	APPROVED: MB	SCALE: 1 : 18 000

DRAWING: FSL_757M_RAPIDS_Nov181.mxd

REV: 0

ERM
Building 32,
The Woodlands,
Woodlands Drive,
Woodmead, 2148
Johannesburg, South Africa
Tel: +27 11 789 4300
Fax: +27 11 804 2289

Projection: UTM Zone 35S. Datum: WGS84
Source: LIDAR Survey/Aster. NDVI - Sentinel 2
Nat Parks: UNEP World Heritage Sites

SIZE: A3

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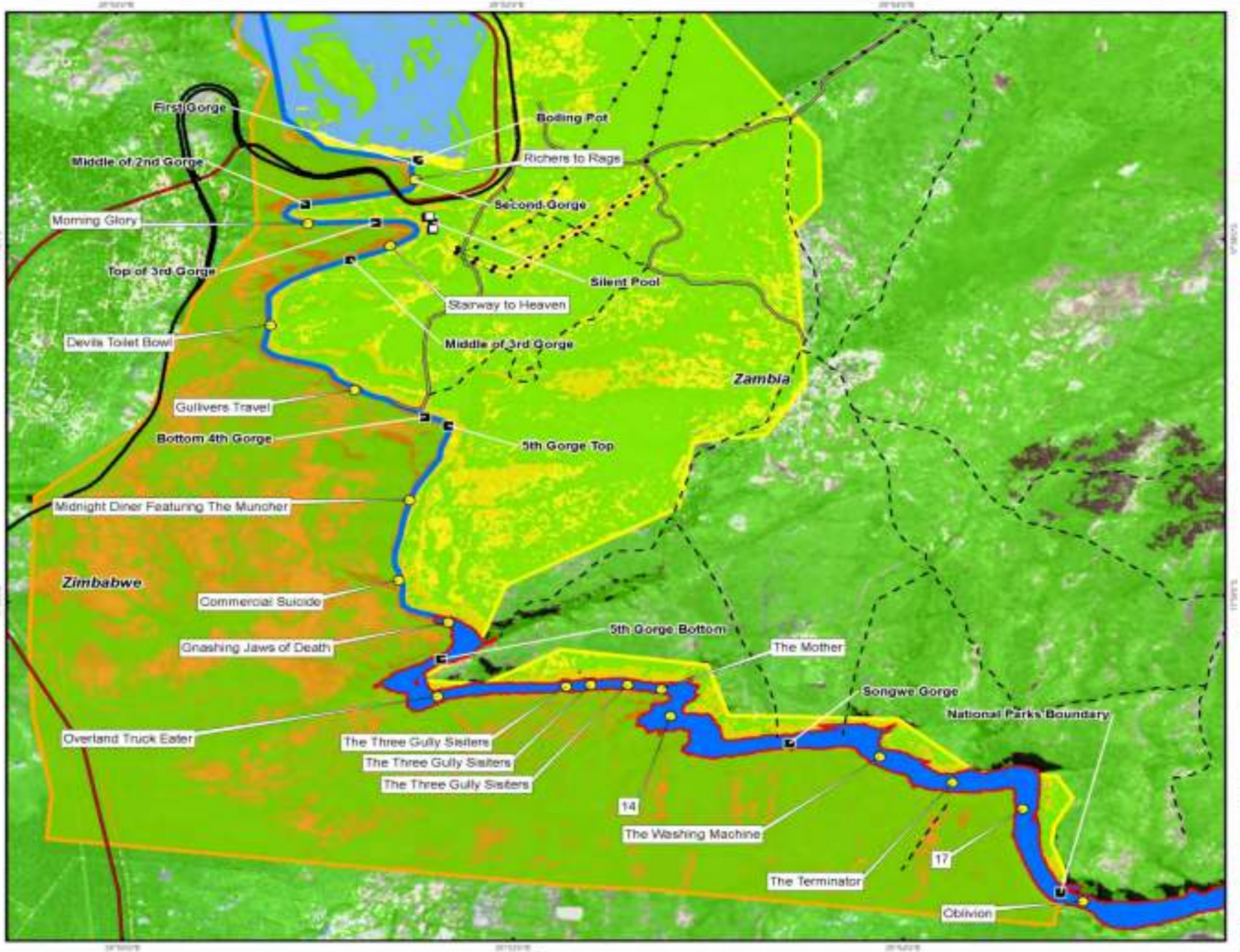

Legend

- Rapids
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- Vic Falls Power Station Outlets
- Zambezi River
- Existing Transmission Lines
- New Road
- Main Road
- Secondary Road
- Tracks
- Railway
- FSL 730m Contour
- ndvi

Protected Areas

- Mosi-Oa-Tunya National Park
- Victoria Falls National Park

SCALE: 0 500 1 000 1 500 2 000 Meters

N

TITLE: Points of Interest in Relation to Dam Inundation FSL 730m Contour

CLIENT: Zambezi River Authority

DATE: Oct 2018 | CHECKED: TR | PROJECT: 0206888

DRAWN: AT | APPROVED: MB | SCALE: 1 : 33 000

DRAWING: FSL_730M_RAPIDS_Nov18.mxd | REV: 0

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Tel: +27 11 789 4300
Fax: +27 11 804 2289

ERM

Projection: UTM Zone 35S, Datum: WGS84
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Tourism Economic Impact - Economic Displacement of Non-river Based Tourism Activities

Baseline

- Other tourism activities in the gorge include birding, angling and hiking
- These activities employ fewer people than the rafting industry, but are nonetheless very popular
- Offered by activity providers as well as Lodges situated along the Gorge
- Activities contribute over US$250,000 annually

Impact Statement

- Inundation of rapids and loss of habitat for river borne insects will reduce numbers of birds and bats in the Gorge. Increased water levels in the Gorge will also remove prime nesting habitat
- Hikers will not be able to hike along the bottom of the Gorge and overnight hiking and camping trips will not be feasible to operate as a result of increased water levels

Impact Significance Rating Before Mitigation	Significance Rating After Mitigation
Major Negative Impact	**Major Negative Impact**

Key management measures

- RAPs and LRPs will be commissioned by the ZRA for those Project components outside of ERM's current scope
- RAPs/LRPs for non-river users, only undertaken at a later stage, inundation of Batoka Gorge is proposed in 2027/2028
- These separate RAPs/LRPs commissioned by the ZRA will be undertaken in accordance with the regulatory requirements of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESS5

Next Steps

Next Steps: ESIA

- Stakeholder can submit additional comments and questions to ERM until 25 January 2021 when the ESIA comment period will close
- All comments received in this forum, as well as additional comments submitted, will be included in the ESIA Comment and Response Report
- Comments, together with a response from the Project team will be included in the ESIA Comments and Response Report to be submitted to the Authorities
- The final ESIAs and associated documents will be submitted to both the EMA and ZEMA for review and consideration

Next Steps: Economic and Physical Displacement to Water Users

- Separate RAPs/LRPs will also be commissioned by ZRA for the Displacement (physical and economic) of upstream / downstream water users
- Resettlement and livelihood restoration will be undertaken in accordance with the regulatory requirements of the Republic of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESF5

Focus Group Discussion

Thank you

Please feel free to reach out to ERM via email at:

batokagorgehes@erm.com

Annex C8.6.3

Special Interest Focus Group
Engagement Presentation

BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES) - ZAMBEZI RIVER - ZAMBIA AND ZIMBABWE

Environmental and Social Impact Assessment Disclosure

04 December 2020

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The business of sustainability

Agenda

1. Introductions
2. Focus Group Discussion Etiquette
3. ESIA Process Undertaken To Date
4. Project Description and Status
5. Impacts Associated with Loss of Critical Habitat and Avifaunal Communities
6. Next Steps
7. Focus Group Discussion

Webinar Etiquette

- As a participant, you will be muted for the duration of the presentation
- During this time you as participant can use the Q&A function (bottom tool bar of your screen) to pose questions and comments to the speaker. Please do not use it for other topics or internal discussion
- These questions and comments will be addressed during the discussion session following the presentation
- To ask a question during the Q&A session please raise your hand using the function on your tool bar
- We will record the meeting and share the presentation on the Project website

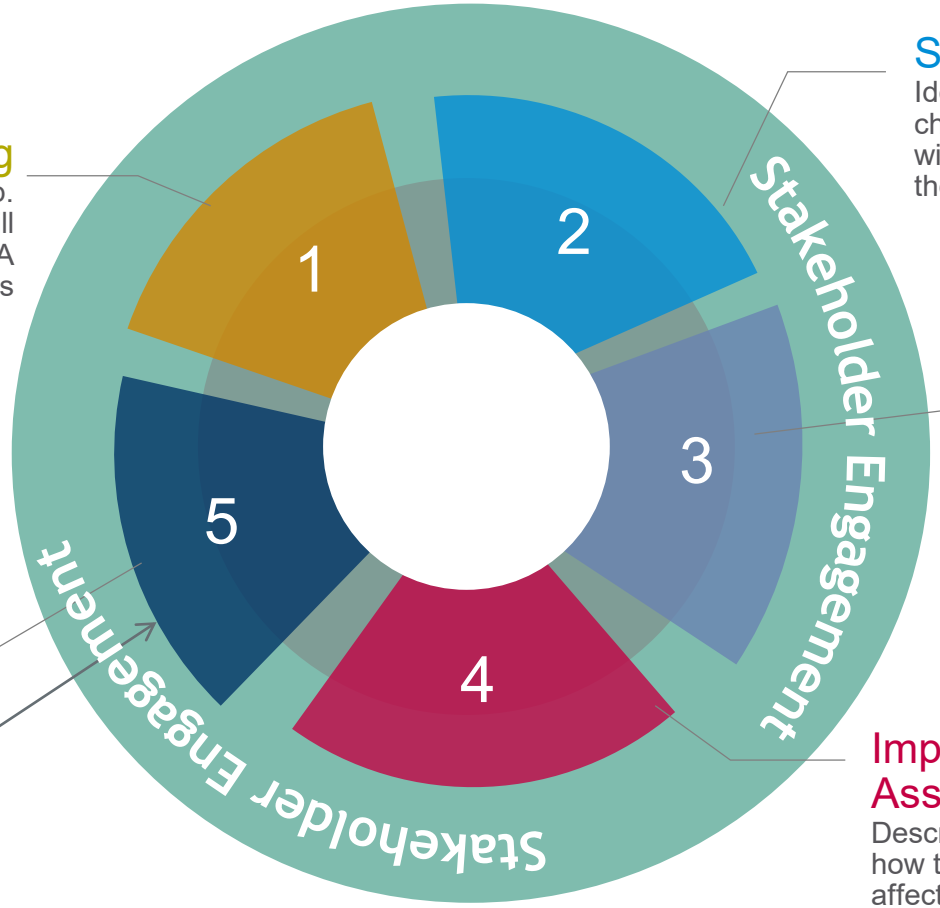
Introduction

ESIA Process Undertaken To Date

Regulatory Framework

- Three separate draft ESIAs have been prepared for the Project to asses potential **physical**, **biophysical**, and **social impacts** of the Project, and propose measures to mitigate adverse impacts and enhance project benefits
- Three ESIA were prepared under the Zambia and Zimbabwe Environmental Management Acts and associated guidelines
- International environmental and social guidelines and standards applicable to the BGHES, include
  - World Bank Environmental and Social Safeguard Policies
  - The International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012)
  - World Commission on Dams (WCD) Guidelines and Recommendations
  - The International Hydropower Association (IHA) Sustainability Guidelines and Sustainability Assessment Protocols
  - The Southern African Power Pool (SAPP) Environmental and Social Impact Assessment Guidelines for Hydroelectric Projects and Transmission Infrastructure in the SAPP region

The ESIA Process



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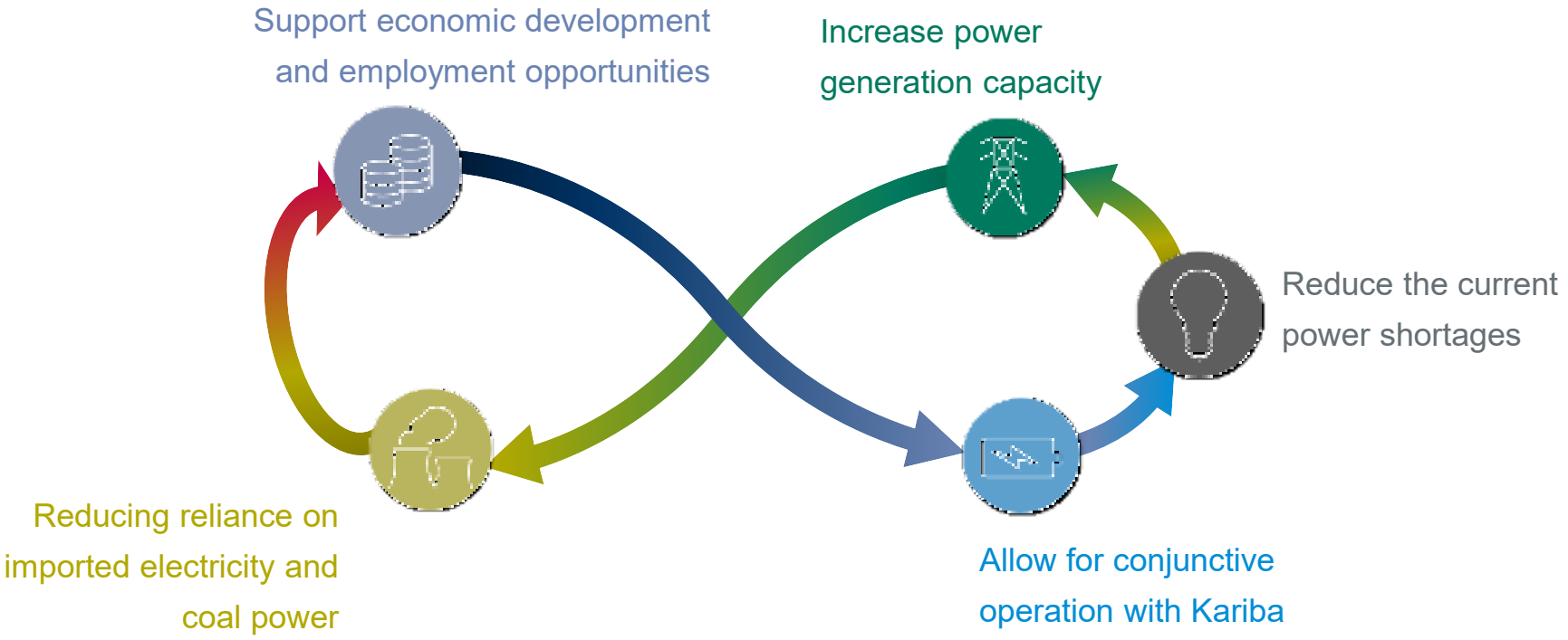
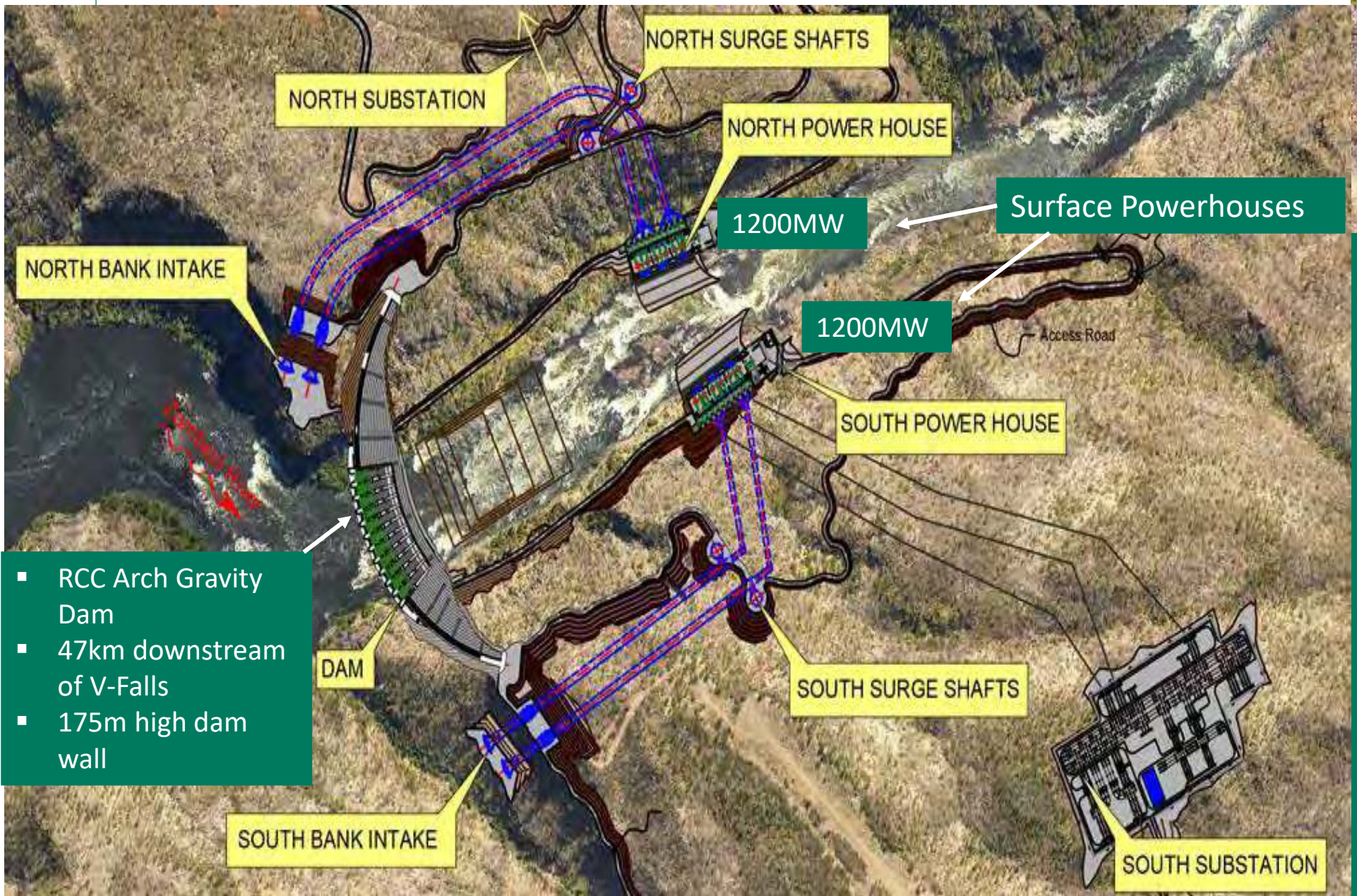


BGHES Proposed Scheme Layout



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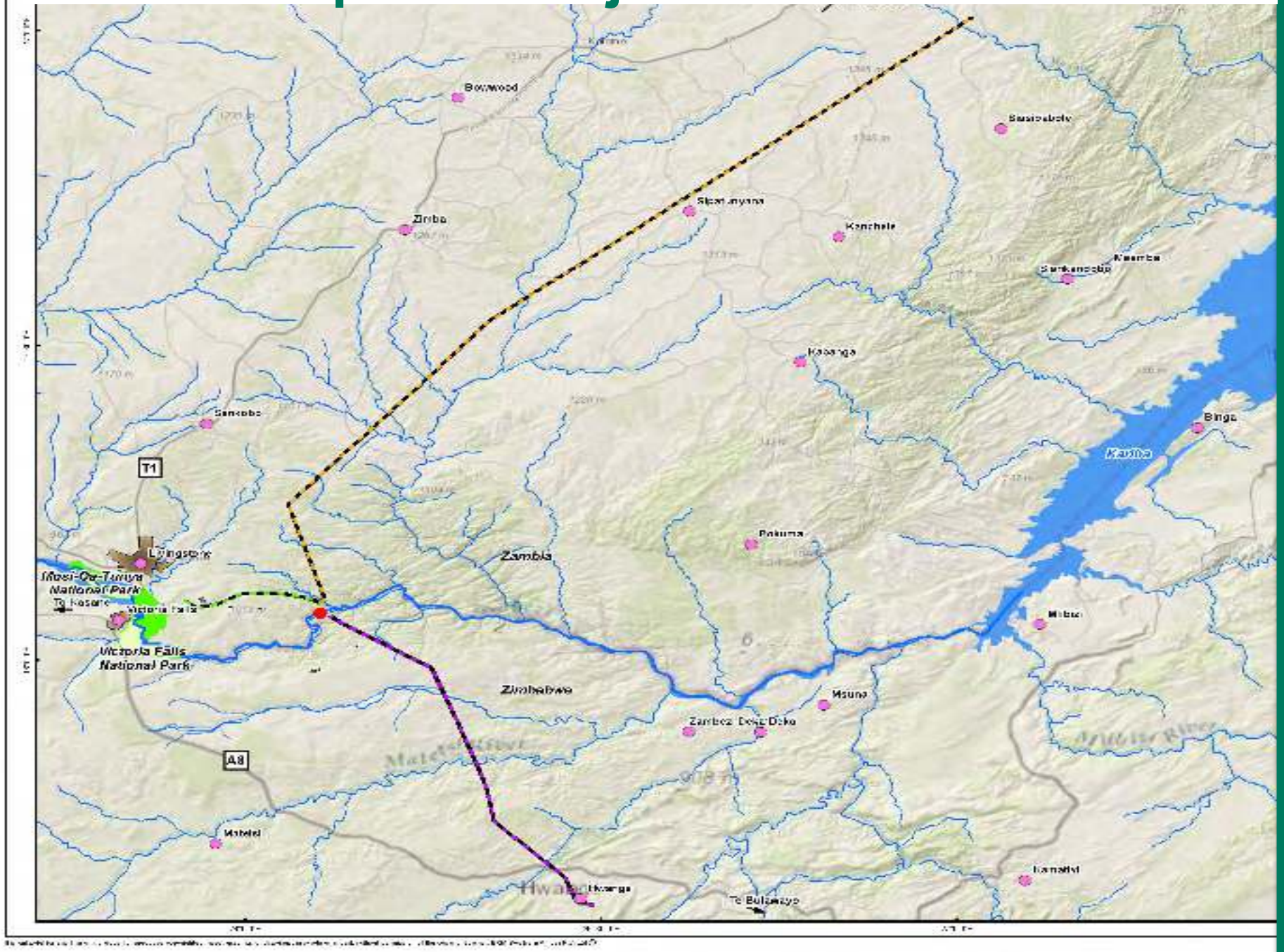
BGHES Proposed Project Transmission Lines



Three transmission line routes are proposed as part of the BGHES Project:

Zambia

- Mukuni 300 kV transmission line - approximately 22 km (from proposed BGHES substation on north bank to newly constructed 330 kV Mukuni ZESCO substation in Livingstone)
- Muzuma 300 kV transmission line - approximately 152 km (from proposed BGHES substation on north bank to Muzuma substation in Choma)

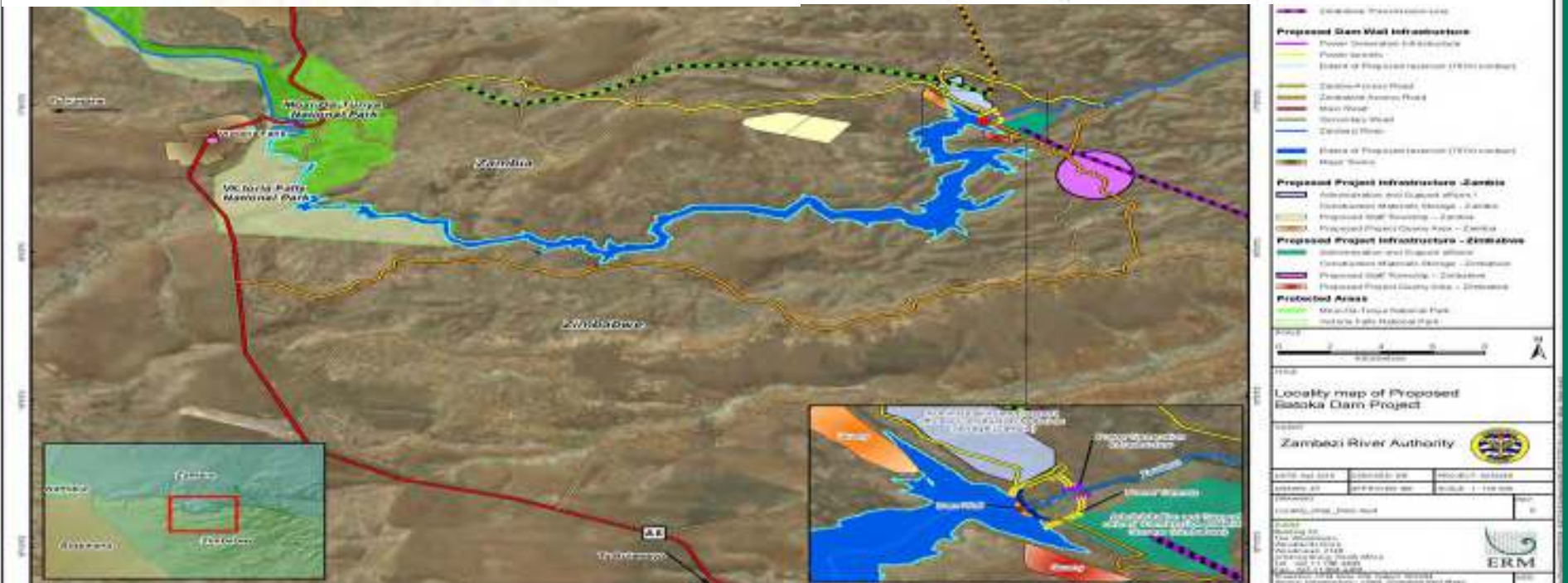
Zimbabwe

- Hwange 400 kV transmission line - approximately 67 km (from the proposed BGHES substation on south bank to the proposed Hwange 400/330kV substation)

BGHES Proposed Access Road & Staff Townships

Figure 5-1: Proposed Northern Township Plan

Figure 5-2: Proposed Southern Township Plan



Access Road

Overall access road length is 35 km on the Zambian side and 53 km on the Zimbabwe side

Staff Townships - There are two proposed Townships on the North bank and South bank

Land Acquisition Progress

Zambia (over 2558Ha allocated for the project)

- All required approvals obtained , pending is numbering of the land parcels to be followed by letters of offer and then title deeds

Zimbabwe (applied for about 3000Ha.)

- Cabinet approved the excision from communal to urban and SI gazetted
- Next steps include preparation of base maps, concept layouts and for submission to Physical planning department

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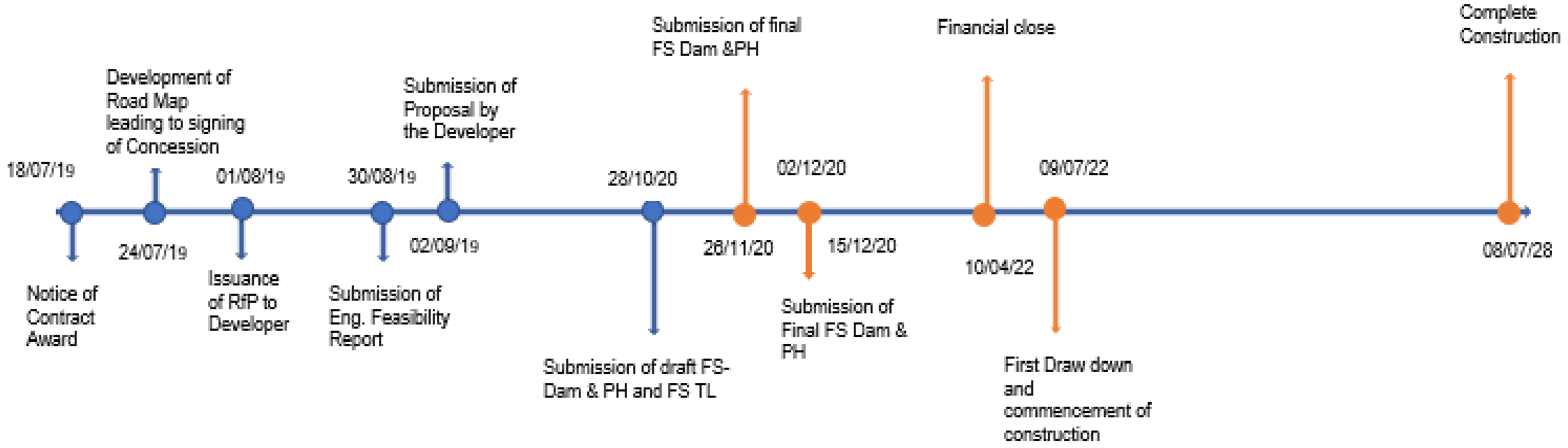


Impacts Associated with Loss of Critical Habitat

Impacts to Avifaunal Communities

Andrew Cauldwell

Impacts to Protected Areas and Loss of Critical Habitat

Baseline

- The Mosi-oa-Tunya (Zambia) and Victoria Falls (Zimbabwe) National Parks are legally protected and recognised as a UNESCO Natural World Heritage Site.
- The whole Batoka Gorge is recognised as an Important Bird Area (IBA) and an IUCN Key Biodiversity Area.
- The Batoka Gorge is a unique ecosystem, which qualifies as a critical habitat as per IFC criteria.

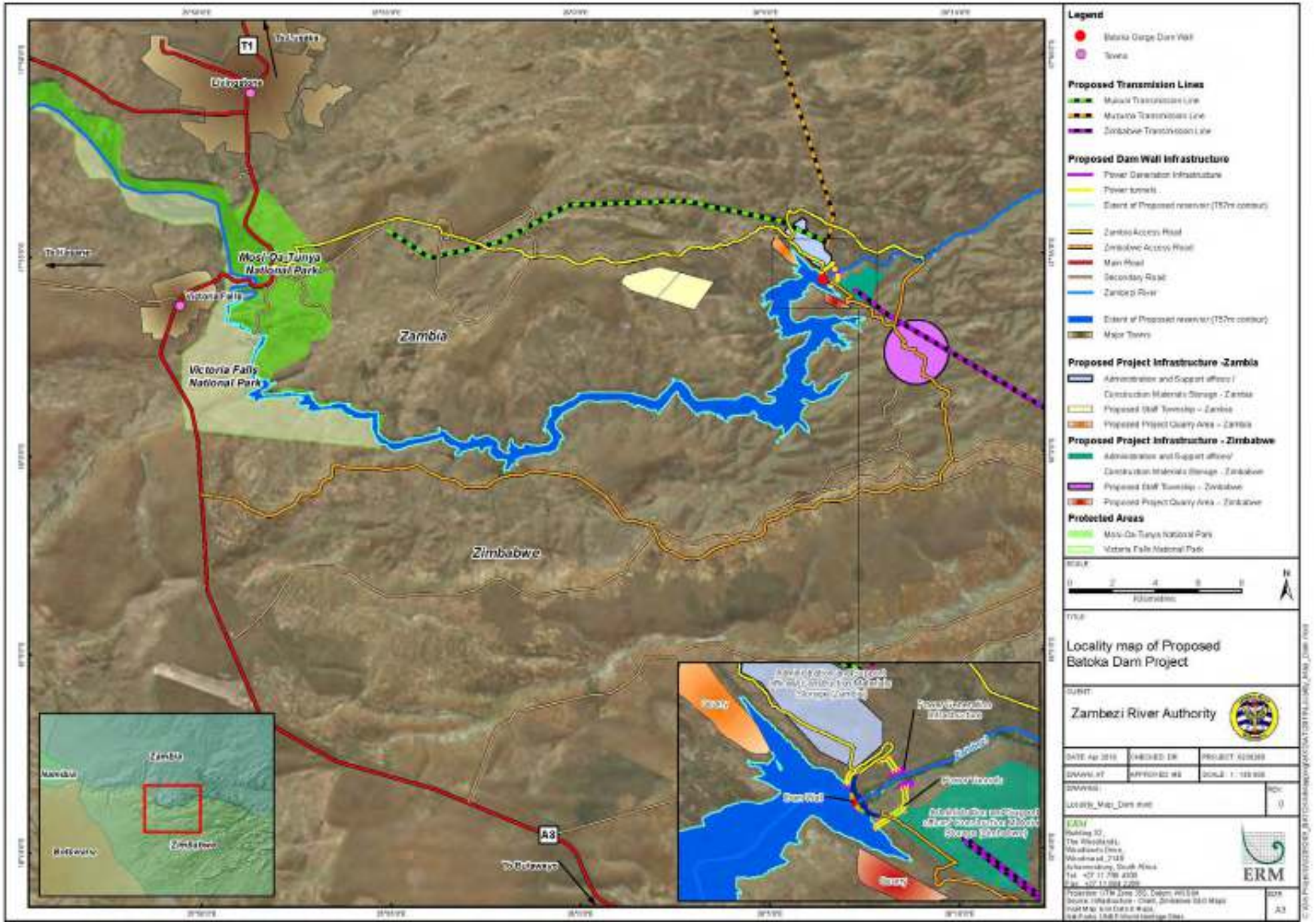
Impact Statement

- Activities causing transformation and loss of habitat are construction of the dam wall, associated infrastructure and inundation of the reservoir.
- Leads to direct loss of critical habitat, legally protected areas and internationally recognised areas, including a UNESCO World Heritage Site (the BGHES reservoir extends into the World Heritage Site).

Key Management Measures

- Avoiding impacts to important areas is not feasible.
- Protecting non-impacted parts of the Batoka Gorge (rim, cliffs, scree slopes) reduces the loss of critical habitat.
- A significant residual impact remains that needs to be offset to align with the IFC Performance Standards.
- Offsetting residual impacts was beyond the scope of this ESIA, and no offset options have been identified.
- Unmitigated impacts to the World Heritage Site present a potential fatal flaw (*as per guidance notes to the IFC Performance Standard 6*).

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact *(potentially of Critical significance)*	**Major Negative Impact**


T1
Livingstone
Mosi-Oa-Tunya National Park
Victoria Falls
Victoria Falls National Park
Zambia
Zimbabwe
A3
To Bulawayo
Legend
Batoka Gorge Dam Wall
Towns
Proposed Transmission Lines
Proposed Dam Wall Infrastructure
Zambia Access Road
Zimbabwe Access Road
Main Road
Secondary Road
Zambezi River
Major Towns
Proposed Project Infrastructure -Zambia
Proposed Project Infrastructure - Zimbabwe
Protected Areas
Mosi-Oa-Tunya National Park
Victoria Falls National Park
Locality map of Proposed Batoka Dam Project
Zambezi River Authority
ERM

Avifauna (Bird) Impacts

Baseline

- The Batoka Gorge is an IBA (*as in previous slide*) as it supports the largest known population of Taita Falcons, and is important for other birds (Rock Pratincole, Verreaux's & Crowned Eagle, Peregrine & Lanner Falcon, Bat Hawk, Augur Buzzard).
- Parts of Batoka Gorge remain un-surveyed for Taita Falcons (surveys undertaken for upper 25 km stretch), also their ecology is not sufficiently understood to predict impacts and develop appropriate mitigation.

Impact Statement

- Primary activity that will affect important species will be loss of the Batoka Gorge habitat from inundation of the reservoir.
- Impact to birds from losses of key biodiversity features (swifts, a key prey source for Taita Falcons, may be adversely impacted by the loss of rapids, but there is insufficient evidence of this impact).

Key Management Measures Required

Key baseline gaps remain, and ZRA are committed to an action plan that outlines an approach to:

i. Species specialists to thoroughly assess the entire Batoka Gorge to determine the occurrence and status of Taita Falcons;

ii. Workshopping with all species specialists to pool available knowledge, raise the level of confidence on potential threats and impacts, and identify if mitigation to address threats is feasible;

iii. Develop an appropriate Biodiversity Action Plan to address the risks.

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact (*low confidence*)	**Uncertain due to data deficiency**

Impacts Associated with Changes to the Downstream River Conditions

Alison Joubert

Downstream Flow Impacts – Environmental Flows

Baseline

- Present ecological status of the downstream river is high (Category A/B and B – slightly modified from natural conditions) for most of the gorge
- The Zambezi River ecosystem supports extensive aquatic habitats, riparian vegetation and serves as important ecological corridor and sustains rich floral and faunal diversity and populations of large fauna including hippo and crocodile populations
- There are important water users downstream closer to Lake Kariba - predominantly informal abstractions in support of agricultural activities
- Larger, more intensive water users are associated with Lake Kariba - it was assumed that impacts will not be felt as far downstream as Kariba

Impact Statement

- Impacts relating to flow and sediment conditions in the river downstream of BGHES during dam filling and operation particularly during hydro-peaking; Potential temperature effects in the dry season.
- It was agreed that there could be no more than a 1.5 class drop in Overall Ecosystem Condition in the downstream river, i.e., from A/B to no less than a mid-C category. This represents a drop in ecological category from “near natural” to “moderately modified”, which is still considered a healthy functioning ecosystem

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact	Moderate Negative Impact (if run-of-river in dry season)
	Major Negative Impact (if hydro-peaking in wet and dry seasons)

Key management measures

- Only operated as a hydro-peaking scheme during the wet season (Feb-Aug) as per operating rules established by scenario AddPM04 (dry season = Sep-Jan).
- ZRA will adopt off peak flow condition during wet season of QMin as per flow statistics in ESIA
- During hydro-peaking, rate of change of flow releases (ramping rate) will be restricted so there is a correspondingly gradual change in downstream water levels
- Gradual (smoothed) transition between wet and dry season minimum flow conditions

Next Steps

Next Steps: ESIA

- Stakeholder can submit additional comments and questions to ERM until 25 January 2021 when the ESIA comment period will close
- All comments received in this forum, as well as additional comments submitted, will be included in the ESIA Comment and Response Report
- Comments, together with a response from the Project team will be included in the ESIA Comments and Response Report to be submitted to the Authorities
- The final ESIAs and associated documents will be submitted to both the EMA and ZEMA for review and consideration

Next Steps: Additional Studies

Zambezi River Authority to develop an action plan to:

- Further assess entire Batoka Gorge to determine the occurrence and status of Taita Falcons
- Work with species specialist to raise the level of confidence on potential threats and impacts, and identify if mitigation to address threats is feasible
- Develop an appropriate Biodiversity Action Plan to address the risks

Focus Group Discussion

Thank you

Please feel free to reach out to ERM via email at:

batokagorgehes@erm.com

Annex C8.6.4

Key Government Stakeholder Engagement Presentation

BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES) - ZAMBEZI RIVER - ZAMBIA AND ZIMBABWE

Environmental and Social Impact Assessment Disclosure

11 December 2020

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4. Project Description and Status
5. Key ESIA Findings and Management Measures
6. Disclosure of Livelihood Restoration Plans for Staff Townships and Access Road
7. Next Steps
8. Question and Answer Session

Webinar Etiquette

- As a participant, you will be muted for the duration of the 60 minute presentation
- During this time, you as participant can use the Q&A function (bottom tool bar of your screen) to pose questions and comments to the speaker. Please do not use it for other topics or internal discussion
- These questions and comments will be addressed during the 60 minute Q&A session, following the presentation
- To ask a question during the Q&A session please raise your hand using the function on your tool bar
- We will record the meeting and share the presentation on the Project website

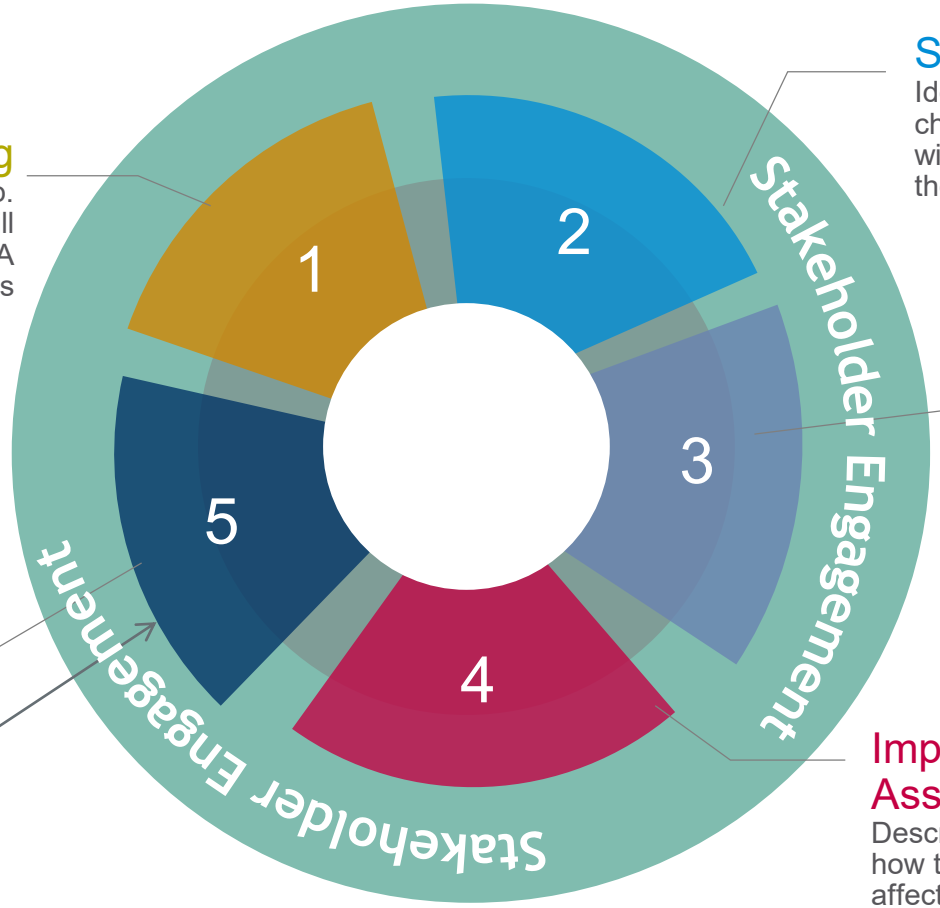
Introduction

ESIA Process and Public Participation Undertaken To Date

Regulatory Framework

- Three separate draft ESIAs have been prepared for the Project to asses potential **physical**, **biophysical**, and **social impacts** of the Project, and propose measures to mitigate adverse impacts and enhance project benefits
- Three ESIA were prepared under the Zambia and Zimbabwe Environmental Management Acts and associated guidelines
- International environmental and social guidelines and standards applicable to the BGHES, include
  - World Bank Environmental and Social Safeguard Policies
  - The International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012)
  - World Commission on Dams (WCD) Guidelines and Recommendations
  - The International Hydropower Association (IHA) Sustainability Guidelines and Sustainability Assessment Protocols
  - The Southern African Power Pool (SAPP) Environmental and Social Impact Assessment Guidelines for Hydroelectric Projects and Transmission Infrastructure in the SAPP region

The ESIA Process



Screening
Screening is the first step. It defines what issues will be considered in the ESIA process

Scoping
Identifies the likely changes (impacts) that will happen because of the Project

Baseline Data Collection
Collect information to understand the environment and people in the area before the Project begins

Impact Assessment
Describes and assesses how the Project could affect the local environment and people, both negatively and positively, how significant the changes (impacts) are likely to be, and how the impacts could be managed

Disclosure
ESIA findings and proposed controls are disclosed with all Project stakeholders

We are now in the ESIA Disclosure Phase

Stakeholder Engagement
Ongoing throughout the ESIA process

ESIA Disclosure

- ESIA Disclosure was disrupted by COVID-19 pandemic – initial engagement planned for March April postponed
- ESIA comment period has remained open since March 2020
- Authority and ERM carried out an alternative approach to ESIA Disclosure:
  - Limited in-person engagement in the Project Area – targeted at local authorities and traditional leadership – late November/ early December
  - All stakeholders on Project Stakeholder Database invited to join a ZOOM webinar where ESIA findings were disclosed, and stakeholders had the opportunity to ask question/ provide feedback – early December
  - Two focus group discussions were held via ZOOM: tourism/ water users and special interest groups – early December
  - Authority and ERM will host a series of radio broadcasts on local radio stations to share ESIA finding with communities located around the Project Area – mid-December

Stakeholder Feedback

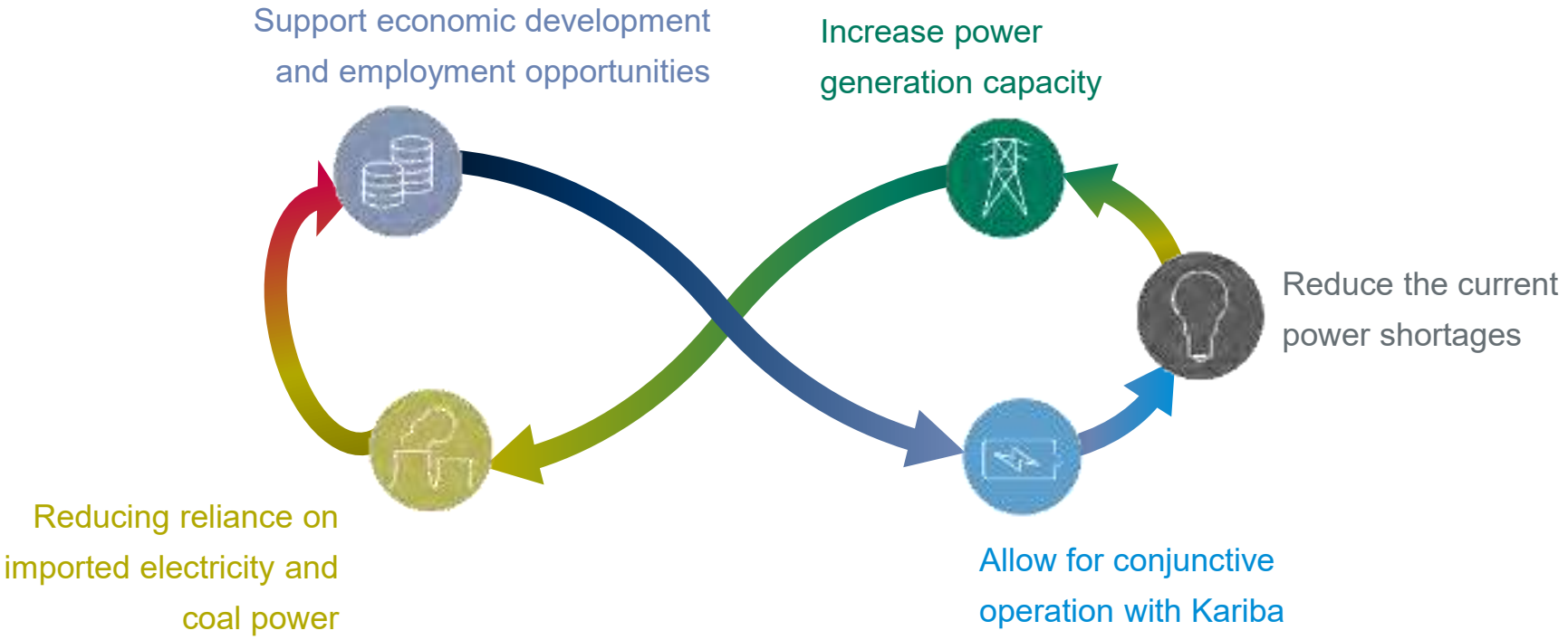
- Local communities are hopeful that the Project will provide employment and procurement opportunities, and many stakeholders welcome the Project
- Economic and physical displacement was a concern, particularly amongst those working in the tourism industry and those located along the proposed transmission lines and roads
- Many stakeholders expressed concern around the impact to river-based tourism – whitewater rafting, nature walks, jet boating. As well as the knock-on effects this might have on tourism in the area
- Stakeholders raised queries around potential impacts to the UNESCO World Heritage Site (Mosi-oa-Tunya World Heritage Site)
- Some stakeholders raised concern about the impact the Project may have on biodiversity in the Batoka Gorge – Taita Falcon, downstream ecology; and the potential impact of the transmission lines on large birds

Project Description

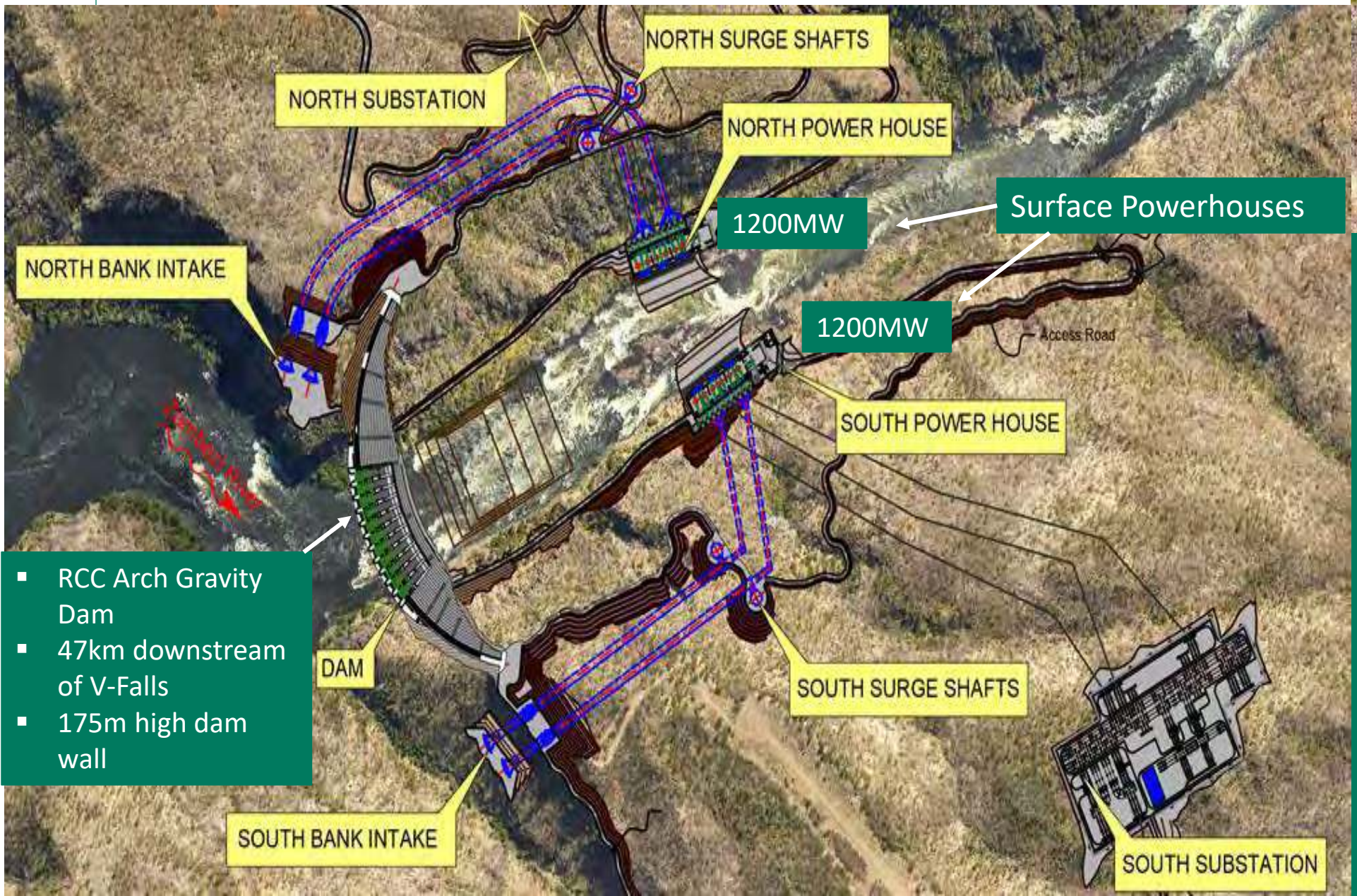
Need for the Project

The Zambezi River has a vast hydropower energy potential. Hydropower is considered the most feasible and reasonable electrification option for both countries

BGHES would contribute significantly to electricity supply of Zambia and Zimbabwe, and to distribute power to southern African countries under the Southern African Power Pool (SAPP). The Project will aim to:



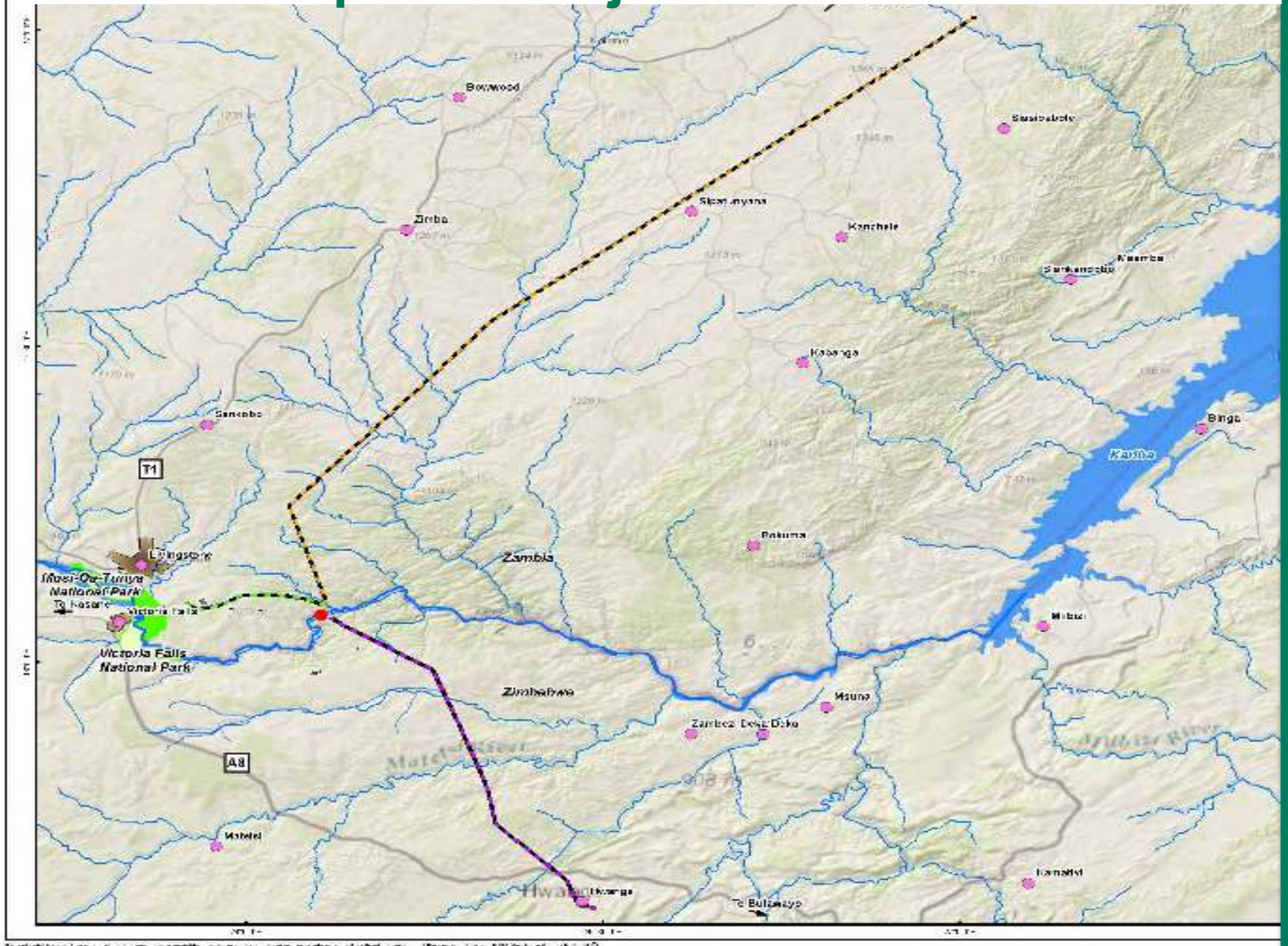
BGHES Proposed Scheme Layout



- RCC Arch Gravity Dam
- 47km downstream of V-Falls
- 175m high dam wall

- Roller Compacted Concrete Arch Gravity Dam Wall and impound area (reservoir)
- Spillway
- Pressure waterways, located in the abutments
- Two surface power houses, one on each side of the river, located on the abutments and two switchyards
- Project townships (in both Zambia and Zimbabwe) and other ancillary infrastructure (such as quarries, spoils area and batching areas)
- Access roads on each side

BGHES Proposed Project Transmission Lines



Three transmission line routes are proposed as part of the BGHES Project:

Zambia

- Mukuni 300 kV transmission line - approximately 22 km (from proposed BGHES substation on north bank to newly constructed 330 kV Mukuni ZESCO substation in Livingstone)
- Muzuma 300 kV transmission line - approximately 152 km (from proposed BGHES substation on north bank to Muzuma substation in Choma)

Zimbabwe

- Hwange 400 kV transmission line - approximately 67 km (from the proposed BGHES substation on south bank to the proposed Hwange 400/330kV substation)

BGHES Proposed Access Road & Staff Townships

Figure 5-1: Proposed Northern Township Plan

Figure 5-2: Proposed Southern Township Plan

Access Road

Overall access road length is 35 km on the Zambian side and 53 km on the Zimbabwe side

Staff Townships - There are two proposed Townships on the North bank and South bank

Land Acquisition Progress

Zambia (over 2558Ha allocated for the project)

- All required approvals obtained , pending is numbering of the land parcels to be followed by letters of offer and then title deeds

Zimbabwe (applied for about 3000Ha.)

- Cabinet approved the excision from communal to urban and SI gazetted
- Next steps include preparation of base maps, concept layouts and for submission to Physical planning department

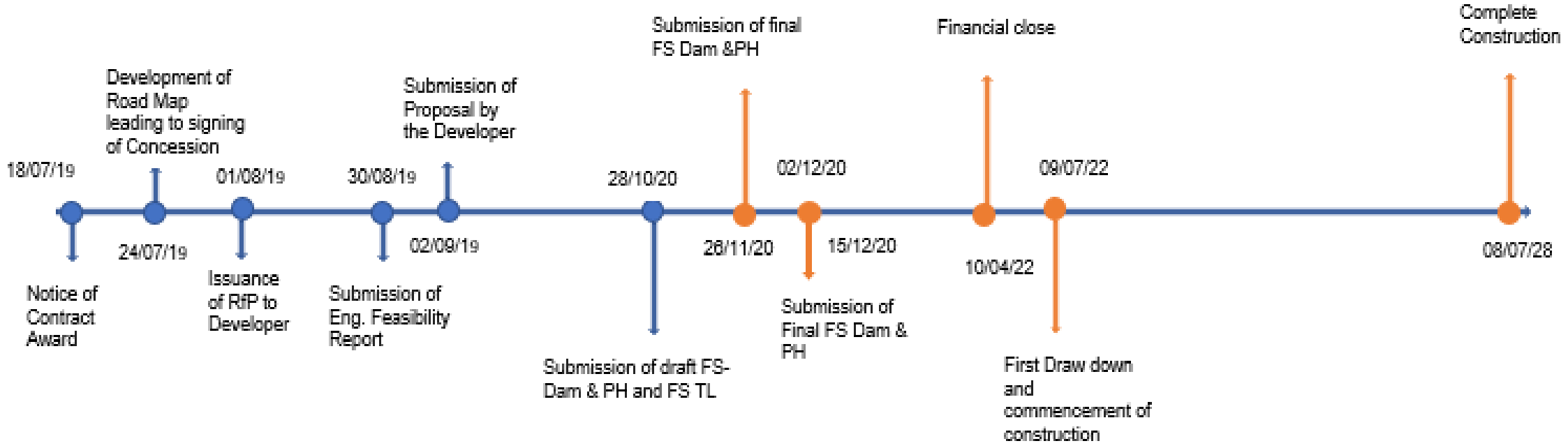
BGHES Project Status

- Engineering Feasibility Studies by Studio Pietrangeli were completed
- Draft ESIA reports completed and placed in the public domain in March 2020, currently ESIA process is at Public Disclosure phase
- The Developer is carrying out predevelopment activities including refining and optimizing the feasibility studies. Developer has since submitted proposal which is currently under Review

Current Pre-Development Activities by the Developer

- Bathymetric Surveys
- Additional Geotechnical Studies
- Aerial Topography Surveys
- Environmental and Social Impact Assessment for Additional Transmission Lines

BGHES Project Timeline

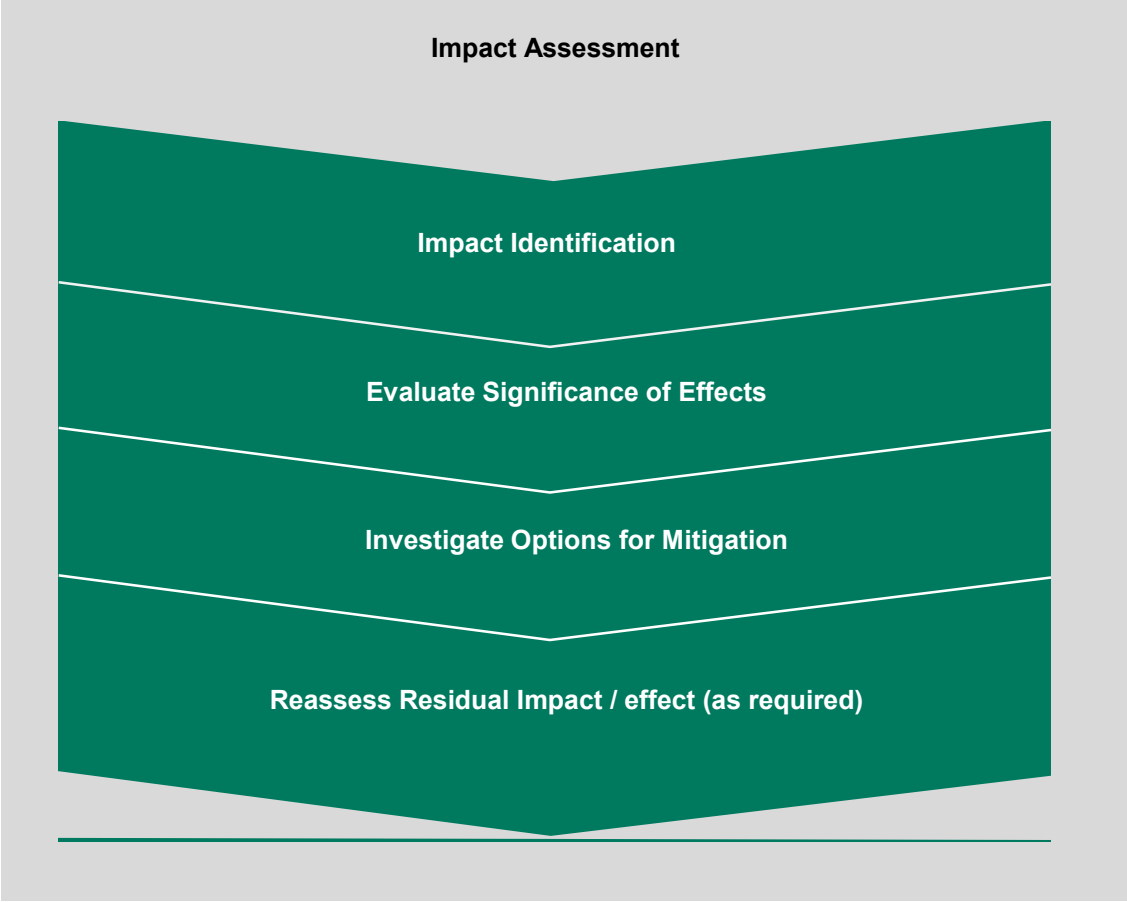


Key ESIA Findings and Management Measures

Specialist Studies Undertaken

- Biodiversity (terrestrial and aquatic) – ERM
  - Avifauna (Taita Falcons) Zimbabwe National Parks and Wildlife Management and Zambian Wildlife Authority
- Climate Change (risk review) – ERM
- Cultural Heritage and Archaeology – Mr. R. Burrett (Zimbabwe) & Mr. Richard Mbewe (Zambia)
- Economic Cost-benefit Analysis – Stratecon
- Greenhouse Gas Emissions Assessment – ERM
- Livelihood Restoration – ERM
- Socio-economic and Health Assessment - ERM
- Tourism – Anchor Environmental
- Water Resource Studies (water quality and environmental flows) – Southern Waters and ERM

Impact Assessment Methodology



Overview of Physical and Biophysical Impacts Assessed

Impact Description	Dam ESIA	Access Road ESIA	Transmission Line ESIA
Physical Environment			
Impacts associated with greenhouse gas emissions	X	X	X
Impacts on air quality	X	X	X
Impacts on noise	X	X	X
Impacts on upstream flow (water level and velocity)	X		
Impacts related to reservoir water quality during filling and operations (including potential eutrophication)	X		
Impacts on downstream flow during filling and operations	X		
Impacts related to changing upstream conditions	X		
Impacts to soils and water resources (accidental spills, sedimentation, etc.)	X	X	X
Biophysical Environment			
Loss of habitat (including critical habitat)	X	X	X
Impacts to avifaunal communities	X		X
Impacts to fauna through road and/or indiscriminate killings		X	
Alteration of fish communities and their utilisation during filling and operations	X		
Impacts to crocodiles and other fauna	X		
Habitat degradation downstream of the dam wall resulting from altered flow regimes during filling and operations	X		
Habitat degradation resulting from increased access and human influx during construction and operations		X	X
Eutrophication and associated floating aquatic weed infestation during filling and operations	X		

Overview of Social Impacts Assessed

Impact Description	Dam ESIA	Access Road ESIA	Transmission Line ESIA
Social Environment			
Economic displacement of land based livelihoods	X	X	X
Economic displacement of livelihoods related to fishing	X		
Economic displacement of downstream river users	X		
Economic displacement of river based tourism activities in Batoka Gorge during filling and operations	X		
Economic displacement of non-river based tourism activities in Batoka Gorge during filling and operations	X		
Positive economic benefits for the national economy	X		
Impact Tourism and the local economy	X		
Social benefits (employment, procurement of goods and services, opportunities for community development)	X	X	X
Community anger and resentment over unmet expectations	X	X	X
Impacts related to in-migration	X	X	X
Impacts related to increased spread of communicable diseases	X	X	X
Impacts related to increased risk of traffic accidents		X	
Impact associated with disturbance due to dust, noise and vibration		X	X
Impacts related to increased incidence of malaria and other vector borne diseases	X		
Impacts to community security	X		
Impacts related to exposure of workforce to health and safety incidents	X	X	X
Impacts associated with unexploded ordnance	X	X	X
Impacts related to destruction of physical cultural heritage during construction of the dam and associated infrastructure	X	X	X
Impacts on living cultural heritage	X	X	X

Most Significant Environmental and Social Impacts

- Impacts associated with Loss of Critical Habitat
- Impacts to Avifaunal Communities
- Impacts associated with Changes to the Downstream River Conditions
- Socio-economic Benefits
- Impacts related to Physical Displacement – Transmission line only
- Economic Impact and Displacement of River Based Tourism Activities
- Economic Impact and Displacement of Non-river Based Tourism Activities

Impacts Associated with Loss of Critical Habitat

Impacts to Avifaunal Communities

Andrew Cauldwell

Impacts to Protected Areas and Loss of Critical Habitat

Baseline

- The Mosi-oa-Tunya (Zambia) and Victoria Falls (Zimbabwe) National Parks are legally protected and recognised as a UNESCO Natural World Heritage Site.
- The whole Batoka Gorge is recognised as an Important Bird Area (IBA) and an IUCN Key Biodiversity Area.
- The Batoka Gorge is a unique ecosystem, which qualifies as a critical habitat as per IFC criteria.

Impact Statement

- Activities causing transformation and loss of habitat are construction of the dam wall, associated infrastructure and inundation of the reservoir.
- Leads to direct loss of critical habitat, legally protected areas and internationally recognised areas, including a UNESCO World Heritage Site (the BGHES reservoir extends into the World Heritage Site).

Key Management Measures

- Avoiding impacts to important areas is not feasible.
- Protecting non-impacted parts of the Batoka Gorge (rim, cliffs, scree slopes) reduces the loss of critical habitat.
- A significant residual impact remains that needs to be offset to align with the IFC Performance Standards.
- Offsetting residual impacts was beyond the scope of this ESIA, and no offset options have been identified.
- Unmitigated impacts to the World Heritage Site present a potential fatal flaw (*as per guidance notes to the IFC Performance Standard 6*).

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact *(potentially of Critical significance)*	**Major Negative Impact**

Avifauna (Bird) Impacts

Baseline

- The Batoka Gorge is an IBA (*as in previous slide*) as it supports the largest known population of Taita Falcons, and is important for other birds (Rock Pratincole, Verreaux's & Crowned Eagle, Peregrine & Lanner Falcon, Bat Hawk, Augur Buzzard).
- Parts of Batoka Gorge remain un-surveyed for Taita Falcons (surveys undertaken for upper 25 km stretch), also their ecology is not sufficiently understood to predict impacts and develop appropriate mitigation.

Impact Statement

- Primary activity that will affect important species will be loss of the Batoka Gorge habitat from inundation of the reservoir.
- Impact to birds from losses of key biodiversity features (swifts, a key prey source for Taita Falcons, may be adversely impacted by the loss of rapids, but there is insufficient evidence of this impact).

Key Management Measures Required

Key baseline gaps remain, and ZRA are committed to an action plan that outlines an approach to:

i. Species specialists to thoroughly assess the entire Batoka Gorge to determine the occurrence and status of Taita Falcons;

ii. Workshopping with all species specialists to pool available knowledge, raise the level of confidence on potential threats and impacts, and identify if mitigation to address threats is feasible;

iii. Develop an appropriate Biodiversity Action Plan to address the risks.

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact (*low confidence*)	**Uncertain due to data deficiency**

Impacts Associated with Changes to the Downstream River Conditions

Alison Joubert

Downstream Flow Impacts – Environmental Flows

Baseline

- Present ecological status of the downstream river is high (Category A/B and B – slightly modified from natural conditions) for most of the gorge
- The Zambezi River ecosystem supports extensive aquatic habitats, riparian vegetation and serves as important ecological corridor and sustains rich floral and faunal diversity and populations of large fauna including hippo and crocodile populations
- There are important water users downstream closer to Lake Kariba - predominantly informal abstractions in support of agricultural activities
- Larger, more intensive water users are associated with Lake Kariba - it was assumed that impacts will not be felt as far downstream as Kariba

Impact Statement

- Impacts relating to flow and sediment conditions in the river downstream of BGHES during dam filling and operation particularly during hydro-peaking; Potential temperature effects in the dry season.
- It was agreed that there could be no more than a 1.5 class drop in Overall Ecosystem Condition in the downstream river, i.e., from A/B to no less than a mid-C category. This represents a drop in ecological category from “near natural” to “moderately modified”, which is still considered a healthy functioning ecosystem

Impact Significance Rating Before Mitigation	Impact Significance Rating After Mitigation
Major Negative Impact	Moderate Negative Impact (if run-of-river in dry season)
	Major Negative Impact (if hydro-peaking in wet and dry seasons)

Key management measures

- Only operated as a hydro-peaking scheme during the wet season (Feb-Aug) as per operating rules established by scenario AddPM04 (dry season = Sep-Jan).
- ZRA will adopt off peak flow condition during wet season of QMin as per flow statistics in ESIA
- During hydro-peaking, rate of change of flow releases (ramping rate) will be restricted so there is a correspondingly gradual change in downstream water levels
- Gradual (smoothed) transition between wet and dry season minimum flow conditions

Socio-economic Impacts

Lindsey Bungartz and Tori Braham

Socio-economic Benefits

Baseline

- Approximately 22% and 41% of populations in Zambia and Zimbabwe have access to electricity - connectivity is lower in rural areas
- Communities are principally subsistence farmers, selling what additional crop they produce to generate small income
- Livestock rearing is common and substantial engagement in curio trade in order to generate additional income
- Other livelihood activities include trading, collection and selling of firewood, grass and forest fruits, furniture making, brickmaking, hunting, fishing, casual labour and tourism related activities

Impact Statement

- Economic benefit for national economy through increase provision of power
- Local employment opportunities
- Local Procurement of goods and services
- Opportunities for community development
- Opportunity to distribute power to southern African countries under coordination of the SAPP

Significance Rating Before Mitigation
Positive Impact

Key management measures

- Mitigation measures in ESIA Reports and ESMPs aim to enhance benefits / positive impacts – Focus on local employment, local procurement, upskilling through on the job training
- Hiring plans and local content requirements will be applicable to all contractors
- Estimated 8,000 jobs will be made available during construction and operation

Impacts related to Physical Displacement

Baseline

- Housing largely traditional and basic (mud walls and thatched or corrugated roofs)
- Few households have electricity and access to waste and sanitation services is poor
- Communities principally rely on subsistence farming for their livelihoods and limited formal employment opportunities exist

Impact Statement

- The transmission lines on the Zambian side is flanked by agricultural and residential land, and some of the residential structures have encroached into the proposed TL servitude and will need to be moved for safety
- Physical displacement as a result of loss of homesteads and potentially business structures, as well as other physical assets owned by households

Magnitude	Significance Rating After Mitigation
Medium Magnitude	**Minor Negative Impact**

Key management measures

- Project infrastructure will be designed to avoid and / or minimise resettlement as far as practicable
- Prepare RAPs (outside of ERM scope)
- Implement the grievance redress mechanism
- Where resettlement is unavoidable, the ZRA will provide required and agreed compensation for loss of physical assets, revenue, and income resulting from both temporary and permanent economic and/or physical displacement

Impact and Displacement of Tourism Activities

Gwyn Letley

Economic Displacement of River-Based Activities

Baseline

- The rafting industry has played a vital role in establishing adventure tourism
- 10 WWR operators in Project Area in 2019
- +/- 250-300 people employed. Difficult to determine exact numbers of part-time/casual staff (fluctuate with each season)
- Almost all employees are from local communities
- WWR largest contributor to tourism value downstream of Falls, US$3.4 million in tourist expenditure annually.

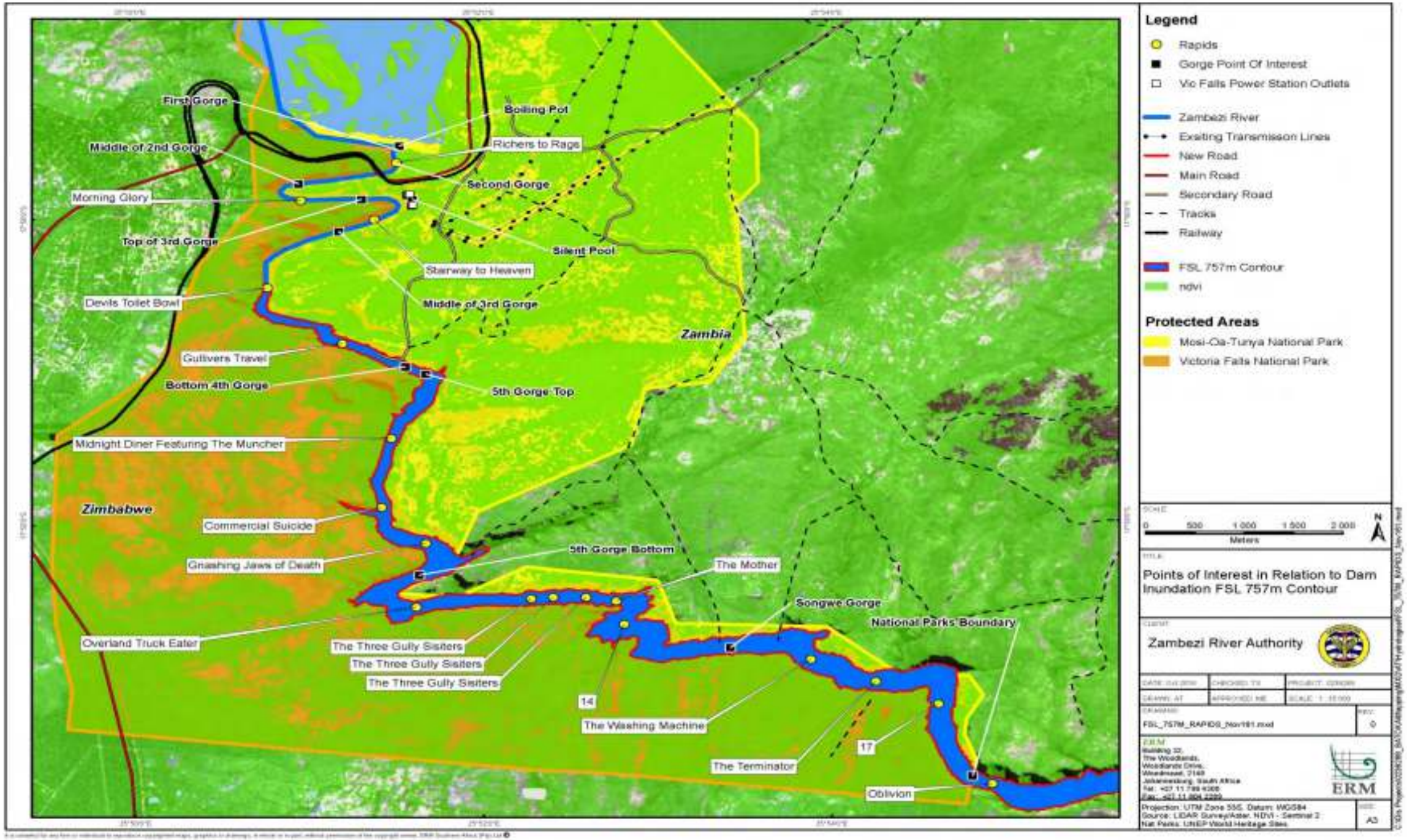
Impact Statement

- BGHES has adopted a variable operating level approach
- Prevents rafting during high-water season (Jan-July): river reach from rapid 10 submerged by reservoir
- Rafting would only operate from rapid 1 to rapid 9/10 during low-water season (Aug-Dec)
- This has changed since 2015, when only FSL 757m ASL was being considered year-round.

Impact Significance Rating Before Mitigation	Significance Rating After Mitigation
Major Negative Impact	Moderate Negative Impact

Key management measures

- Separate RAPs and LRPs will be commissioned by ZRA for those Project components outside of ERM's current scope
- RAPs/LRPs for water users (specifically tourism operators), undertaken at a later stage (inundation proposed in 2027/2028)
- To be undertaken in accordance with the regulatory requirements of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESS5


First Gorge
Middle of 2nd Gorge
Morning Glory
Top of 3rd Gorge
Devils Toilet Bowl
Gullivers Travel
Bottom 4th Gorge
Midnight Diner Featuring The Muncher
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The Three Gully Sisiters
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Boiling Pot
Richers to Rags
Second Gorge
Silent Pool
Stairway to Heaven
Middle of 3rd Gorge
5th Gorge Top
5th Gorge Bottom
The Mother
Songwe Gorge
National Parks Boundary
14
The Washing Machine
The Terminator
17
Oblivion
Zambia
Zimbabwe
Legend
Rapids
Gorge Point Of Interest
Vic Falls Power Station Outlets
Zambezi River
Existing Transmisson Lines
New Road
Main Road
Secondary Road
Tracks
Railway
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Zambezi River Authority
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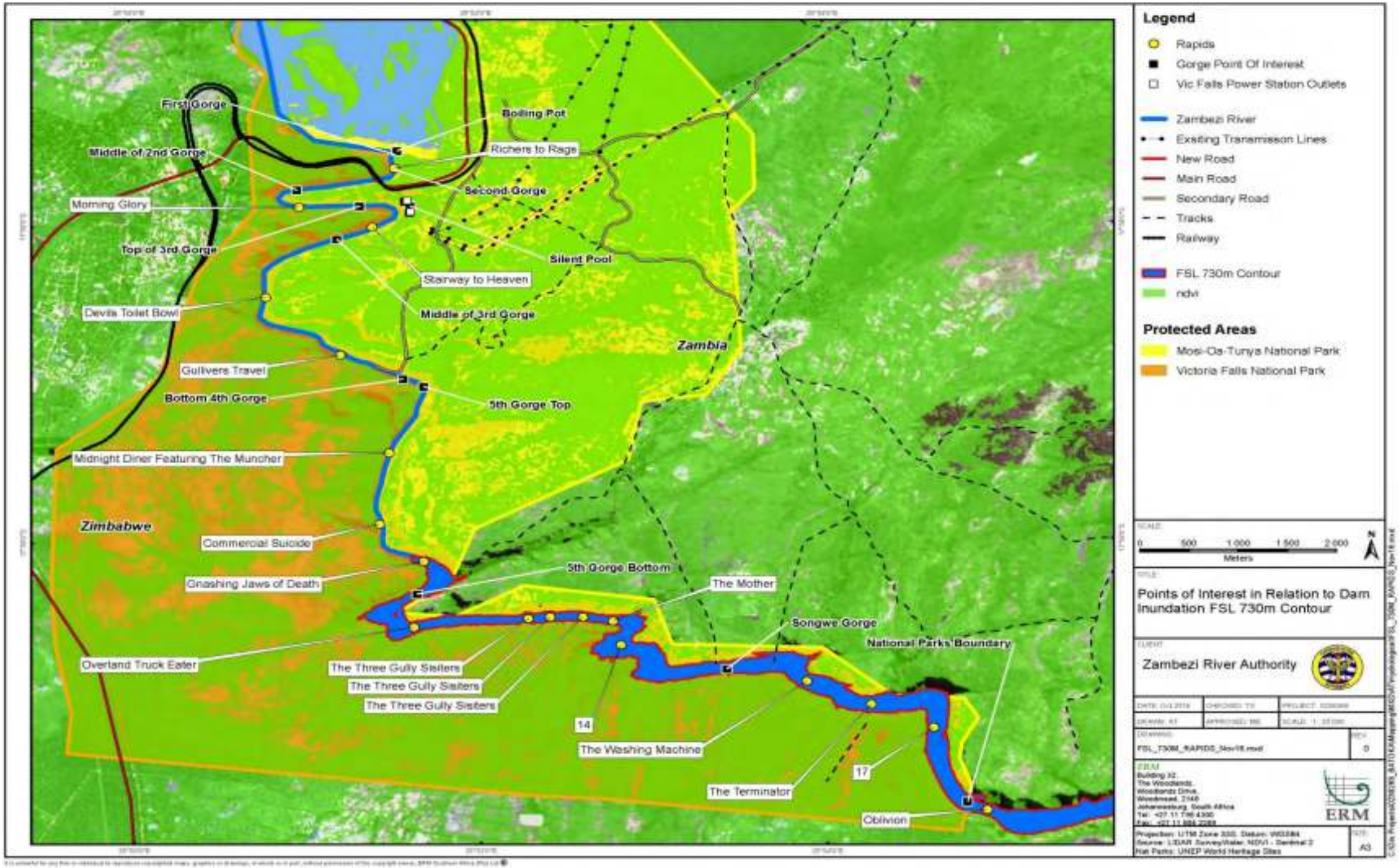
Projection: UTM Zone 35S. Datum: WGS84
Source: LIDAR Survey/Aster. NDVI - Sentinel 2
Nat Parks: UNEP World Heritage Sites
A3



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Zambezi River Authority
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ERM
Projection: UTM Zone 33S, Datum: WGS84
Source: LIDAR Survey/Water, NDVI - Sentinel 2
Nat Parks: UNEP World Heritage Sites
A3

Economic Displacement of Non-river Based Tourism Activities

Baseline

- Other tourism activities in the gorge include birding, angling and hiking
- These activities employ fewer people than the rafting industry, but are nonetheless very popular
- Offered by activity providers as well as Lodges situated along the Gorge
- Activities contribute over US$250 000 annually

Impact Statement

- Inundation of rapids and loss of habitat for river borne insects will reduce numbers of birds and bats in the Gorge. Increased water levels in the Gorge will also remove prime nesting habitat
- Hikers will not be able to hike along the bottom of the Gorge and overnight hiking and camping trips will not be feasible to operate as a result of increased water levels

Impact Significance Rating Before Mitigation	Significance Rating After Mitigation
Major Negative Impact	**Major Negative Impact**

Key management measures

- RAPs and LRPs will be commissioned by the ZRA for those Project components outside of ERM's current scope
- RAPs/LRPs for non-river users, only undertaken at a later stage, inundation of Batoka Gorge is proposed in 2027/2028
- These separate RAPs/LRPs commissioned by the ZRA will be undertaken in accordance with the regulatory requirements of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESS5

Environmental and Social Management Plans

BGHES Management Plans

- The following E&S Management Plans (ESMPs) have been developed for the BGHES:
  - Construction ESMP for the Dam
  - Construction ESMP for Access Roads
  - Construction ESMP for Transmission Lines
  - Operational ESMP
- ESMPs detail the required mitigation measures, identifies specific people or organisations to undertake specific tasks to avoid or reduce impacts during all Project phases
- The compilation of ESMPs has been done prior to the implementation of any activities on site and thus falls within the Planning phase of the Project. Further stages of management including doing, checking and acting are required for the implementation of an effective Environmental and Social Management System (ESMS)

Disclosure of Livelihood Restoration Plans for Staff Townships and Access Road

Livelihood Restoration Plan

To manage the impacts resulting from economic displacement for the staff townships in both Zambia and Zimbabwe and the Access road in Zimbabwe, Livelihood Restoration Plans have been developed as per in country laws and International Best Practise.

Zambia Staff Township

- Land take required for Zambian Staff Township: 489 ha
- **Unpopulated, not suitable for farming**
- **No agricultural fields or residential plots affected**
- Communally held and used
- 210 households from six villages travel through the land and periodically gather timber and non-timber forest products
- Pathways to fishing locations and vegetable gardens
- Designated by Chiefdom as Chibule Grazing Lands
- No graves/cultural heritage identified

Zimbabwe Staff Township

- Land take required for Zimbabwean Staff Township: 705 ha
- **Unpopulated, no impact to agricultural fields or residential plots**
- Communal grazing and collecting natural resources
- 35 households in BH55, Sidakeni and Kasikiri Sub-Villages directly affected
- Access points and footpaths used to access the Zambezi River for fishing

As the BGHES components associated with the LRPs do not require any physical displacement and economic displacement related to agricultural land is minimal, the Project components will not result in those with pre-existing vulnerability to be disproportionately affected.

Zimbabwe Access Road

- Land take for Access Road will impact 241 agricultural fields and 7 residential plots occupied by 210 PAHs
- Average area of affected individual property 0.10 hectares, an average of 5% of entire affected field
- Construction activities along access road may temporarily cause restriction of access to agricultural land
- **No residential structures impacted other**
- Chisuma Primary School water tower, perimeter fence and portions of the nutritional garden are the only communal infrastructure impacted
- no graves/cultural heritage sites impacted

Land Acquisition Progress

Zambia

- Over 2558Ha allocated for the project
- All required approvals obtained , pending is numbering of the land parcels to be followed by letters of offer and then title deeds

Zimbabwe

- Estimated 3000Ha.
- Cabinet approved the excision from communal to urban and SI gazetted
- Next steps include preparation of base maps, concept layouts and for submission to Physical planning department

Next Steps

Next Steps: ESIA

- All comments received in this forum will be included in the ESIA Comment and Response Report
- Stakeholder can submit additional comments and questions to ERM until 25 January 2021 when the ESIA comment period will close
- All comments, together with a response from the Project team will be included in the ESIA Comments and Response Report to be submitted to the Authorities
- The final ESIAs and associated documents will be submitted to both the EMA and ZEMA for review and consideration

Next Steps: Economic and Physical Displacement

- Separate RAPs/LRPs will also be commissioned by ZRA for the following:
  - Displacement (physical and economic) of upstream / downstream water users
  - Displacement (physical and economic) of Project affected peoples in footprints associated with BGHES transmissions lines access road in Zambia quarries and other BGHES associated infrastructure
- Resettlement and livelihood restoration will be undertaken in accordance with the regulatory requirements of the Republic of Zambia and Zimbabwe, and the requirements of IFC PS5 and WB ESF5

Questions and Answer Session

Questions and Answer Session

- Use the Q&A function (bottom tool bar of your screen) to pose questions and comments to the speaker; or
- Raise your hand using the function on your tool bar and the facilitator will take you off mute so that you can comment or ask your question

Thank you

Please feel free to reach out to ERM via email at:

batokagorgehes@erm.com

Annex C8.6.5

Government and UNESCO Virtual Engagement Feedback Session Presentation

BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES) - ZAMBEZI RIVER - ZAMBIA AND ZIMBABWE

Impact of the BGHES on the OUV of the Victoria Falls World Heritage Site

Virtual Feedback Session

21 July 2021

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The business of sustainability

Agenda

1. Introductions
2. Webinar Etiquette
3. ESIA Process and Public Participation Undertaken to Date
4. Project Description and Status
5. Impact of the BGHES on the OUV of the Victoria Falls World Heritage Site
6. Impact of the BGHES on Cultural Heritage Resources
7. Next Steps
8. Question and Answer Session

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- We will record the meeting and share the presentation on the Project website

Introduction

ESIA Process and Public Participation Undertaken to Date

Regulatory Framework

- Three separate draft ESIAs have been prepared for the Project to assess potential **physical**, **biophysical**, and **social impacts** of the Project, and propose measures to mitigate adverse impacts and enhance Project benefits
- ESIAs were prepared under the Zambia and Zimbabwe Environmental Management Acts and associated guidelines
- International environmental and social guidelines and standards applicable to the BGHES, include
  - World Bank Environmental and Social Safeguard Policies
  - The International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012)
  - World Commission on Dams (WCD) Guidelines and Recommendations
  - The International Hydropower Association (IHA) Sustainability Guidelines and Sustainability Assessment Protocols
  - The Southern African Power Pool (SAPP) Environmental and Social Impact Assessment Guidelines for Hydroelectric Projects and Transmission Infrastructure in the SAPP region
  - IUCN World Heritage Advice Note on Environmental Assessment (2013)

ESIA Disclosure

- ESIA Disclosure was disrupted by COVID-19 pandemic – initial engagement planned for March and April 2020 postponed
- ESIA comment period remained open from March 2020 through to 25 January 2021
- Authority and ERM carried out an alternative approach to ESIA Disclosure:
  - Limited in-person engagement in the Project Area – targeted at local authorities and traditional leadership – late November/ early December 2020
  - All stakeholders on Project Stakeholder Database invited to join ZOOM webinars where ESIA findings were disclosed, and stakeholders had the opportunity to ask question/ provide feedback – early December 2020
  - Two focus group discussions were held via ZOOM: tourism/ water users and special interest groups – early December 2020
  - Authority and ERM hosted a series of radio broadcasts on local radio stations to share ESIA findings with communities located around the Project Area – mid-December 2020

Stakeholder Feedback

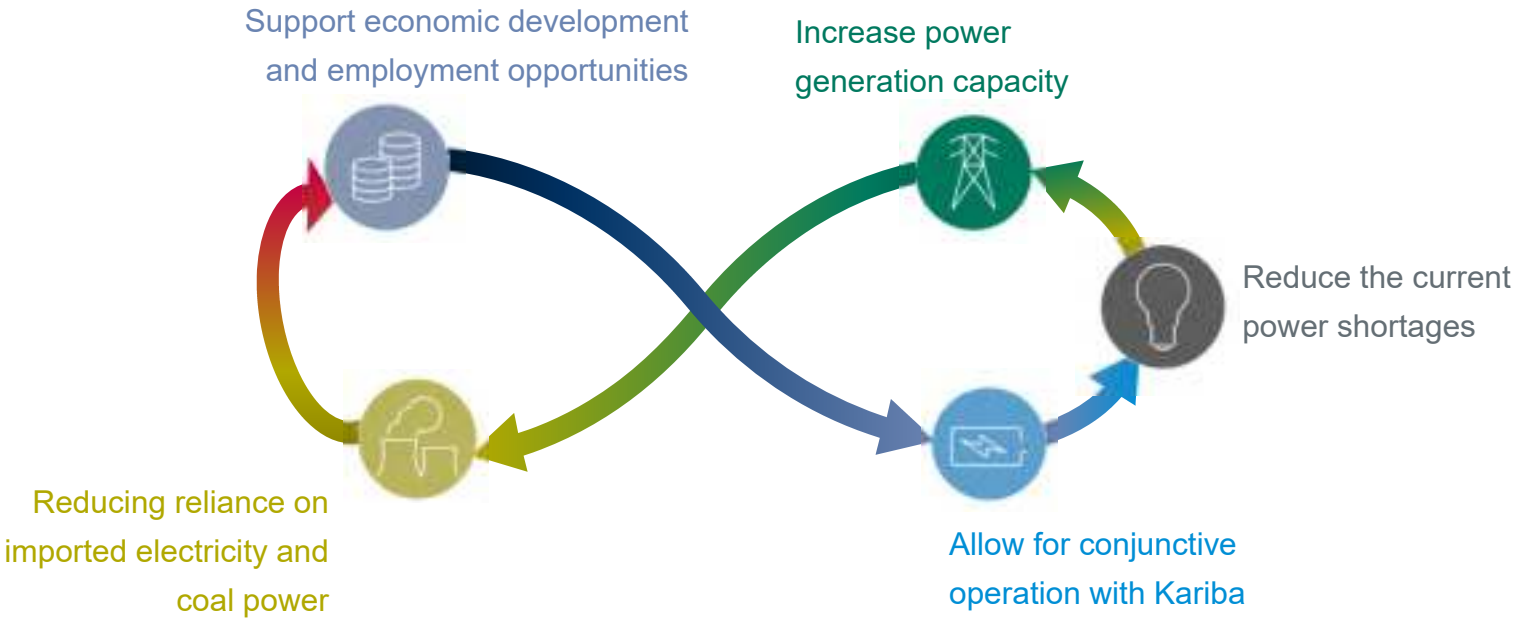
- Local communities are hopeful that the Project will provide employment and procurement opportunities, and many stakeholders welcome the Project
- Economic and physical displacement was a concern, particularly amongst those working in the tourism industry and those located along the proposed transmission lines and roads
- Many stakeholders expressed concern around the impact to river-based tourism – whitewater rafting, nature walks, jet boating. As well as the knock-on effects this might have on tourism in the area
- Stakeholders raised queries around potential impacts to the UNESCO World Heritage Site (Mosi-oa-Tunya World Heritage Site)
- Some stakeholders raised concern about the impact the Project may have on biodiversity in the Batoka Gorge – Taita Falcon, downstream ecology; and the potential impact of the transmission lines on large birds

Project Description

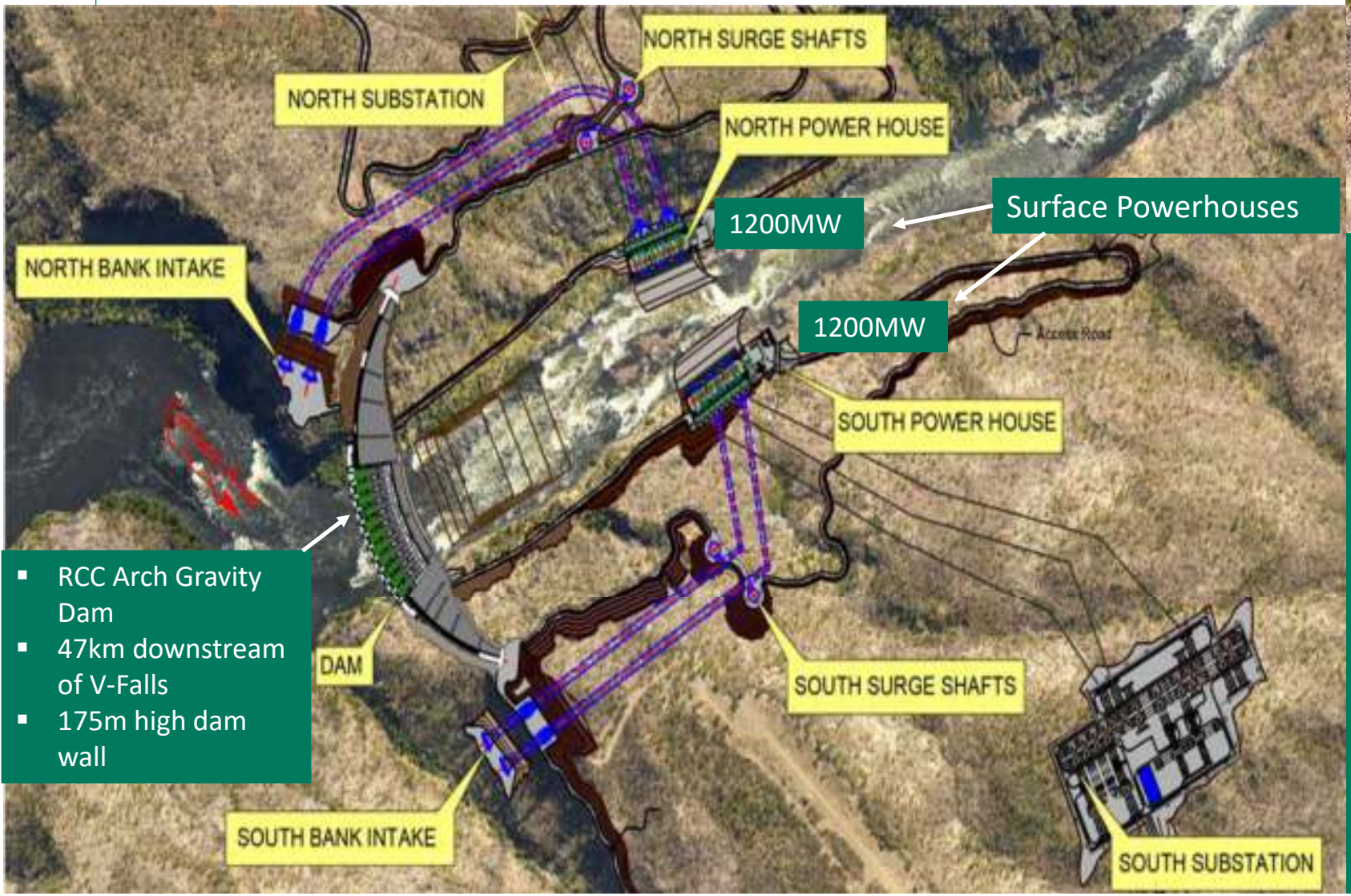
Need for the Project

The Zambezi River has a vast hydropower energy potential. Hydropower is considered the most feasible and reasonable electrification option for both countries

BGHES would contribute significantly to electricity supply of Zambia and Zimbabwe, and to distribute power to southern African countries under the Southern African Power Pool (SAPP). The Project will aim to:



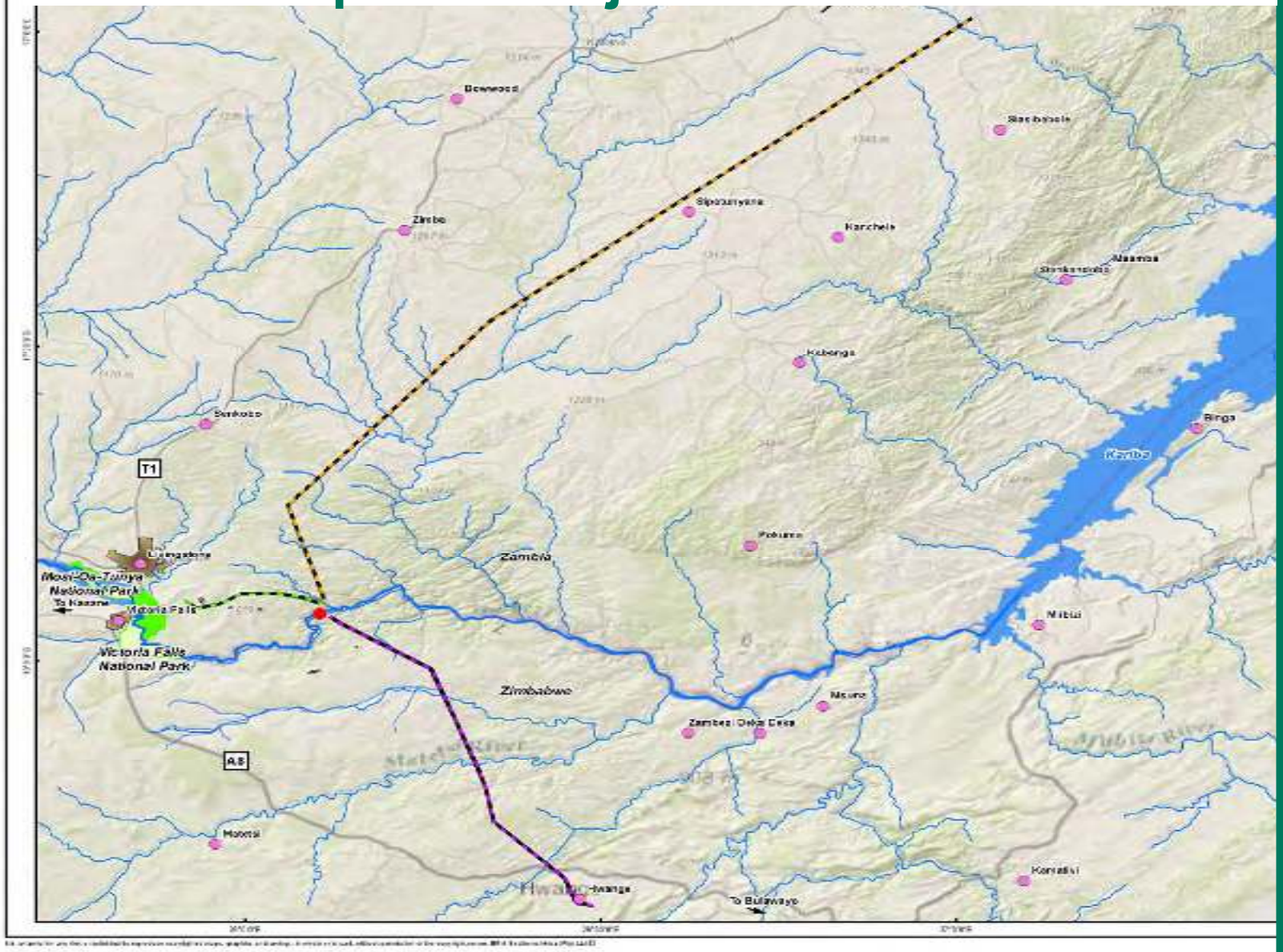
BGHES Proposed Scheme Layout



- RCC Arch Gravity Dam
- 47km downstream of V-Falls
- 175m high dam wall

- Roller Compacted Concrete Arch Gravity Dam Wall and impound area (reservoir)
- Spillway
- Pressure waterways, located in the abutments
- Two surface power houses, one on each side of the river, located on the abutments and two switchyards
- Project townships (in both Zambia and Zimbabwe) and other ancillary infrastructure (such as quarries, spoils area and batching areas)
- Access roads on each side

BGHES Proposed Project Transmission Lines



Three transmission line routes are proposed as part of the BGHES Project:

Zambia

- Mukuni 300 kV transmission line - approximately 22 km (from proposed BGHES substation on north bank to newly constructed 330 kV Mukuni ZESCO substation in Livingstone)
- Muzuma 300 kV transmission line - approximately 152 km (from proposed BGHES substation on north bank to Muzuma substation in Choma)

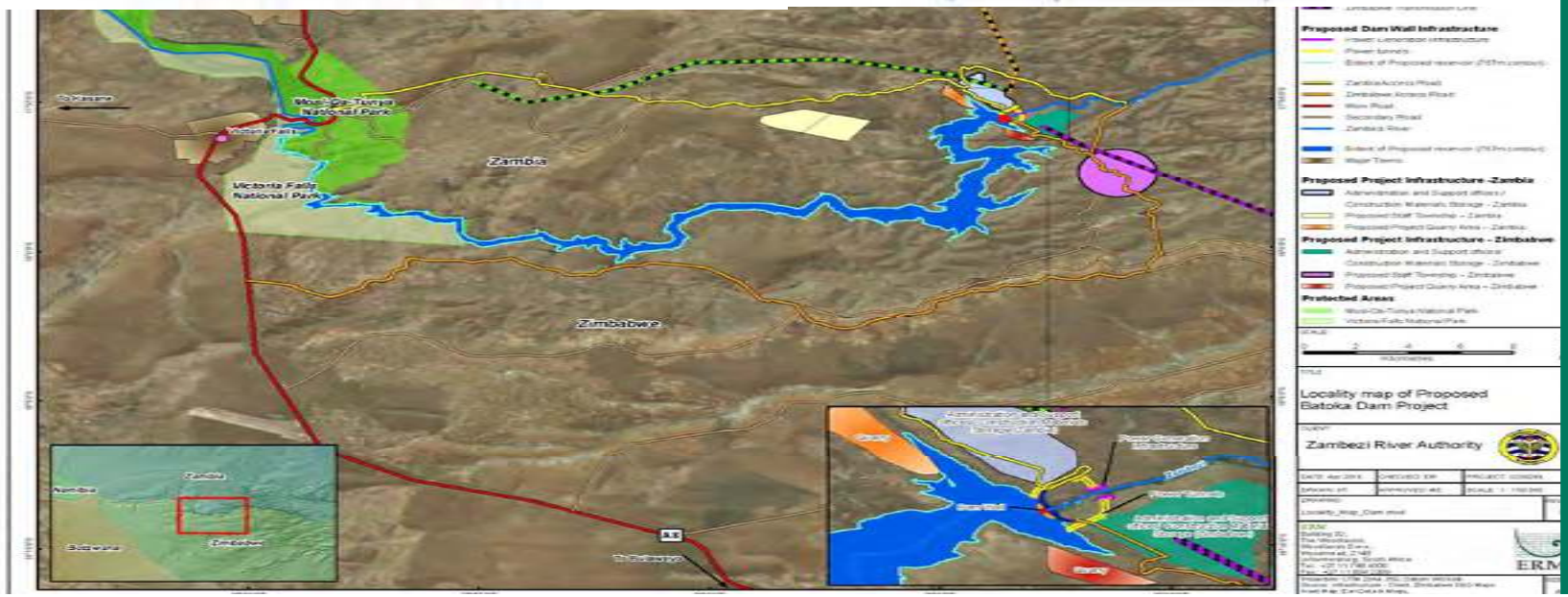
Zimbabwe

- Hwange 400 kV transmission line - approximately 67 km (from the proposed BGHES substation on south bank to the proposed Hwange 400/330kV substation)

BGHES Proposed Access Road & Staff Townships

Figure 5-1: Proposed Northern Township Plan

Figure 5-2: Proposed Southern Township Plan



Access Road

Overall access road length is 35 km on the Zambian side and 53 km on the Zimbabwe side

Staff Townships - There are two proposed Townships on the North bank and South bank

Land Acquisition Progress

Zambia (over 2558Ha allocated for the project)

- Presidential consent in respect to larger parcel of land (dam and power station land). Invitation to treaty issued for other pieces.

Zimbabwe (applied for about 3000Ha however a total of 1170ha has been allocated)

- Surveyor to be appointed to carryout title surveys for the land.

BGHES Preparatory Studies and Advisors

- **Engineering Feasibility Studies (EFS) – Studio Pietrangeli (SP), Italy**
  - Updating of the 1992/3 BJVC Feasibility studies, completed in December 2019

- **PWC - Legal and Financial Transaction Advisory (LFTA) Services**
  - Legal and Financial Transaction advisory services

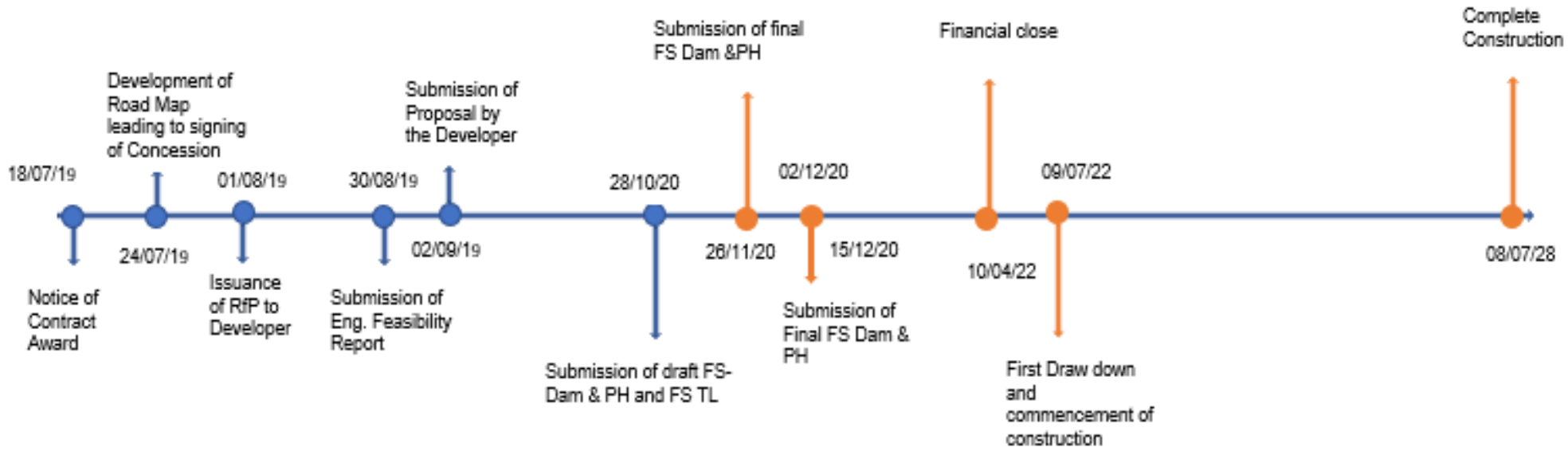
- **Environmental and Social Impact Assessment (ESIA) studies - ERM SA**
  - Draft ESIA & ESMP reports completed and ESIA Publicly disclosed from Nov - Dec 2020
  - Updating ESIA report for submission to the Regulatory Authorities in the 3rd quarter.

- **Technical Advisor - SMEC**
  - Provision of Technical Advisory services to the Authority before project construction

PROGRESS WITH THE CONSORTIUM

- Submitted two proposals : RfP based and an alternative proposal
- Proposes some changes on the Dam type and PH locations
- No changes to the dam height
- ZRA engaging the consortium to ensure proposed changes do not pose material deviations to current ESIA findings
- Consortium requested to carry out additional studies aimed at justifying their proposal and ensuring environmental and social protection

BGHES Project Timeline



- Schedule currently being updated to account for covid 19 instigated delays

Specialist Studies undertaken as Part of the Overall ESIA

Specialist Studies Undertaken

- Biodiversity (terrestrial and aquatic) – ERM
  - Avifauna (Taita Falcons) Zimbabwe National Parks and Wildlife Management and Zambian Wildlife Authority
- Climate Change (risk review) – ERM
- Cultural Heritage and Archaeology – Mr. R. Burrett (Zimbabwe) & Mr. Richard Mbewe (Zambia)
- Economic Cost-benefit Analysis – Stratecon
- Greenhouse Gas Emissions Assessment – ERM
- Livelihood Restoration – ERM
- Socio-economic and Health Assessment - ERM
- Tourism – Anchor Environmental
- Water Resource Studies (water quality and environmental flows) – Southern Waters and ERM

Impact on Outstanding Universal Value

Andrew Cauldwell

Summary of OUV for the Mosi-oa-Tunya / Victoria Falls WHS

Brief Synthesis

- The WHS is significant worldwide for its geomorphological features and active land formation processes with outstanding beauty attributed to the falls.
- The transboundary property (greater than 6,860 ha) includes the National Parks in both Zambia and Zimbabwe.

Criterion (vii)

- The largest curtain of falling water in the world.
- Gorges and islands serve as breeding sites for endangered (EN) and migratory bird species.
- The riverine 'rainforest' within the waterfall splash zone is a fragile ecosystem.

Criterion (viii)

- The gorges are an outstanding example of river capture and the continuing erosive forces of water.
  - Previous Fall locations in the gorges are seen, with a new location developing.
- Upstream islands formed through ongoing geomorphological processes.
- Geology supports artefacts of *Homo habilis* and Stone Age hunter gatherers.

Integrity, Protection and Management

- The transboundary property is relatively intact, defined, buffered and protected under legislation of both Zambia and Zimbabwe, and is a recognised IBA.
- A Joint Integrated Management Plan (JIMP) is prepared, approved and implemented in a participatory manner.
- The Falls are a major tourism attraction that needs to be carefully managed to maintain integrity and protect these OUV.

Overview of Impacts and Alternative Options

Impact

- The BGHES Dam site will be located in the Batoka Gorge 47 km downstream of the Falls.
- The Primary impact to the WHS will occur through flooding of some Gorges. There will be no other infrastructure development affecting the WHS property.

Alternatives

- The ESIA discusses other power generation alternatives.
- This presentation is concerned with hydropower opportunities within the Batoka Gorge.

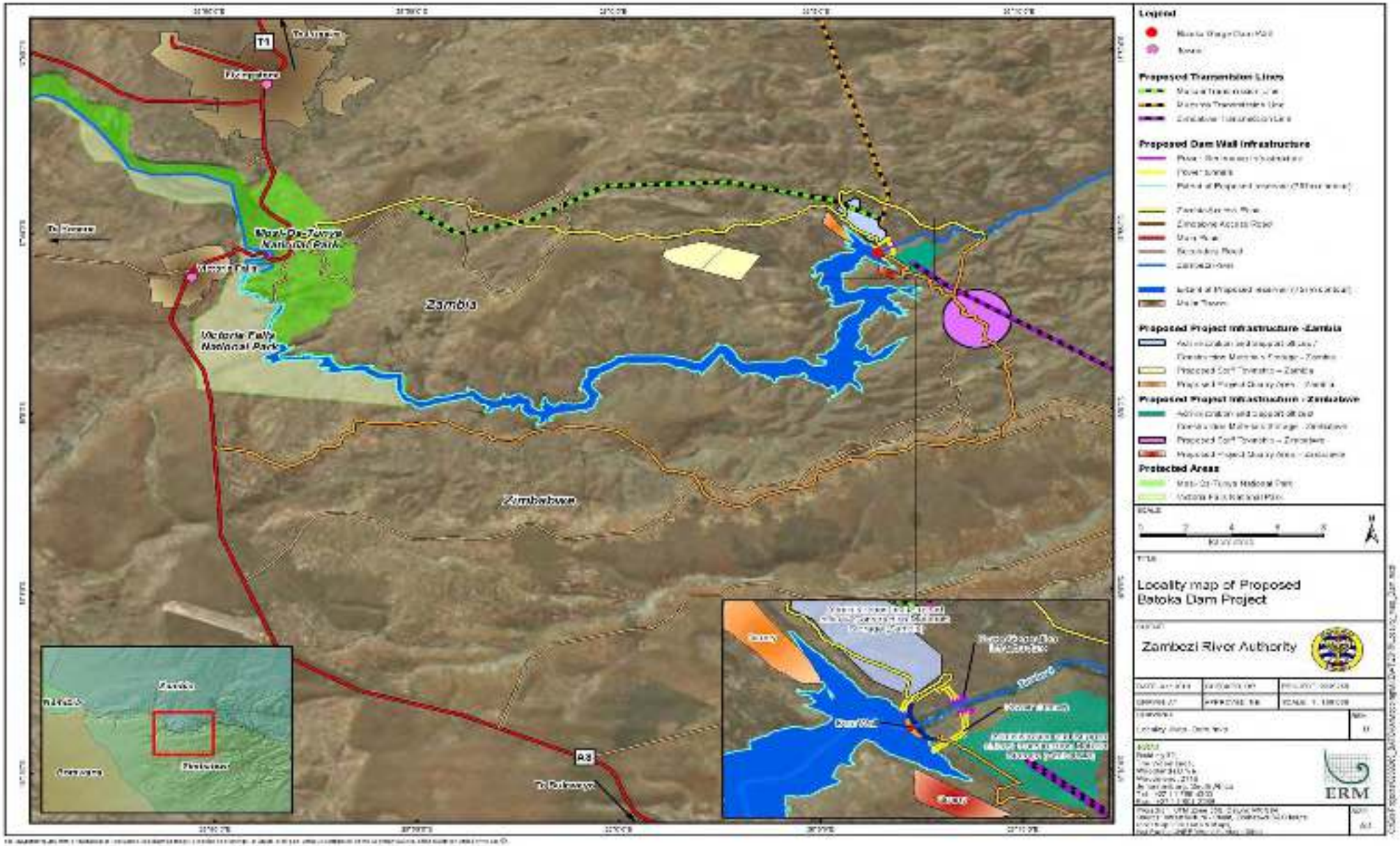
Dam Location Alternatives

- Locations above the selected site were rejected due to high impacts to the WHS.
- Other downstream locations require a larger reservoir (i.e. greater impact), more expensive to build and would jeopardize future hydropower development of Devil's Gorge site.

Dam Height Alternatives

The following Full Supply Levels (FSL) were assessed:

- 800 masl – reservoir would reach the Falls, so was rejected
- 762 masl – reservoir reaches mid-point of Third Gorge
- 757 masl – reaches mid-point of Fourth Gorge - selected option
- 740 masl – reaches mid-point of Fifth Gorge
- Seasonal (dry season: Aug-Jan) drop FSL to 730 masl - reservoir reaches bottom of the Fifth Gorge - selected option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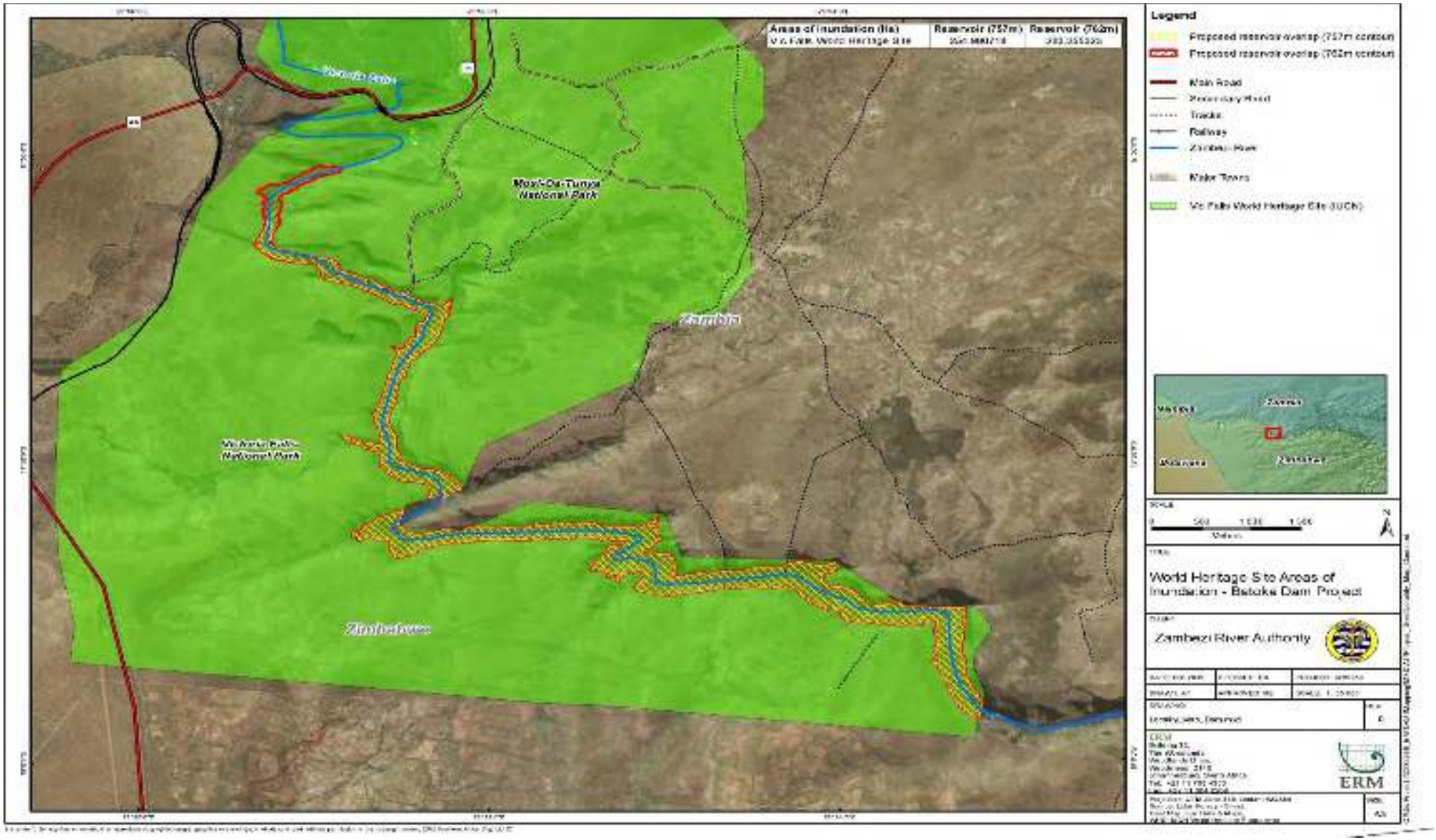
Proposed Transmission Lines
Proposed Dam Wall Infrastructure
Proposed Project Infrastructure - Zambia
Proposed Project Infrastructure - Zimbabwe
Protected Areas
Zambia
Zimbabwe
Victoria Falls National Park
Mosi-Oa-Tunya National Park
T1
R3
Locality map of Proposed Batoka Dam Project
Zambezi River Authority
ERM

Predicted Extent of Inundation of the Batoka Gorge within the Mosi-oa-Tunya Victoria Falls World Heritage Site



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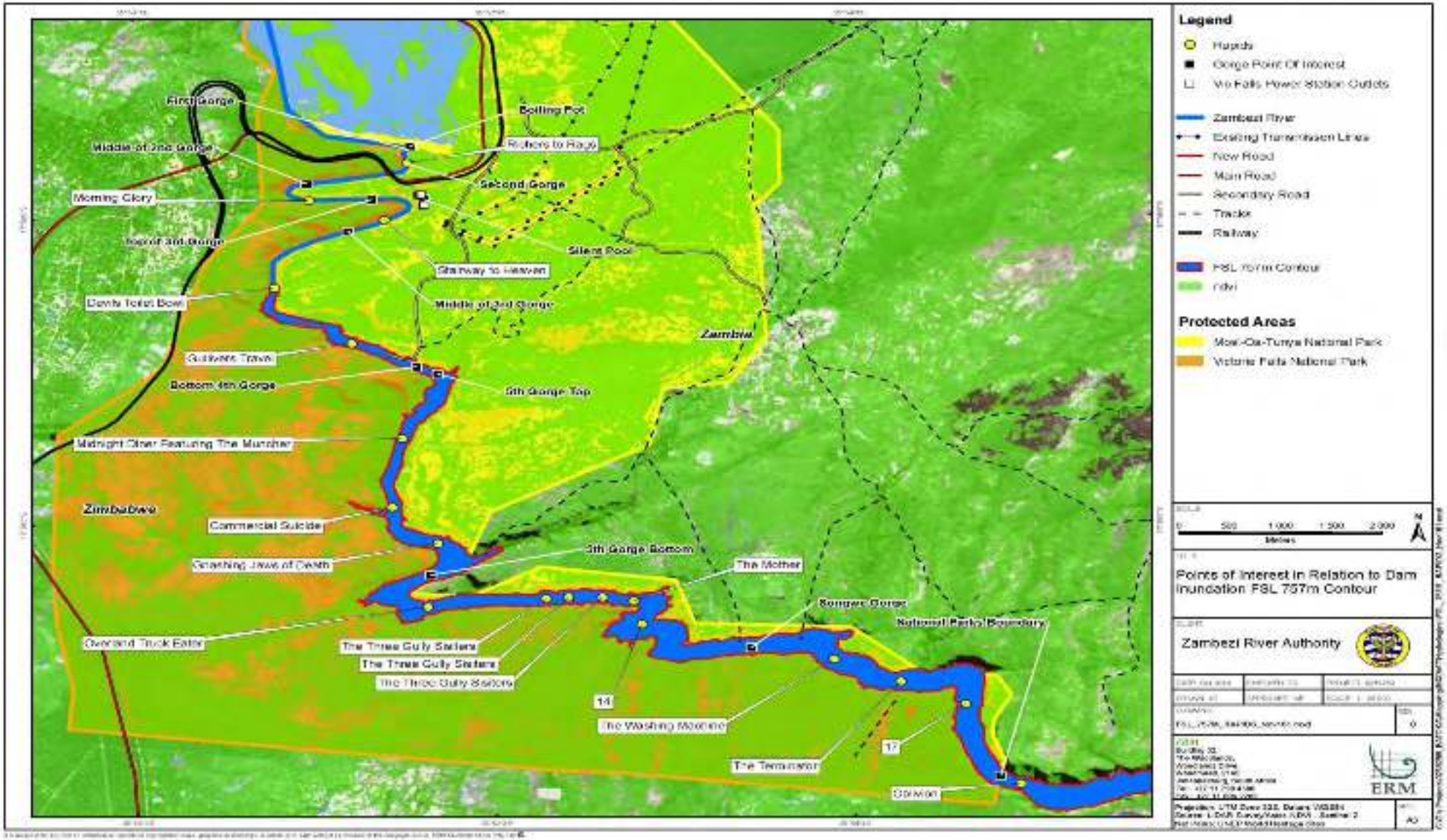

Assessment of the Impact to OUV

Bird pictures from The Cornell Lab of Ornithology

Impacts to Birds (OUV Criteria vii)

Taita Falcons (IUCN Red List: Vulnerable)

- Gorges support the largest known breeding population.
- Population size and key ecological functions of Taita Falcon are unknown, with lower parts of the Batoka Gorge not yet surveyed.
- The Taita Falcon population has declined, which may be due to an increase in Lanner Falcons (due to changing surrounding land use) and tourism-helicopter activity.
- Nesting sites will not be affected but their food chain may be disrupted *(Taita Falcons are thought to feed on swifts that feed on midges that emerge from the rapids)*.
- Seasonal dropping of the FSL will be applied, but the aquatic ecology of the river is unlikely to restore sufficiently within a season to re-establish swift populations to provide sufficient prey for the falcons.

Other Bird Species

- Batoka Gorge is additionally recognized as an IBA for many raptors such as vultures, Black Eagles, Crowned Eagles and Bat Hawk, also Black Storks.
  - Crowned Eagles (NT) nest and forage in the riparian habitat which will be lost.
  - Bat Hawks (LC) may be similarly affected by disrupted food chain caused by loss of rapids.
  - Other raptor and stork species will be less affected.
- Rock Pratincole (intra-African migrant) use emergent rocks as foraging and breeding habitat and occur as a significant population. Lost habitat will lead to significant decline of the species and may cause their threatened status to be uplisted by the IUCN Red List (currently Least Concern).

Assessment of the Impact to OUV

Impacts to Erosive Forces

- The ongoing erosive force of water within six of the eight gorges will be lost once these are inundated but will vary with the planned FSL fluctuations.
- Eroded material will gradually accumulate in the top end of the various FSLs, but the volumes of eroded rock are not defined.
- There is confidence this impact will occur, but it is not possible to define the magnitude or timescale of this impact.

Impacts to WHS Integrity, Protection and Management

- The Gorges are located within the highest ecologically sensitive zone described by the JIMP, and the zonation plan states there will be no infrastructure development within this Zone.
- White-water rafting is a popular tourist sport that generates income to the two national parks.
  - Combined revenue generated from entry fees to both national parks is estimated at approx. USD 0.5 million per annum. Other income streams will also be affected (e.g. rafters license fees etc).
  - National parks income is used to sustain management of the WHS but is also remitted to central Governments. Loss of revenue could have a knock-on affect to conservation activities across Zambia and Zimbabwe.
- An infestation of floating invasive weeds is likely to occur.

Summary and Significance of the Impact to OUV

Summary of OUV Impacts

- Impact to birds (Criterion vii): Large concern but unquantified as baseline data is deficient.
- Impact to erosive forces of water (Criterion viii): Confidence in the impact but magnitude and timescale of the impact are not quantified.
- Impact to WHS Integrity, Protection and Management: Quantified loss of future income and a likely threat of invasive species infestation.

Impact Magnitude	Large
Sensitivity of receptor (WHS)	High Sensitivity
Impact Significance	**Major Negative Impact**

Proposed Mitigation

1. The ESIA requires that parts of the Batoka Gorge habitat not impacted by inundation (i.e. the rim, cliffs and scree slopes that will be maintained as no go zones) be managed as a protected area.
2. The ESIA recommends a comprehensive Taita Falcon survey be conducted to understand and mitigate the impact. ZRA have committed to do this.
3. The ESIA recommends an investigation be conducted into the feasibility of establishing an offset. ZRA have committed to conduct such an investigation.
   - This correlates with a recommendation given by an UNESCO-appointed panel of experts in 2016.
4. The ESIA presents mitigation to address the displacement of tourism.
5. In addition, an annual budget support package is to be provided to Zimbabwe Parks & Wildlife Mgmt. Authority and the Zambian Dept. of National Parks & Wildlife to compensate their future loss of revenue.
6. Preparedness needs to be put in place to manage a likely infestation of invasive alien species.

Residual Impact:

- Until offsetting can be addressed, the significance of the residual impact to OUV remains as a **Major Negative Impact**.

Impact on Cultural Heritage Resources

Lindsey Bungartz

Impacts to Cultural Heritage Resources

- 170 sites have been identified on either side of the Zambezi River.
- Majority of sites recorded date from the Stone Age, in particular the Middle Stone Age (MSA) and Later Stone Age (LSA).
- Most of the Stone Age sites are located in the open basalt plains and low ridges.
- No diagnostic Early Stone Age (ESA) artefacts have been recorded during recent surveys.
- Majority of sites are not of high heritage significance with the exception of 2 intangible sites (Site 94 and 95) of medium to high significance, which fall in the area of inundation.

Impacts to Cultural Heritage Resources

Chemapato Hill

- R equires special and specific management because of importance and the fragile nature of the remains on this site
- This will be based on further consultation with local communities, with a focus on Toka-Leya groups - believed to have been historically the most important group associated with the Hill's ritual use.

Whole Pots Located on Chemapato Hill

Chemapato Hill from the South

Impacts to Cultural Heritage Resources

- Additional pre-construction surveys will be carried out among the affected local communities to identify sites of intangible significance that may disturbed by the Project.
- Where possible, construction designs will be adapted in order to avoid unnecessary impacts on sites on intangible significance.
- Where impacts on sites on intangible value cannot be avoided, memoranda of understanding will be agreed with affected local communities setting out procedures for the relocation of graves.
- Where appropriate, compensation for the loss of sites on intangible/ritual significance.
- The Project will implement a chance finds procedure during construction.

Environmental and Social Management Plans

BGHES Management Plans

- The following E&S Management Plans (ESMPs) have been developed for the BGHES:
  - Construction ESMP for the Dam
  - Construction ESMP for Access Roads
  - Construction ESMP for Transmission Lines
  - Operational ESMP
- ESMPs detail the required mitigation measures, identifies specific people or organisations to undertake specific tasks to avoid or reduce impacts during all Project phases
- The compilation of ESMPs has been done prior to the implementation of any activities on site and thus falls within the Planning phase of the Project. Further stages of management including doing, checking and acting are required for the implementation of an effective Environmental and Social Management System (ESMS)

Next Steps

Next Steps: ESIA

- All comments received in this virtual feedback forum will be included in the ESIA Comment and Response Report
- All comments, together with a response from the Project team will be included in the ESIA Comments and Response Report to be submitted to the Authorities (EMA and ZEMA)
- The final ESIAs and associated documents will be submitted to both the EMA and ZEMA for review and consideration

Question and Answer Session

Questions and Answer Session

- Use the chat function to pose questions and comments to the speaker; or
- Raise your hand using the function on your tool bar and the facilitator will take you off mute so that you can comment or ask your question

Thank you

Please feel free to reach out to ERM via email at:

batokagorgehes@erm.com

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Annex C8.6.6

UNESCO Focus Group Discussion Presentation

BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES) - ZAMBEZI RIVER - ZAMBIA AND ZIMBABWE

Impact of the BGHES on the OUV of the Victoria Falls World Heritage Site

Focus Group Discussion

03 September 2021

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The business of sustainability

Agenda

1. Introductions
2. Focus Group Discussion (FGD) Etiquette
3. Impact of the BGHES on the OUV of the Victoria Falls World Heritage Site
4. Key comments / queries raised during the virtual feedback session held on 21 July 2021
5. FGD Session
6. Next Steps

Introduction

FGD Etiquette

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Criterion (vii)

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Overview of Impacts and Alternative Options

Impact

- The BGHES Dam site will be located in the Batoka Gorge 47 km downstream of the Falls.
- The Primary impact to the WHS will occur through flooding of some Gorges. There will be no other infrastructure development affecting the WHS property.
- ***The chosen design will not flood the Victoria Falls***.
- ***The affected area is downstream of the Victoria Falls and the extent of the inundation is limited by the chosen dam height and the adopted reservoir operating rules***.

Alternatives

- The ESIA discusses other power generation alternatives.
- This presentation is concerned with hydropower opportunities within the Batoka Gorge.

Dam Location Alternatives

- Locations above the selected site were rejected due to high impacts to the WHS.
- Other downstream locations require a larger reservoir (i.e. greater impact), more expensive to build and would jeopardize future hydropower development of Devil's Gorge site.

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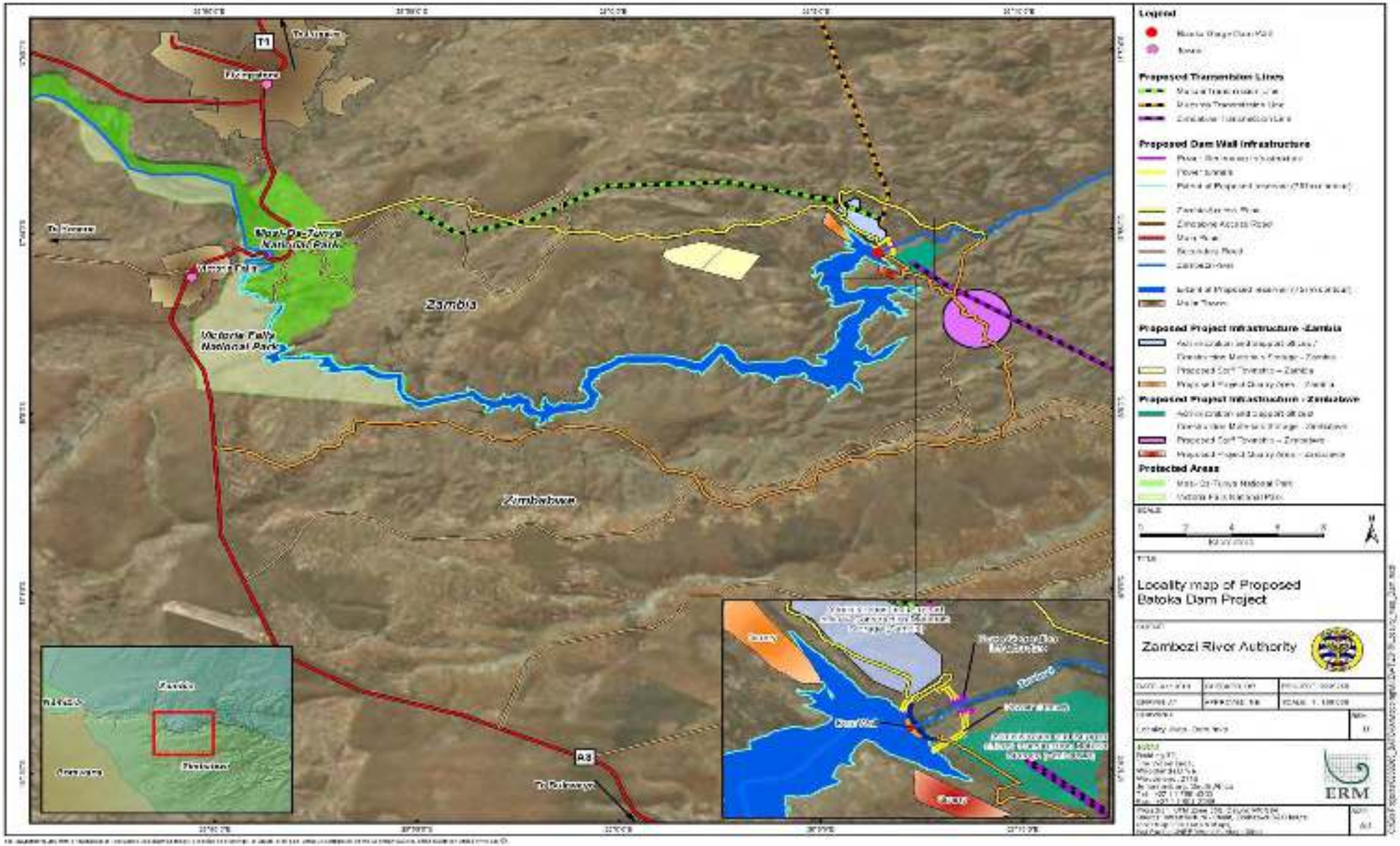
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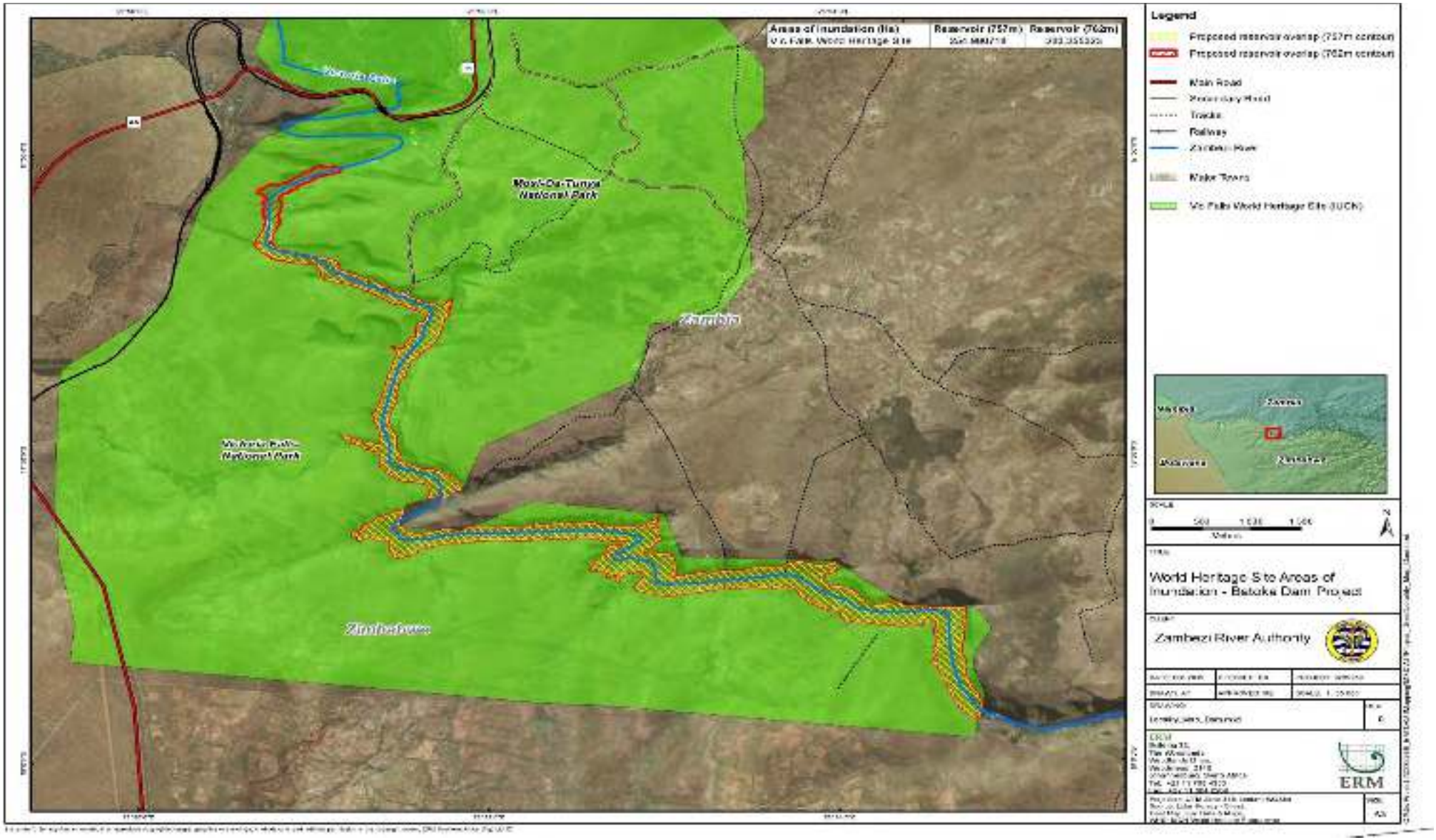

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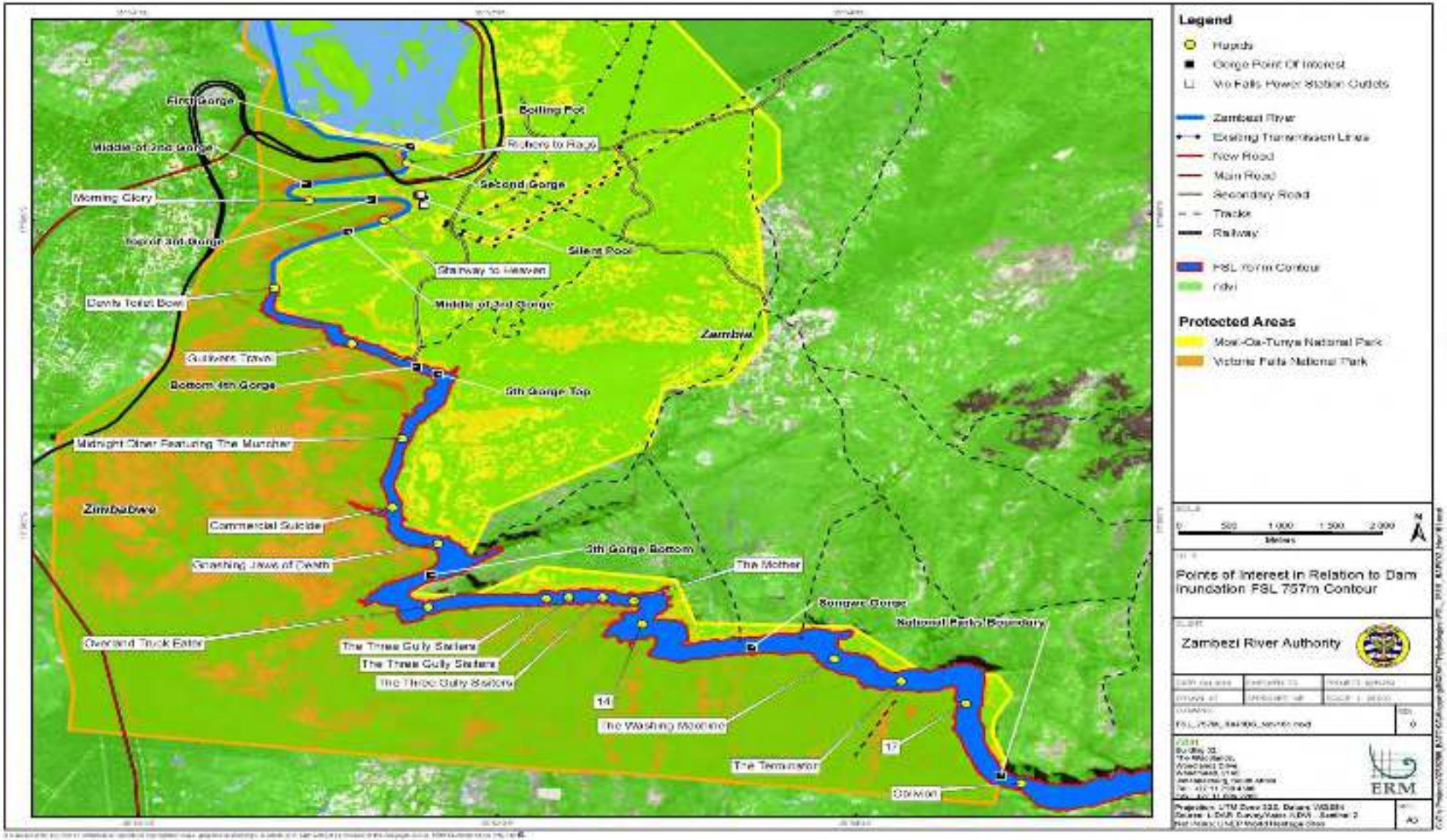

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Summary and Significance of the Impact to OUV

Summary of OUV Impacts

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1. The ESIA requires that parts of the Batoka Gorge habitat not impacted by inundation (i.e. the rim, cliffs and scree slopes that will be maintained as no go zones) be managed as a protected area.
2. The ESIA recommends a comprehensive Taita Falcon survey be conducted to understand and mitigate the impact. ZRA have committed to do this.
3. The ESIA recommends an investigation be conducted into the feasibility of establishing an offset. ZRA have committed to conduct such an investigation.
   - This correlates with a recommendation given by an UNESCO-appointed panel of experts in 2016.
4. The ESIA presents mitigation to address the displacement of tourism.
5. In addition, an annual budget support package is to be provided to Zimbabwe Parks & Wildlife Mgmt. Authority and the Zambian Dept. of National Parks & Wildlife to compensate their future loss of revenue.
6. Preparedness needs to be put in place to manage a likely infestation of invasive alien species.

Residual Impact:

- Until offsetting can be addressed, the significance of the residual impact to OUV remains as a **Major Negative Impact**.

Key Comments / Queries Raised during the Virtual Feedback Session

Lindsey Bungartz

Key Comments / Queries Raised

- The assessment of impacts to OUV follows the sequence of OUV provided by UNESCO, however a point was raised that the approach places too much emphasis on the impacts to avifauna.
- It was agreed that UNESCO should be consulted (i.e. – this FGD) on how a ranking of OUV values can be applied, and whether UNESCO has a preferred approach / methodology for this.
- The Zambian and Zimbabwean UNESCO Commissions are concerned that UNESCO may reject the ESIA in it's current form, as there appear to be gaps in the findings, particularly relating to potential impacts to avifauna and the feasibility of offsetting impacts to an OUV.
- There is a sentiment that the OUV impact assessment should not be presented to UNESCO in it's current format and that it should be repackaged.

FGD Session

Lindsey Bungartz

Next Steps

Lindsey Bungartz

Next Steps: ESIA

- All comments queries raised during the FGD session will be included in the ESIA Comment and Response Report
- All comments, together with a response from the Project team will be included in the ESIA Comments and Response Report to be submitted to the Authorities (EMA and ZEMA)
- The ESIA and associated documents will be finalised and submitted to both the EMA and ZEMA for review and consideration

Thank you

Please feel free to reach out to ERM via email at:

batokagorgehes@erm.com

The business of sustainability

ERM

Annex C (8.7)

Meeting Minutes

Annex C8.7.1

Open House Engagement Minutes

PLEASE ACCESS WEBINAR RECORDING ON THE PROJECT WEBSITE: https://www.erm.com/bghes-esia

Annex C8.7.2

Water Users Focus Group Engagement Minutes

PLEASE ACCESS WEBINAR RECORDING ON THE PROJECT WEBSITE: https://www.erm.com/bghes-esia

Annex C8.7.3

Special Interest Focus Group Engagement Minutes

PLEASE ACCESS WEBINAR RECORDING ON THE PROJECT WEBSITE: https://www.erm.com/bghes-esia

Annex C8.7.4

Key Government Stakeholder Engagement Minutes

PLEASE ACCESS WEBINAR RECORDING ON THE PROJECT WEBSITE: https://www.erm.com/bghes-esia

Annex C8.7.5

Zambia Physical Meeting Minutes

BGHES ESIA Disclosure Field Trip

22nd to 28th November, 2020

By Felix Chisha K.

22nd November 2020

Lusaka to Livingstone Road Trip

I started off from Lusaka by road at 09:00hrs and arrived in Livingstone around 20:45hrs. Before getting to Livingstone I had to link up with the ZESCO and ZRA teams and together went to see HRH Chief Simwatachela before reaching Livingstone.

We met HRH Simwatachela at his village residence. Our meeting commenced at 16:38hrs. Mr. Avitol (BGHES Project Manager) straight away went into the details after the introductions.

He informed the chief that his chiefdom will mostly be affected by the construction of the new parallel power line next to the already existing ZESCO power line. The chief later clarified that actually his chiefdom is not affected by the power line, but instead it will seriously be affected by activities on the river since his chiefdom is part of the downstream users.

Mr. Avitol went ahead and explained that everything will be done to minimize and/or avoid displacement of locals and should this be unavoidable a RAP will be implemented for those directly affected. Communities that will be negatively affected may be compensated through CSR. This option is still being considered. He also informed the chief that most agricultural activities will not be interrupted and chances are that those whose cultivate close to the power lines will most likely continue since ZESCO is not very strict on this for as long as the servitude is observed.

Mr. Avitol also informed the chief that a 'run-of-the-river' method may be done and this is an attempt to minimize adverse impacts on river users and the environment.

The chief was also informed that both Zambia and Zimbabwe have appointed a Chinese developer for the project and he will be supported by General Electric. They are currently conducting their pre-development studies.

By January or February ZRA will have to enter into negotiations with the developer to come up with a win-win agreement. By the end of next year (2021) or start of the following year (2022) we should be ready to commence project construction.

The chief was advised to emulate one chief of Zimbabwe to identify local skills so that they too can benefit through available jobs. It will be beneficial to the locals if the chiefdom came up with a skills database.

The chief was invited to submit comments, contributions and also ask questions.

The chief wanted to know when the radio engagements will be done. He said after consulting his locals it was obvious that this will be a waste of time and resources as his affected villagers don't even have access to local radio stations.

In response, Mr. Avitol informed the chief that there have been some challenges and the organisation is doing its best to interact with the affected people.

The chief informed the meeting that only nine (9) of his villages will be affected. He will give us the names later. Mr. Avitol asked the chief to help us reach the village headmen of these people and he pledged to help us any time we called upon him. Mr. Avitol left the option open and told the chief that we may see them during this visit if we adjust our programme accordingly but we are not promising.

The chief also raised concerns regarding how hard it is to reach the nine (9) villages. He said it is easier (but longer) to access them through the Batoka town access road. He offered to accompany us when that time comes and advised that we will have to lodge in Choma town. Mr. Avitol told the chief that he will be timely advised later.

The meeting ended slightly after 17:00hrs but it was raining heavily we had to wait for a while for the rains to subside.

I reached the lodge at exactly 21:00hrs.

23rd November 2020

Mukuni Chiefdom/Kazungula Council Meetings

Started the day by trying to collect posters and other documents from the Zimbabwe border sent by ERM SA. After collecting the documents went straight to HRH chief Mukuni's palace but we did not find him despite having made an appointment through the prime minister. I texted him for permission to proceed and he responded in the affirmative.

We went and held a meeting at Ng'andu village at the meeting tree. The meeting was well attended and after a project update by Mr. Avitol, the main complaint the locals had was the treatment they get from Chinese contractors who don't seem to observe labour laws and abuse workers. There was also a question of why in most such cases locals don't benefit through getting employment but instead people from outside come to get those jobs. The other main concern was the overspeeding car that may cause accidents and deaths. They requested that locals be employed to regulate traffic.

In response regarding mistreatment of locals it was mentioned that systems will be put in place and grievance offices will be set up so that locals can register their grievances and appropriate remedial measures will be done. On the part of locals not benefitting from such projects, it was mentioned that everything is being done to prioritise locals, but however, it was the locals' responsibility that they position themselves to benefit by ensuring that they keep themselves informed of the project. The locals were also made aware that this is a huge project that covers many chiefdoms both in Zambia and Zimbabwe and they all expect to benefit, and this in itself means that it is not everyone in this village that will be employed.

The locals also wanted to know when they will be engaged through radio as earlier announced. In response they were informed that due to the challenges posed by covid 19, plans to engage them via radio are still there and they will be made aware of the position of that very soon.

There was a question of lack of health centres nearby, the only health centre being located in Mukuni village. In response they were informed that CSR will be used to identify the needs of locals and decisions will be made based on what the communities need. They were also advised not to expect all their needs to be addressed.

There was an appeal to involve traditional leaders (headmen) to update locals on project updates and in response they were informed that all affected locals are informed and consulted in a timely manner.

There was a complaint that currently those working for the contractors conducting pre-development studies at the gorge are not allowed to attend funerals. In response they were informed that it could be as a result of observing covid-19 conditions, but it will be looked into. The locals confirmed that they have noticed a lot of developments going on at the gorge.

The meeting ended at 12:45hrs and we headed to Kazungula for a scheduled meeting with the town council.

Kazungula Town Council Meeting

The meeting started at 15:30hrs.

ZRA gave an update on where the project is and invited the local authority to take a keen interest in the activities considering that the project is in their district.

We were informed that most of the land in Kazungula is still traditional land and it would be prudent to involve HRH chief Mukuni. We confirmed full consultation and encouraging feedback from the chief who.

The acting council secretary Mrs. Lombe Bangili Mwanakanandi informed us that Kazungula being a new upcoming council is currently undergoing a transitional period and it has been challenging as people are being transferred to other areas and moved around. Because of this, it was apparent that the council has not taken time to study the ESIAs that were delivered to them in 2nd March 2020. The council promised to find time to review the documents and also submit comments before the deadline some time in January next year.

ZRA encouraged the council to take keen interest in this project since some activities will be managed by them being the local council. The council was invited to take a tour of the project area to fully appreciate the project. ZRA also informed the council that HRH chief Mukuni is fully supportive and wants to see this project completed, he has even allocated big portions of land to the project.

Kazungula council committed themselves to review all documents and mentioned that they are looking forward to working with us and develop Kazungula district.

The meeting did not take long, it ended within 30 minutes (16:00hrs).

24th November 2020

Katapazi Village Meeting – Mukuni Chiefdom

The trip to Katapazi was very challenging due to bad patches of the road couples with rains. We managed to reach Katapazi in good time for the meeting which started at 10:45hrs held at Katapazi centre.

Despite having had meetings here, most people in attendance seemed not to be aware of the proposed Batoka project. ZRA took time to explain the project and its benefits while explaining the anticipated positive and negative outcomes.

The locals wanted to know if they will be expected to also contribute towards the CSR like they usually are asked by other organisations especially if there is constructions to be done (e.g. making of bricks). In response there was an appeal from ZRA that we should work together as a team and identify the needs of the people. Right now we cannot say you will or will not but it is always good for the communities to play their role when called upon but will not be expected to make monetary contributions. The meeting was informed that the construction phase will take 8 years to complete.

People wanted to know what the minimum qualifications will be for the upcoming jobs. In response the meeting was informed that qualifications will vary depending on what type of job. However, there will be skilled and unskilled labour. For unskilled labour there will be very little qualifications needed but of course one has to be skilled to do that particular job.

When asked if this same electricity to be generated will be for this area alone or for the whole country ZRA explained that the mandate to distribute power lies in ZESCO and REA (Rural Electrification Agency) which identifies areas that they feel require power.

There was also a question of whether transformers will be provided for free if power was to be brought to this area. This was asked because in most cases people are asked to pay for the transformers and poles. In response the meeting was told that for national projects everything is provided, but when an individual decides to have power there are charges attached (connection fees, etc.).

There was a request for a bridge in the area due to the fact that school children suffer a lot during the rains period as some seasonal rivers and streams become unusable. In response the communities were encouraged to organize themselves and agree on these requests/proposals together with their local leadership and then forward such requests. It was worth knowing in advance that not all requests may be granted.

There was a big concern that when such projects commence it is the outsiders that benefit only to leave the locals as spectators, how will this be avoided? In response the people were advised to come up with a skills database and work together with the local leadership and project developers.

The other concern was that there has been too many discussions conducted in this area by various organisations promising jobs and development but it all ends in talking. There was hope that this one will not end like the others and real development will be come to pass/

In his concluding remarks, senior headman Katapazi asked his people to fully support ZRA and pledged to work together with ZRA. He said this place needs ZESCO power because people face a lot of challenges and having power will alleviate most of the challenges. He bemoaned the lack of jobs for the youth of his area due to corruption and the distant urban areas. The headman expressed gratitude for the upcoming jobs once the project commences.

Kalomo District Council Meetings

The presentation was made and was well received. It was obvious that no one had taken time to read the ESIAs that were dropped off in March this year. The other thing we noticed is that there has been too many transfers in government and most people we interacted with have been moved to other areas. In this particular council the deputy council secretary is only two months old here.

The meeting was informed of the upcoming virtual meetings slated for 1st and 2nd December this year, a link will be sent.

The council was looking forward to seeing this project materialize and pledged to give full support to the project since the council was the pipeline for development.

The council wanted to know what type of CSR will be given considering that apparently education seems to be benefit more from CSR, they requested that we consider other equally cardinal areas for development. The council also wanted to know what type of compensation will be given to those that will be affected. In response the council was informed that by international standards it is not recommended to give monetary compensation because there is no guarantee that the money will be used wisely. Material compensation is always best. The council wanted to know what type of jobs will be available ad was informed that it will be both skilled and unskilled labour. In the initial stages there will be need for more unskilled labour.

The council expressed interest to be part of this development and was advised to take a keen interest in this project since it being the local authority will be impacted when it comes to service delivery. The council was also informed of the upcoming sensitization radio programmes between 7th and 11th December this year and was asked to tune in and participate.

From Kalomo we headed to Zimba for another meeting.

Zimba District Council Meeting

The meeting at Zimba district council started at 15:55hrs.

The council secretary here is only two months old in office and is the third council secretary in 3 months.

After we gave the presentation the council promised to read the ESIAs and give feedback within the given time. Even here it was obvious no one has taken time to read the ESIAs.

The council secretary was happy that at least the remote areas will benefit from this project since right now they have no roads or power. He said that Zimba district will greatly benefit once the project commences. He looks forward to seeing these areas become accessible. He also appreciated the good relationship the council has with ZRA especially on the ongoing Nchabalombe clinic.

The council promised to read the documents and provide feedback within the given time frame.

The council was also informed the roads will not affect the district very much.

25th November 2020

HRH Chief Sipatunyana – Sipatunyana Chiefdom

We went to HRH chief Sipatunyana's palace in Kalomo and met the chief in the morning at 09:55hrs and he told us to make appointments in a timely manner and avoid short notices especially during this period since it is farming time.

Before the presentation was given he immediately wanted to know if the new power line won't be contributing to deforestation as there will be a lot of tree cutting. In response he was told that there will be very minimal cutting of trees considering that it will run parallel to the existing power line.

After the presentation he wanted to know why ZRA has opted for the 'Build, Operate, Transfer' (BOT) option when the two countries (Zambia and Zimbabwe) can put resources together and build the project. He was informed that by 2018 both countries had no capacity to fund the project considering it is a very big and expensive undertaking.

The chief wanted to know if the rumours he has heard that the town of Bulawayo in Zimbabwe will be tapping water from the proposed Batoka gorge dam, and how that will impact power generation. He was informed that it is a huge possibility that Bulawayo might tap into the new lake considering that the town has always had water challenges. However, if this is done the amount of water tapped from the dam may be very negligible compared to what a single generator uses.

The chief asked if there will be displacement of the people. The chief was informed that it is likely that very few people may be displaced but a RAP has been generated to address this issue.

The chief was concerned with the flooding of the Kalomo River due to backflows once the dam is inundated but he was told that Kalomo River joins the Zambezi River on the downstream and there be no backflow. He was also informed that compared to Kariba dam, despite the proposed dam wall being higher at a height of 175m, it will be shorter due to the fact that Batoka gorge is very deep. The Victoria Falls, the Victoria fall power station and surrounding areas are very safe.

Chief Sipatunyana wanted to know wanted to know why ZESCO constructs sagging power lines and what danger they pose to communities. In response ZESCO said there is no danger posed that is why people are even allowed to grown short crops under the power lines. He was informed that sensitization on this issue will have to be done.

The chief expressed his concerns about relocations and displacement of people saying that he does not want a repeat of the Kariba saga were people were forcefully evicted from their fertile lands to arid areas without compensation saying it was very painful and still is. He said he was a victim of those evictions and will not allow that to happen to his people. He hoped that the benefits will upgrade his people and that they will positively impact the lives of his subjects.

The chief said that he expects to be connected on the national grid once the project is done and asked ZRA to ensure that happens. In response he was informed that actually the distribution of power lies in ZESCO and the Rural Electrification Agency (REA).

In conclusion the chief said that he very much wants this project to succeed but it is the displacement he was very much concerned with and will not condone a situation where anyone will be displaced without

compensation as having gone through such a situation knows how painful it is to lose ancestral land, cultures and tradition and a sense of belonging. ZRA assured the chief that a RPF is in place and chiefs will be extensively consulted on what happens to those at the risk of being displaced and that ZRA only comes in on the displacement part. ERM also said that a lot of lessons have been learnt from the Kariba dam project and that today international organisations including the World Bank don't condone unnecessary displacements and insist on compensations. Even the environment is protected and mitigation policies have to be agreed to.

The chief has not yet read the ESIAs that were left for him early this year, he promised to look for them and read before the deadline of 25th January 2021

We left comment sheets and two copies of the NTS with the chief and asked him to encourage his people to come through and make comments.

25th November 2020

Syamwamvwa Village Meeting – Sipatunyana Chiefdom

The meeting was held at Syamwamvwa primary school.

After the presentation people wanted to know that since there will be a new power line does that mean they will now have power connected to their homes?

ANS: These power lines carry very high voltage and cannot be used for domestic purposes. ZESCO and REA will work together to determine which areas need the power most.

Q: Are the jobs available only for men or women will take part too?

ANS: We encourage women to fully take part since gender balance is cardinal.

Q: Some people recently came looking for driver, were they from your project?

ANS: It will be difficult to confirm or deny, but what we can confirm is that pre-development activities have commenced at the site. Please note that these jobs are firstly for all the involved chiefdoms from both Zambia and Zimbabwe, and secondly for the two nations. Ensure you organise yourselves in your communities and work with your leaders and formulate skills databases.

Q: Who is eligible to work for this project?

ANS: Anyone who has a national registration card (NRC) and has the skills required.

Q: Is there compensation for those that get injured while on duty?

ANS: Other factors come into play in such an event. If the cause of your injury is caused by negligence or not observing the instructions you may not be compensated. Also, temporal/casual job contracts may not have extensive cover. We do have labour laws in this country that guide us, if you feel aggrieved there are grievance mechanisms to employ.

Q: Are we going to be compensated when we lose our fields?

ANS: Its most unlike that there will be loss of farming land because currently farming under power lines is allowed. We will work together with the local leadership to map the way forward. Tall crops or tree are not allowed under power lines.

Q: How is compensation made for those whose structures will be affected?

ANS: We shall identify which structures will be affected and come up with a rate after evaluating the structure. Please note that the average clearance is 50m from the power line.

We left comment sheets with the area councilors.

25th November 2020

Chuundwe Village Meeting – Sipatunyana Chiefdom

Q: Is the new power line going to be smaller than the existing one so that our communities can be connected?

ANS: It will be the same capacity and as you may be aware currently no tapping is done.

COMMENT: Thank you for your project, we hope and pray that you can really employ locals unlike what has currently been happening where the employment process is not transparent. We need to benefit as locals.

COMMENT: Do not segregate the women, we also can work, don't just employ men.

Q: Will the people that will live along the transmission line be affected and what will be done if they get affected?

ANS: Through the local leadership we will identify those to be affected, document and later compensate accordingly. This will be done in consultation with the headmen.

COMMENT: There are those who got relocated by other projects before and they got preferential treatment, remember to treat us all the same since we are one, put that in your plans.

Q: What are you going to do with the opportunistic people who will want to quickly build near or along the proposed transmission line so that they get compensated?

ANS: There already exists a law that bans people from building from building near the power line. Furthermore, we will be consulting from the headmen who know these locals and where they live/lived. As at now, it is only the project team that knows where the lines will pass.

COMMENT: You need to allow the people to benefit, these transmission lines pass through our villages but we benefit nothing. Ensure that your partners, REA, bring us power here in Sipatunyana chiefdom.

Please note that the clearance between 330kv lines to any structure is 50m both ways.

25th November 2020

Monde Village Meeting – Sipatunyana Chiefdom

Q: Explain exactly what type of comments/questions we should be asking on those sheets?

ANS: Anything in relation to the works on the project and your expectations.

Q: We don't see the benefits of these power lines despite our rivers being the ones that feed the Zambezi River where power is made. Are you going to give us power this time?

ANS: Ours is to generate and transmit power. REA and ZRA can assist in that area.

Q: We have schools and clinics that need power. What benefits are there for our communities?

ANS: REA is responsible for the electrification of rural areas.

COMMENT: As a community come up with a committees that will be engaging either ZRA, REA or ZESCO. You need to be proactive and vocal about your needs, for power as well or else this too might bypass you. Let us work together.

Q: Can you assure us that you will employ our community members?

ANS: We cannot make that assurance or else we will be perceived to be corrupt. Besides, there will be many potential employment seekers.

Q: What types of jobs will be available?

ANS: Skilled and unskilled.

ZRA: We have plans to train some community members with skills so that they will continue benefitting from those skills forever.

26th November 2020

Lugobo Village Meeting – Sipatunyana Chiefdom

Q: Will you manage to connect all schools to electricity even if they are far from the transmission lines because others are far from transmission lines?

ANS: We work with different authorities like ZESCO and REA and they play different roles to play. This project will endeavor to assist communities.

COMMENT: You need to work with the headmen to know who exactly has what skills so that we all benefit from this project.

Q: Are you going to repair our roads in our villages?

ANS: No. Remember we are not here to repair roads, this is an electricity project, but roads in the project area where we will be working may be improved in some sections to make our work easier. We shall leave the place better.

Q: When you install transformers, how many villages will they cover?

ANS: We will be constructing transmission lines of very high lethal voltage equivalent to already existing power line and will go directly to substations. But with increased capacity many will be connected.

Q: Why are you constructing a new power station when you are already experiencing bad rainfall?

ANS: We are building a cascade system in which the same little water will be used many times to generate power.

Q: Where is the line going to pass, will it be near our community?

ANS: Yes.

Q: What will happen to those found within the proposed transmission corridor?

ANS: We will work with headmen, affected people and experts to determine how much they will lose so that proper compensation is given according to international guidelines.

Q: Currently some people have been displaced and compensated by ZESCO to pave way for an upcoming power line which will run parallel to the left of the existing lines. They were moved to the right hand side of the existing line, now here you are saying your proposed power line will be on the right hand side of the existing line. How many times will these people be displaced and where else will they go now?

ANS: Understand that there are two proposed projects here, ZESCO's project is still on hold but the ZRA project will encompass the ZESCO project, thus the actual displacement will be confirmed when the project starts.

We left the comment sheets with headman Lugobo.

26th November 2020

Muziya Village Meeting – Sipatunyana Chiefdom

Q: Using headmen to manage the employment part may cause problems as headmen might prioritise their relatives, therefore, why not use a different method of identifying skills and creating a database?

ANS: Headmen are our best source of information from the villages, but ultimately the selection will be done transparently so that everyone has a fair chance, we can also employ methods similar to secret ballots.

Q: How are you going to handle displaced people especially those that have settled and have nowhere else to go?

ANS: We are going to work closely with the village headmen ad chiefs to identify suitable relocation areas so that compensation is properly done. Also note that we have to be in line with guiding international standards.

Q: Given the expanse of the project, how will security be handled especially where theft is concerned?

ANS: This is where we engage locals to be security conscious and treat this project and its assets as their own.

Q: After the transmission lines terminate at the substation and the power has been stepped down, will this power then be distributed to our villages?

ANS: We have various partners like ZESCO and REA who will also tap into this project to bring power to the people. However, our main interest is to increase the power capacity and in retrospect make it easier for REA to connect you.

Q: Are you going to help with maintaining the roads?

ANS: Only those directly used by the project, but we have a CSR component which may be used. Bear in mind that maintaining roads is not our main task here.

Q: Will the new transmission line go along the road or it will go straight?

ANS: We shall follow the existing power line since there are less people settled along this area.

Q: What other developments are you going to bring, how about boreholes?

ANS: CSR component will identify what you need with consultations with you the locals and will implement.

COMMENT FROM THE CHIEF'S REPRESENTATIVE

These people you see here bust be treated in a special way because in 1948 they were forcefully displaced and chased like dogs from their own lands without compensation. This was to pave way for white First World War soldiers who grabbed their lands. They ran to this place and named it 'Mangonda' which means 'confusion' and this is because they were confused and did not understand why their lands were grabbed without compensation. They came to this arid place, even today you can see that this is not fertile land.

A second displacement may break them. Please consider them and fairly compensate them.

ZRA:

Organise yourselves and make a written request to the council for roofing sheets so that that classroom block we saw can be roofed urgently. Make this request directly from the council secretary and we will quickly pick it up from there. The entire school has no window panes, we need to fix this. Make a very strong appeal through your area councilor, we can assist just like we assist other such issues. Treat this as an emergency.

The comment sheets were left with Mr. Victor Sindowe.

27th November 2020

Kamukeza Village Meeting, Kamukeza School – Simwatachela Chiefdom

The meeting started at 13:30hrs after a long drive in the Zambezi valley. We did not physically visit the 9 villages, the chief only invited some people to come for a meeting at the school.

A brief project background was given by ZRA and also the expected economic outcome in terms of job opportunities and minor negative impacts that may occur. It was apparent that these people were hearing about this project for the first time.

The meeting was informed that since this is a very big project traversing between two countries a lot of chiefdoms, jobs will be widely contested and we are not under the illusion that everyone will get a job. The people were told that they may be at a disadvantage due to the almost inaccessible location and the distance to the project area but every effort will be made to ensure they don't miss out on the opportunities. ZRA will work with local authorities.

During the project construction and operation, no economic activities on the river will be hindered or forbidden, life will go on like always.

People were advised to always seek the right information from their leaders (headmen) and not rely on rumours from unreliable sources.

Q: When is the project starting and ending?

ANS: Per-construction activities have commenced at the dam wall area. Construction may take up to 8 years starting between end of 2021 and/or early 2022.

Q: When we were forcibly displaced in 1958 during the construction of the Kariba dam we were promised electricity, up to now we are still waiting, also, we were promised that the bottom road will be done, up to now nothing has been done. We are tired of these empty promises and talking. What have you come to promise us this time? Only you and the government seem to be benefitting.

ANS: A lot of things have changed since 1958 including stringent project monitoring mechanisms put in place by both local and international organisations. It is for this reason that it was a requirement for us to engage ERM to conduct environmental studies and monitor our activities. No one will be displaced in this area and should anything happen on the river that negatively affects you systems are in place to negate the impacts.

The government has plans to work on the bottom road. We can only submit your question to road development agency (RDA) so that they provide an answer. What you can do as a community is put pressure on RDA, keep reminding the government.

On electricity, we have less capacity even in urban areas hence the need to construct the BGHES. This will increase capacity so that even those given the mandate to connect villages will have enough to go round.

Q: We have been promised schools, roads, clinics, electricity etc., the only school we have is the one which was built by the late president Levy Mwanawasa. So, for us the only benefit is just the small jobs or are we getting electricity as well?

ANS: As ZRA we have a development program called Zambezi Valley Development Fund (ZVDF) to help the displaced people during the construction of the Kariba dam. Through local councils we get 5 project proposals needed by the communities. You need to submit through your headmen, but please note that depends on availability of funds.

COMMENT: Our biggest problem is our road, if the road can be fixed will help us greatly.

COMMENT: We need quick and fast progress on this project, we tired of always talking.

Q: I don't trust our elected councilors and it will not help us if we submit our application through them. Since I was born nothing has ever been done. You are also using the same language. How is dam going to be made, won't there be disturbances on downstream activities?

ANS: Water will continue to flow through 3 ways; 1. Turbine discharge, 2. Spillways, and 3. Environmental flows. There is an assurance that water will continue to flow like always.

Q: How will we know that jobs are now available?

ANS: We will communicate through chiefs.

Q: Why do you call it Batoka Gorge instead of Zambezi gorge, and how long will our children work?

ANS: The area where the dam will be located is called Batoka gorge. The jobs will be available for about 7 years, but that does not mean each employee will work through all those years, there are a lot of other factors that come into play.

COMMENT: We are a community that is neglected community, we just watch as those with power and privilege bypass us. Our appeal is that you should not neglect us.

ZRA: We urge you to speak through your councilors. As we receive your proposals and having been here in person we have a good idea of your condition. We shall strive to attend to your issues urgently.

COMMENT: We don't have representatives from our area. We have no councilors. Even if Zimba council sits, lacking a representative makes it hard for us to form a consensus. We may have projects but we lack a credible and reliable representative.

COMMENT: We government and council does nothing for us, we built this school by ourselves without any assistance from anyone. If you are to help us don't even think of going through the council because they don't care about us. Get our contact numbers and invite to meetings as headmen.

HRH CHIEF SIMWATACHELA:

Let us work with these people as you have heard they have assured us that there will be no significant negative impacts on the river and life will go on like always. You need to capitalize to on the Zambezi Valley Development Fund (ZVDF), we need to be part of this initiative

Let us organise ourselves and work together. If I am not available contact my headmen

28th November 2020

Trip back to Lusaka

Made a trip back to Lusaka.

Annex C8.7.6

Zimbabwe Physical Meeting Minutes

Minutes of meeting: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**30 November 2020**
Time	**13.20hrs – 15.45hrs**
Venue	**Chidobe Primary School**
Chiefdom	**Mvuthu**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald (ZRA Public Relations Manager)
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
7. Brian Gada (Chief Environmental Manager ZETDC)
8. Phillip Ziduche ((ZRA Environmental Manager)
9. Bongani Dhlodhlo (Black Crystal Consulting)
10. Tasara Marondedze (Black Crystal Consulting – minuting)
11. Meeting participants are shown on the Meeting Registers

Introduction

This meeting was undertaken as part of Public Disclosures following ESIAs that identified and assessed a number of potential negative and positive impacts to the physical, natural and socio-economic environment that may occur as a result of the construction and operation of the project. The team involving the ZRA, Zimbabwe Electricity Supply Authority and ZESCO in association with the appointed Consulting firm that undertook the ESIA studies, Environmental Resources Management, represented by their Zimbabwean consulting partner, Black Crystal, presented project impacts and measures designed to enhance benefits and prevent or minimise adverse impacts.

ZRA gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. ZRA narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption, going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. ZRA provided timelines for the project, on-going stakeholder engagements through radio programmes and ascertained desirable evening times for the radio programmes as well as radio receptivity in the area.

ZRA also gave a background of environmental and social impact assessments to illustrate why the project has not commenced years after planning started.

Black Crystal Consulting presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these. Below are questions and responses from the meeting	
Question	**Response**
Issues of cultural significance	• A participant called upon the project to refer to the 1996 ESIA report which highlighted the critical importance of establishment of museums for both Zimbabwe and Zambia as part of project impact enhancement measures. • ZRA acknowledged the call and expressed keen interest in promoting tourism in both countries
Local employment opportunities for people under different chiefs	○ Greenline Africa expressed scepticism over promises of local employment as no other company in Hwange and the Matebeleland North Province had fulfilled such promises ○ The response was that a Local Employment Program is being developed to address this issue and any failure on its part will be addressed through the Grievance Redress Mechanism ○ Stakeholders recommended a liaison engagement forum that has an ethnic mix to ensure that locals are represented ○ For locals eligibility for contractual opportunities ZRA will provide sensitisation and capacity buildings in the local area in 2021 to improve the eligibility capacities of locals ○ Skilled persons in the local area will also receive considerations ○ This is a national project and other nationals are not entirely alienated from employment prospects. There will however be transparent recruitment mechanisms that will abide by the Local Employment Program
For economic and physical displacement when will affected people be compensated?	○ Compensation is provided before construction. Any issues that may arise will be addressed through the Grievance Redress Mechanism
How will people's livelihoods and livestock be safe from traffic hazards during and after road construction	○ There will be measures such as speed reduction through humps, signage, traffic education, fences if approved by local communities to prevent livestock straying onto roads
Zambezi river capacity for hosting 2 dams, Batoka and Kariba	○ The ESIA addressed such concerns through specialist reports such as the Hydrological, Ecological and Climate change studies. The AfDB and WB commissioned separate studies on Climate change ○ The EIA process is rigorous, applying mandatory policies and international best practice and applicable policies, standards

	and regulations identified by the ESIA will be followed to the letter o The WB and AfDB instituted separate studies on climate change to ensure transparency and certainty on impacts of climate change and viability of the Batoka project
Corruption	o Participants expressed concern about corruption once the project commenced as this is inevitable in Zimbabwe o The ESIA provides management measures in the ESMP that includes corruption prevention measures
Height of dam wall, viability of rafting, retention of diving skills essential for life saving and retrieval of drowned persons (Rafters' Association)	o Height of dam was lowered to ensure that water levels would not build up to the level of the Victoria Falls. Height of 220m can give maximum production output but this does not augur well for environmental considerations. o An ESMP guides the Health and Safety Plan and the project will benefit from existing expertise in health and safety
Compensation for affected persons	o Compensation will be provided prior to commencement of construction. Any issues arising will be addressed through the Grievance Redress Mechanism
Security of people and livestock on the upgraded access road	o A Traffic Management Plan will be developed. Options involving fencings off the road will also be looked at in consultation with stakeholders. o Other standard mitigation measures involve mechanisms for speed reduction, road signages and traffic education
Electrification of communities	o ZETDC will have a downstream network refurbishment programme. The 400kV line will not service domestic users
Effects on tourism and establishment of a museum in accordance with 1996 Batoka ESIA report	o Zimbabwe and Zambian governments interested in establishing tourism in both countries to benefit on and lean on Batoka project. A museum is one of the projects being committed to (Eng Chisense)
Effects on white water rafting, contingency measures for ensuring skills contained by rafters in recovering drowned people are retained (Skinner Ndhlovu, Rafting Association)	o The presence of persons with critical skills for H&S is acknowledged and these will be engaged as appropriate. The ESMP has a component of H&S with measures and plans for ensuring safety that has already identified critical risks. The ESMP can be updated to incorporate new information received o Batoka Gorge wishes to co-exist with stakeholders whose livelihoods depend on the Zambezi River while we generate power o Rafting will be affected but will not become extinct

Local geo-politics and need for an ethnic-mixed stakeholder engagement structure	○ It was acknowledged that there are different ethnic groups in the Hwange district and avoidance of promotion of one at the expense of others could be done through ensuring an ethnic mix in stakeholder engagements

Minutes of meeting: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**3 December 2020**
Time	**14.00hrs – 115.20hrs**
Place	**DA's office**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald Muchindu (ZRA Public Relations Manager)
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
7. Eng Edson Manyewe (Network Development Eng, ZESA)
8. Brian Gada (Chief Environmental Manager ZETDC)
9. Bongani Dhlodhlo (Black Crystal Consulting)
10. Tasara Marondedze (Black Crystal Consulting – minuting)
11. Stakeholders
    a. ZRP
    b. Zimstat
    c. Forestry Commission
    d. Ministry of Health and Child Care
    e. Ministry of Youth, Employment Creation
    f. President's Office
    g. Department of Social Services
    h. Agritex/Ministry of Lands

Introduction

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ZRA gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. ZRA narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption, going to the present disclosures that are mandated by legislation and

best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. ZRA provided timelines for the project, on-going stakeholder engagements through radio programmes and ascertained desirable evening times for the radio programmes as well as radio receptivity in the area.
Black Crystal Consulting presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these.

Below are key points from the meeting

Question	**Response**
Social media is being used to falsely make money from bogus recruitment for Batoka Gorge Project	• Project has been made aware and a press statement will be released to set the record. Construction hasn't started and recruitment is still pending
There are people who settled in the project area after the Asset Inventory was done. Will they be compensated when physical displaced?	○ The creation of new settlements will have to be confirmed. Ideally any physical displacements will be addressed through compensation.
How many people will be displaced?	○ From the staff township no one will be relocated. From the road expansion no one will be relocated
There is construction work on-going at the Gorge. Is construction officially started?	○ It is just the developer making their preparations. Construction awaits finalisation of the ESIA process
What are the mitigation measures for health and safety risks during construction? Kariba dam construction led to several fatalities	○ We've learned from the past and now prioritise safety. There will be supervision and monitoring. ○ Reservoir will be small, confined to the gorge and no flooding of outlying environments is envisaged
How many people will be employed and recruited from where?	○ 8000 for Zimbabwe and Zambia. Unskilled labour will be sourced from project fence-line communities

Figure 1: DDC addressing the meeting

Figure 2: A. Nkwendeenda (ZRA) & T. Marondedze (ERM)

Figure 3: Govt representatives at DA's office meeting

Figure 4: Meeting participants after meeting

Minutes of meeting: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**30 November 2020**
Time	**11.09hrs – 12.40hrs**
Place	**Vulindela clinic**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
7. Eng Edson Manyewe (Network Development Eng, ZESA)
8. Brian Gada (Chief Environmental Manager ZETDC)
9. Phillip Ziduche ((ZRA)
10. Bongani Dhlodhlo (Black Crystal Consulting)
11. Tasara Marondedze (Black Crystal Consulting – minuting)
12. Meeting participants are shown on the Meeting Registers

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Black Crystal Consulting presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these.

Below are key points from the meeting	
Item	**Remarks**
Issues of cultural significance	• The Batoka project site is a site of cultural significance. A scared goat used to be found at the premises and the Project should engage chiefs to avoid any taboos according to a participant. • ZRA responded that the ESIA has already identified some sites of cultural heritage and significance and any chance findings should be relayed to the project by stakeholders so that appropriate management measures are adopted
Local employment opportunities for people under different chiefs	○ Chiefs will play a significant role in the secondment of eligible employment candidates through confirming candidate residence and eligibility. Contractors will also be mandated to respect the Local Employment Program. Not everyone will be employed. ○ For locals eligibility for contractual opportunities ZRA will provide sensitisation and capacity buildings in the local area in 2021 to improve the eligibility capacities of locals ○ Skilled persons in the local area will also receive considerations ○ This is a national project and other nationals are not entirely alienated from employment prospects. There will however be transparent recruitment mechanisms that will abide by the Local Employment Program
Stakeholder engagement	○ Concerns were expressed about absence of stakeholder engagement. Communities worried about employment adverts purporting to represent the Batoka Gorge project ○ The project indicated that stakeholder engagement will be scaled up and a Grievance Redress Mechanism activated for stakeholders to more ably lodge complaints and have access to project information
Viability of radio programme	○ Some communities had access to radio transmission ad preferred radio programme to be between 19.00 and 20.00 hours

Minutes of meeting: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**1 December 2020**
Time	**13.20hrs – 15.45hrs**
Venue	**Chief Hwange Homestead**
Chiefdom	**Hwange**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald Muchindu (ZRA Public Relations Manager)
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
7. Eng Edson Manyewe (Network Development Eng, ZESA)
8. Brian Gada (Chief Environmental Manager ZETDC)
9. Phillip Ziduche ((ZRA Environmental Manager)
10. Bongani Dhlodhlo (Black Crystal Consulting)
11. Tasara Marondedze (Black Crystal Consulting – minuting)
12. Stakeholders
    a. Kasibo village head
    b. Shatchatunda Village 1 head
    c. Shatchatunda Village 2 head
    d. Shatchatunda 3 village head
    e. Shatchatunda 4 village head
    f. Mashala Top village head
    g. Mashala Down village head
    h. Mashala Down 2 village head
    i. Mr Neshavi Headman village 9
    j. Chief Hwange
    k. Mrs Hwange

Introduction

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ZRA also gave a background of environmental and social impact assessments to illustrate why the project has not commenced years after planning started.
Black Crystal Consulting presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these.

Below are key points from the meeting

Question	**Response**
How does the chiefdom benefit from local employment creation when local employment is for the entire district?	• The project is national, regional and local in character and benefits will be spread in that way. Unskilled labour that can be supplied from local communities will be sourced from the local communities and arrangements will be made for local recruitment to be made in consultation with chiefs and village heads. Skilled labour will be sourced regionally and nationally. There will be a Stakeholder Engagement Plan under which stakeholders are kept notified of developments • The project has a CSR component under which projects in health, education and sanitation identified using participatory approaches will be implemented to raise the local standards of living
In Hwange the real local people do not benefit from local employment. Recruitment can even be done from outside Hwange for jobs in Hwange. Locals can be employed for brief periods then fired to be replaced by people from outside Hwange. How will this be resolved? Will Human Resources Managers be local?	• Your recommendations form the basis of plans that guide the implementation of the project. Through this dialogue we are getting the profile of the local area and will use information acquired to make appropriate plans for the social management of impacts • Employment regulations are complex. We ae going to have contractors who employ independently but we can prevail upon them to respect local recruitment under the guidance of our HR department at ZRA • Not everyone will be employed. Will however work alongside traditional leaders for local recruitment • Local people also have a role in not influencing an immigration influx for people looking for job opportunities from the Batoka Gorge project

Some conmen have been advertising jobs for the Batoka Gorge Project	• This has been noted. The conmen have not been engaged to do this by ZRA. When ZRA and contractors start recruitment this will be transparent and formal
What are the downstream effects of dam wall impoundment?	• This will be a run of river without excess water storage and water access for downstream users is still guaranteed
Will local communities benefit from powerline?	• This will be a 400kV power line that cannot offload power to users but deposit to substations. Substations will be built to stepdown power to 132kV lines that will in turn step down power to 32kV and 11kV power lines that can supply direct consumers. No details on power distribution can be provided at this stage but definitely once power is produced it will be distributed because it cannot be retained
Will the power lines pass through our villages?	•
Significance of local employment when it is meant for the entire district	• Local employment modalities will be worked on in collaboration with the three chiefs in project affected areas • A Stakeholder Engagement Plan will ensure adequate information flows and use of the Grievance Redress Mechanism should there be unmet expectations • Employment used as a ruse before locals are fired and not acceptable anymore. • The project can benefit from the specification of such concerns in writing and suggestions on how this can be addressed • Role of traditional leaders will be respected on employment • In-migrants can contribute to challenges associated with local employment
CSR program	• ZRA will have a CSR program. Previously have implemented programs in health, education and sanitation that are identified in collaboration with stakeholders
False job adverts purported to be from ZRA	• Disowned by ZRA
Downstream impacts	• Livelihoods may be affected. A study on downstream impacts undertaken. As a run of river project impacts not expected to be very significant
Power supplies to project communities	• ZETDC will have downstream network refurbishment projects involving substations and smaller 11kV and 33kV lines for local consumers • The project is informed by Sustainable Development Goals
What is the actual route of the TL?	• This will be revealed in the next ESIA on the TL. The TL will try as much as possible to avoid settlements
Request from Chief Hwange	• Requests that the three chiefs affected by the project meet together with ZRA to agree on modalities for local employment

Figure 1: Meeting at Chief Hwange homestead

Figure 2: Some project team members, Chief Hwange homestead meeting

Minutes of meeting: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**1 December 2020**
Time	**14.10hrs – 15.30hrs**
Place	**Hwange Rural District Council**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
7. Eng Edson Manyewe (Network Development Eng, ZESA)
8. Brian Gada (Chief Environmental Manager ZETDC)
9. Phillip Ziduche ((ZRA)
10. Bongani Dhlodhlo (Black Crystal Consulting)
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Below are key points from the meeting	
Item	**Remarks**
Staff camp	• HRDC intends to establish its presence at the staff camp and has engaged a consulting firm AMRE to make an urban design for the staff camp. • The AMRE concept note awaits review by Cabinet before HRDC develops a Master Plan for the staff camp area • ZRA requires the AMRE concept note to share with developer • Fears that the staff camp will destroy crop fields dispelled on the basis that the 3000 ha applied for do not interact with any settlement or crop fields • The Statutory Instrument gazetted by government specifies that all within gazetted land should remove themselves. ZRA committed to studying the SI for any unseen impacts and further RAP studies will be undertaken if that is the case
Physical displacement and compensation	• Physical displacements deemed to be definite according to Cllr. Some homes within servitude while others cannot remain when road construction begins because effects of noise and other pollution will make existing homes inhabitable • RAP still to be finalised • A Resettlement Policy Framework guides issues of compensation for losses. Compensation will be provided prior to construction • Issues arising to be addressed through Grievance Redress Mechanism
CSR	• Authenticity of CSR questioned on the basis of established and committed budget as well as programmes • ZRA has existing CSR programme for the Kariba hydro-electric project, Zambezi Valley Development Fund that can be used as specimen although this has not been adopted for use on the Batoka. ZVDF has projects identified through collaborations with stakeholders involving health, education and water and sanitation
Local recruitment	• Councillors protested the involvement of chiefs in local recruitment and associated ongoing employment scams reported in the media as irresponsible recruitment • Chiefs are critical stakeholders who can be marginalised • Local recruitment will proportionally consider fenceline communities and the rest of the district and province accordingly • Area has skilled persons eligible for skilled work

Contract opportunities	• ZRA interested in providing capacity building for local companies and upcoming companies to have readiness for competitive bidding when Batoka projects invites contract bids
Extent of ecological damages	• Specialist studies in ecology have been undertaken and the reports are available for thorough review. Compensation forests are a mitigation strategy to mitigate against vegetation loss after land clearance
Stakeholder engagement	• Lack of stakeholder engagement between HRDC and project source of concern
Local employment opportunities for people under different chiefs	○ Chiefs will play a significant role in the secondment of eligible employment candidates through confirming candidate residence and eligibility. Contractors wil also be mandated to respect the Local Employment Program. Not everyone will be employed. ○ For locals eligibility for contractual opportunities ZRA will provide sensitisation and capacity buildings in the local area in 2021 to improve the eligibility capacities of locals ○ Skilled persons in the local area will also receive considerations ○ This is a national project and other nationals are not entirely alienated from employment prospects. There will however be transparent recruitment mechanisms that will abide by the Local Employment Program
Local infrastructure and amenities	○ Project advised to asses potential damage to and pressure on social services and infrastructure
Contractors	• Fear that contractors will bring their own people and disregard locals • Plans for Local Recruitment Program to compel contractors to abide by applicable terms and conditions

Minutes of meeting for the November- December 2020 Public Disclosure meetings for the Batoka Gorge Hydro-Electric Project ESIA

Date	**02 December 2020**
Time	**09.30hrs – 11.00hrs**
Place	**Chief Shana's homestead**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald Muchindu (ZRA Public Relations Manager)
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
7. Eng Edson Manyewe (Network Development Eng, ZESA)
8. Brian Gada (Chief Environmental Manager ZETDC)
9. Bongani Dhlodhlo (Black Crystal Consulting)
10. Tasara Marondedze (Black Crystal Consulting – minuting)

Introduction

This meeting was undertaken with Chief Shana and his village headmen. Avitol gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. He narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption, going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. He provided timelines for the project, on-going stakeholder engagements through radio programmes and ascertained desirable evening times for the radio programmes as well as radio receptivity in the area.

Tasara presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these.

Below are key points from the meeting

Item	Remarks
Unauthorised recruitment for Batoka Gorge Project	• Chief Shana summoned Luke Ncube, the man who had purported to recruit fpr the Batoka Gorge Hydro Electric Project • Luke Ncube explained that he was not recruiting but creating a database of persons interested in taking up jobs on the project on behalf of the Chief in support of the agreed position with ZRA, that Chiefs would be involved in the recruitment and selection of candidates

	• He said that he did not demand payment for his services • Luke made an apology for bringing the name of the Chief and ZRA into disrepute • Other stakeholders reprimanded him for abusing his knowledge of the project, derived from his earlier engagement with ERM's ESIA, to purpot to recruit persons on behalf of the project • Village heads present said the database generated should be surrendered to the chief
Questions	**Responses**
Why has construction and recruitment started secretively at the Gorge?	○ The developer is undertaking preparatory activities. It is not construction per se
For local recruitment would national Identity Numbers (starting with 79 for Hwange) be the exclusive selection criteria?	• No. National IDs can be misleading for persons who have been resident for years but have national IDs from different districts. Chiefs and headmen can attest to bona fide residents
As locals we wish to avoid politics in recruitment and CSR. Traditional leaders represent everyone regardless of political affiliation whilst politicians are selective	• This is noted
We wish to have the Grievance Redress Mechanism	• It should be availed
How will the 20% for project procurement allocated to locals be utilized?	• ZRA has made a provision of 20% of procurement costs to be availed to locals for Zambia and Zimbabwe at a national level. This implies that 20% of local goods and services should be procured. Locals are therefore encouraged to prepare to not just seek employment but become contractors
We need our own help desk so that we engage the ZTA and communicate effectively with our own local stakeholders	• A Stakeholder Engagement Plan will be used for communication with stakeholders. This involves stakeholder engagement platforms and forums that can co-opt the help desk
Will women benefit	• The project made gender considerations, which is also a requirement under IFC/AfDB requirements
This is a multi-ethnic environment where we try to co-exist with every ethnic group. However our local people are alienated from most opportunities be it in	• The best approach may be to allow chiefs and headmen to provide guidance on local recruitment and selection of CSR beneficiaries

employment or CSR. Offspring of contractors in Hwange have local IDs but they are not local. These swallow up all opportunities	
What are the health and safety considerations for road construction and operation?	• Options include putting up fences on the roads and other H&S considerations such as traffic education and signages
Most of the employed people in the district are not local. How can alienation of locals be stopped	• These engagement processes and the Local Recruitment Program as well as the Grievance Redress Mechanism should be able to deal with such issues

The Chief provided a blueprint for Batoka Gorge Programme implementation that acknowledges local realities.

02/12/2020

2020
02/12/2021

Minutes of meeting for the November- December 2020 Public Disclosure meetings for the Batoka Gorge Hydro-Electric Project ESIA

Date	**02 December 2020**
Time	**11.30hrs – 13.00hrs**
Place	**Jambezi Hall**

PARTICIPANTS

1. Eng Avitol Nkweendenda (ZRA Project Manager)
2. Eng Chrispin Namakando (ZRA)
3. Pherry Mwiinga (ZRA Hydrologist)
4. Fitzgerald Muchindu (ZRA Public Relations Manager)
5. Eng Christopher Chisense (ZRA Director)
6. Eng Emmanuel Manyau (Project Manager ZESA)
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10. Tasara Marondedze (Black Crystal Consulting – minuting)

Introduction

This meeting was undertaken with Chief Shana's village heads. Avitol gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. He narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption, going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. He provided timelines for the project, on-going stakeholder engagements through radio programmes and ascertained desirable evening times for the radio programmes as well as radio receptivity in the area.

Tasara presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these.

Below are questions and responses from the meeting

Questions	Responses
The project contractor is doing survey and pegging work in the project site and it's not clear what the intention is	o ZRA engaged a contractor to start preparatory works. This should not be misconstrued as construction. Surveying and pegging should be within the scope of planned activities indicated in the ESIA. There will be no displacements separate

	from those already acknowledged and anticipated in the ESIA and RAP reports
A peg was installed in my field. How can I proceed to till the land?	○ A follow up will be made with the contractor/project developer
How will people be resettled?	○ In accordance with the Resettlement Policy Framework. The RAP is still being worked on
Will resettled persons have to built own houses o they enter already built houses?	○ Compensation and replacement of lost assets will be done before construction
How will locals benefit from local recruitment?	○ ZRA will work with traditional leaders in this regard to implement the Local Recruitment Program
How safe will workers and surrounding communities be during construction and at operational phases	○ There is a H&S plan for all project phases
How many households will be displaced?	○ None
How is the Grievance Handling Mechanism to be accessed and used?	• The team will leave their details so that any queries can be addressed
How will compensation be handled?	• Affected persons who lost properties through economic or physical displacement will be compensated. The criteria and forms/amounts for compensation will be contained in the RAP report. Those who lose opportunities are also liable for direct compensation or through Livelihood Restoration Programmes
ZRA can work with traditional leaders not politicians because traditional leaders also represent politicians within their villages without fear or favour	• Noted

02/12/2020

02/12/2020

Minutes of meeting: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**3 December 2020**
Time	**14.30hrs – 15.30hrs**
Venue	**Makwa Primary School**
Chiefdom	**Hwange**

PARTICIPANTS

1. Eng Chrispin Namakando (ZRA)
2. Pherry Mwiinga (ZRA Hydrologist)
3. Eng Christopher Chisense (ZRA Director)
4. Eng Emmanuel Manyau (Project Manager ZESA)
5. Eng Edson Manyewe (Network Development Eng, ZESA)
6. Brian Gada (Chief Environmental Manager ZETDC)
7. Bongani Dhlodhlo (Black Crystal Consulting)
8. Tasara Marondedze (Black Crystal Consulting – minuting)

Introduction

This meeting was undertaken as part of Public Disclosures following ESIAs that identified and assessed a number of potential negative and positive impacts to the physical, natural and socio-economic environment that may occur as a result of the construction and operation of the project. The team involving the ZRA, Zimbabwe Electricity Supply Authority and ZESCO in association with the appointed Consulting firm that undertook the ESIA studies, Environmental Resources Management, represented by their Zimbabwean consulting partner, Black Crystal, presented project impacts and measures designed to enhance benefits and prevent or minimise adverse impacts.

ZRA gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. ZRA narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption, going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. ZRA provided timelines for the project, on-going stakeholder engagements through radio programmes and ascertained desirable evening times for the radio programmes as well as radio receptivity in the area.

ZRA also gave a background of environmental and social impact assessments to illustrate why the project has not commenced years after planning started.

Black Crystal Consulting presented the project impacts in summary as employment, livelihoods improvement, displacement, immigration and outlined the mitigation and enhancement measures designed for these.

The meeting had been convened by the Chief's Headman, Mr Prosper Neshave. The Makwa Headman failed to mobilise participants on time. When the Consultants and ZRA team arrived only a few headmen and teachers were available for the meeting. The participants however undertook to share the meeting's findings and deliberations in a communal meeting to be held in the next two days, including Comments Sheets and NTSs.

Below are the questions and responses from the meeting

Question	**Response**
Where will power lines be built?	• From the Batoka to Hwange and from Batoka to Chakari. The TL will try as much as possible to avoid settlements. The ESIA for the TL still to be done
Will local roads in Makwa be affected	• Less likely. Principal project infrastructure involves the Chisuma-Batoka road, staff township, Batoka dam and hydro facility, as well as the TL. The location of these projects will not significantly impact Makwa area in terms of roads. Access roads may however be developed to reduce adverse impacts on existing gravel roads
What are project timelines?	• Construction should begin last quarter of 2021 or first quarter of 2022. Construction should take 76 months
Is Hwange Power Station expanding	• It is. And this also affects the Deka water project
Are locals assured of employment?	• Yes. A Local Recruitment Programme will be put in place and strengthened by a Stakeholder Engagement Plan as well as a Grievance Redress Mechanism
Who is the developer	• Power China and General Electric
Are jobs adverts for the Batoka project authentic?	• They are not. ZRA has already issued a press statement to this effect

Annex C8.7.7

Byta Radio Broadcast Minutes-Zambia

Virtual BGHES ESIA Disclosure/Radio Broadcasts

Date : Friday, 18th December, 2020

Station : BYTA FM – Choma Town

Time : 13:00hrs

By : Felix Chisha K

I logged in 10 minutes before the programme started.

The broadcast started at 13:10hrs with Mr. Avitol Nkwendeenda introducing the participants and the project.

Mr. Nkwendeenda talked about the positive and negative impacts and the remedial mitigation measures.

The connection was ok at the beginning but became erratic midway.

The following are the questions I was able to capture before going offline;

Q1 : [Presenter]. Talk about the positive and negative impacts

Ans: The positives include but not limited to more power for the country, jobs for the citizens, schools, police stations, clinics, roads, development of new townships in some areas. The negatives will include loss of access to agricultural land, fishing areas, some tourism activities like white water rafting, economic displacement crop fields etc. Those directly affected will be adequately compensated.

Q2 : [Presenter]. Who are the beneficiaries of this electricity? I ask because lately our rivers have not had enough water.

Ans: The power will firstly benefit the two countries, Zambia and Zimbabwe. Ours is to build and manage the dam/river, ZESCO in Zambia and ZESA in Zimbabwe will decide how the excess power will be used.

Q3 : [Presenter]. What jobs should people look forward to?

Ans: There will be both skilled and unskilled labour.

Q4 : [Presenter]. When there is such a project, we usually get people from far flung areas who come and get these jobs leaving the locals unemployed. What measures have you put in place to ensure the locals access these jobs?

Ans: We have engaged all traditional authorities in both countries through the chiefs and headmen to ensure that they sensitise their subjects about this project. Of course we cannot guarantee jobs for all the locals, this is a government project and everyone is free to take part on merit. For easy access to jobs, labour offices will be set up in respective areas to deal with both employment and grievances arising from the same.

Q5 : *[Presenter]. What will happen to people whose livelihoods depend on the river?*

Ans: *We do not anticipate any significant impacts on the river and as such river users will continue to use the river like they always do. There will be a slight change in water levels downstream during the filling up of the dam but we do have mitigation measures in place to ensure lives are not disrupted.*

I was unable to complete the programme, I went offline. I will be more than glad to get the full recording so that I update my report.

Annex C8.7.8

Namwianga FM Radio Broadcast Minutes-Zambia

Virtual BGHES ESIA Disclosure/Radio Broadcasts

Date : Monday, 15th December, 2020

Station : Namwianga FM – Kalomo Town

By : Felix Chisha K

The first radio broadcast on BYTA FM in Choma town which was scheduled for 19:00hrs on Monday 14th December 2020 was moved to 13:00hrs, Friday 18th December 2020 at the last minute.

Namwianga FM, Kalomo Town.

The broadcast started at 19:18hrs with Mr. Avitol Nkwendeenda introducing the participants and the project.

Avitol talked about the positive and negative impacts and the remedial mitigation measures.

The following were the questions asked;

Q1 : Are you going to employ builders? When are you going to start accepting applications for jobs?

Ans: Yes. There are vacancies for builders. We have engaged a contractor who has been advised to ensure that priority be granted to locals on merit. Pre-commencement activities have started at the proposed dam site and am sure the contractor has started engaging the needed manpower for now.

Q2 : [Innocent]. What type of builders are you going to employ?

Ans: Builders will be employed depending on the need. The contractor will ensure that the right builders are employed. As for what type of builders, the contractor will make that determination.

Q3 : [Nchimunya]. Will you be charging application fees for those seeking employment?

Ans: There is no application fee for these jobs. Please ensure that those that will be purporting to represent ZRA and charge you for job applications are reported to police.

Q4 : [Caller from Nampongo]. What qualifications will you be looking for, is it certificate level or just someone with specific skills?

Ans: Since we will need both skilled and unskilled labour, the qualification level will depend on what type of job one is applying for. So unskilled labour, e.g. land clearing, loaders/off-loaders, may require mere experience. Some jobs may require some training and this we will provide.

Q5 : What type of people will be accepted for these jobs?

Ans: There will be no exclusion criteria applied, everyone is encouraged to take part. We however encourage women to take part so that we are gender sensitive. There will be both skilled and unskilled labour requirements. We will need a lot of diverse skills. We will liaise with the contractor and advise that at least 20% of the contracts remain in Zambia/Zimbabwe. We will set up labour camps in various places to help locals access these job.

Q6 : *Won't this new dam affect the water levels of the Kariba Dam?*

Ans: *This will be a 'run-of-river' type of dam. This means that there will be continuous flow of water to feed the Kariba dam.*

Q7 : *[Kennel]. Is the contractor an NGO or not? Why can't you disclose his/her name so that we know who it is?*

Ans: *We have engaged a Chinese contractor who is working together with General Electric to build the dam.*

Q8 : *[Headman Sindowe]. What benefit is there for those that will be affected by the construction of the transmission lines? We have had this situation before where a line was constructed but the displaced people got no compensation or benefit in 1948. Why do you want to construct new transmission lines when there already exist a transmission line? Assure us that this time there will be compensation for those that will be displaced.*

Ans: *Unfortunately we won't be able to comment on the past occurrence. However, it is worth noting that today such big projects are monitored by a number of world and local organisations to ensure that both people and the environment are not harmed. There will be compensation to those that will be directly negatively affected. There are jobs available but they are fewer, we will try our best to ensure that all villages/chiefdoms benefit from these jobs. The current power lines are not big enough to carry the power that will be generated.*

Q9 : *[Presenter]. Are the jobs only reserved for those that will be directly affected by the construction of the transmission lines?*

Ans: *No. But we encourage the locals to take advantage of this project for them to benefit and appreciate the project.* We will employ on merit. Those that will be directly affected/displaced will be compensated accordingly.

Q10: *How long will this project take?*

Ans: *Six (6) years.*

The programme ended at 20:18hrs with Avitol inviting people to contact ERM should they have any comments or questions. He also reminded them that they should make such submissions before 25th January 2021. He further invited those interested to view the NTS and ESIA at their respective chiefdom palaces and also at their district council offices.

Annex C8.7.9

Zambezi FM Radio Broadcast Minutes-Zambia

Virtual BGHES ESIA Disclosure/Radio Broadcasts

Date : Tuesday, 16th December, 2020

Station : Zambezi FM – Livingstone Town

By : Felix Chisha K

I have no idea what time this programme started since Lindsey and I logged on using the link that was shared previously and there was just the two of us waiting for others to join and only discovered that ZRA had generated another link which apparently they did not share with us. We were only able to join in 26 minutes later after I visited the ZRA whatsapp group where the new link was shared amongst themselves.

The link was very intermittent and I was only able to record one question before everything else went quiet. An email was sent later stating that studio had a system failure which disconnected those of us who connected virtually. The email further states that even the studio was only able to record the 26 minutes only.

The following was the only question I was able to record;

Q1 : [Mrs. Matakala]. What will be the economic impact of this project?

Ans: Economic benefits include being able to meet current and future demand for electricity, creating jobs, improved roads, schools, health facilities, police stations, lodges and restaurants, …..

I do not know what time the programme ended since I was still offline and unable to rejoin the broadcast.

Annex C8.7.10

Breeze FM Radio Broadcast (1) Minutes-Zimbabwe

Minutes of Radio Programme: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**16 December 2020**
Time	**13.20hrs – 14.30hrs**
Radio Station	**Breeze**

Project team members

1. Programme Presenter (Breeze)
2. Eng Avitol Nkweendenda (ZRA)
3. Fitzgerald Muchindu (ZRA)
4. Tori Brahman (ERM)
5. Nombukiso Ntshalintshali (ERM)
6. Lindsey Bungartz (ERM)
7. Bongani Dhlodhlo (ERM)
8. Tasara Marondedze (ERM)

Introduction

This meeting was undertaken as part of Public Disclosures following ESIAs that identified and assessed a number of potential negative and positive impacts to the physical, natural and socio-economic environment that may occur as a result of the construction and operation of the project. Zambezi River Authority (ZRA) through Avitol Nkwendeenda (Batoka Project Manager) ZRA gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. ZRA narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption(including where they can be accessed), going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. Avitol also presented project impacts and measures designed to enhance benefits and prevent or minimise adverse impacts in English and Tonga. Bongani Dhlodhlo representing Environmental Resources Management (ERM) similarly presented project impacts and their mitigation and enhancement measures in Ndebele. Listeners were invited to phone in and ask questions. None did and the presenter had to seek clarification on some aspects of the presentations.

Listeners were given the opportunity of raising follow-up questions or seeking clarification using mobile numbers for personnel in Zambia and Zimbabwe.

Below are questions and responses from the programme

Question	Response
When is the project expected to commence?	• Last quarter of 202 and construction period is 5 years
What is the project cost?	• Us$5 billion using a Build, Operate and Transfer model
Who are the contractors?	• Power China and General Electric

What are the project impacts?	• Positive • Social benefits e.g employment creation, procurement of goods and services, community development Economic development through power generation and electrification • Negative ○ Economic displacement ○ Disturbances to livelihoods and tourism ○ Health and safety risks
How will local employment be enhanced?	• Through stakeholder engagement and policies/programmes such as Local Employment Programme involving working with local traditional leaders. Employment will also be national and regional

Annex C8.7.11

Breeze FM Radio Broadcast (2) Minutes-Zimbabwe

Minutes of Radio Programme: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**17 December 2020**
Time	**19.20hrs – 20.20hrs**
Radio Station	**Breeze**

Project team members

1. Programme Presenter (Breeze)
2. Eng Avitol Nkweendenda (ZRA)
3. Fitzgerald Muchindu (ZRA)
4. Tori Brahman (ERM)
5. Nombukiso Mtshali (ERM)
6. Lindsey Bungartz (ERM)
7. Bongani Dhlodhlo (ERM)
8. Tasara Marondedze (ERM)

Introduction

This meeting was undertaken as part of Public Disclosures following ESIAs that identified and assessed a number of potential negative and positive impacts to the physical, natural and socio-economic environment that may occur as a result of the construction and operation of the project. Zambezi River Authority (ZRA) through Avitol Nkwendeenda (Batoka Project Manager) ZRA gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. ZRA narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption (including where they can be accessed), going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. Avitol also presented project impacts and measures designed to enhance benefits and prevent or minimise adverse impacts in English and Tonga. Bongani Dhlodhlo representing Environmental Resources Management (ERM) similarly presented project impacts and their mitigation and enhancement measures in Ndebele. Listeners were invited to phone in and ask questions.

Listeners were given the opportunity of raising follow-up questions or seeking clarification using mobile numbers for personnel in Zambia and Zimbabwe.

Below are questions and responses from the programme

Question	Response
When is the project expected to commence?	• Last quarter of 202 and construction period is 5 years
What is the project cost?	• Us$5 billion using a Build, Operate and Transfer model
Who are the contractors?	• Power China and General Electric

What are the project impacts?	• Positive • Social benefits e.g employment creation, procurement of goods and services, community development Economic development through power generation and electrification • Negative ○ Economic displacement ○ Disturbances to livelihoods and tourism ○ Health and safety risks
How will local employment be enhanced?	• Through stakeholder engagement and policies/programmes such as Local Employment Programme involving working with local traditional leaders. Employment will also be national and regional
Will women be considered for employment?	• Yes.. A gender balance will be considered and women will be recruited

Annex C8.7.12

Star FM Radio Broadcast Minutes-
Zimbabwe

Minutes of Radio Programme: 2020 Public Disclosure meetings - Batoka Gorge Hydro-Electric Project ESIA

Date	**18 December 2020**
Time	**19.20hrs – 20.20hrs**
Radio Station	**Star FM**

Project team members

1. Programme Presenter (Star FM)
2. Eng Avitol Nkweendenda (ZRA)
3. Phillip Ziduche (ZRA)
4. Fitzgerald Muchindu (ZRA)
5. Tori Brahman (ERM)
6. Nombukiso Mtshali (ERM)
7. Lindsey Bungartz (ERM)
8. Bongani Dhlodhlo (ERM)
9. Tasara Marondedze (ERM)

Introduction

This meeting was undertaken as part of Public Disclosures following ESIAs that identified and assessed a number of potential negative and positive impacts to the physical, natural and socio-economic environment that may occur as a result of the construction and operation of the project. Zambezi River Authority (ZRA) through Avitol Nkwendeenda (Batoka Project Manager) ZRA gave a brief on the origins of the project and the nature of the bilateral institution of the Zambezi River Authority. ZRA narrated the project progress from the ESIA studies including specialist studies, previous public disclosures involving distribution of the various ESIA reports and Non-Technical summaries for public consumption (including where they can be accessed), going to the present disclosures that are mandated by legislation and best practice for the project and are designed to validate ESIA findings and incorporate any other issues or comments. Avitol also presented project impacts and measures designed to enhance benefits and prevent or minimise adverse impacts in English and Tonga. Bongani Dhlodhlo representing Environmental Resources Management (ERM) similarly presented project impacts and their mitigation and enhancement measures in Ndebele. Listeners were invited to phone in and ask questions.

Listeners were given the opportunity of raising follow-up questions or seeking clarification using mobile numbers for personnel in Zambia and Zimbabwe.

Below are questions and responses from the programme

Question	**Response**
When is the project expected to commence?	• Last quarter of 202 and construction period is 5 years
What is the project cost?	• Us$5 billion using a Build, Operate and Transfer model
Who are the contractors?	• Power China and General Electric

What are the project impacts?	• Positive • Social benefits e.g employment creation, procurement of goods and services, community development Economic development through power generation and electrification • Negative ○ Economic displacement ○ Disturbances to livelihoods and tourism ○ Health and safety risks
How will local employment be enhanced?	• Through stakeholder engagement and policies/programmes such as Local Employment Programme involving working with local traditional leaders. Employment will also be national and regional
Some stakeholders received eviction notices that local chiefs are not aware of. Is this procedural/legal?	• The Batoka project works on the basis of a ESIA findings and a RAP. The RAP has not been finalised or being implemented and no evictions are being carried out for the purpose of this project
How are you going to manage corruption? (Tawanda from Chitungwiza)	• The project will follow international guidelines and standards. It will be audited by the Environmental Management Agency. A Grievance Redress Mechanism will be available for stakeholders to channel complaints and have them resolved
In the Mola area of Kariba the language being used on this programme is not suitable (listener from Kariba). Why were translations not done for other languages e.g Tonga?.	• On the Breeze FM programmes Tonga and Ndebele were used. Two other radio programmes have been done with language considerations for the listenership. On-going radio broadcasts will be done in languages local for the listeners.
Will all schools be electrified? (Lewis from Highfield)	• Yes. Rural electrification will be used to connect schools
How will downstream water users be affected?	• This will be a run of river project implying that water will continue flowing downstream for use in Kariba dam and for other downstream users
What else will the water be used for after impoundment?	• Local authorities in the project area can use the water for irrigation, fishing and tourism
Will project be viable considering Lake Kariba has had water shortages and now there are two hydro-electric projects?	• A study was done by Mott Macdonalds on environmental flows. The study confirmed that the Batoka project will not adversely affect the Kariba hydro-electric project but rather compliment it

Annex C (8.8)

Stakeholder Database

Annex C8.8.1

Zambia Stakeholder Database

Organisation/Stakeholder name	Contact Name	Position
NATIONAL MINISTERIES		
Ministry of Communication and Transport	Fewdays Chanka	Director - Maritime and Inland Waterways Dept
Ministry of Communication and Transport	Nicholas Chikwenya	Director - Department of Transport
Ministry of Communication and Transport	Steve Mbewe	Director - Planning and Monitoring Dept.
Ministry of Energy, Zambia	Mr Arnold Simwaba	A/Director – Energy Chairperson – BGHES PSC
Ministry of Tourism, Zambia	Mr. W.H. Katongo	Acting Permanent Secretary
Ministry of Tourism, Zambia	Mr. Willie Kaputo	A/Director -Planning and Information
Ministry of Tourism, Zambia	Mr John Zulu	Site Manager National Heritage Conservation Commission, Victoria Falls World Heritage Site, Livingstone
Ministry of Commerce, Trade and Industry	Mr. Mwila Daka	Director - Planning and Information
Ministry of Lands and Natural Resources	Mr. Allan Danchi	Ag. Chief Natural Resources Officer, Land and Natural Resources Dept.
Ministry of National Planning and Development	Mr. Muketo Mulele	Director - Development Planning Dept.
Ministry of Works and Supply	Mr. Davies Chimfwembe	Director - Planning
Ministry of Water Development, Sanitation and Environmental Protection	Mr. Kenneth Nyundu	Director - Department of Water Resources Development (Former Dept. of Water Affairs
Ministry of Community Development and Social Services	Changano Ngoi	Director- Community Development
Ministry of Agriculture	Mr.Moses Mwale	Director - Zambia Agriculture Research Institute
Ministry of Agriculture	Mr. Peter K. Lungu	Director - Department of Agriculture
Ministry of Agriculture	Mr Mwango	D/Director - Department of Fisheries

Ministry of Agriculture	Julius Shawa	Permanent Secretary
Ministry of Agriculture	Emmanuel M. Nyirenda	Principal Engineer
Ministry of Fisheries and Livestock	Dr. Benson Mwenya	Director - Livestock Development
Ministry of Infrastructure Development and Housing	Mr. Nkumbu Siame	Director - Department of Housing and Infrastructure Development
Ministry of Local Government	Mr.N. Banda	Director - Dept. of Physical Planning
Ministry of Tourism and Arts	Mr. Zulu	Director - Dept. of Tourism
Ministry of Health	Dr. A. Silumesi	Director - Dept of Public Health
Ministry of Health	Dr. Kennedy Malama	Director - Health Promotion and Environment
Ministry of General Education	Mr. Mwansa Lewis	Director - Planning and Information
Ministry of Energy	Mr. Arnold M. Simwaba	Director - Department of Energy
Ministry of Energy	Mrs. Francesca Zyambo	Director - Department of Planning and Information
Mnistry of Chiefs and Traditional Affairs	Mr. Joseph Mpishi	Director - Dept. of Chiefs and Traditional Affairs
Ministry of Mines and Mineral Development	A. P. Dokowe	Acting Chief Geologist - Geological Survey Department
Ministry of Mines and Mineral Development	Everisto Kasumba	Senior Geologist -Geological Survey Department
Ministry of Finance and National Planning (MFNP)	Mr. F. K. Yamba	Secretary to the Treasury

WARMA	Oscar Silembo	Act. Director - Water Resources Mgnt Info
Energy Regulation Board (ERB)	Ms. Langiwe Lungu	Executive Director
Human Rights Commission	Florence Chibwesha	Director
Ministry of Community Development, Mother and Child Health(MCDMCH)	Dr. D.M. Chikamata	Permanent Secretary
Ministry of Community Development, Mother and Child Health(MCDMCH)	Mr. Cosmas Lukupulo	Director - Dept of Community Development
Ministry of Community Development, Mother and Child Health	Edmond Mwakalombe	HOD - Planning
Ministry of Health(MoH)	Dr. K.Malama	Permanent Secretary - Administration
Ministry of Gender		Director, Dept. of Gender in Development
Ministry of Labour and Social Security(MLSS)	B. B. Mulenga	Permanent Secretary
Water and Sanitation Association of Zambia (WASAZA)	Alexadra Couroy	Engineer
Ministry of Livestock and Fisheries Development	Dr. D. Shamulenge	Permanent Secretary
National Council for Construction (NCC)	Matthew Ngulube	Executive Director
National Road Fund Agency (NRFA)	Anthony Mwanumo	Chief Executive Officer
The National Water Supply and Sanitation Council (NWASCO)	Curtis Muleya	Technical inspector
The National Water Supply and Sanitation Council (NWASCO)	Kelvin Chitumbo	Director
Zambia Environmental Management Agency (ZEMA)	Mr. Constantino Mwembela	
Zambia Environmental Management Agency (ZEMA)	Mr. Fredrick Muyano	Principal EIA Officer
Livingstone City Council	Ms. Mambwe Chisunka	Director - Planning
Road Development Agency (RDA)	Elias Mwape	Chief Executive Officer
Road Transport & Safety Agency (RTSA)	Lo Zindaba Soko	Chief Executive Officer
Southern Water and Sewerage Company Limited	Charles Shindaile	Managing Director
Water and Sanitation Association of Zambia (WASAZA)		Engineer
Zambia National Commission for UNESCO	Dr. Charles Ndakala	Secretary General, Zambia National Commission for UNESCO
Zambia National Commission for UNESCO	Hilda Sinywibulua	Senior Programme Offier - Culture

ZESCO Ltd.	Christopher Kaniki	Environmental Scientist
Department of National Parks and Wildlife		
ZESCO Limited	Victor Mundende	Managing Director
PROVINCIAL AND LOCAL MINISTRIES		
National Heritage Conservation Commission (NHCC)	Francis K Shalwindi	Conservationist and Biologist, Retired Deputy Executive
Southern Province	M Liomba	Permanent Secretary _ Southern Province
Southern Province	Kennedy Mubanga	DPS
National Heritage Conservation Commission (NHCC)	Kagosi Mwamulowe	Regional Director
National Heritage Conservation Commission (NHCC)	Ndiyoi Muyumbwa	Chief Natural Heritage Officer
National Heritage Conservation Commission (NHCC)	Issac Kanguya	Manager Information and Public Relations
Ministry Of Tourism, Environment And Natural Resources	Serah Nyondo	Toursim Development Officer
Ministry of Tourism and Arts	Lucas Zulu	Principal Planner
Ministry of Tourism and Arts	Brian Mwamba M	Tourism Development Research Officer
Department of Energy - Min of Energy	Aggrey Siuluta	Energy Informatics officer
Department of Social welfare	Modern Simabenga	District Officer
Energy Regulation Board	Steven Mwiinga	Senior Manager
National Assembly of Zambia	Hon. D. Livine	Member of Parliament
Ministry of Tourism and Arts Zambia	Joseph Thole	
National Assembly of Zambia	Hon. Edgar Sing'ombe, Member of Parli	Member of Parliament
National Assembly of Zambia	Hon. Harry Kamboni (MP)	Member of Parliament
Zambian Wildlife Authority	Mwale Lusizi	Senior Wildlife Ecologist

Zambian Wildlife Authority	Jones Masonde	Senior Wildlife Ecologist
Zambian Wildlife Authority	Chilembo Robert	Research Technican
Zambia Electricity Supply Corporation (ZESCO)	Eng. Ernest C. Banda	Senior Manager- Generation Development
Zambia Electricity Supply Corporation (ZESCO)	Eng. David Zimba	Director- Batoka North
Zambia Electricity Supply Corporation (ZESCO)	Jack Munthali	Principal Environmental Scientist
ZESCO Ltd	Mr. Ntobani Ntobani	Technician
Ministry of Local Government	Eugene Mapuwo	His Worship The Mayor
National Assembly of Zambia	Hon. Edify Hamukale	Provincial Minister - Southern Province
Zambia Environmental Management Agency (ZEMA)	Mr. Constantino Mwembela	
Zambia Environmental Management Agency (ZEMA)	Mr. Fredrick Muyano	Principal EIA Officer
ZEMA	Simon Tembo	Inspector
ZEMA	Lillian Kalenge	Principal Inspector
ZEMA	Lloyd Numdwe	Inspector
DISTRICT AUTHORITIES		
Livingstone Museum	Clare Mateke	Keeper of Mammalogy
Livingstone Museum	Choolwe Shalwindi	Keeper of Botany
Minstry of Agriculture	Goliath Chooye	District Agricultural Coordinator
Ministry of Fisheries and Livestock	John Kaira	Aquaculturist
Choma District Council	Jones Kalumbwa Mulomba	Senior Forestry Technician
Choma District Council	Sheena Muleya	District Commissioner
Ministry of Education	Samson D Sakala	District Education Board Secretary
Ministry of Local Government	Watson Mutoka	Director Of Works
Ministry of Local Government	Pamela Minyoyi	Secretary, Destrict Education Board
Department of Community Development / Kazungula District Council	Momex Habanji	Assistant Town Planner
Department of Social welfare	Modern Simabenga	District Social Welfare Officer
Department of Community Development / Kazungula District Council	Getrude Muvwimi	Assistant Community Development Officer
Department of Community Development	Gisford Muleya	Community Development Officer

Livingstone City Council	Bertha Nkhata	Assistant Director City Planning
Livingstone City Council	Muyunda Muyambango	Assistant Director, Engineering
		Director of City Planning
Livingstone City Council	Chilufya Chibiliti	Town Clerk
Livingstone City Council	Harriet Kawina	District Comissioner
Livingstone City Council	Mr Billings Chandu	Chief Fire Officer
Kalomo Town Council	Muzyani Franis	
Kalomo Town Council	Trevor Mulenga	Chief Admin
Kalomo Town Council	Future Chisenga	Civil Engineer
Kalomo Town Council	Kalumba Ethel	DACA
Kazungula District	P. Musokotwane	District Commisioner
Kazungula District Council	Kelyson Manuola	Physical Planner
Kazungula District Council	Mutoka Watson	
Kazungula District Council	Kelyson Manzioza	Planner
Kazungula District Council	Chrosebery Nchimunya	Planner
Kazungula District Council	Julius N. Simfukwe	District HIV/Aids Advisor / DACA
Kalomo District Council	Edwin Miyoba	Senior Agricultural Officer
Kalomo District Council	Cosmas Chiiba	District Comissioner
Kalomo District Council	Joseph Mambwe Sakala	Environmental Health Officer
Miistry of Agriculture - Zimba	Ronald Hamaimbo	Junior Technical Officer Irrigation
Miistry of Agriculture - Zimba	Mambo Lilanda	Assistant Technical Officer Land Husbandry
Mnistry of Agriculture	Sepiso Mungandi	DACO
Ministry of Education (General)	Mr. Himoonde Nzila	District Education Board Secretary
Ministry of Fisheries and Livestock	Brian Fyacepa	Acting Fisheries Officer
Zimba District Council	Elizabeth Kalaluka	District Commissioner
Zimba District Council	Hibaajene Mainza Chavwanga	District Forest Officer
Zimba District Council	Katuta Mbewe	Deputy Director of Works
Zimba District Council	Josephine Chiila	Planning Officer
Zimba District Council	Elizabeth L Moteto	Council Secretary

Ministry of Health	Musa Muyapekwa	District Health Planning Officer
LOCAL POLITICIANS		
Ministry of Local Government	Cheembo	Council Secretary
Ministry of Local Government	Mr. Edmark Ilyamupu	Councilllor
Ministry of Local Government	Mr. Gift Malindi	Councillor
Ministry of Local Government	Alfred Siampola	Councillor
Ministry of Local Government	Mr. Mantanyani	Councillor
Ministry of Local Government	Mr. Mutentwa	Councillor
Ministry of Local Government	Liberty Chifuwe	Councillor
Ministry of Local Government	Bugoga	Councillor
Ministry of Local Government	Denny Moono	Councillor
Ministry of Local Government	Kelvin Siakaja	Councillor
Ministry of Local Government	Peter Chiile	Councillor
Ministry of Local Government	Mweemba	Councillor
Ministry of Local Government	Germinator	Councillor
Ministry of Local Government	Mr. Koi Magaya	Council Chairman
Ministry of Local Government	Vincent Hamugwala	Councilllor
Ministry of Local Government	Mitulu Mabote	Councilllor
Ministry of Local Government	Mr. Josam Kanatela	Councilllor
Ministry of Local Government	Mr. Grave Muleya	Council Chairperson
Ministry of Local Government	Webby Kabamba	Councilllor
Ministry of Local Government	Mr. Clive Miyanda	Member of Parliament - Mapatizya
National Assembly of Zambia	Mr. Albert Siachola	Councillr, Kanyanga Ward
Ministry of Local Government	Mr. Davison Mudenda	Chief Simwatachela Representative
Ministry of Local Government	Mr. Victor Sindowe	Chief Sipatunyana's Advisor
Ministry of Local Government	Mr. Josam Kanatela	Councilllor
TRADITIONAL AUTHORITIES		
Chief	Chief Mukuni	Chief Silowa Mukuni
	Stanley Syamapa (Syachulubwi)	
Chief	Chief Musokotwane	
Chief	Senior Chief Mweemba	Chief Edson Shamu

Chief Mweemba	Chief Retainer	Alex Simunchembu
Chief	Chief Sipatunyana	Timonth Masaka
Chief Sipatunyana	Chief Retainer	Shabby Mudenda
Chief Sipatunyana	Chairman of Reco Royal Establishment Committee	Tennyson S Sindowe
Chief Sipatunyana	Vice Chairman Mutala Settlement	Wesley Simweena
Chief	Chief Simwatachela	Chief Bothwell Staleka
INTERESTED PARTIES		
Tourism stakeholders		
Adventure logic	Mr. Ruaridh Stevenson	Owner
Bundu Adventures Ltd.	Johannas Stallman	Owner
Bundu Adventures Ltd.	Christa Fromhert	Administration
Euma Tours	Chief Executive	
Dune Tours	Keith Martyn	
Fawlty Towers	Eussa Davie	General manager
Limbo lodge	Kingsley Lilamono	Owner
Livingstone Tourism Association	Rodney Sikumba	Chairperson
Maramba River Lodge	Theresa Lermer	Lodge Manager
Munga Eco Lodge	John Sikaneta	Director
Mukwa Travel & Tours Zambia.	Hanida Malik	Chief Executive Officer
Taita Falcon Lodge	Anmarie Fourie	
Munga Eco Lodge	Dr Samuel Sikaneta	Director
Raft Extreme	Mack Gill	Director
Safari Par Excellence	Graham Nel	Managing Director
Safari Par Excellence	Gene Pecker	Manager
Safari Par Excellence	Tony King	Operations
Safari Trek international group	Dave Gyles	CEO
Water By Nature	Hamish McMaster	Owner
Water By Nature		
Savannah Southern Safaris	Chilwza Saavanda	Guide
Stanley Exploration & Safari	Mr Reinout De Gruijter	

Tabonina Guesthouse	Lambert Mate Kalaluko	Director
Taita Falcon Lodge	Faan Fourie	Director
Taita Falcon Lodge	Ann Marie	
Wasawange Lodge & Tours	Kalinda Hamabwe	Operations Manager
Zambezi Rafting Company	Kelom Muyatwa	River Guide
AOS - Sportagentur Strobl GmbH	Lukas Strobl	
Jet Extreme		
DRC Fishing Camp	John Mwamsa	Madyongo Village, Mwense Leapula Province
Bimbi Fishing Camo	Misheck Mwenya	Madyongo, Kafunambila, Chezya, Musuma, Muyaba
Mcdonald	Bridget (Care taker)	Madyongo
Tourim Council of Zambia		
Eco Tourism Association of Zambia		
International organisations		
UNESCO	Felicitas Chinanda	Secretary - General
OWA	Catherine Loke	Safety Training Director
WWF	Gershom Pule	Project Officer
WWF	Ms. Nachilala Nkombo	Country Director
WWF	Agness Musutu	Senior Hydrologist
International Rivers	Rudo A. Sanyanga	Africa Program Director
SADC	Lubasi Mungandi	SADC National Contact Point
Oxfam GB		Country Director
World Vision	Sebastian E Kunda	Technical Advisor/Programme Manage
Save the Zambezi	A Waterkeeper Alliance Affiliate	

Other Interest Groups - Organisations		
Zambia Climate Change Network	Robert Chimambo	Board Member
Community Based Natural Resources Management Forum	Vincent Ziba	National Coordinator
Jesuit Centre for Theological Reflection	Father Emmanuel Mumba SJ	Director
Jesuit Centre for Theological Reflection	George S Makaha	Outreach Regional Officer
Southern Medical Centre		
Zambia Vulnerability Assessment Committee		
Zambia Community Based Natural Resource Management Forum	Mr. Chongo	Co-ordinator
Caritas Zambia	Steve Mulafulafu	Executive Director
Hearth Earth Art (Permaculture Fundi)	Carolyne (Carrie) Pretoriys	
EAG and Environment Africa	Bernard Sinyangwe	Chairperson
WESCZ	Margaret Whitehead	Member
The Livingstonian	Gill Staden	Director
Zambezi Memories	Sean Edington	
Zambezi Memories	Julius Nalishebo	
Zambezi Nkuku Farm	Arthur Sonnusbreg	Director
University of California	Grace Wu	
University of California	Ranjit Deshmukh	
University of South Africa	Tracey Mckay	Senior Lecturer
Copperbelt University	Stanford Siachoono	Lecturer in Wildlife Management
AZMEC, WECSZ, ZAMDEX	Narayana Money	Geologist
Private Sector Development Association(PSDA)	Chair Person, Yusuf. M. Dodia	Mulungushi International Conference Centre(MICC), Annex Buidling
Livingstone Chamber	Malte Bvedelf	EO
Livingstone & Kazungula Farmers Association	Ruth Henson	Women's Representative
Livingstone & Kazungula Farmers Association	Veronica Siachenga	Chairperson

Zambia Chamber of Small and Medium Business Associations(ZCSMBA)	Ms. Evelyn Puuka	Provincial Rep
Non-Governmental Organisations		
Non Governmental Coordinating Council	Engwase B. Mwale	Executive Director
Wildlife and Environmental Conservation Society of Zambia	Patrick Shawa	National Coordinator
The Butterfly Tree	Emma kennedy	Project manager
Birdlife Africa (Former Birdwatch Zambia	Mwape Sichilongo	Vice Chairperson
Care International	Geraldine Zwack	Country Director
Environment Africa	Obert Mubiana	Director
Environment Africa	Ackson Shala	Secretary
Alliance for Sustainable Agriculture(ASA)	Executive Director, Brenda Hanampota	Kabulonga, Plot No.39 A Kudu Road
Plan International	Mercy Chabu Ngoma	Interim Country Director, Plan International Zambia
Save the Children		
Africa Impact		
Corridors of Hope	Robert Chiegil	Country Director, Chief of Party
UNICEF	Precious M. Habeenzu	Communication officer
Response Network	Håkon Spigseth	Country Director
Land O'Lakes	Chuck Lippstreu	
Peace Parks Foundation KAZA	Ian Middleton	Project Manager: Simalaha Community Conservancy, KAZA TFCA
WWF Zambia	Michael	
Waterkeeper Alliance, Inc.	Daniel E. Estrin, Esq	General Counsel & Advocacy Director

Save the Zambezi Foundation	James Hitchins	Director
Other Interest Groups - Individuals		
N/A	Humphry C. Mhango	Conservationalist
N/A	Mike Nawa	Renewable Energy Resources Researcher and Conservationalist
N/A	Cooper Freeman	
N/A	Helen Cave	
N/A	Robert Le Brun	Freelance events organizer, assistant & logistics
N/A	Scott Ramsay	Registered tour guide
N/A	Pam Bell	
N/A	Fiona Buttrey	
N/A	Erin Carey	
N/A	Stone	
N/A	Matt Blue	
N/A	Richard Addison	
N/A	Sam Helliwell	
Avgphotographer	Alan	Photographer
	Mike Wright	
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N/A	Lisa Benham	
N/A	Sean Lavin	
N/A	Rebecca Wildbear	
Chundukwa River Lodge, Simalaha Horse Safaris	Alison	
N/A	Ruth Danziger	
N/A	Benjamin Warr	
Armitage Consulting	Nyundo Armitage	
N/A	Billy Sakavuyi	
N/A	Laurie Simpson	
N/A	Chanda Mwale	
N/A	Selusiwe Sibanda	
N/A	Neil Deacon	Consultant Biologist
Grassroots Trust	Rolf Shenton	
Lower Zambezi Tourism Association	Paula Vrdoljak	LZTA Secretary

	Loreen Katiyo	
Chundukwa River Lodge, Ride Zambezi Horse Trails	Gail Kleinschmidt	Lodge Owner
ZEMA	Constantino Mwembela	
ZTA	Givemore Chidzidzi	
	Victor sindowe	Chief Sipatunyana's representative
	Sean Lavin	
	Piers Oliphant	
	Michael	
	Timothy Phiri	
	Matthew Lotz	
	Loretta Archer	
	Ian Perks	
	Kate Hughes	
	Marc Joeris	
	Gareth Lake	
	sophie portier	
	Thomas Smith	
	Yango James John	
	Greg Lee	
	Usch Pilz	
	Juanette Cremin	
	Josef I. Stocker	
	Lindsey Davis	
	courtney burton	
	Richard Andrews	
	Samuel Helliwell	
The Royal Society for the Protection of Birds (RSPB)	Bruce Liggitt	Senior International Casework Officer
	Eric David	
	Makenna Cavarzan	
	Andrew Atkinson	
	Walter Ringelmann	
	Richard Addison	

	Aidan Fulcher	
	anna maracuja	
	Garrett Quinn	
	Heather Buckingham	
	Richard Maggs	
	James Griesedieck	
	Matthew Clarkson	
	Matej Sottner	
	Greg Healy	
	Christina Nel	
	Brayden Raw	
	Grace Drummond	
	Trevor Fordyce	
	Tristan Edey	
	Amy Clarke	
	Reservations Chundukwa	
	Janet Abbey	
	Ashley Mead	
	Tamara Keays	
	Vernon Booth	
	Philani Moyo	
	Scott Tiley	
	Michael Bucci	
	Andrea K. Amend	
	Daniel Sterk	
	Jonathan Piers Tyler	
	Sean Lavin	
	Lillian	Kalenge
	Daniel	Phiri
	Clara	Nanja
	Kelvin	Mkandawire

	Billy	Sakavuyi
	Evis	Siamachoka M
	Clare	Mateke
	Bernard	Musukuma
	Lloyd	Nundwe
	Gail and Doug	Kleinschmidt/Evans
	Lucas	Zulu
	Caroline	Mooto Mooto
	Namunji	Tobani
	Marie-Louise	Kellett
	Barra	Liddy
	Rachel	Chen
	Bronwyn	Maree
	Wayne	Simpson
	Bruce	Liggitt
	Melissa	Baker
	JOHN	GOULD
	Sue	Liell-Cock
	Robin	Brown
	Ken	Mwathe
	Johannes	Stallmann
	Nicolaas	Fourie
	Terence	Creamer
	Claudio	Bacigalupi
	Imakando	Sinyama
	Denford	Chirenje
	David	Zimba
	christopher	chisense
	david	mazvidza
	phillip	ziduche
	Mike	Everett
	Ndomupeyi	Chikonye

	LOZIWE N	Chilufya
	Phanuel	Kudakwashe Mangisi
	Nothani	Ndlovu
	Nelton	Mangezi
	Samson	Chibaya
	Sibeti	Masuku
	Benson	Munyaradzi
	TINAAPI HILARY	MADIRI
	Roseline	Mandisodza
	Brian	Siakweenda
	Hilda	Sinywibulula
	Tsitsi	Munetsi
	michelo	mwiinga
	Itai Hilary	Tendaupenyu
	Tawandah	Munambah
	relent	ncube
	Lillian	Kalenge
	CHARLES	NDAKALA
	geoffreys	matipano
	Gilbert	Moyo
	BILLINGS	NG'ANDWE.CHANDA
	edward	kabwe
	Doris	Tom
	Mulala	Mulala
	Felix	Chisha
	Gwyneth	Ngoma
	Wellington	Maphosa
	KELVIN	Chanda
	Muyumbwa	Ndiyoi
	Chilala	Mayanda
Community Members		
Musokotwane	Kennyford Simakalanga	

Musokotwane	Alfred Katiti	
Musokotwane	Richard Mulibo	
Musokotwane	Elina Likukela	
Musokotwane	Jailosi Sikanzama	
Musokotwane	Donald Sitondo	
Musokotwane	Lydia Simuyandi	
Musokotwane	Siamabole Josephine	
Musokotwane	Mwiinga Donald	
Musokotwane	Kennedy Kameli	
Musokotwane	Sunday Siakasweka	Treasurer
Musokotwane	Raphaelmuzala	
Musokotwane	Conerlius Mulikisa	
Musokotwane	Austin Sitali	
Musokotwane	Benson Malumanda	
Musokotwane	Daylight Chibbalo	
Musokotwane	Josua Ndambo	
Musokotwane	Lingwabo Robert	
Musokotwane	Chiyanika H. Grant	
Musokotwane	Edward	
Musokotwane	Boston Muzandu	
Musokotwane	Precious Kambulu	
Siandavu	Maureen Chikatala	
Sintabungu	Juju Mbamabele	
Sintabungu	Brown Santabangu	
	Sunday Munkombwe	
	Kenneth Siatebe	
Siasimambeba	Victor Mweemba	
Musokotwane	Patrick M. Sibofu	
Sheleni	Partson Kahemba	
Kapongo	Kenneth Muyama	
Mwiinga	Mweemba Royson	
Mwiinga	Situnga Godfrey	
Silelo	Siamunda George	

Mukemu	Kambole Ishmael	
Mwileli	Sando Kenneth	
Siamalambe	Mazunga Ishmael	
Mandandi	Thomas Simbotwe	
Mandandi	Alex Sililo	
Masunda	Maxon Mutema	
Pisami	Owen Manioponi	
Masuya	Aubrey Mbanachole	
Zambela Wasyamwalu	Benard Meduke	
Siamalange	Alfred Syamalange	
	Atson Kwimbe	
	Yona Kammando	
	Kenandi Mashachani	
Chilemfwe	Evans Chipango	
Mujala	Robert K. Mufalali	
Mujala	Winston Mumala	
Kpulanga	Henry Sitali	
Chilemfwe	Arnold Sionyungwe	
Nyagule	Geofrey Nyagule	
Nyagule	Bweenje Rogen	
Siasopo	Joshua Mbambo	
	Daylight Chibbalo	
Matengu	Benson Malumanda	
Sitahame	Austin Sitali	
Sitahame	Corneliuos Mwikisa	
Musoko	Raphaelmuzala	
Siakasipa	Kenush Siadudu	
Siasikambala	Lloyd S. Masamu	
Siasikambala	Katumba Moses	
Namatongo	Enock Siamasiku	
Zangala	Josephat Kandiana	
Zangala	Royd Sambo	
Siamatete	David Kesazi	

Chilizya	Emmanuel Kesho	
Siamatata	Anton Mukaye	
Chilizya	Kilian B. Siatontola	
Zangala	Lanny Mukumbuta	
Chilizya	Jim Siatontola	
Chilizya	Malumo Simasiku	
Siachuma	Steven Simubwele	
Siazibole	Dereck Sikanyama	
Sialulobe	Fwenco Ndelelwa	
Siachuma	Emmanule Moola	
Chibule	Gardina Malake	
Makalahani	Gift Nyambe	
Chbule	Andrew Chalinga	
Ngandu	Tichaona Ncube	
Ngandu	Makay Siyinda	
Makalahani	Peter Nyama	
Siakondo	Eliot Simasiku	
Siejoba	Boston Siachetola	
Chimbalani	Jacob Mufana	
Makalahani	Brian Silabi	
Munwana	Peter Simunomba	
Makalahani	Brandina Chembe	
Ngandu	Victoria Mutendwa	
Munwana	Marita Chekapa	
Ngandu	Getrude Solochi	
Siamatete	Layness Sibajene	
Siamatete	Anoya Muyangwa	
Munwana	Mary Sitali	
Chibule	Makanzala Malumo	
Chibule	Chathrine Siamantundi	
Chibule	Juliet Siansulinga	
Chibule	Ireen Simatele	
Muntu Muswana	Jerpha Gwelwauni	

Muntu Muswana	Angela Mumba	
Munwana	Mary Kasoka	
Ngandu	Lilian Sitwala	
Chibule	Modesta Mabunda	
Chibule	Mirriam Sikiti	
Ngandu	Patricia Simate	
Ngandu	Chathrine Siamukwele	
Muntu Muswana	Simasiku Justina	
Muntu Muswana	Banachibule Mwalasili	
Mukalahari	Pumulo Mary	
Mukalahari	Lownar Sizalia	
Ngandu	Jornar Nakalizya	
Munwana	Bweenda Siapuni	
Chibule	Rosarline Siamukwele	
Chibule	Iliun Siapongo	
Muntu Muswana	Idina Muhelo	
Ngandu	Loveness Simalongwa	
Chilizya	Philli Siatontola	
Siachoma	Mwaka Siachikuni	
Ngandu	Bult Nakakolizya	
Ngandu	Morren Mazanga	
Munwana	fIDELIS Mazanunga	
Munwana	Anna Siasayi	
Ngandu	Lray Siana	
Ngandu	Dorothy Kambole	
Ngandu	Cecilia Libetwa	
Ngandu	Josephine Sibenzu	
Ngandu	Anna Mundila	
Munwana	Gorrety Simutembo	

NATIONAL MINISTERIES		
Ministry of Communication and Transport	Fewdays Chanka	Director - Maritime and Inland Waterways Dept
Ministry of Communication and Transport	Nicholas Chikwenya	Director - Department of Transport
Ministry of Communication and Transport	Steve Mbewe	Director - Planning and Monitoring Dept.
Ministry of Lands and Natural Resources	Mr. Allan Danchi	Ag. Chief Natural Resources Officer, Land and Natural Resources Dept.
Ministry of Agriculture	Mr.Moses Mwale	Director - Zambia Agriculture Research Institute
Ministry of Agriculture	Mr. Peter K. Lungu	Director - Department of Agriculture
Ministry of Agriculture	Mr Mwango	D/Director - Department of Fisheries
Ministry of Agriculture	Julius Shawa	Permanent Secretary
Ministry of Agriculture	Emmanuel M. Nyirenda	Principal Engineer
Ministry of Fisheries and Livestock	Dr. Benson Mwenya	Director - Livestock Development
Ministry of Energy	Mr. Arnold M. Simwaba	Director - Department of Energy
Ministry of Energy	Mrs. Francesca Zyambo	Director - Department of Planning and Information
Ministry of Energy	Mr Arnold Simwaba	A/Director – Energy Chairperson – BGHES PSC
WARMA	Oscar Silembo	Act. Director - Water Resources Mgnt Info
Energy Regulation Board (ERB)	Ms. Langiwe Lungu	Executive Director
Ministry of Livestock and Fisheries Development	Dr. D. Shamulenge	Permanent Secretary
National Council for Construction (NCC)	Matthew Ngulube	Executive Director
ZESCO Ltd.	Christopher Kaniki	Environmental Scientist
ZESCO Ltd.	Victor Mundende	Managing Director
National Heritage Conservation Commission (NHCC)	Kagosi Mwamulowe	Regional Director
WARMA	Oscar Silembo	Act. Director - Water Resources Mgnt Info
Department of National Parks and Wildlife		
Ministry of Tourism and Arts	Mr. Zulu	Director - Dept. of Tourism
Ministry ot Tourism and Arts	Ms Bridget Mwansa	Director Personal Assistant
Zambia Tourism Agency	Mr Peter Jones	Chairman of Destination Livingstone
Ministry of Communication and Transport	Cecilia Chinkumbi	Director - Maritime and Inland Waterways Dept
Ministry of Communication and Transport	Paul Mulola	Director - Department of Transport
Ministry of Communication and Transport	Cecilia Chinkumbi	Director - Planning and Monitoring Dept.
Ministry of Lands and Natural Resources	Allan Dauchi	Ag. Chief Natural Resources Officer, Land and Natural Resources Dept.
Ministry of Agriculture	Annie Mukutuma	Director - Zambia Agriculture Research Institute
Ministry of Agriculture	PK Lungu	Director - Zambia Agriculture Research Institute
Ministry of Agriculture	Lillian Moyo	Director - Department of Agriculture
Ministry of Agriculture	B. Musonda	Director - Department of Fisheries
Ministry of Agriculture	Loviwe	Director - Department of Fisheries
Ministry of Agriculture	Cathy	Permanent Secretary
Ministry of Agriculture	Mutinta	Principal Engineer
Ministry of Energy	R. M. Siya	Director - Department of Energy
Ministry of Energy	Brain Siakweenda	Sinior - Department of Energy
Ministry of Energy	Grace Kaunda	Director - Department of Planning and Information
Energy Regulation Board (ERB)	Langiwe Lungu	Executive Director

Ministry of Livestock and Fisheries Development	Jane Takusanikwa	Director - Livestock Development
Ministry of Energy	Young Vibetti	Director - Department of Planning and Information
National Council for Construction (NCC)	E. Besa	Executive Director
ZESCO Ltd.	J. Chisonta	Environmental Scientist
ZESCO Ltd.	K. Mutukwa	Managing Director
ZESCO Ltd.	Eng. Ernest C. Banda	Senior Manager- Generation Development
ZESCO Ltd.	Eng. David Zimba	Director- Batoka North
ZESCO Ltd.	Jack Munthali	Principal Environmental Scientist
UNESCO	Mr. Charles Ndakala	Secretary General, Zambia National Commission for UNESCO
National Heritage Conservation Commission (NHCC)	M. Ndiyoi	Regional Director
WARMA	G. Mwango	Director - Water Resources Mgnt Info
WARMA	Mrs Sungwe Banda	Director - Secretary
Department of National Parks and Wildlife	B. Mwansa	Director - Dept. of National Parks and Wildlife
Department of National Parks and Wildlife	Willie Kaputo@mota.gov.zm	Director - Dept. of National Parks and Wildlife
Ministry of Tourism and Arts	I. Mwale	Director - Dept. of Tourism
Ministry of Tourism and Arts	Mr. W.H. Katongo	Acting Permanent Secretary
Ministry of Tourism and Arts	Mr. Willie Kaputo	A/Director -Planning and Information
Ministry of Tourism and Arts	Mr John Zulu	Site Manager National Heritage Conservation Commission, Victoria Falls World Heritage Site, Livingstone
Ministry of Tourism and Arts	Lillian Sabe	Regional Director
ZEMA	Fredrick Muyano	Manager
	Constantino Mwembela	Principal Inspector
Zambia Environmental Management A gency	Mr. Constantino Mwembela	
Zambia Environmental Management A gency	Mr. Fredrick Muyano	Principal EIA Officer
Ministry ot Tourism and Arts	Ms Bridget Mwansa	Director Personal Assistant
	David	Zimba
	christopher	chisense
	david	mazvidza
	phillip	ziduche
	Ndomupeyi	Chikonye
	LOZIWE N	Chilufya
	Phanuel	Kudakwashe Mangisi
	Nothani	Ndlovu
	Nelton	Mangezi
	Samson	Chibaya
	Sibeti	Masuku
	Benson	Munyaradzi
	TINAAPI HILARY	MADIRI
	Roseline	Mandisodza
	Brian	Siakweenda
	Hilda	Sinywibulula
	Tsitsi	Munetsi
	michelo	mwiinga
	Itai Hilary	Tendaupenyu
	Tawandah	Munambah
	relent	ncube
	Lillian	Kalenge
	CHARLES	NDAKALA
	geoffreys	matipano
	Gilbert	Moyo
	BILLINGS	NG'ANDWE.CHANDA
	edward	kabwe

	Doris	Tom
	Mulala	Mulala
	Felix	Chisha
	Gwyneth	Ngoma
	Wellington	Maphosa
	KELVIN	Chanda
	Muyumbwa	Ndiyoi
	Chilala	Mayanda

Rafting stakeholders		
Adventure logic	Mr. Ruaridh Stevenson	Owner
Bundu Adventures Ltd.	Johannas Stallman	Owner
Bundu Adventures Ltd.	Christa Fromhert	Administration
Livingstone Tourism Association	Rodney Sikumba	Chairperson
Raft Extreme	Mack Gill	Director
Safari Par Excellence	Graham Nel	Managing Director
Safari Par Excellence	Sean Edington	
Safari Par Excellence	Gene Pecker	Manager
Safari Par Excellence	Tony King	Operations
Zambezi Rafting Company	Kelom Muyatwa	River Guide
AOS - Sportagentur Strobl GmbH	Lukas Strobl	
Taita Falcon Lodge	Anmarie Fourie	
International Rivers	Rudo A. Sanyanga/ Sive Motae	Africa Program Director
Jet Extreme	Tony	
Maano Adventures	Enock	Owner
Water By Nature	Hamish McMaster	Owner
Water By Nature		
Euma Tours	Chief Executive	
Dune Tours	Keith Martyn	
Savannah Southern Safaris	Chilwza Saavanda	Guide
Stanley Exploration & Safari	Mr Reinout De Gruijter	
	munyaradzi	munodawafa
	phillip	ziduche
	fitzgerald	muchindu
	relent	ncube
	David	Zimba
	J	Munthali
	relent	ncube
	Markus	Schreiner
	Claire	Powell
	Justine	Likuka
	Sabao	Kantu
	Rolf	Shenton
	Rosie	Mercer
	Timothy	Phiri

Annex C8.8.2

Zimbabwe Stakeholder Database

Organisation/Stakeholder name	Contact Name	Position
NATIONAL MINISTRIES		
Ministry of Local Government, Public Works and National Housing	George Magosvongwe	Permanent Secretary
Ministry of Women Affairs, Community, Small and Medium Enterprises Developments	Ambassador Rudo M. Chitiga	Permanent Secretary
Ministry of Health and Child Care	Dr. Gerald Gwinji	Permanent Secretary
Ministry of Primary and Secondary Education	Mrs Tumisang Thabela	Permanent Secretary
Home Affairs and Cultural Heritage	Mr Melusi Matshiya	Permanent Secretary
Ministry of Youth ,Sports, Arts and Recreation	Dr Chitepo	Permanent Secretary
Ministry of Finance and Economic Development	Mr Guvamatanga	Permanent Secretary
Ministry of Transport and Infrastructural Development	Engineer Marawa	Permanent Secretary
Ministry of Energy and Power Development	Dr Gloria Magombo	Permanent Secretary
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Ringson Chitsiko	Permanent Secretary
Ministry of Environment, Tourism and Hospitality Industry	Mr M. Munodawafa	Permanent Secretary
Ministry of Environment, Climate Tourism and Hospitality Industry	Mr. Samuriwo	Director-Conservation
	Mr. Runyowa	Director-Tourism
	Mr. T. Mundoga	Deputy Director-Natural Resources, Global Environment Facility OFP
Ministry of Mines	Mr Onesmo Mazai Moyo	Permanent Secretary
EMA	Aaron Chigona	Director General
Environmental Management Agency (EMA)	Mr. C. Mushava	Environmental Protector Director
Zimbabwe Parks and Wildlife Management Authority	Mr F. U Mangwanya	Director General
Department of District Development Fund	Mr JK Jonga	Director General:
District Development Fund (DDF)	Mr T. Chiwera	Deputy Director Planning and Construction
President's Office	Richard Moyo	Minister of State for Matableland North Province
Ministry of Energy and Power Development	Z.G Shumba	
Ministry of Energy and Power Development	Mr. Benson Munyaradzi	Principal Director – Power Co-Chairperson-BGHES PSC
Department of Physical Planning	Mrs Mutyambizi	Acting Principal Director
Department of Physical Planning	Diana Chimhanda	Chief Planning Officer
Zimbabwe Parks and Wildlife Management Authority	Mrs Rushesha	PA
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Hilary Madzikanda	Chief Ecologist
Zimbabwe Tourism Authority	Karikoga Kaseke	Chief Executive Officer

Zimbabwe Council Of Tourism	Tichaona Hwingwiri	President
Zimbabwe National Water Authority (ZINWA)		
City of Harare	Herbert Gomba	Mayor
Zimbabwe National Commission for UNESCO	H. E. Ms Abigail Shonhiwa	Ambassador Extraordinary and Plenipotentiary of Zimbabwe to France
Zimbabwe National Commission for UNESCO	Professor Jonathan Moyo	Chairperson
Zimbabwe National Commission for UNESCO	Ms M. J. Chirapa	Secretary General
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Mellisa Muchena	Culture Programme Assistant Regional Office for Southern Africa
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Mr. Rodney Bunhiko	Culture Programme Assistant
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Ms. Mulekeni Ngulube	Culture Programme Consultant Team Leader

PROVINCIAL AUTHORITIES		
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Dumisani Nyoni	Chief Lands/Agritex Officer
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Lungile Dhlomo	Dept of Livestock Product Development
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Raymond Nyandoro	Provincial Physical Planning officer
Provincial Mining Director	Mr F. Ngulube	PMD
Ministry of Local Government, Public Works and National Housing	Lathiso Dlamini	Provincial Administrator
Ministry of Transport and Infrastructure Development	Kamutema	Provincial Roads Engineer
ZINARA	Eng Masocha	Planning and Monitoring Technician
Ministry of Health	Dr Alfred Muchara	Provincial Medical Officer Matebeleland North
Zimbabwe National Water Authority (ZINWA)	Engineer Manyeka	Operations Engineer
ZINWA	B. Tagwirei	Quality Assurance Officer

Surveyer General's Office		Deputy Surveyer General
LOCAL/DISTRICT AUTHORITIES		
Ministry of Health and Child Care	Ms Elizabeth Moyo	PrEHO
Ministry of Youth	Mirriani Esther Chikwama	Youth Officer
Ministry of Youth	Ndlovu Khethiwe	Youth Officer
Civil Aviation Authority of Zimbabwe (CAAZ)	Mr Ronnie Masawi	Vic Falls Airport Manager
Civil Aviation Authority of Zimbabwe (CAAZ)	Sandra Nsamba	Secruit Officer
Department of Health	Winfrida Ngwenya	District Nursing Officer
Zimbabawe Forestry Comission / Dept. Forestry Services	Bekithemba Ngwenya	District Manager
Department of Immigration	Vincent Gombero Owen Mukombero	Principal Immigration Officer
Victoria Falls Municipality	Lot Mpande	Director: Housing & Community Services
Victoria Falls Municipality	Ms Kholwani Mangena	Chamber Secretary
Victoria Falls Municipality	Ngoabutho Moyo	Public Relations and Economic Development Officer
Victoria Falls Municipality	Tabani Mhlanga	Director of Housing and Community Servcies
Victoria Falls Council	C Dingani	Town Cleck
Zimbabwe Tourism Authority	Solphy Chimba	acting reg manager
Zimbabwe Parks and Wildlife Management Authority	Ticharamba Jura	Area Manager - Hwange Main Camp
Zimbabwe Parks and Wildlife Management Authority	Mr Edwin Makuwe	Ecologist
Environmental Management Agency (EMA)	Day Mudyariwa; N. Khombe	
Zimbabwe Parks and Wildlife Management Authority	Edmore Ngosi	Area manager - Zambezi Nat Park
Metereological Services Department	Faith Chiramba	Met Officer - Vic Falls
Ministry of Home Affairs	Snr Ass Mbangwa	Officer commanding Province
EMA	N. Ndhlovu	District Officer Victoria Falls
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	Mr Marandu Misheck	District Lands Officer
Department of Veterinary Services	Dr Dube	Prov Vet. Officer
Agritex	Mangwiro Rurwakumire	Extension Officer
Ministry of Primary and Secondary Education	Mr Lovemore Ncube	District Education Officer
Ministry of Defence – Engineering Batillon	Musa Dhlawa	I.O. Officer
Ministry of Defence – Engineering Batillon	Munyoro Glabman	I.O. Officer
Zimbabwe National Water Authority (ZINWA)	Mr Tom Rosen	Gwayi Catchment Area Manager
Zimbabwe National Water Authority (ZINWA)	Taruvinga Bvambure	Operator in Charge
ZINWA (Zimbabwe national water authority)	Dumisani Nyathi	Watsan Superintendent
Zimbabwe Parks and Wildlife Management Authority	Edmore Ngosi Tcharamba Jura	Area Manager Hwange National National Parks
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Mr Chiza	Parks Officer
Zimbabwe Parks and Wildlife Management Authority	C. Gurure	Area Manager Zambezi National Parks
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Tawanda Gotosa	Regional Manager
ZIMPARKS	Mr. Alec E. Dangare	Special Assignments Manager
ZIMPARKS	Mr. Geoffreys Matipano	Deputy Director General (Conservation)
ZIMPARKS	Ms. Roseline Mandisodza-Chikerema	Chief Ecologist Terrestrial
ZIMPARKS	Mr. Courage Mutema	Principal Park Planning Officer Focal Person World Heritage Convention
ZIMPARKS	Mr. M. Kapesa	Cluster Manager – Sebungwe Cluster, Gokwe
ZIMPARKS	Mr. D. Madhalmoto	
ZIMPARKS	Mr. Avambe	
ZIMPARKS	Mr. Itai Hilary Tendaupenyu	Chief Ecologist - Aquatic
Environmental Management Agency (EMA)		District Officer
Registrar General's Office	Alfred Jijah	Registrar General, Processing Officer
Rural Electrification Agency		
Social Services Department	Ivy Mutandagai	District Officer
District Development Fund (DDF)	Jairos Mukuli	District Artisan
Civil Service Commission	Scholastica Mhlanga	District Inspector

District Development Fund	George Phiri	Roads Supervisor
District Development Fund	Jairos Mukuli	District Artisan
ZRP	Inspector Ncube Makeyi	Police Inspector
ZRP	Chief Superintendant Chiwona	SISPOL
ZRP	Inspector Mkwebu	Police Officer
Central Statistical Ofice		
Department of Local Government and National Housing	Previous Ncube	Intern
Department of Local Government and National Housing	Mr Simon Muleya	DA's office
Department of Local Government and National Housing	Mrs Nyaradzo Magoja	Principal Administrative Officer
National Museums and Monuments of Zimbabwe	Chrispen Chauke	Regional Director
Hwange Local Board	Nqobile mabhena	Environmental Health Technician
Hwange District Youth Development	Trymore Ndolo	Coordinator
Hwange Rural District Council (HRDC)	Alic Mudenda	Engineer
Hwange Rural District Council (HRDC)	Willard Paul Phiri	
Hwange Rural District Council (HRDC)	Sithokozile Kwidini	
Hwange Rural District Council (HRDC)	Sikhumbuzo Moyo	
Civil Protection Unit	Mr Simon Muleya	Chairman
	Sansole Tose	Local MP
	Daniel Molokela	Local MP
	Godfrey Dube	Local MP
Hwange District Administrator	Mr Simon Muleya	DA
Hwange Rural District Council (HRDC)	Pendele Ncube	CEO
Hwange Rural District Council (HRDC)	Sipiwe Mapfuwa	Chairperson
Mashala Ward (HRDC)	Mpofu Pastor	Ward Councillor
Simangani ward (HRDC)	Abigail Milazi	Ward Councillor
Sidinda ward (HRDC)	Sinikiwe Nyathi	Ward Councillor
Jambezi ward (HRDC)	Sino Moyo	Ward Councillor
Nemananga ward (HRDC)	Christopher Sibanda	Ward Councillor
Mbizha (HRDC)	Gregory Zulu Dropa	Ward Councillor

Mbizha ward	Benson Ncube	Makuni Village 2
Mbizha ward	Josias Mudenda	Makuni Village 3
Mbizha ward	Clinos Dube	Makuni Village 1
Matetsi Ward (HRDC)	Vulindhlela Mhlanga	Ward Councillor
Chidobe Ward	Mukoma Shakani	Ward Councillor
Kachecheti Ward	Givemeagain Moyo	Ward Councillor
Chikandakubi Ward	Tobia Moyo	Ward Councillor
TRADITIONAL AUTHORITIES		
Matetsi	Agatha Shoko	Headman
Chidobe	Maratuza	Headman
Katchetcheti (Acting Chief Mvutu Mr Sibanda)	Sibanda	Headman
Mbizha/Milonga	Nzazi	Headman
Mbizha	Alois Ngozi	Headman
Jambezi	Aaron Sibanda, Sifelani Ncube, Phillip Chuma	No Headman, Snr Village Heads
Chikandakubi	Nedundwe	Headmen
Nemanhanga	Chabwa	Headman
Nemanhanga	Peter Ncube	Kasikili village head
Nemanhanga	Noah Nkomo	Skumbi 134 village head
	Tatani Nkomo	Skumbi 1 village head
Sidinda	David Kufa Ncube	Headmen
Mashala Ward 9	Patrick Nyoni	Headman
Mashala	Prosper Neshazi	Headman
Simangani	Raphael . Nyoni Chabwa	Headman
Acting Chief Mvutu	Acting Chief Mvutu	Acting Chief
Chief Shana	Chief Shana	Chief
Chief Hwange	Chief Hwange	Chief
Jambezi ward (HRDC)	Anathasias Chitope	Village Head Zhulandangalilo Village 5
Jambezi ward (HRDC)	Godfrey Nyoni	Village Head Village D
Jambezi ward (HRDC)	Aaron Sibanda	Village Head Zhulandangalilo Village 3
Jambezi ward (HRDC)	Betty Nyathi	Village Head Village B
	Zansi Mathias Ncube	Village Head Village 3 Tamuka

Mbizha ward	Richard Nyoni Mashake	Village head Kwalala Village 2
INTERESTED PARTIES		

Tourism stakeholders		
CANSAF	Robin Brown	Managing Director
International Rafting Federation	Sue Liell-Cock	Secretary General
International Rivers	Rudo A. Sanyanga	Africa Program Director
Zambezi River Society	Richard Maarsdorp	Strategic Director
Hotel Association for Matabeleland North	Jonathon Hudson	Chairman HAZ-VF
Backpackers Lodge	Lodge	Lodge
Shearwater Adventures	Cephas Moyo	Ops Manager
Rafting Association & Wild Horizons	Skinner Ndlovu	Chairman
Wild Horizons	Clive Bradford - Rafting or Barbra Murasiranwa or Gary Archer - MD	Directors
Wild Horizons	Barbra Murasiranwa	Director
Wild Horizons	Gary Archer	CEO
Adventure Zone	Brent Williamson	Managing Director
Adventure Zone	Edmore Sibanda	Manager
Shock Wave	Phillane Moyo	General Manager
Shock Wave	Marvel Nyathi	Communication and Information Officer
Gravity Adventures	Mr Andrew and Mrs Marie-Louise Kellett	
Askari Safaris	Steve Taylor	Senior Guide & Managing Partner
AOS Rafting	Kor Ger	
Khanondo	Ben Tessa	General Manager
Dingane Tours	Raz Dube	MD
Lion Encounter Alert	Jonasi	Director
African Predator Diving / Crco Cage Diving	Tendayi Mupanguri	Manager
Dabula Safaris	Mavis or Karen	
Zambezi Helicopter Company (Shearwater)	Mike Davis	Director
Bonisair	Ioan David Gibbs	Director
Hotel Association for Matabeland North	Jonathan Hudson	Chairman HAZ - VF
Imvilo Gorges Lodge	Rob Waters	Project Manager
Imvilo Gorges Lodge	Mark Butcher	Director
Victoria Falls Hotel	Giulio Togni	General Manager
Victoria Falls Hotel	Farai Chimba	Deputy General Manager
Victoria Falls Hotel	Graham Muzunze	Accountant
Kingdome Hotel	Derek Kung	General Manager
Ilala Lodge	Martin Vaughan	General Manager
Rainbow Hotel	Chris Svova	General Manager
Zambezi Hotel	Hilda Magaso	General Manager
Heritage Expeditionsafrica	Fungai Mutseyekwa	General Manager
Elephant Hills Hotel	Mr Nkosinathi Moyo	General Manager
Elephant Hills Hotel	M Sholw	Loss Control
Victoria Falls Safari Lodge	Jonathan Hudson	General Manager
Mputalo hunters	Zondo or Mark Butcher	Director
Imvelo Safari Lodges (Gorges Lodge)	Rob Waters	Projects Manager
Victoria Falls Publicity Association	Knowledge	
Regional Tourism Organisation of Southern Africa		
Cheziya Crocodile Ranch	Joshua N. Magaba	Director
Victoria Falls Wonders Online	Collin Wilbesi	Editor
Imvelo Lodge	Imvilo Lodge, Sidinda ward	778538425
Zambezi Fish Farm	Zambezi fish farm, Kanjeza, Hwange	775150828
Olive Beadle Fishing Club	Olive Beradle, Simangani Ward, Hwange	N/A
Dream Land	Msuna Village< Simangani Ward 10, Hwange	Mr Bwerinofa 0773256560
Chezya Crocodile Farm	Chezya Village, Simangani ward, Hwange	777051865
Chezya Irrigation	Chezya Village, Simangani ward, Hwange	779555448
Simangani Irrigation Scheme	Simangani primary	778673882
Imvelo Lodge		Tin Kok 0778538425
Hwange Power Station	Hwange	Chivurayise GM 0779713587
Hwange Local Board	Hwange	Eng Nguni 0772414186
Hwange Colliery Company	Hwange	
Non-governmental organisations		
The Victoria Falls Wildlife Trust	Roger Parry or Jessica Dawson	Wildlife Manager
Bird Life Zimbabwe	Darryl Teran	Regional Rep.

Environment Africa	Namo Chuma	Director
Environment Africa	Edith January	Field Officer
Eco Elements	Peter Roberts	
Green Africa	Charlene Hewat	CEO
Birdlife Zimbabwe	Julia Pierini	Director
Birdlife Zimbabwe		Member
Green Fund	Yvonne Jandler	
KAZA (Kvango-Zambezi Transfrontier Conservation Area)	Alan Sparrow	Technical Advisor
Environment Africa	Oliver Wales Smith	PA
Zimbabwe Conservation Task Force	Johnny Rodrigues	Chairman
Victoria Falls Anti-Poaching Unit	Charles Brightman	Manager/Director
Environment Africa	Namo Chuma	Director
Zimbabwe Conservation Task Force	Jonny Rodrigues	Chairman
World Vision	Andrew Shamu	Communications and External Engagements Team Leader
Painted Dog Conservation		
Lubancho House,	Sr Sharon Ngwenya	
Integwe – Victoria Falls	Elizabeth (Liz) Marken	
Dhibha Mombe	Mr Garikayi	
International organisations		
University of California	Grace Wu	16263885257
University of California	Ranjit Deshmukh	
WWF	Mrs Charity Mvirimi	
United Nations Development Programme	Resident Representative	
Other Interest Groups		
Jafuta Foundation	Godfrey S Maphosa	Trustee / Administrator
Matetsi ECS	Honye Herbert Sansole	Committee Member
Tree Society of Zimbabwe	Mark Hyde	
The Falls Private Medical Centre - Health Bridge	Dr Manyise	Director
Self	Trevor Lane	
PSMI Medical Clinic (VF)	Dr Sinnity Finnity	Medical Doctor
Victoria Falls Communications Bureau		
Elderman Indubiwa	Alderman Indubiwa	Ex Councilor
EMRAS Ambulance Services		
Friends of Victoria Falls	Larry Norton	Chairman
Batoka Clan	N. Maphosa	Official
Batoka Clan	B. Ncube	Coordinator
Zimbabwe Power Company (ZPC)	Eng Andrew Ramani	Civil Engineer (Projects)
Zimbabwe Power Company (ZPC)	Modling Mberengwa	Civil Engineer (Projects)
Zimbabwe Power Company (ZPC)	Theodore Ncube	Community Relations Officer
Hwange Power Station (HPS)	Chovivofa	Risk Manager
Champion Farmers	Langton Khumalo	Coordinator
Hwange Colliery	Anna Chuma	Environmental Officer
Hwange Show Society	Herbert Sansole	
Hwange Colliery Company	Miss Netsai Munengami	Junior Environmental Officer
Champion Farmers	Langton Khumalo	Coordinator
Media: Finx	Tendai Sahondo	Reporter
The Chronicle	Leonard Ncube	Senior Reporter
VFM	Mumpande Lot	Deputy Director
VFM	N. Ndoluv	DTT
VFM	N. Ncube	TP
VFM	S Sibanda	TE
VFM	P. Masbhreni	HRO
VFM	MD Sibanda	I.A
VFM	P.S. Ndlovu	CS
Caritas	Ratidzai Nyazenga	Program Officer
University of Zimbabwe's Centre for Applied Social Studies	Maxwell Barson	
UZ Dept of Biological Sciences	Prof Isla Grundy	Head of Ecology
N/A	S Chenaux Repond	Director
N/A	Dr Robbie Robinson	Private International Protected Areas Consultant
N/A	Nicholas Simpson	PhD Candidate
N/A	John Chikeya	Project Coordinator Power Generation
N/A	Peter Roberts	Interested party

N/A	Dr T. Nhiwatiwa	Interested party
N/A	Dr M. Barson	Interested party
N/A	Nan Jiang	Engineer
N/A	Ms Andrea Amend	Tourist
N/A	Jean Whiley	
N/A	Dr Drew Cowybeare	Academic
N/A	Bongani Ncube	civil engineer
N/A	Helen Cave	Interested party
N/A	Scott Ramsay	Photojournalist
	Mr Ockie Strumpher	
N/A	Gary Wockner	
Rose of Charity	Nyika	Manager
Campfire Project, Zimbabwe	Charles	
Intengwe	Elisabeth (Lisa) Marken	Director
Catholic Development Commission (CADEC)	CADEC	Main office
	Andrew Matthews	
N/A	Larry Norton	
Leopard Leap Lodge	Maya Oosterhoff	
Robert Eric Swanepoel		Ecologist
Save the Zambezi	A Waterkeeper Alliance Affiliate	
SustiGlobal Consulting	Mr. Oliver Mutasa	Chief and Managing Consultant
Deep Green Resistance	Max Wilbert	Executive Director
ZESA Holdings (Private) Limited	Ndomupeyi Flora Chikonye	Projects Manager
National Museums and Monuments of Zimbabwe	Kundishora Chipunza	
Nomagugu Delphin	Makhetho	
Maasdorp	Richard	
Clemence	Zimudzi	
Darryl	Tiran	
Clive	Wakefield	
Jaco	Kok	
Vernon	Booth	
Angelica	Ncube	
Jeffreys	Manjengwa	
Brent	Williamson	
Agrippa	Mandiwona	
Clive	Bradford	
Farai	Chimba	
Community members		
Sacred Heart Mision	Mr Progress Ncube	
Sacred Heart Mision	Ms Gracious Tshuma	
Sacred Heart Mision	Ms Tumane	
Sacred Heart Mision	Mr Khayelihle Zulu	
Sacred Heart Mision	Mr Linny Zulu	
Sacred Heart Mision	Mr Lovemore Netha	
Sacred Heart Mision	Mr Talent Ndhlovu	
Sacred Heart Mision	Mr Mwikis Mathe	
Sacred Heart Mision	Mr Alexander Ncube	
Sacred Heart Mision	Mr Delroy Sakhala	
Sacred Heart Mision	Ms Kethiwe Nyoni	
Sacred Heart Mision	Ms Faresi Kumwenda	
Sacred Heart Mision	Ms Sina Nyoni	
Sacred Heart Mision	Ms Madelina Dube	
Sacred Heart Mision	Ms Belita Nyathi	
Sacred Heart Mision	Ms Blessed Tshuma	
Sacred Heart Mision	Ms Safira Nkomo	

Sacred Heart Mision	Ms Priscilla Sibanda	
Sacred Heart Mision	`	
Sacred Heart Mision	Ms Anna Moyo	
Sacred Heart Mision	Ms Agnes Nyoni	
Sacred Heart Mision	Ms Margaret Nyoni	
Sacred Heart Mision	Mr Orchad Ndhlovu	
Sacred Heart Mision	Mr Bekezela Ncube	
Sacred Heart Mision	Mr Phillip Banda	
Sacred Heart Mision	Ms Ottilia Chuma	
Sacred Heart Mision	Mr Lawrence Nyathi	
Silibinda	Mr Tadious Zulu	
Sikumbi	Mr Godwin Nyoni	
BH80	MrThembelihle Ncube	
BH86	Mr Patrick Neta	
BH124	Mr Judia Nyoni	
ZRP Jambezi	Mr Tafadzwa Mukaro	
ZRP Jambezi	Ms Letwin Chikohora	
Musani	Mr Jairos Ncube	
Musani	Mr Shephered Ndhlovu	
Musani	Mr Maxmillan Nyoni	
Musani	Ms Siphathisiwe Ndhlovu	
Musani	Ms Thembekile Dube	
Musani	Ms Jeska Mudzana	
Musani	Ms Loveness Sibanda	
Nemanhanga	Ms Rosa Kandimba	
Musani	Ms Margaret Nyoni	
Musani	Mr Fandison Ncube	
Jabula	Mr Kenias Mbewe	
Nemanhanga	Ms Rosina Nyoni	
Silibinda	Mr Themba Nyathi	
Silibinda	Mr Shephered Ngwenya	
Silbinda	Mr Kenneth Sibanda	
Siamwele	Mr Lifas Muleya	
Siamwele	Mr Linos Nkomo	
Siamwele	MrAlois Ncube	
Siamwele	Mr Herbet Ncube	
Jambezi	Mr Emmanuel Ncube	
Siamwele	Mr Richard Nyoni	
Siamwele	Mr Edward Ndhlovu	
Siamwele	Mr martin Dube	
Siamwele	Mr Mabuya Ndhlovu	
Siamwele	Mr Augustine Mlauzi	
Siamwele	Mr Leornad Nkomazana	
Jabula	Mr Cosmas Sithete	
Jabula	Mr Jee Mhlanga	
Jabula	Ms Sarudzai Dube	
Musena	Ms Bett Tshuma	
Silibinda	Ms Matilda Sibanda	
Silbinda	Ms Greedys Mpala	
Silbinda	Mr F Shoko	
Silbinda	Mr Sylvester Nyoni	
Silbinda	Mr Japhet Mathe	
Jabula	Mr Vela Mhlanga	
Jabula	Mr Mica Moyo	
Jabula	Mr F Chawira	
Jabula	Mr Ishmael Ncube	
Jabula	Mr Success Ncube	
Jabula	Mr Peter Ncube	
Jabula	Mr Victor Mupanduki	
Jabula	Mr Peter Kubi	
Sikumbi	Mr Noah Nkomo	
Siamwele	Mr M Zondo	
Siamwele	Mr Bheki	
Jabula	Mr Austin	
Jabula	Mr Makhosini	
Silibinda	Mr Doubt Ncube	

Silbinda	Mr Douglas Mathe	
Jabula	Ms Pretty Nkala	
Nemanhanga	Ms Sitabile Mlauzi	
Jabula	Ms Leah Mpofu	
Jabula	Ms Agadah Ndhlovu	
Jabula	Ms Mayi Chuma	
Musani	Ms Rosemarry Netha	
Musani	Ms Lydia Ntutu	
Musani	Mr Cherest Ncube	
Jabula	Mr Never Munsaku	
Jabula	Mr M. Muzamba	
Musani	Mr Chinene Ndhlovu	
Musani	Mr Kwenjani Ngwenya	
Musani	Mr Patrick Muketeyi	
ZP Jambezi	Mr B Nkatazo	
BH43	Mr Fetty Nyoni	
Jabula	Mr Nicholas Dube	
Jabula	Mr Patrick Ncube	
Jabula	Mr Notani Nkomo	
Jabula	Mr Philemon Nyathi	
Skhumbi	Mr Martin Sibanda	
Jabula	Mr Michael Mbewe	
Jabula	Mar Farai Moyo	
Jabula	Mr Masawuso Nyathi	
Jabula	Mr Konani Shoko	
Jabula	Mr Mongameli Khumalo	
Jabula	Mr Jivas Ndhlovu	
Jabula	Mr Andrew Ndebele	
Jabula	Mr Samsosn Nyathi	
Jabula	Mr Gilbert Ndhlovu	
Sikumbi	Mr Victor Nyathi	
Sikumbi	Mr N. Nkomazana	
Sikumbi	Mr Kenneth Zulu	
Jabula	Mr Mateya Ndhlovu	
Siamwele	Mr Darnsaw Siamwele	
Siamwele	Mr Alois Mathe	
Siamwele	Mr David Moyo	
Siamwele	Mr Victor Chiti Mutale	
Musani	Mr Christopher Sibanda	
Nemanhanga	Mr Vish Silibindi	
Musani	Mr Austin Nyathi	
Nemanhanga	Mr Abel Sibanda	
Sikumbi	Mr Lucky Sibanda	
Sikumbi	Mr G. Nkomazana	
Jabula	Mr Lenin Moyo	
Silbinda	Mr Y. Moyo	
Silibinda	Mr Dadani Ncube	
Silibinda	Ms Saliwe Ndhlovu	
Jabula	Mr Gungwe Sibanda	
Jambezi	Mr Daniel Rwendo	
Nemanhanga ward,	Headman Chabwa	
Jabula	Village head Amos Tolani	
Shantani Village 5	Mr Johane Shoko	
Nemanhanga Vill 1	Mr Peter Nyoni	
Musani	Ms Dorothy Ndhlovu	
Lukungani Mission	Headman Nkomo	
Silbinda	Kayelihle Ndhlovu	
Silibinda 3	Mr George Ncube	
Simwele 3	Village Head Ncube	
Simwele 3	Village Head Adolph Ndhlovu	
Nemanhanga	Village Head Daniel Dube	
Silibinda	Ms Josephine Ngwenya	
Musani	Mr Bongani Ncube	
Sacred Heart Mision	MrJabulani Mkwananzi	
Nemanhanga Vill 1	Mr innocent Viyazhante	
Nemanhanga	Nkosilathi nyoni	

Musani Village 4	Mr Patrick Nyoni	
Nemanhanga Village 4	Mr Phillip Chipaya	
Musani	Mr Davison Ncube	
Musani	Mr Bulowe Nyoni	
Nemanhanga	Mr Simon Muyambo	
Nemanhanga	Ms Nokuthula Sibindi	
Nemanhanga	Ms AliceMoyo	
Musani	Ms Elphina Ndhlovu	
Musani	Ms Ottilia Ncube	
Sikumbi	Mr Stephen Nyoni	
Jabula	Mr Chistopher Sibanda	
Silibinda	Ms Anastazia Sibanda	
Musani Village 4	Ms Conelia Ndhlovu	
Silbinda	Mr Newman Nyoni	
Silbinda	Mr Killion Mathe	
Silbinda	Mr Alexander Chuma	
Siamwele	Mr Khulani Ndhlovu	
Jabula 7	Mr Samson Muleya	
Jabula	Mr Darani Sibanda	
Sikumbi 1	Mr Mutambo Siachingongo	
Sikumbi	Mr Paipasi Tuturu	
Jabula 1	Mr Tawino Ngoni	
Nemanhanga	Ms Fimha Ndhlovu	
Nemanhanga	Mr Tapiwa Ganye	
Nemanhanga	Ms G. Chabwa	
Nemanhanga	Mr Richard Chatombota	
Nemanhanga	Mr morris Ngwenya	
Nemanhanga	Mr Mabuza Moyo	
Nemanhanga	Mr Richard Muleyi	
Vulindlela	Qhubekani Nkomazana	
Vulindlela	Talent Banda	
Vulindlela	Mcebisi Sifuya Sibanda	
Kachechete	Israel Moyo	
Kachechete	Obert Mpofu	
Vulindlela	Champion Ndlovu	
Ndlovu	Albert Ndlovu	
Vulindlela	Fred Ndlovu	
Mpumelelo	Raphael Dube	
Ndlovu	Chikuduri Elvis	
BH 129	Chikwa Sibanda	
BH 9	Everest Mpofu	
BH 25	Gladys Maphosa	
BH 127	Chiedza Sibanda	
BH 118 Lupinyu	Sibongile Sibindi	
BH 82	Deliwe Ncube	
BH 26	Jerita Ncube	
BH 37	Gladys Dube	
BH 38	Christine Moyo	
BH 24 Ndlovu Village	Nomusa Ncube	
BH 128	Nicholas Mpofu	
BH 59	Methia Mthupha	
BH 57	Precious Thebe	
BH 58	Ntabiso Thebe	
Ndlovu	Cllr Martin Ndlovu	
Ndlovu	Joshua Ngwenya	
Vulindlela	B Sibanda	
Vukuzenzele	First Dube	
Ndlovu	A Madhkwa	
Mpumelelo	Charles Moyo	
Kachechete	Ndabayabo Moyo	
Kachechete	Makitu Mpofu	
Mvutu	Andrew Moyo	
Vulindlela	Mtshayeli Msipa	
ZRP Victoria Falls	Sgt Chikweu	
Vulindlela	Moses Monhosa	
Village Head, Katshetsheti	Wonder Weza	

Vulindlela	Flonder Jabulani	
Vulindlela	Ngaiwi Moyo	
Vulindlela	Pilate Ndlovu	
Vulindlela	Wilson Moyo	
Vulindlela	Thayimoni Moyo	
Mnuthu	Lovemore Moyo	
Vulindlela	Jonathan Sibanda	
Vulindlela	Ngaqabutho Sibanda	
Vulindlela	Simon Sibanda	
Vulindlela	Nkosilathi Masipo	
ZRA	Elizabeth Karonga	
ZRA	Chrispin Namakando	
Chisuma	Lilani Chuma	
Chisuma	Sikhanyiso Moyo	
Chisuma	Patricia Mathe	
Chisuma	Bekithemba Mpofu	
Chisuma	John Zulu	
Jembwe	Sidaniso Mabhena	
Jembwe	Nthembiso Miyo	
Jembwe	Thomas P Ncube	
Jembwe	Pilate Ndlovu	
Jembwe	Albert Moyo	
Jembwe	Jameson Sibanda	
Chisuma	Qondani Ngwenya	
Chisuma	Phineas Tshuma	
	Milton Ncube	
Chisuma	Cleopas Moyo	
Chisuma	Felex Ncube	
Chisuma	Talent Mathe	
Chisuma	Godfrey Mudimba	
Chisuma	David Ndlovu	
Monde	Sebastian M Mathe	
Chisuma	Beatrice Nyoni	
Chisuma	Sara Ncube	
Dibu Dibu Chisuma	M Tshuma	
Chisuma	Charity Tona	
Chisuma	Maria Phiri	
Chisuma	Sekani Mudimba	
Chisuma	Cathrine Tshuma	
Chisuma	Limukani Tshuma	
Chisuma	Grace Jangiya	
Chisuma	Priscilla Ncube	
Chisuma	Gladys Shoko	
Chisuma	Benita Nethsa	
Chisuma	Otilia M Shoko	
Chisuma	Ficleia Ndlovu	
Chisuma	Sizilabuka Masuka	
Chisuma	Virginia Mathe	
Chisuma	Patricia Chuma	
Chisuma	Georgina Mzamba	
Chisuma	Dorcas Chuma	
Chisuma	Otilia Shoko	
Chisuma	Seria Nyoni	
Chisuma	Alice Lungu	
Chisuma	Agness Banda	
Chisuma	Jemila Mangomba	
Chisuma	Agnes Dube	
Chisuma	Tshambaja Chuma	
Sizinda	Dorcas Mabhena	
Chisuma Village Head	Tabona Ncube	
BH 34 Village Head	Yangi Vundla	
Chisuma	Safilo Muuma	
Chisuma	Jabulani Mjuma	
Chisuma	SM	
Chisuma	Jonathan Mabuthi	
Chisuma	Mbiyo Ncube	

Chisuma	J F	
Chisuma	Lucky	
Chisuma	Akwa	
Chisuma	Shakani	
Chisuma	Banda	
Chisuma	Lewis Mpala	
Chisuma	R M Ncube	
Chisuma	Matthew S Mathe	
Chisuma	Forget Mhlanga	
Chisuma	Stanley Mzamba	
Chisuma	Akin Bhebhe	
Chisuma	Amos G Ndlovu	
Chisuma	Itai Mkandla	
Chisuma	Ephraim Dube	
Chisuma	John Thebe	
Dibu Dibu	Nkosilathi Moyo	
Sizinda	Marupila A Ncube	
Chisuma	Andre Muzambani	
Chisuma	Joshua Bhebe	
Chisuma	Pidekelo Mathe	
Chief (A)	B Sibanda	
Headman	A Ndlovu	
Ass Headman	J Mkhawananza	
Monde Village Head	M M	
Jembwe No 5 village head	D Ndlovu	
Ass Headman	Thebe Stanford	
Monde Village Head	Mpala Paul M	
Chisuma	Cosmos Shoko	
Chisuma	Dorcus Masuku	
Chisuma	Sharon Mabhena	
Chisuma	Angela Ncube	
Chisuma	Ronka Dube	
Sizinda	Sifundo Ndlovu	
Chidobe Ward	Gama Siwela	
Monde	Dennis Tibu	
Ndimakule	Mokwala David	
Ndimakule	Abraham Nyathi	
Takazipila	albert Mathe	
Batanai	Edmond Zulu	
Takazipila	Enock Mpofu	
Takazipila	Dumisani Nyathi	
Takazipila	Patrick Dube	
Takazipila	Prince Sibanda	
Takazipila	Grant Moyo	
Takazipila	George Ncube	
Takazipila	kammor Ncube	
Takazipila	Christopher Mathe	
Takazipila	Mike Dube Dube	
Takazipila	Brighton E	
Milimitemba	I Ncube	
Ndimakule	H Kokosa	
Bhatanani	Lines Bwila	
Mitimithula	Richard Ngwenya	
Chishanga	Innocent Zimba	
Chishanga	Nchesi Ngwenya	
Chishanga	Cosmas Ncube	
Chishanga	Chetani Muleya	
Chishanga	Misheck Phiri	
Chishanga	Dennis Nyoni	
Ndimakule V 2	Janet Siband a	
Ndimakule V 3	Assa Nkomazana	
Ndimakule V 2	Beniter Mathe	
Ndimakule V 6	Loveness Tshuma	
Ndimakule V 6	Beniter Ncube	
Ndimakule V 6	Stella Ncube	
Ndimakule V 3	Zondiwe Moyo	

Ndimakule V 2	Tawana Moyo	
Ndimakule V 3	Blessing Moyo	
Ndimakule V 3	Perseverance Khumalo	
Ndimakule V 1	Masawenkosi Ncube	
Chishanga	Thuthukani Ndlovu	
Takazwi	Leonard Ndlovu	
	Samasani Sibanda	
Takazwipila	T Mathe	
Takazwipila	R Tshuma	
Ndimakule	Leornard Nyoni	
Ndimakule	Reign Moyo	
Takaziwi	Blessed Sibanda	
Takaziwi	A Sibanda	
Takazwipila	Michael Ncube	
Taka	Brighton Dube	
Ndimakule	David Khanye	
Chishanga	Morisen Moyo	
Takazwipila	Zenzo Mathe	
Ndimakule	Kadebona Bango Dube	
Mashange Sec School	Kabome Langton	
Government official	T Mvuti	
Agritex	I Liwonde	
Jambezi	D Renolo	
Jambezi Communal Lands	Chief Shana	
Takazwipila Chik Ward	Clement Moyo	
Chikandakubi Primary School	C R Ncube	
Agritex Chikandakubi	T Runhare	
Village Head, Chikandakubi	M Mungeletoni	
Village Head, Chikandakubi	Tobvasi Nyoni	
Village Head, Chikandakubi	Rasmus Nyoni	
Village Head, Chikandakubi	Jacob Ncube	
Village Head, Chikandakubi	Vinika Sibanda	
Village Head, Chikandakubi	Bulayani Ncube	
Village Head, Chikandakubi	Charles T Shoko	
Village Head, Chikandakubi	Chipango Nyatsi	
Takazwipila Chikandakubi	Grant Moyo	
Village C	T Moyo	
Village Chikandakubi	J L Palale	
Village Head Batanani	Raphael Muleya	
Village head Ndimakule Village 4	Selina Ncube	
Village head Chishanga Village 3	Lucia Ngwenya	
Village head BH 7	Mulindela Moyo	
Takazwipila Chikandakubi	Sibani Nkamazana	
Takazwipila Chikandakubi	Tangani Phiri	
Takazwipila	Cephas Ncube	
Chishanga	Bongani Mathe	
Chishanga	Irene Msaka	
Chishanga	Emeldah Nkomo	
Ndimakule	Esnat Ndlovu	
Ndimakule	Alice Tshabalala	
Chishanga	Elen Dube	
Takazwipila Chikandakubi	Evelyn Rwasarira	
Takazwipila	Precidias Chuma	
Takazwipila	Metade Tshuma	
Ndimakule	Selistina Makaza	
Chewumba	Mgotshwelwa Moyo	
Ndimakule	Sithembile Sibanda	
Ndimakule	Sitshengisiwe Muleya	
Chishanga	Nosizi Moyo	
Ndimakule	Alice Ncube	
Chishanga	Chuma Felistas	
Ndimakule	Mdimba Lydia	
Ndimakule	Sibanda Selina	
Takazwipila	Sibanda Veronica	
Ndikule	Muleya Esnath	
Ndimakule	Ndlovu Madoka	

Ndimakule	Kudakwashe Chibatamoto	
Chishanga	Brighton Nkomo	
Ndimakule	Kenneth Famela	
Ndimakule	Bret Ndlovu	
Ndimakule	Usumari Bhanda	
Takazipila	Eleza Chuma	
Takazwipila	Pauline Phiri	
Takazwipila	Christine Nyoni	
Takazwipila	Joyce Mpofu	
Takazwipila	Oliver A Sibanda	
Ndimakule	Nkululeko Khumalo	
Takazwipila	Christmate Chuma	
Takazwipila	Bright Nyoni	
Takazwipila	Mitchell Nyathi	
Ndimakule	Melody Nyoni	
Ndimakule	Naniwe Kafunga	
Takazupila	Regina Sibanda	
Takazupila	Mrs P Nkomanana	
Ndimakule	Sheila Chirwa	
Takazupila	Lambani Nyoni	
Takazupila	P Dube	
Takazwipila	Virginia Nyoni	
Talazipila	Phyllis Dube	
Ndimakule	Christine Ncube	
Ndimakule	Blessed Ncube	
Ndimakule	Precious Nyoni	
Chishanga	Yabani Nkunyawete	
Ndimakule	Simangaliso Ncube	
Ndimakule	Bridget Ngwenya	
Ndimakule	Nicoleen Dube	
Ndimakule	Siboniso Lugule	
Ndimakule	Margret Ncube	
Ndimakule	Mirian Khumalo	
Ndimakule	Matilda Sibanda	
Musenyika	Mishulisi Ndlovu	
Musenyika	Mthaisi Komazana	
Takazipila	B Pakhetikozana	
Takazipila	Paul Madimba	
Chishanga	Fabian Mumba	
Chishanga	Rabison Nyoni	
Chikandakubi	Reason Mukeya	
Chikandakubi	Gordin Mpala	
Chikandakubi	Ephraim Nyoni	
Ndimakule	Shelton Mathe	
Ndimakule	Petros Ngwenya	
Ndimakule	Malumani Moyo	
Ndimakule	Ronald Maseko	
Ndimakule	Hazvineyi Moyo	
Ndimakule	Hassen Mvundla	
Ndimakule	Lexlex K Dube	
Ndimakule	Harrow Moyo	
Ndimakule	Desire Ncube	
Ndimakule	Pilan Ncube	
Takazvipila	Ernest Mayabo	
Ndimakule	Mavuto Kfuiwa	
Ndimakule	Melusi Moyo	
Chenamisa	Lesuthu Mnkandla	
Chenamisa	Ozias Ncube	
Ndimakule	Thembani Maphosa	
Batanani	Lafion Moyo	
Batanani	Liveson Muleya	
Takazwipila	Lawrence Sibanda	
Chishanga	Joseph Ndlovu	
Chishanga	Ngwabi Nathaniel	
Chishanga	Alice Ncube	
Takazwipila	James M Sibanda	

Ndimakule	Joel Sibanda	
Sekebelo Farm Ward 1	Polite Shoko	
Dorn Roven Sekebelo ward 1	Given Nkomo	
Sekebelo Farm Ward 1	Fiddman Nyoni	
Sekebelo Farm Ward 1	Shelton Sibanda	
Masitili	Obert Sibanda	
Khayalethu	Navigator Dube	
Masilili	Isayab Ngwenya	
Khayalethu	Stradford Sibanda	
Sekebelo Farm Ward 1	Clever Ndlovu	
Sekebelo Farm Ward 1	Honest Ncube	
Sekebelo Farm Ward 1	Linos Ncube	
Mapanigomo	Chebeshos Sibanda	
Khayalethu	yabani Shoko	
Mapaningoma	Euberth Ngwenya	
Maskili	Bongani Dube	
Sekebelo Farm Ward 1	Michael Ncube	
Mapaningoma	Franscisco Nyoni	
Mapaningoma	Pelani Chuma	
Mapaningoma	Sharani Sibanda	
Khayalethu	Elias Chuma	
Farm 55	Amon Mudimbu	
Farm 55	Zebedia Dube	
Farm 55	J Marinami	
Maskili	Lindeline Ndlovu	
Matetsi	Sibanda P	
Matetsi	Nyathi D	
Isala	Aria Stephen	
Isala	Tallo Tshono	
Matetsi	Captain Z	
56 Farm	S C Shoko	
56 Farm	Dubani Shoko	
56 Farm	Willson Mudenda	
Farm Mapaningoma	Fulfilment Ngwenya	
Matetsi	Ronald Maths	
Isla Farm	Edmore Mudenda	
Sekebelo	Kennias Ndlovu	
Sekebelo	Josphit Moyo	
Maskili	Josphat Mhlanga	
Oliphent Farm	Ephrem Weza	
Maskili	Ncan Busumani	
Maskili	Joshua Nkomo	
Maskili	Ben Nyathi	
Sikabelo	Ursher Ncube	
Sikabelo	Jeffrey Mandla	
Kalethu	Zani Mudenda	
Maskili	Nyathi Sibongilizwe	
Maskili	Million Ndlovu	
Maskili	Ronald Ngwenya	
Maskili	Oswell Mathe	
Maskili	Richard Nyathi	
Village 5	J Manmani	
Farm 55	Gabriel Sibindi	
Farm 55	Zebedia Dube	
Farm 55	Amon Mudimbu	
Khayalethu	Elias Chuma	
Farm 56	N Bonomali	
Breakfast	Protty Ndlovu	
Mapaningoma	Edington Mpofu	
Farm 55	Gabriel Sibindi	
Farm 56	N Bonomali	
Farm 55	Phinia Mathe	
	Joram Nyathi	
Masikili		
Breakfast	Abel Nyoni	
Breakfast	Joram Phiri	

Masikili	Bruce Makarutse	
Shantani	Patricia Mafuko	
Shantani	Janet Ncube	
Shantani	Joice Nyoni	
Kwalala	Prisca Ncube	
Chenambi	Angela Shava	
Chenambi	Adela Namukowa	
Sisyathu	Sinazeni Shoko	
Chenambi	Sambina Nyathi	
Kwalala	Mukedzayi Sibanda	
Kwalala	Evangelista Sibanda	
Makuni	Kasheru Nyoni	
Makuni	Siphiwe Phiri	
Sisyathu	Khelesi Moyo	
	Memory Moyo	
Ntiba	Elizabth Moyo	
Ntiba	Fesina Sibanda	
Ntiba	Sibonginkosi Mahlanga	
Ntiba	Media Sibanda	
Makhuni	Jesita Phiri	
Makhuni	Zeria Ngozi	
Tishenambi	P Mathe	
chenambi	Jenata Zulu	
Sisyathi	Cynthia Kambole	
Sisyathi	Christina Ncube	
Sisyathi	Senzeni M Ncube	
Makhuni	Lethi Ngwenya	
Makhuni	Beatrice Nyoni	
Shantani	Cathrine Moyana	
Shantani	Priscillar Ngwenya	
Shantani	Ketty Shumba	
Shantani	Siphathelaphi Ndlovu	
Shantani	Simangaliso Mhlanga	
Sisyathi	Maria Moyo	
Village head	Orders Moyo	
Village head	J Dube	
Village head	M A Shava	
Village head	Stephen Sithole	
Village head	Joe Shoko	
Village head	Lenond Nkomo	
Village head	A Peter Ndlovu	
Village head	Ambrose Aloise Nyoni	
Village head	Benson Ncube	
	Florence Ngwenya	
	Dalesi Nyoni	
	Felix Sibanda	
	Rozina Ncube	
	Joyce Ncube	
	Joyce Dube	
	Jenper Mpala	
	Shilla Mwembe	
	Maria Ncube	
Care taker	Polina Shoko	
malaria Champion	Monica Ngwenya	
	Christine Mpofu	
	Wilani Tshuma	
	Matilda Shoko	
	Efan Ngwenya	
	Saviour Ngwenya	
Care taker	Trinity Ndlovu	
Mbizha Ward	Chr Farayi M Sholo	
Mbizha Ward	Village Head Sebastian Ngwenya	
Jambezi	Benelo	
Jambezi	Chief Shana	
Mbizha Ward	Alois Ndazi	
Mbizha Ward	Phineas Ncub	

Mbizha Ward	David Masuku	
Mbizha Ward	Shoko Conman	
Mbizha Ward	Herbert Ndlovu	
Mbizha Ward	Dominic Ncube	
Mbizha Ward	Jeqe Ncube	
Milonga Primary School	Nyoni B	
Mbizha Ward	Ambrose Aloise Nyoni	
Mbizha Ward	Benson Ncube	
Mbizha Ward	Theresa Mulale	
Mbizha Ward	Leornard Nkomo	
Mbizha Ward	Joe Shoko	
Mbizha Ward	Edward Mathe	
Mbizha Ward	Shobai Shoko	
Mbizha Ward	Jacob Sichoni	
Mbizha Ward	Thabhani Zulu	
Mbizha Ward	Nqobile Makufa	
Mbizha Ward	Peter Ndlovu	
Mbizha Ward	Shoko N	
Mbizha Ward	Patrick Sibu	
Mbizha Ward	Shoti Shoko	
Mbizha Ward	Ngalumi Ndlovu	
Mbizha Ward	Jivas Muleya	
Mbizha Ward	Lowani Befu	
Mbizha Ward	Dominic Shoko	
Mbizha Ward	Isaac Manjuzu	
Mbizha Ward	Isaac Mulenga	
Mbizha Ward	Sipho Ncube	
Mbizha Ward	Gift Ngwenya	
Mbizha Ward	Joel Ncube	
Munka	Bol S	
Chenambi	M Shoko	
Chenambi	T Mathe	
Kwalala	Christopher Dube	
Sisyatwi Mbizha	S Makulula Shoko	
Shantani Mbizha	S Mathe	
Sisyatwi	F Tshuma	
Kasalala	Michael Ncube	
Chenambi	Joseph Tshuma	
Ntiba	Simon Shoko	
Chenambi	Stephen Shoko	
Sisyatwi	Ken Shoko	
Kwalala	Joseph Ngwenya	
Sisyatwi	Kizito Nyoni	
Kwalala	Mandla Mpofu	
Chenambi	Stephen Moyo	
Kwalala	Simoloka	
Kwalala	Innocent Nyoni	
Sisyatwi	Jonathan Ncube	
Shantani	Mkhululi Masuku	
Sisyatwi	Gift Chidakwa	
Makuni	Lot Ngwenya	
Makuni	Ephraim Nyathi	
Ntiba	Malon Msaka	
Kwalala	Ernest Sibanda	
Ntiba	Venastius Nyoni	
Mununa	Washington Ngweny	
Sitwatwi	Enock Dube	
Gondwa	Croud Sibanda	
	Jimmy Ndlovu	
	Shelton Zulu	
Milonga	Joseph Mathe	
Ntiba	Ncube Christopher B	
Shantani	Ngezelwa Tshuma	
Chenambi	Lawrence Banda	
Chenambi	Godfrey Nyoni	
Kwalala	Gift David Tshuma	

Shantani	Ngwiza Ngwenya	
Shantani	Danisa Moyo	
Shantani	Felex Moyo	
Sisyatwi	Vincent Phiri	
Sisyatwi	Cleomore Sibanda	
Sisyatwi	Never Ndlovu	
Shantani	Admire Sithole	
Ntiba	Michael Ngwenya	
Sisyatwi	Fandoon Dube	
Sisyatwi	Lungisani Muleya	
	Ronald Neta	
Ntiba	Lawrence Sibanda	
Chenambi	S Nayo	
Ntiba	Isaac Sibanda	
Ntiba	Yeyani Ndlovu	
Ntiba	Ganzoni M	
Makala	Themba Ncube	
Lumbora	Kenneth Bhebhe	
Lumbora	Douglas Sibanda	
Makala	Jubelepi Ncube	
Sidinda	Gabriel Tshuma	
Dobolo	Philimon Nyilengo	
Ndoweni	Gibson Sibanda	
Ndoweni	Fabion Sibanda	
Bhombo	Lelani Mudimba	
Mbhombo	Dadani Madimba	
Mbhombo	Calton Nyoni	
Makala	Alexious Munkuli	
Makala	Tembo Simon	
Makala	Zebani Dube	
Makala	Driver Mudimba	
Makala	Shamiso Mathe	
Makala	M Ngwenya	
Dobolo	Danani Phiri	
Makala	Gidion Nyoni	
Lumbora	Owen Nyathi	
Lumbora	Wiziwell Nyoni	
Dobolo	Taitas Ncube	
Sidinda	Emmanuel Sibanda	
Sidinda	Innocent Ncube	
Sidinda	Chipiwa Ncube	
Chishoma	Bhebhe Ephraim	
Sidinda	Shephard Mbambo	
Sidinda	Emmanuel Mapeta	
Lumbola	Sophy Nkomazana	
Sidinda	Stanley Ncube	
Ndoweni	Vinsto Mhodi	
Lumbora	Pretty Masumu	
Lumbora	Lophias Mumpande	
Lumbora	Peter Mumpande	
Sidinda	Mendris Shoko	
Lumbora	Hurbert Moyo	
Lumbora	Lazarus Sibanda	
Ndoweni	Moffat Sibanda	
Lumbora	Peter Mumpande	
Ndoweni	Abraham Sithole	
Sidinda	Cosmas Mbambo	
Sidinda	Christopher Nyoni	
Sidinda	Paul Zulu	
Sidinda	Francis Shoko	
Sidinda	Dedick Sibanda	
Sidinda	Peter Munsaka	
Matetsi	Ceaser Munsaka	
Lumbora	Trust Bhebhe	
Makala	Peter Kayura	
Lumbora	Enock Moyana	

Ndoweni	Misheck Mathe	
Lumbora	Hillary Nkomo	
	Morris Ndlovu	
Lumbora	Ncedano Ncube	
	Peter Tembo	
Makala	Norman Change	
Makala	Dusani Muntanga	
Makala	Champion Mudimba	
Ndoweni	Peter Nyathi	
Sidinda	Emmanuel Ndlovu	
Makala	Admire Ngwenya	
Lumbora	Norman Mkhandla	
Makala	Hilbert Ncube	
Makal	Lawson Tshuma	
Ndoweni	Enock Nyathi	
Lumbora	Phumulani Ncube	
Lumbora	Innocent Bhebhe	
Lumbora	Raphael Nyathi	
Sidinda	Never Nyathi	
Sidinda	Japhet Sibanda	
Sidinda	Justin Ncube	
Sidinda	Leonard Dube	
Sidinda	Bonani Nyoni	
Sidinda	Anna Nyoni	
Sidinda	Derick Musaka	
Lumbora	Michael Nyoni	
Lumbora	Elisha Matekenya	
Lumbora	Siphelile Moyo	
Lumbora	Cynthia Chuma	
Lumbora	Letria Bhebhe	
Lumbora	Irene Chuma	
Lumbora	Jesta Shoko	
Lumbora	Yabani Shoko	
Lumbora	Swikani Mpala	
Lumbora	Lawrence Sibanda	
Kayamizi	Shantani Mutenda	
Lumbora	Kwezizakele Moyo	
Lumbora	Yenzini Sibanda	
Lumbora	Mtelisi Ndlovu	
Lumbora	Langton Mkanda	
Lumbora	Jechemisho Bhebhe	
Makala	Charson	
	Clatono Ncube	
Ndoweni	Nkalelo Sibanda	
Ndoweni	Agrippa Sibanda	
Ndoweni	Abraham Sibanda	
Lumbora	Moster Sibanda	
Lumbora	Welcome Nyathi	
Lumbora	Alice Mpala	
Lumbora	Tracy Tshuma	
Makala	Polite Munkula	
Sidinda	Emelda Sithole	
Matetsi	Tinos Mudenda	
Sidinda	Ausha Ndlovu	
Sidinda	Fiso Mudimba	
Sidinda	Inzoni Zulu	
Makala	Josphat Dube	
Sidinda	Lazarus Shoko	
Matetsi	Clement Ncube	
Makala	Shingiwe Nkomazana	
Makala	Sheila Ncube	
Makala	Lingiwe Ngwenya	
Ndoweni	Noreen Ncube	
Dobolo	Dafiya Ncube	
Dobolo	Lindiwe Lupahla	
Dobolo	Lombiwe Zimbo	

Makala	Alfred Mathe	
Lumola	Simon Sibanda	
Lumola	Mathias Mzamba	
Ndoweni	Sedias Nkonidzawa	
Ndoweni	Nomsa Vemani	
Ndoweni	Anastasia Ncube	
Ndoweni	Kadius Sibanda	
Ndoweni	Shakani Ngwenya	
Dobolo	Obert Njosi	
Matetsi	Bhubekani Bhebhe	
Matetsi	Nelson Tshuma	
Matetsi	Memory Munsaka	
Matetsi	Roy Sibanda	
Lumbora	Predance Mpofu	
Lumbora	Lydia Chuma	
Lumbora	Themba Ncube	
Makala	Shamiso Ncube	
Makala	Morgan Chanakira	
Makala	Aid Munsaka	
Mukonda	Gizo Sibanda	
Matetsi	Precious Tunaka	
Matetsi	Tichaona Thandla	
Lumbora	Leonard Chuma	
Makara	Allois Shoko	
Lumbora	Edith Sibanda	
Makara	Lameck Maths	
Ndoweni	Patson Sibanda	
Sidinda	Dubani Aleck	
Lumbora	Sinikiwe Zulu	
Lumbora	Siphathisiwe Moyo	
Lumbora	Chinamano Ncube	
Lumbora	Gracious N Sibanda	
Lumbora	Polite Sibanda	
Dobolo	Tshuma David	
Lumbora	Matthew Sibanda	
Sidinda	Tshuma Kevin	
Lumbora	Malunga Mackson	
Lumbora	Nyathi P C	
Lumbora	Gornelius M Bango	
Lumbora	Mdimba Darlington	
Dobolo	Mukaladi Ngwenya	
Makala	Million Ngwenya	
Makala	Crispen Ndazi	
Ndoweni	Oscar Ngwenya	
Makala	Charles Shoko	
Dobolo	Ehiya Ndlovu	
Lumbora	Bernard Sibanda	
Makonda	Jaison Chuma	
Lumbora	Patrick Mathe	
Lumbora	Sibanda Johannes	
Lumbora	Denny Sibanda	
Dobolo	Nkonekwi Mlilo	
Dobolo	Kelvin Mwalugale	
Lumbora	Mumpande Lyon	
Lumbora	Sehlulekile Makwasa	
Lumbora	Blessed Sibanda	
Lumbora	Loti Shaba	
Lumbora	T Mangena	
Lumbora	B Phiri	
Lumbora	P Ngwenya	
Lumbora	Moffat Ndlovu	
Lumbora	Herbert Nalbe	
Ndoweni	Prosper Ndlovu	
Lumbora	Monica Nyoni	
Ndoweni	Febi Mudenda	
Ndoweni	Lambile Nyoni	

Ndoweni	Irene Nyoni	
Ndoweni	Boniwe Nyoni	
Dobolo	Dafiya Ncube	
Makwa	Victor Chuma	
Mashala	Francis Shok	
Mashala	Paul B Munyandi	
Mashala Ward 9 Kasibo	Isaac L Tshuma	
Mashala	Charles Nyoni	
Mashala Ward 9 Kasibo	Zwela Mathe	
Siashashunge Ward 9	L P Tshuma	
Shashachunda Ward 9	Rosemary Shoko	
Chachachunda Ward 9	Joyce Ndlovu	
Chachachunda Ward 10	Bongani Chuma	
Mashala Down Ward 9	Linda Siachaba	
Mashala Down Ward 9	Virginia Mpofu	
Mashala Down Ward 9	Joyce Mathe	
Mashala Down Ward 9	Cecilia Ncube	
Mashala Down Ward 9	Hauka Muyambo	
Mashala Down Ward 9	Violet Ncube	
Mashala Down Ward 9	Gladys Myambo	
Chachachunda Ward 9	Sibonginkosi Nyathi	
Mashala Ward 9 Kasibo	Josifini Mahlanga	
Chachachunda Ward 9	Noria Mudeda	
Mashala	Sithembile Maluleka	
Kasibo	Cathrine Nkomo	
Kasibo	Jesi Nyoni	
Mashala	Enjeline Nphanzi	
Kasibo	Roseline Zulu	
Kasibo	Elizabeth Sibanda	
Mashala	Letiwe Maluleka	
Kasibo	Nyoni Cathrine	
Kasibo	Nyoni Sihle	
Kasibo	Chuma Chabani	
Shashachunda	Eveline Munsaka	
Mashala Down	Chiyano P Munsaka	
Mashala Down	Lashiwe Munsaka	
Mashala Down	Chatiwa Munsaka	
Mashala Down	Silibaziso Ncube	
Mashala Down	Judis Ngwenya	
Mashala Down	Lindani Ndlovu	
Zwabo	Gladys Muyambo	
Mashala Down	Maggie Chulu	
Chachachunda	Pauline Ndebele	
Chachachunda	Elina Muzamba	
Chachachunda	Rosina Dube	
Makuyu	Nokhutula Mpala	
Mashala Down	Joyce Mpofu	
Mashala Down	Shylet Sibanda	
Mashala Down	Sofi Mpofu	
Mashala Top	Kelvin Tshuma	
Mashala Down	Clement Moyo	
Mashala Down	Alexander Munsaka	
Mashala Down	Shadreck Dube	
Mashala Top	Andrew Tshuma	
Mashala Down	Shelton Nyathi	
Mashala Top	Mbuso Moyo	
Mashala Top	Shadreck Nyathi	
Nechishala Secondary School (teacher)	Ndlovu N	
Mashala Top	Vusani Ndlovu	
Mashala Top	Tinashe Shoko	
Mashala Top	Dumisani Ndlovu	
Mashala Top	Letiwe Maluleka	
Mashala Top	Shamiso Ncube	
Mashala Top	Eunice Tshuma	
Mashala Top	Sifiso Sibanda	
Mashala Top	Sophie Moyo	

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Champepo	Jane Ncube	
Champepo	Saphira Phiri	
Mashala Top	Isaac Ncube	
Chachachunda	Alois Nyoni	
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Zwabo/ Makuyu	Jameson Dube	
Mashala Down	M Ndlovu	
Kasibo	Stephen Sibanda	
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Zwabo	Patrice Mkomon	
Zwabo	Ella Shoko	
Champepo	Mtshona Nyoni	
Makuyu	Green Dube	
Lubweludile	Mathias Ndlovu	
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Makawa	F Shoko	
Shachunda	M Nyathi	
Chezya	Gabriel Nyoni	
Madumabisa	A Chinunungu	
Mashala down	Oliver Ndlovu	
Mashala top	R Ncube	
Champepo	Lovemore Moyo	
Champepo	Clement Phiri	
Mashala Down	Shadreck Moyo	
Mashala Down	Bhuzani Ncube	
Makuyu	Tata Dube	
Kasibo	K Tshuma	
Shachanda	Stephemn Nyamusika	
	Eusanc Mbeena	
Shachachunda	Memory Nyathi	
Shashachunda	Melusi Sibanda	
Shashachunda	Lebani Nkomazana	
Shashachunda	Felistas Nyathi	
Mashala Top	Remind Masarakufa	
Mashala Top	David Sibanda	
Mashala Top	Marvellous Mhlanga	
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Makuyi/ Zwabo	Stella Dube	
Makuyi/ Zwabo	Joyce Dube	
Shachachunda	Clemenzia Mpala	
Shachachunda	Lebani Nyoni	
Mashala Down	Listina Ndlovu	
Mashanana	Enerst Sibanda	
Chezya	Dorris Moyo	
Makuyu	B Mudenda	
Makuyi/ Zwabo	Loius Moyo	
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Zwabo/ Makuyu	Christina Mudimba	
Zwabo/ Makuyu	Berita Munsaka	
Zwabo	Brandina Nyoni	
Zwabo	Senzeni Zulu	
Zwabo	Lizzy Phiri	
Zwabo	Singu Shoklo	
Chachunda	Frolen Ndlovu	
Zwabo	Catrine Mundumba	
Zwabo	Berita Mundimba	
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Shachachunda	Jane Shoko	
Mashala	Mrs Zulu	
Shachachunda	Lucia Ndlovu	
Shachachunda	Somuleya Chuma	
Shachachunda	Donton Shava	
Shachachunda	S Choni Ndlovu	
Mashala down	Pascar Mpofu	
Makuyu	Tobias Mwembe	

Mashala Down	D Mudimbu	
Zwabo/ Makuyu	Matthew Mayambo	
Chezya	Charlie Muzanaba	
Zwabo/ Makuyu	Alvin Ncube	
Kasibo	Conious Chuma	
Mashala Down	Shephard Mudimba	
Mashala	Stephen Mubembwe	
Mashala Down	Elestina Nyoni	
Mashala Down	Ncube Zimbani	
Mashala Down	Banda Eunice	
Mashala Down	Mtombeni Kololo	
Mashala Down	Dube Christini	
Mashala Down	Gutu Mavis	
Mashala Down	Maja Asura	
Mashala Down	Livett Nyathi	
Mashala Down	Mbonisi Ncube	
Mashala Down	Ndobile Mudimba	
Mashala Top	Precious Mhlanga	
Mashala Down	Vincent Mable	
Chief Hwange	Chief Hwange	
Mashala Ward 9	Cllr James Phiri	
Headman - Mashala Ward 9	P Nyoni	
Shachachunda Village head	W Sibanda	
Mashala top village head	E Tshuma	
Nechishala Secondary School	V Zimuto	
Mwemba hall	S Mpala	
prov ZANU PF	S Mlotshwa	
Village head ward 10	Christopher Shoko	
Chief coordinator	E Chopeni Sibanda	
mashala ward	Reeds Dube	
Simat	Makina Kunda	
Shachachunda	Roda Sakala	
Shachachunda	Cathrine Chuma	
Shachachunda	Agnes T Ngwenya	
Shachachunda	Thembeni Munsaka	
Shachachunda	Georgina Munsaka	
Shachachunda	Sithokozile Mhlanga	
Shachachunda	Loveness Nyathi	
Shachachunda	Peter Dube	
Shachachunda	Lazarus Munsaka	
Shachachunda	Alick Mathe	
VIDCO Chair Kasibo	Shadreck L Mpuza	
Pasta kasibo	Cowboy Ndlovu	
Kasibo Resident	Augustine Chipembere	
Namatongo	Enock Simasoku	
Zangala	Josephat Kandiana	
Zangala	Royd Sambo	
Siamatete	David Kesazi	
Chilizya	Emmanuel Kesho	
Siamatete	Anton Makaye	
Chilizya	Kilian B Siantontoia	
Zongala	Lanny Mukumbuta	
Chilizya	Jim Siantontola	
Chilizya	Makumo S	
Siachuma	Steven Simunkwere	
Siazibola	Dereck Sikanyama	
Sichilobe	Franco Ndebele	
Siachuma	Emmanuel Moola	
chibwe	Gardini Malaka	
Mukalahani	Gift Nyambe	
Chibule	Andrew Chalinga	
Ngandu	Tichaona Ncube	
Ngandu	Makayi Siyinja	
Makalahani	P Nyama	
Siakondo	Ehios Simasiku	
Siejoba	Boston Sichetola	

Chibalani	Jacob Mufana	
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Munwana	Peter Simunomba	
Mukalahani	Brendina Chembe	
Ngandu	Victoria Mukendwa	
Munwana	Malita Chakapu	
Ngandu	Getrude Solochi	
Siamatete	Layness Sirajene	
Siamatete	Anoya Muyangwa	
Munwana	Mary Jitali	
Chibule	Makanzala Malumo	
Chibule	Cathrine Siamantundi	
Chibule	Juliet Siamsulinga	
Chibule	Irene Simatele	
Muntumuswana	Jerpha Gwemani	
Muntumuswana	Angela Mvuba	
Munwana	Mary Kasoka	
Ngandu	Lilian Swanala	
Chibule	Modester Mabunda	
Chibule	Mirriam Sikiti	
Nganzhu	Patricia Siamate	

27-Nov-20

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Ministry of Energy and Power Development	Dr Gloria Magombo	Permanent Secretary
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Ministry of Environment, climate Tourism and Hospitality Industry	Mr. Runyowa	Director-Tourism
Ministry of Environment, climate Tourism and Hospitality Industry	Mr. T. Mundoga	Deputy Director-Natural Resources, Global Environment Facility OFP
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ZIMPARKS	Mr. Geoffreys Matipano	Deputy Director General (Conservation)
ZIMPARKS	Ms. Roseline Mandisodza-Chikerema	Chief Ecologist Terrestrial
ZIMPARKS	Mr. Courage Mutema	Principal Park Planning Officer Focal Person World Heritage Convention
ZIMPARKS	Mr. M. Kapesa	Cluster Manager – Sebungwe Cluster, Gokwe
ZIMPARKS	Mr. D. Madhalmoto	
ZIMPARKS	Mr. Avambe	
ZIMPARKS	Mr. Itai Hilary Tendaupenyu	Chief Ecologist - Aquatic
Ministry of Energy and Power Development	Z.G Shumba	
Ministry of Energy and Power Development	Eng. B. Munyarandzi	Chief Director
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Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Hilary Madzikanda	Chief Ecologist
Zimbabwe Parks and Wildlife Management Authority	Mr A. Musakwa	Director Conservation
Zimbabwe Energy Regulatory Authorities (ZERA)	Learnmore Nechitoro	Senior Manager Economic Regulation
ZETDC (Zimbabwe Electricity Transmission & Distribution Company)	I. Dube	Systems Development Manager Engineer
ZESA Holdings	Fullard Gwasira	Public Relations Manager
ZINWA	Dr Jefter Kuziwa Sakupwanya	CEO
National Museums & Monuments of Zimbabwe	Farai Chabata	Curator of Ethnography
National Museums and Monuments of Zimbabwe	Dr Mahachi	Director
National Museums and Monuments of Zimbabwe (NMMZ)	Pascall Taruvinga	Director Research and Development
ZINARA	Engineer Hatinzwani	Chief Technician
ZINARA	A.D. Moyo	Contact person
Zimbabwe Tourism Authority	Karikoga Kaseke	Chief Executive Officer
Zimbabwe Council Of Tourism	Paul Matamica (President) and Winnie Muchanyauka (CEO)	President & CEO
Zimbabwe National Water Authority (ZINWA)	Nyaradzai Mawango	
Home Affairs and Cultural Heritage	Mr. A.D.T. Nhepera	Permanent Secretary
	Mrs Munhuweyi	
Ministry of Transport and Infrastructural Development	Eng A Marawa	Permanent Secretary
Ministry of Energy and Power Development	Dr. Gloria Magomo	Permanent Secretary
Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement		Permanent Secretary
Ministry of Environment, Tourism and Hospitality Industry	Mr M Munodawafa	Permanent Secretary
EMA	Nkululeko Mathobela	
EMA	Mangisi. P. Kudakwashe	
EMA	Mr. C. Mushava	Environmental Protector Director
Zimbabwe Parks and Wildlife Management Authority		Director General
Ministry of Energy and Power Development	Gwyneth Ngoma	Economist
	Acting CEO	PA to Acting CEO
Zimbabwe Parks and Wildlife Management Authority	F.U Mangwanya	Director General
Zimbabwe Parks & Wildlife Management Authority (ZPWMA)	Roseline Mandisodza-Chikerema	Chief Ecologist
Zimbabwe Parks and Wildlife Management Authority	Ticharamba Jura	Area Manager - Hwange Main Camp
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National Museums and Monuments of Zimbabwe (NMMZ)	Mr Chipunza	Director Research and Development
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	Saru (PA)	Secretary
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United Nations Educational, Scientific and Cultural Organization (UNESCO)	Mellisa Muchena	Culture Programme Assistant Regional Office for Southern Africa
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Mr. Rodney Bunhiko	Culture Programme Assistant
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Ms. Mulekeni Ngulube	Culture Programme Consultant Team Leader

Annex C (8.9)

Attendance Registers

Annex C8.9.1

Open House Attendance Register

Environmental and Social Impact Assessment for the BGHES: Disclosure Webinar			
Wednesday, 02 December 2020			
Attendence Register			
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Lucas	Zulu		Zambia
Clive	Bradford		Zimbabwe
Caroline	Mooto Mooto		Zambia
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Namunji	Tobani		Zambia
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Annex C8.9.2

Water Users Focus Group Attendance Register

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Annex C8.9.3

Special Interest Focus Group
Engagement Attendance Register

BGHES ESIA Disclosure: Special Interest Focus Group Discussion			
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Vernon	Booth	vernonrbooth@gmail.com	Zimbabwe
Bruce	Liggitt	bruce.liggitt@rspb.org.uk	United Kingdom
Edith	January	ejanver@gmail.com	Zimbabwe
Julia	Pierini	juliapierini@birdlifezimbabwe.org	Zimbabwe
Ken	Mwathe	Ken.Mwathe@birdlife.org	Kenya
Bronwyn	Maree	bronwyn.maree@birdlife.org.za	South Africa
Bright	Moyo	bright_moyo@yahoo.com	
Marie-Louise	Kellett	savethezam@gmail.com	
Veronica	Chapman	veronicachapman12@gmail.com	
Bryn	Chikumbo	bryncn83@gmail.com	
Andrew	Jenkins	andrew@avisense.co.za	
Sean	Lavin	seandlavin@gmail.com	
Charlene	Hewat	Charliehewat@gmail.com	
Sithembinkosi	Ndhlovu	Thembinkosi813@gmail.com	
Rebecca	Wildbear	rebeccawildbear@gmail.com	
Sibangani	Dube		Namibia
Fadzai	Matsvimbo		Zimbabwe
Neil	Deacon		Zimbabwe
Denis	Tweddle		South Africa
Nombukiso	Ntshalintshali		South Africa
Khosi	Dlamini		South Africa
David	Shandler		South Africa
Victoria	Braham		South Africa

Annex C8.9.4

Key Government Stakeholder Engagement Attendance Register

BGHES ESIA Disclosure: Key Government Stakeholders		
Friday December 11, 2020		
Attendence Register		
First Name:	**Last Name**	**Email**
Nombukiso	Ntshalintshali	nombukiso.ntshalintshali@erm.com
Alison	Joubert	alison@southernwaters.co.za
fitzgerald	muchindu	fitzgerald.muchindu@zambezira.org
Dieter	Rodewald	dieter.rodewald@erm.com
Tori	Braham (Victoria Braham)	tori.braham@erm.com
lindsey	bungartz	lindsey.bungartz@erm.com
avitol	nkweendenda	avitol.nkweendenda@zambezira.org
Andrew	Cauldwell	andrew.cauldwell@bcmss.onmicrosoft.com
stephen	maidza	stephen.maidza@zambezira.org
	bkalundu	bkalundu@zesco.co.zm
David	Shandler	david.shandler@gmail.com
Gwyn	Letley	gwyn@anchorenvironmental.co.za
David	Zimba	dzimba@zesco.co.zm
christopher	chisense	christopher.chisense@zambezira.org
david	mazvidza	david.mazvidza@zambezira.org
phillip	ziduche	phillip.ziduche@zambezira.org
Mike	Everett	mike.everett@erm.com
Ndomupeyi	Chikonye	nchikonye@zesaholdings.co.zw
LOZIWE N	Chilufya	loziwec@gmail.com
Phanuel	Kudakwashe Mangisi	phanuel.mangisi@ema.co.zw
Nothani	Ndlovu	nothani.ndlovu@ema.co.zw
Nelton	Mangezi	nelton.mangezi@ema.co.zw
Samson	Chibaya	schibaya@zimparks.org.zw
Sibeti	Masuku	sibeti48@gmail.com
Benson	Munyaradzi	bensonmunyaradzi@gmail.com
TINAAPI HILARY	MADIRI	hmadiri@zimparks.org.zw
Roseline	Mandisodza	rmandisodza@zimparks.org.zw
Brian	Siakweenda	siakweendabrian@gmail.com
Hilda	Sinywibulula	hmmilumbe@gmail.com
Tsitsi	Munetsi	tsitsi@ztazim.co.zw
michelo	mwiinga	michelo.mwiinga@moe.gov.zm
Itai Hilary	Tendaupenyu	itendaupenyu@zimparks.org.zw
Tawandah	Munambah	tawanda@ztazim.co.zw
relent	ncube	relent.ncube@zambezira.org
Lillian	Kalenge	lkalenge@gmail.com
CHARLES	NDAKALA	ndakalac@yahoo.com
geoffreys	matipano	gmatipano@yahoo.com
Gilbert	Moyo	gmoyo@zimparks.org.zw
BILLINGS	NG'ANDWE.CHANDA	billingschanda@gmail.com
edward	kabwe	edward.kabwe@zambezira.org
Doris	Tom	dtom@zimparks.org.zw
Mulala	Mulala	mmulala9@gmail.com
Felix	Chisha	felixchisha@yahoo.com

Gwyneth	Ngoma	gngoma@zera.co.zw
Wellington	Maphosa	wmaphosa@zpc.co.zw
KELVIN	Chanda	kcchanda@yahoo.com
Muyumbwa	Ndiyoi	kutwisiso@gmail.com
Chilala	Mayanda	habasimbi@gmail.com

Annex C8.9.5

Government and UNESCO Virtual Engagement Feedback Session Attendance Register

Key Government Stakeholders and UNESCO								
Wednesday, 21 July 2021								
Attendance Register								
First	**Last Name**	**Email**	**Country/ Region Name**					
Avitol	Nkweendenda	avitol.nkweendenda@ZAMBEZIRA.ORG	Zambia					
Selusiwe	Sibanda	selusiwe.sibanda@zambezira.org	Zambia					
Stephen	Maidza	stephen.maidza@zambezira.org	Zambia					
Relent	Ncube	relent.ncube@zambezira.org	Zambia					
Munjeri								
Edward	Kabwe	edward.kabwe@zambezira.org	Zambia					
Fitzgerald	Michundu	fitzgerald.muchindu@ZAMBEZIRA.ORG	Zambia					
Jack	Buchi	JMunthali@zesco.co.zm						
George	Chivuise							
Peter	Kapinga	peter.kapinga@zambezira.org						
Gumi	Gwenzi							
Elizabeth								
Pascall	Taruvinga	pastar143@yahoo.com	Zimbabwe					
Tom	Kamkwindo							
Timoty								
Jack	Buchi							
Charlse	Ndakala	ndakalac@yahoo.com	Zambia					
Stephen	Maidza							
John	Zulu	Thumbikani15@gmail.com	Zambia					
Kagosi	Mwamulowe	mwamsprog@gmail.com	Zambia					
Sithembinkosi	Mhlanga							
Midwell	Kapesa	couragemutema@gmail.com	Zimbabwe					
Emmanuel	Manyau							

Annex C8.9.6

UNESCO Focus Group Discussion
Attendance Register

UNESCO Focus Group Discussion: Disclosure Webinar			
Friday, 03 September 2021			
Attendance Register			
First	**Last Name**	**Email**	**Country/ Region Name**
Avitol	Nkweendenda	avitol.nkweendenda@ZAMBEZIRA.ORG	Zambia
Relent	Ncube	relent.ncube@zambezira.org	Zambia
Munjeri			
Fitzgerald	Michundu	fitzgerald.muchindu@ZAMBEZIRA.ORG	Zambia
Jack	Buchi	JMunthali@zesco.co.zm	
Christopher	Chisense	christopher.chisense@ZAMBEZIRA.ORG	Zambia
Peter	Kapinga	peter.kapinga@zambezira.org	
Pascall	Taruvinga	pastar143@yahoo.com	
Jack	Buchi	JMunthali@zesco.co.zm	
Charlse	Ndakala	ndakalac@yahoo.com	Zambia
John	Zulu	Thumbikani15@gmail.com	Zambia
Kagosi	Mwamulowe	mwamsprog@gmail.com	Zambia
Sithembinkosi	Mhlanga	sithembinkosi.mhlanga@zambezira.org.zm	
Midwell	Kapesa	couragemutema@gmail.com	Zimbabwe
Abigail	Shonhiwa	zimparis@zimfa.gov.zw	Zimbabwe
Natcom			
Zimnatcom		zimnatcom3@gmail.com	

Annex C8.9.7

Zambia Physical Meetings Attendance Register

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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: Chrundwe Village
Date: 25/11/2020

Venue: Chrundwe P. Sch.
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHAK	ERM	LUSAKA	Tel: 0974074384 Email: 35.6°	[signature]
Nkweendenda Avitor	ZRA	Lusaka	Tel: 0977320756 Email: 36.2	[signature]
PHILLIP ZIDUCHE	ZRA	LUSAKA	Tel: +26096034 0741 Email: phillip.ziduche@zambezira.org	35.9°C [signature]
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966116090 Email: JMunthali@zesco.co.zm	[signature] 36.0
ENG. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel: 0977-807758 Email: chrispin.namakando@~~zarah~~ zambezira.org Temp 36.2°	[signature]
TAFFEN MALELE	FARMER	SIMUYUNI	Tel: Email: NIL	T. MALELE 35.1°
GEOFFRY SICHIKATO	H/man	Siambula.	Tel: Email: 0979044457	[signature] 36.1°
SIMIZA BEATON	PTC TRESURE	Simuyuni	Tel: Email: 0950531700	[signature] 36.4

CHUUNDWE - 25/11/2020

...AME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Oclina				
Mwapnga Jine	Mandava	CHUUNDWE ~~SIMWATACHELA~~	Tel : Email : —	Oclina 36.6°
BBAAKA	Nasilele	S "	Tel : Email : —	J BBAKA 36.8°
EMERDAH SIAMPISANI	SHUNTA	"	Tel : Email : —	E S 36.6°
Lainety	Siambula	"	Tel : Email : —	L S 36.1
Muleya Simbwenda	Siambula	"	Tel : Email : 0977199096	m. S 36.3°
Carol Matanshi	Simuyuni	"	Tel : Email :	C.M 36.1°
TEACHER JESSY CHIMA		CHUUNDWE PRIMARY SCHOOL	Tel : 0971865150 Email :	[signature] 36.2°
PRISCILLA ~~Chiunda~~	SIAMBULA Chilundika	Simwetachela	Tel : Email : 0953583421	[signature] 36.5°
PRUNDNE	Hamanyati	nasilele	Tel : Email : —	P - Hamanyati 36.1°
Doris Sanka	naselele	Sipatunyana	Tel : Email : —	D.S 35.3°
Belinda Siagiako	Siambaka	Sipatunyana	Tel : Email : —	B.S 36.3°

	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Dr. JAHAY	CWAC CHAIRPER	NASILELE	Tel : 0977188226 Email :	36.0°
BARIAT SIMIZA	FARMER	SIMUYUNI	Tel : 0972-900643 Email :	35.7°
LAZAROUS INAMBAO	" "	SIAMUNYATI	Tel : 0977-186861 Email :	36.2
MIYANDA ETHEL	TEACHER	CHUUNDWE	Tel : 0978-699841 Email :	36.6°
Winford Kaate	~~Kaate~~ Farmer	Simbayi	Tel : 0974269626 Email :	36.4°
Twaiting Chinkuku	W.D.C	Chinkuku	Tel : 0978728703 Email :	36.4°
Millet Kasungu	Farmer	Siamazila	Tel : 0975752904 Email :	M. Kasungu 36.5°
Kebby Siabona	farmer	Nasilele	Tel : 0971750255 Email :	36.3°
Dennis Muuka	W D C ~~Chuundwe~~ &	CHUUNDWE	Tel : 0953921520 Email :	36.3°
WILLIE SIADINDI	HEAD MAN SIMBAYI	CHUUNDWE	Tel : 0976833022 Email :	35.5°
NYAMBE MAYBIN	TEACHER	CHUUNDWE SCHOOL	Tel : 0957761065 Email :	36.2

NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
KNEST MILIMO	EDUCATION	CHUUNDWE SCHOOL	Tel : 0954102425 Email :	Milimo 36.3°
MEMORY SIACHAMBA	RESIDENT FARMER	SIAMBOLE	Tel : 0955 356715 Email :	36.5°
OLINI CHIKOBELA	RESIDENT	SIAMBOLE	Tel : Email : —	36.6°
HOPE MIYOBA	RESIDENT	SIAMBOLE	Tel : 097 8 238105 Email :	36.2°
CONCEPTOR SIACHIYAKO	RESIDENT	SIAMBOLE	Tel : 0975 232770 Email :	36.0°
MELINE MOONO	RESIDENT	SHUUNTA	Tel : 0970 625256 Email :	M.Moono 35.9°
Miyanda Simukumba	RESIDENT	SIAMBOLE	Tel : Email : —	36.4° M. Simukumba
RHODA MUDENDA	RESIDENT	SHUUNTA	Tel : 0976 887794 Email :	Rhoda Mudenda. 35.8°
MONDE KAWANDA	FARMER	SIAMBOLE	Tel : Email : —	MK. 36.7°
BRYAN KALUNDU	ZESCO-ENG-CIVIL	LUSAKA	Tel : 0977 350528 Email : bKalundu@zesco.co.zm	
			Tel : Email :	

& NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
CHEMA	ZNFU		Tel :	
SIAKUBA	MEMBER	NASILELE	Email : 0955-145711	36.7°
BRIDGET			Tel :	
BANKA	FARMER	SIMUNUNI	Email : Nil	B.A 35.8
CLEVER			Tel :	
SIKOMBWA	EZITA	Lusaka	Email : 0977-571077	36.5°
			Tel :	
			Email :	
			Tel :	
			Email :	
			Tel :	
			Email :	
			Tel :	
			Email :	
			Tel :	
			Email :	
			Tel :	
			Email :	
			Tel :	
			Email :	

... & NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
... PHERRY C MWIINGA	ZRA	LUSAKA	Tel : 0979772017 Email :	36.1°
purity kasanda mukanga	Teacher	Chuundwe	Tel : Email : 0978266002	36.4°
Fitzgerald Muchindu	ZRA	Lusaka	Tel : 0978 731 621 Email :	35.4°
SINDOWE VICTOR	CHIEF REP	SIPATUNYANA	Tel : 0977759096 Email : victorsindowe gmail.com	36.9°
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel :	

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Draft ESIA Disclosure
November 2020

(5)

ATTENDANCE REGISTER

Meeting: MUKUNI VILLAGE
Date: 23/11/2020

Venue: BIG TREE
Head count (male/female): 01
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MUSETA KWALOMBOTA	MUKUNI VILLAGE	MUKUNI VILLAGE	Tel : 0955-808429 Email :	
FELIX CHISHA	ERM	LUSAKA	Tel : 0974074384 Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel :	

10X Command Sheet + 1 NTS

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Draft ESIA Disclosure

November 2020

ATTENDANCE REGISTER

(2)

Meeting: HRH Chief Simwata Chela

Date: Kalomo

Venue: Chief's Village Palace

Head count (male/female): 08

(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
CHIEF SIMWATACHELA		SIMUKANDA BOX 81, ZIMBA	Tel : bsaleka76@gmail.com Email :	[signature]
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia

Draft ESIA Disclosure

November 2020

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ATTENDANCE REGISTER

Meeting: HRH Chief Simwatachela

Date: 22/11/2020

Venue: Palace

Head count (male/female): 08

(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA	ERM	LUSAKA	Tel: 0974074384 Email: felixchisha@yahoo.com	
FITZGERALD MUCHANDU	ZRA	LSK	Tel: 0978 731 624 Email:	
JACK MUNTHALI	ZESCO	LUSAKA	Tel: Email: 0966116090	
CLEVER SIMONDWA	EZITA	LUSAKA	Tel: Email: 0977571077	
MIKE AKATAMA	ZESCO	LUSAKA	Tel: Email: 0979484096	
BRYAN KALUNDU	ZESCO	LUSAKA	Tel: 0977 350528 Email: bkalundu@zesco.co.zm	
Nkweendenda Avitor	ZRA	Lusaka	Tel: 0977320750 Email: avitor.nkweendenda@zambezira.org	
			Tel: Email:	

SIPATUNYANA palace.

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ENG. PHERRY C. MWIINGA	ZRA	LUSAKA	Tel : 0979 3017 77 Email : 36.1°C	[signature]
SINDOWE VICTOR	CHIEF REP	SIPATUNYANA	Tel : 0977759096 Email : VictorSindowe gmail.com	[signature] 35.8°
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

Chief Sipatungama Palace.

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Philip Ziduchu	ZRN	LUSAKA	Tel : +260960340741 Email : philip.ziduchu@zambezira.org	36.8°
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

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Meeting: Sipatunyana ~~Chief~~ Palace

Date: 25/11/20

ATTENDANCE REGISTER

Venue: Sipatunyana palace

Head count (male/female):

(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA K	ERM	LUSAKA	Tel: 0974 074384 Email: 35-9°	[signature]
HRH. CHIEF SIPATUNYANA MR. T.S. MASAKA	CHIEF SIPATUNYANA	ZUNGA-ZUNGA OWN PALACE KALOMO	Tel: 0972489262 Email: 0977328492	[signature] 37.2°
TENNYSON S. SINDOWE	SIPATUNYANA ROYAL ESTABLISHMENT CHAIRMAN	ZUNGA-ZUNGA OWN PALACE KALOMO	Tel: 0975968718 Email:	[signature] 36.0°
MUDENDA SHABBCO	Retainer Chief Sipatunyana	" "	Tel: Email: 0975147877	[signature] 36.3°
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966116090 Email: JMunthali@zesco.co.zm	[signature] 36.2
BRYAN KALUNDU	ZESCO-EN-CIVIL	LUSAKA	Tel: 0977 350528 Email: bkolundu@zesco.co.zm 36.3	[signature]
MIKE AKATAMA	ZESCO	LUSAKA	Tel: 35.8 Email: 0979484096	[signature]
CLEVER SILONDWA	ELITA	LUSAKA	Tel: Email: 0977-571077	36.1° [signature]

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Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

(1)

ATTENDANCE REGISTER

Meeting: HRH Chief Simwatachela
Date: 22/11/2020
Venue: Palace
Head count (male/female): 08
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA K	ERM	LUSAKA	Tel: 0974074384 Email: felixchisha@yahoo.com	
FITZGERALD MUCHANDU	ZRA	LSK	Tel: 0978 731 624 Email:	
JACK MUNTHALI	ZESCO	LUSAKA	Tel: Email: 0966116090	
CLEVER SINONDWA	EZITA	LUSAKA	Tel: Email: 0977571077	
MIKE AKATAMA	ZESCO	LUSAKA	Tel: Email: 0979484096	
BRYAN KALUNDU	ZESCO	LUSAKA	Tel: 0977 350528 Email: bkalundu@zesco.co.zm	
Nkweendenda Avitor	ZRA	Lusaka	Tel: 0977320758 Email: avitor.nkweendenda@zambezira.org	
			Tel: Email:	

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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
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November 2020

ATTENDANCE REGISTER

Meeting: Kalomo District Council
Date: 24/11/2020
Venue: Director of Works
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Felix Chisha K	ERA	Lusaka	Tel: 0974074384 Email:	
Martha Mwanza	(DCS) Deputy Council Secretary	Kalomo	Tel: 0979791784 Email: marthamwanza44@gmail.com	37.5
Mweempe Joel	Deputy Director of Works	Kalomo	Tel: 0978465772 Email: mweempejoel@yahoo.com	36.0
Rose Chuku	Socio Economic Planner	Kalomo	Tel: 0979681740 Email: roselynnmalaikachuku24@gmail.com	36.9°
Muchula Maboshe	Kalomo Town Council; A/C. Chief Admin Officer	Kalomo	Tel: 0955626683 Email: muchulamaboshe@gmail.com	35.8
Jack. B. Munthali	ZESCO	Lusaka	Tel: 0966116090 Email: JMunthali@zesco.co.zm	36.3°
Eng. Chrispin Namakando	ZRA	Lusaka	Tel: 0977-807758 Email: chrispin.namakando@zambezira.org	35.9°
Clever Siondwa	EZITA	Lusaka	Tel: 0977-571077 Email: siondwaclever@gmail.com	35.9°

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Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: KANUKESA VILLAGE
Venue: KANUKESA P. School
Date: 27/11/20
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA	ERM	LUSAKA	Tel: 0974074384 Email:	36.6°
JOYCE NKOKA	FARMER	TUBAVUNE	Tel: NIL Email:	J.N 36.6°
LONTIA KAMINI	" "	MUSANSANO	Tel: NIL Email:	L.K 37.6°
LOVENESS SIACHOBA	" "	TUBAVUNE	Tel: NIL Email:	L.S 38.3°
ESTELI NAMUBOO	" "	MAIABA	Tel: NIL Email:	Namubo 36.6°
MAGGIE TATILILA	" "	SHAMPONDO	Tel: NIL Email:	M.T 37.0°
FOY MUMBALA	FISHERMAN	MULOLA	Tel: 0954-935376 Email:	36.5°
MARY KAUKE	FAMER	SHAMPONDO	Tel: NIL Email:	M.K 36.6°

RAMUKETA

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MOSTERN KALIZYA	CHAIRMAN OF DEVELOPMENT COMMITTEE	MALABA	Tel : 0954-547811 Email :	37.1°
AGENT KANENE	FISHERMAN	MULOLA	Tel : 0955-991709 Email :	38.0°
ELIOT MUNDANDO	FARMER	SIAGAHULA	Tel : 0953-846586 Email :	37.3°
KEBBY MAPETA	FARMER	MULOLA	Tel : 0953-957381 Email :	36.8°
COMITE SIMUPCHEMBUE	FISHERMAN	SIAGAHULA	Tel : 0957.181248 Email :	36.4°
MAVIS SHANOTI	FARMER	" "	Tel : 0955-688263 Email :	36.1°
GIVEN MAPETA	" "	MULULA	Tel : 0954-948140 Email :	37.0°
Justin Sikatali	" "	MAJONGO	Tel : 0954-~~9447~~ 947911 Email :	36.0°
SIANSOWA GIVEN	" "	SIAGAHULA	Tel : 0953-601026 Email :	36.9°
GIFT MAYEMUNA	FISHERMAN	MADIONGO	Tel : NIL Email :	36.8°
DANVER BBEBE	FARMER	SIAGAHULA	Tel : 0956-861979 Email :	35.8°

KAMUKENDA

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
DICKSON SIMANGONAD	HEADMAN	MALAIZA	Tel : Email : 0957390778	35.7°
Cryford Siamenge	HEADMAN	SIAMPondo	Tel : Email : 0955580522	37.6°
Alfred Sikatali	HEADMAN	Mulola	Tel : Email : 0954142948	36.4°
Simon Sikainga	HEADMAN	tubakune	Tel : Email : 0950482244	36.8°
SILUUNGA ALEX	Scritary	TUBAVUNG	Tel : Email : 0954475627	37.4°
TIMOTHY MUSENDA	TUBAVUNE VILLAGE	"	Tel : Email : —	T.M 37.8°
Arnold Siagwangwa	Posani villagis	Posani	Tel : Email : 0957088652	37.4° A. Siagwangwa
CHARLES KAPONGO	MADYONGO VILLAGE	MADYONGO	Tel : Email : —	35.6° CHARES: Kapongo
WILSON SYAMPWILI	MADYONGO VILLAGE	"	Tel : Email : —	
CONARD NGANDU	POSANI	POSANI	Tel : Email : —	C. N.
JACK MUNTHALI	ZRSCO	LUSAKA	Tel : 0966116090 Email :	36.7°

KAMUKEZA COMMUNITY - SIMWATACELA 27/11/2020

...FIRST & ...AST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ENELIS SIMALIMBU	SIAMPONDO VILLAGE	KAMUKEZA SCHOOL	Tel : Email : —	E.S. 36.5°
GIVEN SIANKWECECE	"	"	Tel : Email : 0957390997	[signature] 37.0°
EPHRAIM SIMANGOWANI	MALABA VILLAGE	"	Tel : Email : 0957029844	[signature] 36.7°
David Siamaanzi	Dunder Village	"	Tel : Email : 0954209324	[signature] 37.4°
Tangson Siachikula	Tubavune Village	"	Tel : Email : —	37.2° T Siachikula
Conard ngandu	posani village	"	Tel : Email : —	36.7° C. ngandu
WILSON SIAMPWILI	madyongo village	"	Tel : Email : —	36.8° WILSON SIAMPWILI
Venong MUDENDA	KANTONDO	"	Tel : Email : 0978099581	[signature] 36.6°
NELSON SYACHIKULA	MALABA	"	Tel : Email : 0957173509	[signature] 37.6°
Kameme JORDAN	Siagala	"	Tel : Email : 0953229797	[signature] 37.5°
Tensord sidenda	Siampondo ~~SES~~		Tel : Email : 0956151466	[signature] 37.1°

KAMUKEZA

...NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
...ALLO SIMANYONGE	V. tubavune	TUBVVUNE	Tel : Email : 0957873974	[signature] 36.6°
PETER MUDENDA	POSANI VILLAGE	POSANI	Tel : Email : —	P.M. 36.3°
EMMANUEL SIMAAMBA	MADYONGO VILLAGE	MADYONGO	Tel : Email : 0955947056	[signature] 36.4°
STANLEY BBEEKE	SIAGALULA VILLAGE	SIAGALULA	Tel : Email : 0953237399	S.B. 36.9°
MISSILE MUTELEMANI	DUNDU VILLAGE	DUNDU	Tel : Email : —	M.M. 36.4°
ALECK MUNDANDO	SIAGALULA VILLAGE	SIAGALULA	Tel : Email : 0955946679	[signature] 37.2°
Saam Simundanbe	Siagalula Village	Siagalula	Tel : Email : 0950471951	[signature] 36.5°
TEACHER MUTANDI KALUWE	SCHOOL COMPOUND	SCHOOL COMPOUND	Tel : Email : 0978215235 0956299962	[signature] 36.5°
SIMOONGA ARON	SCHOOL COMPOUND	MALABA VILLAGE	Tel : Email : 0954177882	[signature] 35.8°
CLEVER SILONDWA	EZITA	LUSAKA	Tel : Email : 0977-571077	[signature] 36.7°
			Tel : Email :	

KAMUKEZA

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
JOSEPH MAMBILO	SIAGALULA VILLAGE	SIAGALULA	Tel : Email : 0954751447	J. M. 36.8°
MUTINTA SIMUTELO	DUNDU VILLAGE	DUNDU	Tel : Email : —	M. S 36.7°
~~BEUTY~~ BEAUTY MUCHANKA	TUBAVUNE VILLAGE	TUBAVUNE	Tel : Email : —	B. M 37.0°
BEATRICE KAMINI	"	"	Tel : Email : —	B. K. 38.3
MAVIS SIAMAAMBO	SIAGALULA VILLAGE	SIAGALULA	Tel : Email : 0 —	B. S. 37.3°
MIKE AKATAMA	ZESCO	LUSAKA	Tel : Email : 0979484096	36.7° [signature]
Fitzgerald Muchindu	ZRA	LUSAKA	Tel : 0978731621 Email :	[signature] 36.7°
PHERRY C. MWIINGA	ZRA	"	Tel : Email : 0979773017	[signature] 36.5°
ENG. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel : 0977-807758 Email :	[signature] 36.1°
ENG. AVITOL NKWEENDENDA	ZRA	LUSAKA	Tel : 0977320156 Email :	36.7°
CHIEF SIMUSATACHELA		ZIMBA DISTRICT	Tel : 0976-320291 Email : bsialeka76@gmail.com	[signature] 36.4°

KAMULEZA

E, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
BRYAN KALUNDU	ZESCO. ENG. CIVIL	LUSAKA	Tel : 0977 350528 Email : bkalundu@zesco.co.zm	
PHILLIP ZIDULUKE	ZRA MANAGER EHS	ZIMBABWE/LARIBA	Tel : +263773107842 Email : phillipziduluke@zambezira.org	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

ERM

Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: KATAPAZI VILLAGE
Date: 24/11/2020

Venue: KATAPAZI CENTRE
Head count (male/female):
(Note: Children not counted)

15

10:35

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA K	ERM	LUSAKA	Tel: 0974074384 Email: 36.4	
BRYAN KALUNDU	ZESCO	LUSAKA	Tel: 0977350528 Email: 36.7	36.7
CHIYUKA MOONDE	Headteacher	KATAPAZI PRIMARY SCHOOL	Tel: 0965136127 Email: greywellchizyuka65@gmail.com	36.1
Siachitema Actim	A.P.M	Katapazi	Tel: Email: 33.5 0763399025	
MUSENA OSCAR	VILLAGE HEADMAN	LIBONDA	Tel: Email: 32.0 0965058260	
MUZIMBUZA VICTOR	KATAPAZI	LIVINGSTONE	Tel: 0968 6838 OR / Email: 0979230306.	35.7
CHARLES MUNGALA	~~VH~~ HEADMAN ~~MAKAMUSA~~	MAKAMUSA	Tel: Email: 0967-235488 35.5	Mungala
Evans Mumomba	Headman	Mungala	Tel: 34.1 Email: 0963172268	

	hot use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Heston Luchingo	headman	Katapazi	Tel : 0967240640 Email : 35.7°	[signature]
Eight Manomba	headmaker	Katapazi	Tel : Email : 0969207849 32.2°	[signature]
marble Siachitema	farming	katapazi	Tel : 36.3° Email : 0960528027	m. siachitema
HELLEN MUDENDA	FARMER	KATAPAZI	Tel : 36.2° Email : NIL	H. M
REGINA KUNDA	Farming	KATAPAZI	Tel : 35.7° Email : 0962155158	R. K
FIDES MUKASIMATA	FARMER	KATAPAZI	Tel : 35.0° Email : NIL	F.M
MATUWA	FARMER	Katapazi	Tel : 33.1° Email : 0962596404	A M[illegible]
Lyamba Doreen	FARMER ~~Lyamba~~	SAMBELELE	Tel : 34.0° Email : NIL	[signature]
MARY MUTOKWA	FARMER	LIBONDA	Tel : 33.6° Email : 0760174389	m. m.
Richard Kalombwana	Headman	Kabbonana	Tel : Email : 0764048489 36.2°	[signature]
EDWIN SIKABONDO	HEAD MAN	Siambelele	Tel : 0969450927 Email : 36.5°	[signature]

LAST NAME	Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Simunjaya Ridon	farmer	Siakwale	Tel : 35.7 Email : Nil	
JUSTINE simunjaya	Farmer	Katapazi	Tel : 0962106814 Email : 38.2°	
MIKE AKATAMA	ZESCO	LUSAKA	Tel : 35.7° Email : 0919484096	
G. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel : 0977 807758 Email : chrispin.namakando@zambezira.org	Temp 35.1°
JACK. B. MUNTHALI	ZESCO	LUSAKA	Tel : 0966116090 Email : JMunthali@zesco.co.zm	Munthali 32.9°
FITZGERALD MUCHINDA	ZRA	"	Tel : 0978731621 Email : 35.3°	
CLEVER SINONDWA	EZITA	"	Tel : 35.3° Email : 0977-571077	
PHERRY C. MWIINGA	ZRA	"	Tel : 0979773017 Email : pherry.mwiinga@zambezira.org	36.0°
CAROL SISHASHA	FARMER	KATAPAZI	Tel : Email : Nil 36.2°	Kalo
Pamela Siachai	farmer	Katapaazi	Tel : Email : Nil 35.9	
			Tel : Email :	

...NA COUNCIL. 23/11/2020

...FIRST & ...AST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FITZGERALD MUCHINDU	ZRA	KAZUNGULA	Tel : 0978 731 621 Email :	[signature]
CLEVER SIKONDWA	EZITA	LUSAKA	Tel : Email : 0977-571097	[signature]
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

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...(BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: LAZVMGULA COUNCIL
Date: 23/11/2020
Venue: COUNCIL CHAMBERS
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Jack Nzunthali	LESCO	Lusaka.	Tel: 0966116090 Email: JNzunthali@zesco.com	
PHILLIP ZIDUCHE	ZRA	ZRA- LUSAKA	Tel: +260 960340744 Email: phillip.ziduche@zambezira.org	
BRYAN KALUNDU	ZESCO	LUSAKA	Tel: 0977 350528 Email: bkalundu@zesco.co.zm	
Nkweendenda Avitor	ZRA	LUSAKA	Tel: 0977320756 Email: avitol.nkweendenda@zambezira.org	
PHERRY C MWIINGA	ZRA	"	Tel: 0979773017 Email: pherry.mwiinga@zambezira.org	
MIKE AKATAMA	ZESCO	Lusaka	Tel: Email: 0979484096	
F			Tel: Email:	
			Tel: Email:	

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...g Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

(10)

ATTENDANCE REGISTER

Meeting: KAZUNGULA COUNCIL
Date: 23/11/2020
Venue: COUNCIL CHAMBERS
Head count (male/female):.....
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISITA	ERM	LUSAKA	Tel: 0974 074 384 Email:	
LOMBE BANGILI MWAKANANDI	KTC	KAZUNGULA	Tel: 0976891880 Email: lombemwakanandi@gmail.com	
RICKY SIAMATU	KTC	KAZUNGULA	Tel: 0976554801 Email: rickysiamatu@gmail.com	
ODN MUNTATE	KTC	KAZUNGULA	Tel: 0973437117 Email: odinmunts@gmail.com	
NAKENA MUYANGWA	Kz. T. C	KAZUNGULA	Tel: 0964 281126 Email: nakenamuyangwa@gmail.com	
MERCY MWALE	KTC	KAZUNGULA	Tel: 0978586505 Email: mercymwale8@gmail.com	
TASPHER CHILONGA	Sw&e/Plumber	Kazungula	Tel: 0974818829 Email:	
ENG. CHRISPIN NAMAKANDO	ZAMBEZI R. AUTHORITY MGR-ES	LUSAKA	Tel: 0977-807758 Email: chrispin.namakando@zambezira.org	

LUGOBO

...T & NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
CHEAT MULEYA VIOLET	FARMER	LUGOBO	Tel : Email : NIL	35.3° B. muleya
SIKANJENJENE	" "	" "	Tel : Email : —	36.5° V. Sikanjenje
CHALIKONGA RICHARD	HEAD - LUGOBO SCHOOL	LUGOBO COMMUNITY SCHOOL	Tel : Email : 0977709652	36.9° [illegible]
VICTOR SINDOWE	CHIEF REP	SIPATUNYANA ZIMBA TOWNSHIP	Tel : 0977759096 Email : victorsindowe gmail.com	36.9° [illegible]
NILTON SADUNKA	V-HEADMAN	LUGOBO	Tel : 0978-396001 Email :	36.6° [illegible]
MILDRED SIAKAPONGO	FARMER	" "	Tel : 0979-700180 Email :	M.S 35.5°
MUBANDA MUCHINDU	" "	" "	Tel : 0976-469300 Email :	35.9° M.M.
THESINA MWEEMBA	" "	" "	Tel : 0975-396091 Email :	36.5° T.M
DECKSINE MUCHIMBALA	" "	" "	Tel : NIL Email :	36.3° D M
TOMA SIALWINDI	" "	" "	Tel : 0975-229882 Email :	35.8° T.S
SIATONTOLA BRAIN	" "	" "	Tel : 0976 ~~266020~~ 266021 Email :	" 36.2°

LUGOBO

...AST & ...NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
...BUKU JONATHAN	FARMER	LUGOBO	Tel : 0976-263395 Email :	36.8°
MUOENE OSCAR	" "	" "	Tel : 0972-966530 Email :	35.5°
ASABBATA SIMONGUSE	" "	" "	Tel : NIL Email :	35.2°
CHARITY KANTOLUSA	" "	" "	Tel : NIL Email :	N. Simoongwe
RABBONI KALUNU	" "	" "	Tel : 0972-175108 Email :	36.3° C. KANTOOLO
CHRISPINE MUNYENGA MUSETA	VILLAGE SECRETARY	" "	Tel : 0972-732600 Email :	Rabboni 35.2°
LACKY MULILO	FARMER	" "	Tel : ~~0972-52226~~ Email : 0976-033927	35.8°
NASHO SIBBUKU	" "	" "	Tel : 0978-322543 Email :	36.6°
ANNIE SIACHINDI	" "	" "	Tel : 0974-649335 Email :	36.0° NS
EDWARD SIANJAGA	" "	" "	Tel : 0976-140704 Email :	A. Siachinji 35.9°
ENG. CHRISPIN NAMAKANDO	~~LUSAKA~~ ZRA	LUSAKA	Tel : 0977-807758 Email :	35.2° Sianjaga
				35.9°

LUGOBO

...RST & ... NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
... Z MAZUIDZA	ZRA	LUSAKA	Tel: +260 966745800 Email:	35.9°C
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966116090 Email: JMunthali@zesco.co.zm	35.6°C
PHERRY C MWIINGA	ZRA	"	Tel: 0979773017 Email:	35.7°C
FELIX CHISHA	ZRA	LUSAKA	Tel: 0974-074384 Email: 35-5°	
Akweendenda Avitor	ZRA	Lusaka	Tel: 0977320756 Email:	35.7
BRYAN KALUNDU	ZESCO-ENG-CIVIL	LUSAKA	Tel: 0977 350528 Email: bkalundu@zesco.co.zm	38.5
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	

LUGOBO

...HST & ...T NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
BERT MULENJA	FARMER	LUGOBO	Tel: 0979-367888 Email:	36.0°
MISHECK SIADUNKA	" "	" "	Tel: Email: NIL	R. Mulenga 35.8°
CHRIS MUDENE	" "	" "	Tel: 0971-074402 Email:	37.0°
CHAINDA SIBETE	" "	" "	Tel: 0973-966304 Email:	35.4°
FRANK LUGOBO	" "	" "	Tel: 0976-305814 Email:	35.9°
MIKE BKATAMA	ZESCO	LUSAKA	Tel: Email: 0979484096	35.8°
CLEVER SILONDWA	EZITA	LUSAKA	Tel: 0977-571077 Email:	35.6°
SHADRECK MUSENE	H/MAN	LUGOBO	Tel: 0979150265 Email:	36.3°
ILETI KAPALAYA	FARMER	" "	Tel: 0972-221357 Email:	I. Kapalaya 35.8°
JOYCE MUOIYA DALEYA	" "	" "	Tel: NIL Email:	35.8° Joyce Muoiya
LAZAROUS MUUKA	" "	" "	Tel: 0974-277246 Email:	Lazarous Muuka 35.2°

...toka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia

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Draft ESIA Disclosure

November 2020

ATTENDANCE REGISTER

Meeting: ~~[illegible]~~ LUGOBO VILLAGE

Date: 26/12/20

Venue: ~~[illegible]~~ LUGOBO Pr. Sch

Head count (male/female):

(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MACKSON SEKO	FARMER	LUGOBO	Tel : 0971-562154 Email :	37.0° MSeko
SIABWEKA LAMECK	" "	MUNANSWI	Tel : 0977-525389 Email :	36.7° [signature]
FRANCIS MUUKAA	" "	LUGOBO	Tel : 0978-040136 Email :	36.0° [signature]
CHARLES SIPATUNJANA	BRICKLAYER	" "	Tel : 0978-306700 Email :	36.6° [signature]
TEDDY MUNCHOBE	FARMER	" "	Tel : 0972-902110 Email :	36.9° [signature]
BRITEL MAUNGA	" "	" "	Tel : 0979-864920 Email :	36.6° B.
STENLY SIBWEETE	DRIVER	MUNANSWI	Tel : 0978-798003 Email :	35.8° SS
MATEO SIAMUKALA	FARMER	LUGOBO	Tel : Email : NIL	35.4 M.S

MONDE

E, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
CHIEF MUCHELO	CHIEF	SIBUHULI	Tel : • Email : NIL	CHEIF 36.9°
ALICE CHILUNDIKA	FARMER	SHIBINDA	Tel : 0978-608098 Email :	35.6°
ROSEMERY MINYOI	" "	SIALUNDI	Tel : 0777-532044 Email :	R minyoi 37.0°
EMELY KAFULO	" "	SIBULUH	Tel : 0975-810998 Email :	Ekafulo A chilundika 37.1°
AARON SIMUUMBE	HEADMAN	SIANTALI	Tel : 0974-950729 Email :	36.1°
HASWELL MULENJA	FARMER	SIBOLOLI	Tel : 0972-906219 Email :	36.9°
CHRIS BUUMBA	BUSINESSMAN	" "	Tel : 0972-953027 Email :	36.7°
RASSO MWELYA	FARMER	MOONDE	Tel : 0971-949340 Email :	R mwelya 36.2°
CONARD SIBULUH	" "	SIBULUHI	Tel : Email : NIL	36.1°
LENARD MWANANYAMBE	" "	" "	Tel : 0977-248945 Email :	37.0°
KAHUMBU HAKAHILE	" "	" "	Tel : 0976-209295 Email :	K. Hakahile 36.2°

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Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
March 2020

ATTENDANCE REGISTER

Meeting: MOONDE VILLAGE

Date: 26/11/20

Venue: MOONDE COMMUNITY SCHOOL

Head count (male/female):.....
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHAK	ERM	LUSAKA	Tel: 0974-074 384 Email:	36.3°
MOONO SIMATOBO	SENIOR TEACHER	MOONDE SCH	Tel: 0972370901 Email:	36.5°
MONDAY SIMUJUMA	VILLAGE SECRETARY	" " VILLAGE	Tel: 0971-585501 Email:	36.4°
JOHN MUKOBOTO	HEADMAN	SIBULULI	Tel: 097[illegible]961684 Email:	36.1°
KELVIN SIANKUPI	VILLAGE COMMETTE	SIAMBALA	Tel: 0974-130736 Email:	35.6°
FISHER SIAKATITI	VILLAGE SECRETARY	MULWA	Tel: 0977-273498 Email:	36.8°
MUAMBA FRANCIS	BUSINESSMAN	MOONDE	Tel: 0972-416512 Email:	36.0°
FERNANDO SIPATELA	" "	SIAMBALA	Tel: 0973-920081 Email:	36.4°

Gorge Hydro-Electric Scheme (BGHES) Zimb...

MONDE

...FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MRECY CHILUNDIKA	BUSINESLADY	SIBULUH	Tel : 0975-251458 Email :	[illegible] 35.8°
CLEVER SILONDWA	EZIT	LUSAKA	Tel : 0977 571077 Email :	36.6°
MIKE AKATAMA	ZESCO	LUSAKA	Tel : Email : 0979484096	36.2 [illegible]
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

ERM

...ro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
March 2020
ATTENDANCE REGISTER

Meeting: MONDE VILLAGE
Date: 26/11/20

Venue: MONDE P SCH

Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MS LYDIA KATIMBE	HEALTH/ ENVIRONMENTAL HEALTH TECHNOLOGIST (EHT)	MOONDE RURAL HEALTH CENTRE MOONDE VILLAGE	Tel : +260971600495 Email : Katimbelydia97@gmail.com	[signature] 35.7°
VICTOR SINDOWE	CHIEF REP	SIPATUNYANA ZIMBA	Tel : 097775-9096 Email : Victorsindowe@gmail.com	[signature] 36.7°
ENG. CHRISPIN NAMAKANDO	ZAMBEZI RIVER AUTHORITY	LUSAKA	Tel : 0977-807758 Email : chrispin.namakando@zambezira.org	[signature] 36.0°
HANSIOMBE MUDENDA D	SIMAYAKWE WARD COUNCILLOR KAFOMO DISTRICT COUNCIL	MOONDE BASIC SCHOOL	Tel : 0974408381 Email :	[signature]
ENG. DZ MAZVIDZA	ZRA	LUSAKA	Tel : 0966745800 Email :	[signature] 36.8° 35.4°
NKWEENDENDA AVITOR	ZRA	LUSAKA	Tel : 0977320736 Email :	[signature] 36.1°
PHERRY C. MWIINGA	ZRA	LUSAKA	Tel : Email : 0979773017	[signature] 35.4°C.
JACK MUNTHALI	ZESCO	LUSAKA	Tel : 0979 093462 Email : JMunthali@zesco.co.zm	[signature] 36.3°

MONDE

...AST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
AURENCE MWIINGA	BUSINESSMAN	SIANTALI	Tel : 0972-779013 Email :	[signature] 36.8°
DAVID MULEYA	FARMER	SHIBINDA	Tel : 0972-769181 Email :	[signature] 35.2°
Buumba GRIDWELL	~~Farmer~~ Business	SIBULULI	Tel : 0976-401659 Email :	[signature] 35.8°
DICKSON KANYEBA	" "	" "	Tel : ~~0972-774409~~ Email : 0972-744049	[signature] 35.8°
NESTER MWEETWA	" "	" "	Tel : Email : NIL	N.M 36.2°
FUNWELL KAFULO	" "	" "	Tel : 0978-544673 Email :	P.Kafulo 35.4°
TWAMBO MOONO	" "	" "	Tel : 0972-300069 Email :	[signature] 36.8°
KEDRON MUNKOMBWE	" " ~~MOONDE~~	MOONDE	Tel : 0972-535764 Email :	Kmunkombwe 36.0°
PAUL MULEYA	" "	SIANTALI	Tel : Email : NIL	paul 36.1°
AGRIPA CHIMAMBA	" "	SIBULULI	Tel : 0972-056624 Email :	[signature] 36.7°
MACKSON SIAMONDA	" "	MOONDE	Tel : Email : NIL	[signature] 36.8°

ERM

Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
March 2020
ATTENDANCE REGISTER

Meeting: MUZIYA VILLAGE MEETING

Date: 26/11/20

Venue: MUZIYA P. Sch

Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
CLEVER SILONDWA	EZITA	LUSAKA	Tel : 0977-571077 Email :	[signature] 36.2°
HUMPHREY LIBANA	DATA COLLECTOR	MUNGALA	Tel : 0972-949054 Email :	[signature] 36.3°
ALICK MUMBWATASAI	VICE HEADMAN	SIAMEJA	Tel : 0977-229634 Email :	[signature] 35.8°
NAWA KAWAWSI	HEADTR.	MUZIYA PR. SCH	Tel : Email : 0977 315841	[signature] 35.7°
SIMON LIBINDO	VICE HEADMA	LIFALE	Tel : NIL Email :	[signature] 35.7°
DOREEN MWAULUKA	FARMER	SIABOZU	Tel : 0979-107316 Email :	[signature] 35.4°
Rodger Siakabene	FARMER	Siameja	Tel : Email : 0979387304	[signature] 36.7°
LOVENESS HANAMOONGA	" "	" "	Tel : ~~0955-61215~~ Email : 0955-361215	[signature] 36.0°

COVID-19 Prevention and P...

MUZYA – ZIMBA/SIPATUNYANA. 26/11/2020

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MAVIS MITI	MUZYA (SINGLE)	MUZYA SCHOOL MUNGALA VILLAGE	Tel : Email : –	
Estelly Chipongo	MUZYA	MUZYA SCHOOL LIFELALE	Tel : Email : –	MM 36.9°
HAROLD KALUWE	MUZYA	DINDI VILLAGE	Tel : Email : 0971142322	E C 36.8°
DAVISON LIBINDO	MUZYA	MUZYA SCHOOL LIFALALE VILLAGE	Tel : 0975616075 Email : DavisonLibindo@76gmail.com	HKlume. 36.8°
STANLEY SIKADUNA	MUZYA	SIANDWAZI VILLAGE	Tel : Email : 0953610777	[signature] 36.8°
PATSON KABUKU	MUZYA	SINDOWE VILLAGE	Tel : Email : 0975863595	[signature] 35.4°
Cathel Siachitema	MUZYA ~~Syandwazi~~	Siandwazi	Tel : Email : 0972084750	[signature] 35.8°
WEGAN SIACHITEMA	MUZYA	SIANDWAZI	Tel : Email : wegansia@gmail.com 0956153303	[signature] 36.8°
DANNY SIASIMULE	MUZYA	Lifalale Village	Tel : Email : 0976842596	[signature] 35.1°
HEDIMANI	SIAMEJA	MUZWA	Tel : Email : 0976015323	[signature] 36.2°
MEBSOW SIKABUTU	MUZYA	SIAMEJA	Tel : Email : 0970701602	[signature] 36.5°

MUZIYA

...AST & ...NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
mERCY kabayame	Lifalele	muzya school	Tel : 0770612655 Email :	36.9° kabayame
memory mandandi	Lifalele	muzya school	Tel : Email :	36.6° mandandi
EVANS chipongo	Lifalele	muzya school	Tel : 0972333898 Email :	37.0° chipongo
MAINGAILA VOUGHAN		MUZYA PRIMARY	Tel : 0977111519 Email : voughanmaingaila48@gmail.com	36.1°
ENG. PHERRY MWINGA	ZRA	LUSAKA	Tel : 0979773017 Email :	36.2°
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

~~MUZIYA~~ MUZIYA

IRST & ST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ABLE KALUWE	FARMER	DINDI	Tel : 0978-~~8292~~ 4468222 Email :	Kaluwe 35.4°
ISABLE NYAMBE	" "	SIAMEJA	Tel : NIL Email :	E. Nyambe 35.6°
IREEN KAPOKOLA	" "	" "	Tel : NIL Email :	I. Kapokola 36.0°
MAYBIN SIKANYITI	TEACHER	MUZYA PRIMARY SCH	Tel : 0977143768 Email :	Sikanyiti 35.4°
ALEX DONDOLO	FARMER	SIAMEJA	Tel : 0974-386455 Email :	35.9°
LEONARD MUDENDA	FARMER	SIONI	Tel : Email : 0979516124	Mudenda 36.3°
KAZOKA MARTIN	TEACHER	MUZYA PRIMARY SCH	Tel : 0979478940 Email :	Kazoka 35.8°
Siamalumba partson	Farmer	Vlge-Mungala	Tel : 0976457941 Email :	36.3°
Vincent Mandewu	FARMER	Vlg. Mungala	Tel : 0977693912 Email :	36.5°
GIDEON DAKAMISA	Herman	Siambale	Tel : Email : — —	35.8°
Roy SINDOLOE	HEADMAN	SINDOLOE	Tel : 0950-041794 Email :	36.3°

MUZIYA

...ST & NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
...NDOWE VICTOR	CHIEF REP SIPAFUNYAONA	ZIMBA TOWNSHIP	Tel: 0977759096 Email: victorsindowe gmail.com	35.3°
MIKE AKATAMA	ZESCO	LUSAKA	Tel: Email: 0979484096	35.2
ENG. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel: 0977-807758 Email: chrispin.namakando@zambezira.org	36.2°
ENG DAVID Z MAZUIDZA	ZRA	LUSAKA	Tel: +260966745800 Email:	35.1°C
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966116090 Email: JMunthali@zesco.co.zm	35.2°C
BRYAN KALUNDU	ZESCO-ENG-CIVIL	LUSAKA	Tel: 0771 350528 Email: bkalundu@zesco.co.zm	35.9.
FELIX CHISHA K.	ERM	LUSAKA	Tel: 0974-074384 Email:	36.9
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	

ERM

November 2020

ATTENDANCE REGISTER

Meeting: N'GANDU VILLAGE

Date: 23/11/2020

Venue: Meeting Tree

Head count (male/female):

(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
RODRICK MUSONDA	N'GANDU VILLAGE SECRETARY	N'GANDU	Tel : Email : 0977-773474	
AARON NAKALIZYA	FORMER HEADMAN	" "	Tel : Email : - -	
SILOLA SIAMWIZA	MUNWANA V/C SECRETARY	MUNWANA VILLAGE	Tel : Email : 0973653274	
HOWARD SIACHALIWA.	HEADMAN.	MUNWANA VILLAGE.	Tel : Email : 0975141515.	
PHILIMON SYASAYI	SENIOR H/MAN NAMILANGU ZONE	NGANDU VILLAGE	Tel : Email : 0976438944	
CHIBWE ACKSON	BRICK LAYER	N'GANDU	Tel : Email : 0976831960	
PETER Simunomba	V/C HEADMAN	MUNWANA	Tel : Email : 0977641211	
			Tel : Email :	

NGABDU VILLAGE

(9)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ENG. PHERRY C MWIINGA	ZRA	LUSAKA	Tel: 0979772017 Email: pherry.mwiinga@zambezira.org	
BRYAN KALUNDU	ZESCO	LUSAKA	Tel: 0977 350528 Email: bkalundu@zesco.co.zm	
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966 116090 Email: JMunthali@zesco.co.zm	
CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel: 0977-807758 Email: chrispin.namakando@zambezira.org	
FITZGERALD MUCHINSOU	"	"	Tel: 0978 731 621 Email:	
CLEVER SILONDWA	ZETA	" "	Tel: Email: 0977-571077	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	

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Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: N'GANDU VILLAGE
Date: 23/11/2020

Venue: Meeting tree
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
KAUNDULA STEVEN	OPERATOR	N'GANDU	Tel : Email : 0962-824013	[signature]
SILOKA SIASAYI	VILLAGER	" "	Tel : Email : Nil	[signature]
MAKAYE SIYANDO	VILLAGER	MUNWANA	Tel : Email : NIL	[signature]
SIAKAINGA SIYAMUKWELE	FARMER	" "	Tel : Email : NIL	S. Siamunkwele
GANI MOSES	" "	MUKAHANI	Tel : Email : 0979-374364	[signature]
SIBUKA GRACE	Volunteer	Munwana	Tel : Email : 0974859975	[signature]
MUBI MILDRED	FARMER	" "	Tel : Email : NIL	M.M
~~MOO~~ MOONO SIMUKALE	VILLAGER	MUNWANA	Tel : Email : NIL	M. Simu

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Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: MG'ANDU VILLAGE
Date: 23/11/2020
Venue: Meeting Tree
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
RUTH SIAKAJOBO	VILLAGER	N'GANDU	Tel : Email : NIL	R. S.
ANNAH	" "	" "	Tel : Email :	
mundila	villager	Ngandu	Tel : Email : nil.	A. M
muzamba	" "	Ngandu	Tel : Email : 0970601616	[illegible]
MATHEW	VILLAGER	" "	Tel : Email : 0966937373	[illegible]
Wingrey	VILLAGER	Ngandu	Tel : Email : Nil	W. N
PHILLIP	VILLAGE	MUNWANA	Tel : Email : 0977829522	[illegible]
GODFREY	VILLAGE	N'GANDU	Tel : Email :	P. M

Meeting: NGANDU VILLAGE
Date: 23/11/~~200~~ 2020

ATTENDANCE REGISTER

Venue: Meeting Tree
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ALLAN NAKALIZYA	VILLAGER	Ngandu	Tel : Email : NIL	ALLAN NAKALIZYA
Sophia Muzi	" "	" "	Tel : Email : " "	S. M
MAUREEN CHALINGA	VILLAGER	MUNWANA	Tel : Email : " "	M.C
B. Siloka	Farmer	Ngandu	Tel : Email : 0972136458	
G. SIMUTOMBO	VILLAGER	MUNWANA	Tel : Email : 0764000359	Gumbo
Anna Siasayi	" "	Ngandu	Tel : Email : 0978808046	A. Siasayi
maureen mazanga	" "	Ngandu	Tel : Email : 0970243367	nonga
Musiye SIAGWALI	" "	Ngandu	Tel : Email : NIL	M. SIAGWALI

NATURE

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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

(8)

Meeting: N'GANDU VILLAGE
Date: 23/11/2020

Venue: Meeting Tree
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MONICA NYOMBO	VILLAGER	N'GANDU	Tel : Email : 0979-875209	[signature]
JUDITH MAZANGA	" " "	" "	Tel : Email : NIL	Imazanga
Siamapepa Jacqueline	" " "	" "	Tel : Email : NIL	[signature]
SIMUSHI Janet	" " "	MUNWAINA	Tel : Email : 0968495961	J. SIMUSHI
SIBUKA NAMASIKU	" "	" "	Tel : Email : 0977-272581	D. Novaty
FELIX CHISHAK	ERM	LUSAKA	Tel : 0974074384 Email :	[signature]
			Tel : Email :	
			Tel : Email :	

Batoka Gorge ...

Syamwanamywa P. Sch.

...T & NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ENG. PHERRY C. MWINGA	ZRA	LUSAKA	Tel : 0979779017 Email : 36.0 °C.	
ENG. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel : 0977-807758 Email : chrispin.namakando@zambezira.org	35.6°
JACK MUNTHALI	ZESCO	LUSAKA	Tel : 0966116090 Email : JMunthali@zesco.co.zm	36.00
PHILLIP ZIDUCHE	ZRA	LUSAKA	Tel : +260960340741 Email : philip.ziduche@zambezira.org	36.9
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	
			Tel : Email :	

NAME	Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
IDAH VUUKA MIZIMO	FARMER	SIAMWANVWA	Tel : Email : NIL	IDAH 35.2°
CHIKONGA	" "	" "	Tel : Email : NIL	Chikonga mizimo 36.3
FLORENCE KAZEMBE	" "	" "	Tel : Email : 0950-320008	kazembe Florence K 36.4°
JOYCE LIWAKALA	" "	" "	Tel : Email : NIL	Liwakala Joyce 36.4°
PENYOP KALONGA	TEACHER	SIAMWANVWA & SIBALWA	Tel : Email : 0971-555824	36.5°
MOSES VUUKA	FARMER	SIAMWANVWA	Tel : Email : 0953956551	M. VUUKA 36.4°
TAMAH MULENGA	TEACHER	KAMBULU	Tel : Email : 0953010780	36.4°
HABBA LAIKUMBA	FARMER	SIAMAWU	Tel : Email : 0953516205 ~~0953 571 5162~~	36.6° Laikumba
CRISON SIALWENDO	" "	SIANCHONGWE	Tel : Email : 0957-231094	C.Sialwendo 35.9°
JESSY SINKWAYA	" "	SIAMWANVWA	Tel : Email : 0953-456830	J.Sinkwaya 36.4°
TRUST CHIKONGA	BUSINESSMAN	" "	Tel : Email : 0974-621090	36.2°

ERM

Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: Syamwamvwa School
Date: 25/11/20
Venue: Syamwamvwa P. School
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
ALFRED SIAMPOLA	COUNCILLOR	KASKILI PRIMARY SCH LUYALA	Tel: 0979889023 Email:	35.8°
MICHAEL SIMUBALI	CHAIRMAN	INKUMBI BASIC SCH KAMBULU	Tel: 0979723114 Email:	35.5°
Syron Sialanga	Farmer	Village Siamwaamvwa	Tel: Email: 0978161524	35.5°
SIKWEMBELA Lita	FARMER ~~Sikwembela~~	SIAMWANVWA ~~Yaa~~	Tel: Email: NIL	36.7°
BESTER MOONO	FARMER	" "	Tel: Email: 0950-484188	36.1° B. MOONO
FIDES ZIMBA	CHW	SIANCHONGO	Tel: Email: 0977-190122	36.4°
SARAFINA SIMADAWA	FARMER	SIAMWANVWA	Tel: Email: NIL	S. Simadawa 35.8°
JESTINA SIKABENGA	M.Y.C.W	" "	Tel: Email: 0976-062473	36.5°

NAME	Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
IDAH VUUKA MIZIMO	FARMER	SIAMWANVWA	Tel : Email : NIL	IDAH 35.2°
CHIKONGA	" "	" "	Tel : Email : NIL	chikonga mizimo 36.3
FLORENCE KAZEMBE	" "	" "	Tel : Email : 0950-320008	kazembe Florence K 36.4°
JOYCE LIWAKALA	" "	" "	Tel : Email : NIL	Liwakala Joyce 36.4°
PENKOP KALONGA	TEACHER	SIAMWANVWA & SIBATWA	Tel : Email : 0971-555824	36.5°
MOSES VUUKA	FARMER	SIAMWANVWA	Tel : Email : 0953956551	M. VUUKA 36.4°
TAMAH MULENGA	TEACHER	KAMBULU	Tel : Email : 0953060780	36.4°
HABBA LAIKUMBA	FARMER	SIAMAWU	Tel : Email : 0953516205 ~~0953 575162~~	36.6°
CRISON SIALWENDO	" "	SIANCHONGWE	Tel : Email : 0957-231094	C.Sialwendo 35.9°
JESSY SINKWAYA	" "	SIAMWANVWA	Tel : Email : 0953-456830	J.Sinkwaya 36.4°
TRUST CHIKONGA	BUSINESSMAN	" "	Tel : Email : 0974-621090	36.2°

NAME	Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
IDAH VUUKA MIZIMO	FARMER	SIAMWANVWA	Tel : Email : NIL	IDAH 35.2°
CHIKONGA FLORENCE	" "	" "	Tel : Email : NIL	Chikonga mizimo 36.3
KAZEMBE JOYCE	" "	" "	Tel : Email : 0950-320008	kazembe Florence K 36.4°
LIWAKALA PENYLOP	" "	" "	Tel : Email : NIL	Liwakala Joyce 36.4°
KALONGA	TEACHER	SIAMWANVWA & SIBALWA	Tel : Email : 0971-555824	36.5°
MOSES VUUKA	FARMER	SIAMWANVWA	Tel : Email : 0953956551	M. VUUKA 36.4°
TAMAH MULENGA	TEACHER	KAMBULU	Tel : Email : 0953010780	36.4°
HABBA LAIKUMBA	FARMER	SIAMAWU	Tel : Email : 0953516205 ~~0953 575162~~	36.6° Laikumba
CRISON SIALWENDO	" "	SIANCHONGWE	Tel : Email : 0957-231094	C.Sialwendo 35.9°
JESSY SINKWAYA	" "	SIAMWANVWA	Tel : Email : 0953-456830	Jiwaya 36.4°
TRUST CHIKONGA	BUSINESSMAN	" "	Tel : Email : 0974-621090	36.2°

Syamwamuwa P- Sch

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel: 0977519525 Email:	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel: 0975303192 Email:	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel: 0977228589 Email:	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel: — Email:	EUS 36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel: 0979309658 Email:	TS 36.3°
MUSSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel: 0954300159 Email:	M.S 36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel: 0950514543 Email:	D.C 36.7°
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel: Email: —	WS. 36.0°
CLEVER. SIONDWA	EZITA	LUSAKA	Tel: Email: 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel: Email: 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATINYANA	Tel: 0977775-9096 Email: victorsindowe@gmail.com	36.0°

Syamwamuwa P. Sch.

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel: 0977519525 Email:	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel: 0975303192 Email:	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel: 0977228589 Email:	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel: — Email:	36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel: 0979309658 Email:	36.3°
MUSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel: 0954300159 Email:	36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel: 0950514543 Email:	36.7° D.C
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel: Email: —	36.0° WS.
CLEVER. SIONDWA	EZITA	LUSAKA	Tel: Email: 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel: Email: 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATINYANA	Tel: 0977775096 Email: victorsindowe@gmail.com	36.0°

Syamwamuwa P. Sch.

FIRST & ST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel : 0977519525 Email :	[signature] 36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel : 0975303192 Email :	[signature] 36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel : 0977228589 Email :	[signature] 36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel : — Email :	EUS 36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel : 0979309658 Email :	[signature] 36.3°
MUSSA SIAMWAMUA	FARMER	SIAMWAMUWA	Tel : 0954300159 Email :	M.S 36.7°
DETERIORATE CHIKOONGA	FARMER	SIAMWAMUWA	Tel : 0950514543 Email :	D.C 36.7°
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel : Email : —	WS. 36.0°
CLEVER. SILONDWA	EZITA	LUSAKA	Tel : Email : 0977-571077	[signature] 36.6°
MIKE AKATAMA	ZESCO	LUSAKA	Tel : 3' Email : 0979484096	[signature] 36.2
SINDOWE VICTOR	CHIEF REP	SIPATUNYANA	Tel : 0977759096 Email : victorsindowe@gmail.com	[signature] 36.0°

Syamwamuwa P- Sch.

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel: 0977519525 Email:	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel: 0975303192 Email:	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel: 0977228589 Email:	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel: — Email:	36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel: 0979309658 Email:	36.3°
MUSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel: 0954300159 Email:	36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel: 0950514543 Email:	36.7° D.C
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel: Email: —	36.0° WS.
CLEVER. SIONDWA	EZITA	LUSAKA	Tel: Email: 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel: 3' Email: 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATUNYANA	Tel: 0977775-9096 Email: victorsindowe@gmail.com	36.0°

Syamwamuwa P. Sch.

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel: 0977519525 Email:	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel: 0975303192 Email:	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel: 0977228589 Email:	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel: — Email:	36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel: 0979309658 Email:	36.3°
MUSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel: 0954300159 Email:	36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel: 0950514543 Email:	36.7°
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel: — Email:	36.0°
CLEVER. SIONDWA	EZITA	LUSAKA	Tel: Email: 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel: Email: 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATINYANA	Tel: 0977775096 Email: Victorsindowe@gmail.com	36.0°

Syamwamuwa P. Sch.

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel: 0977519525 Email:	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel: 0975303192 Email:	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel: 0977228589 Email:	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel: — Email:	EUS 36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel: 0979309658 Email:	36.3°
MUSSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel: 0954300159 Email:	M.S 36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel: 0950514543 Email:	36.7° D.C
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel: Email: —	36.0° WS.
CLEVER. SIONDWA	EZITA	LUSAKA	Tel: Email: 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel: Email: 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATUNYANA	Tel: 0977775-9096 Email: Vectorsindowe@gmail.com	36.0°

Syamwamuwa P. Sch.

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel : 0977519525 Email :	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel : 0975303192 Email :	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel : 0977228589 Email :	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel : — Email :	36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel : 0979309658 Email :	36.3°
MUSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel : 0954300159 Email :	36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel : 0950514543 Email :	36.7° D.C
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel : Email : —	36.0° WS.
CLEVER. SIONDWA	EZITA	LUSAKA	Tel : Email : 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel : Email : 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATUNYANA	Tel : 0977775096 Email : victorsindowe@gmail.com	36.0°

Syamwamuwa P- Sch.

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FREKSOW MAUNGA	SIAMWAMUWA FARMER	SIAMWAMUWA	Tel: 0977519525 Email:	36.5°
OSCAR SIBAJENE	FARMER	LUYALA FARMS	Tel: 0975303192 Email:	36.5°
MUNDIA NAMBULA	TEACHER	SIAMWAMUWA V/GE	Tel: 0977228589 Email:	36.5°
EVERLYNA SIAKAWAINE	FARMER	SIAMWAMUWA	Tel: — Email:	EUS 36.1°
TICKY SIALWENDO	FARMER	SIACHONGO	Tel: 0979309658 Email:	36.3°
MUSA SIAMWAMUWA	FARMER	SIAMWAMUWA	Tel: 0954300159 Email:	36.7°
DETERIORATE CHIKONGA	FARMER	SIAMWAMUWA	Tel: 0950514543 Email:	36.7° D.C
WEBBY SIAKAMWAYA	FARMER	SIAMWAMUWA	Tel: Email: —	36.0° WS.
CLEVER SIONDWA	EZITA	LUSAKA	Tel: Email: 0977-571077	36.6°
MIKE AKATAMA	ZESCO	Lusaka	Tel: Email: 0979484096	36.2
SINDOWE VICTOR	CHIEF REP	SIPATINYANA	Tel: 0977775-9096 Email: victorsindowe@gmail.com	36.0°

NAME	Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
IDAH VUUKA MIZIMO	FARMER	SIAMWANVWA	Tel : Email : NIL	IDAH 35.2°
CHIKONGA	" "	" "	Tel : Email : NIL	Chikonga mizimo 36.3
FLORENCE KAZEMBE	" "	" "	Tel : Email : 0950-320008 ~~NIL~~	kazembe Florence K 36.4°
JOYCE LIWAKALA	" "	" "	Tel : Email : NIL	Liwakala Joyce 36.4°
PENYAP KALONGA	TEACHER	SIAMWANVWA & SIBALWA	Tel : Email : 0971-555824	[illegible] 36.5°
MOSES VUUKA	FARMER	SIAMWANVWA	Tel : Email : 0953956551	M. VUUKA 36.4°
TAMAH MULENGA	TEACHER	KAMBULU	Tel : Email : 0953010780	[illegible] 36.4°
HABBA LEIKUMBA	FARMER	SIAMAWU	Tel : Email : 0953516205 ~~0953 575162~~	36.6° [illegible]
CRISON SIALWENDO	" "	SIANCHONGWE	Tel : Email : 0957-231094	C. Sialwendo 35.9°
JESSY SINKWAYA	" "	SIAMWANVWA	Tel : Email : 0953-456830	J. Sinkwaya 36.4°
TRUST CHIKONGA	BUSINESSMAN	" "	Tel : Email : 0974-621090	[illegible] 36.2°

...BA DIST. COUNCIL

(18)

FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
BRYAN KALUNDU	ZESCO - ENG-CIVIL	LUSAKA	Tel: 0977 350528 Email: bkworld@gmail.com ZESCO	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	
			Tel: Email:	

ERM

ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: ZIMBA DIST. COUNCIL
Date: 24/11/2020

Venue: COUNCIL CHAMBERS
Head count (male/female):
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA K.	ERM	LUSAKA	Tel: 0974 074 384 Email: 36.2°	[signature]
COSTER M MUTANDI	Council Secretary ~~ZIMBA TOWN COUNCIL~~	36.6° ZIMBA TOWN COUNCIL	Tel: 0977100886 Email: mutandicoster@gmail.com	[signature]
Caroline Kafuko	Administrative Officer	37.1° ZIMBA TOWN COUNCIL	Tel: 0976338967 Email: carolkafs@gmail.com	[signature]
BIEMBA BISESA	WORKS FOREMAN	ZIMBA TOWN COUNCIL	Tel: 0979710530 Email: ~~Bier~~ biembabisesa@gmail.com 36.7°	[signature]
JOSEPHINE CHIILA	DISTRICT PLANNING OFFICER	ZIMBA TOWN COUNCIL	Tel: 0972450206 Email: chiilajosephine@gmail.com 37.1°	[signature]
ENG. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel: 0977-807758 Email: chrispin.namakando@zambezira.org ~~@zaraho.org~~	35.7° [signature]
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966116090 Email: JMunthali@zesco.co.zm	36.8° [signature]
PHERRY C. MWIINGA	ZRA	LUSAKA	Tel: 0979773017 Email: pherry.mwiinga@zambezira.org	36.3° [signature]

ERM

November 2020

ATTENDANCE REGISTER

Meeting: ZIMBA DIST. COUNCIL

Date: 24/11/2020

Venue: COUNCIL CHAMBERS

Head count (male/female):.....

(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
FELIX CHISHA K.	ERM	LUSAKA	Tel: 0974074384 Email: 36.2°	
COSTER M MUTANDI	COUNCIL SECRETARY ~~ZIMBA TOWN COUNCIL~~	36.6° ZIMBA TOWN COUNCIL	Tel: 0977100886 Email: mutandicoster@gmail.com	
CAROLINE KAFUKO	ADMINISTRATIVE OFFICER	37.1° ZIMBA TOWN COUNCIL	Tel: 0976338967 Email: carolkafs@gmail.com	
BLEMBA BISESA	WORKS FOREMAN	ZIMBA TOWN COUNCIL	Tel: 0979710530 Email: biembabisesa@gmail.com 36.7°	
JOSEPHINE CHILA	DISTRICT PLANNING OFFICER	ZIMBA TOWN COUNCIL	Tel: 0972450206 Email: chilajosephine@gmail.com 37.1°	
ENG. CHRISPIN NAMAKANDO	ZRA	LUSAKA	Tel: ~~0977-807758~~ Email: chrispin.namakando@zambezira.org ~~@zarahq.org~~	35.7°
JACK MUNTHALI	ZESCO	LUSAKA	Tel: 0966116090 Email: JMunthali@zesco.co.zm	36.8°
PHERRY C. MWIINGA	ZRA	LUSAKA	Tel: 0979773017 Email: pherry.mwiinga@zambezira.org	36.3°

Annex C8.9.8

Zimbabwe Physical Meetings Attendance Register

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ERM

ATTENDANCE REGISTER

Meeting: CHIEF MUSUNA CONSTITUENCY
Date: 30-11-2020

Venue: Chidobe Pry School
Head count (male/female): 3 MALE 3 FEMALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Lawrence Sub	Secretary of Tribal Chiefs Chisuma Ward	Chisuma	Tel: 0775297651 Email:	36.0
Alan Mwape	Secretary - Habbertain May	Chisuma	Tel: 0777820514 Email:	35.6
Tabona Newby	Village Head	Chisuma Village	Tel: 0774702300 Email:	36.0
Cadrea Mbewa	Village Head	Chisuma Village	Tel: 0771048488 Email:	35.8
Alfred Musu	Village Head	Chidobe	Tel: 0772 582 230 Email:	36.6
Talent Mpu	Village Head	Chidobe	Tel: 0779 676835 Email:	35.2
Cecilia Mk	Secretary	Chidobe	Tel: 0777856634 Email:	36.5
[illegible]	Operations Mgr Secretary	[illegible]	Tel: 0775778691 Email:	34.6

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ERM

ATTENDANCE REGISTER

Meeting: CHIEF MUSUNA CONSTITUENCY
Date: 30-11-2020

Venue: Chidobe Pry School
Head count (male/female): 6 MALE 3 FEMALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Stephen Mwape	Village Head Chidobe 4 B	Chidobe	Tel: 0775 107 972 Email:	36.2
Isaac Chumalo	Village Head Sizinda	Sizinda	Tel: 0774951486 Email:	34.8
M.G. Mpefu	Office Headman Chidobe 2 A	Chidobe	Tel: 0712396079 Email:	36.4
Silosina Sibanda	Chidobe 1	Chidobe	Tel: 0717808930 Email:	35.0
Dereas Hatibu	Village Head Sizinda	Sizinda	Tel: 0783127748 Email:	35.8
Barry C Mwiinga	ZRA	Lusaka	Tel: +260 0977777017 Email:	36.4
Brian Chada	ZESA	25 Samora Machel Ave Lusaka	Tel: +263 717 802615 Email: bgada@zetdc.co.zw	36.4
Edson Namewe	ZESA	25 Samora Machel Avenue, Lusaka	Tel: +263 773 209862 Email: nmayewe@zetdc.co.zw	36.2

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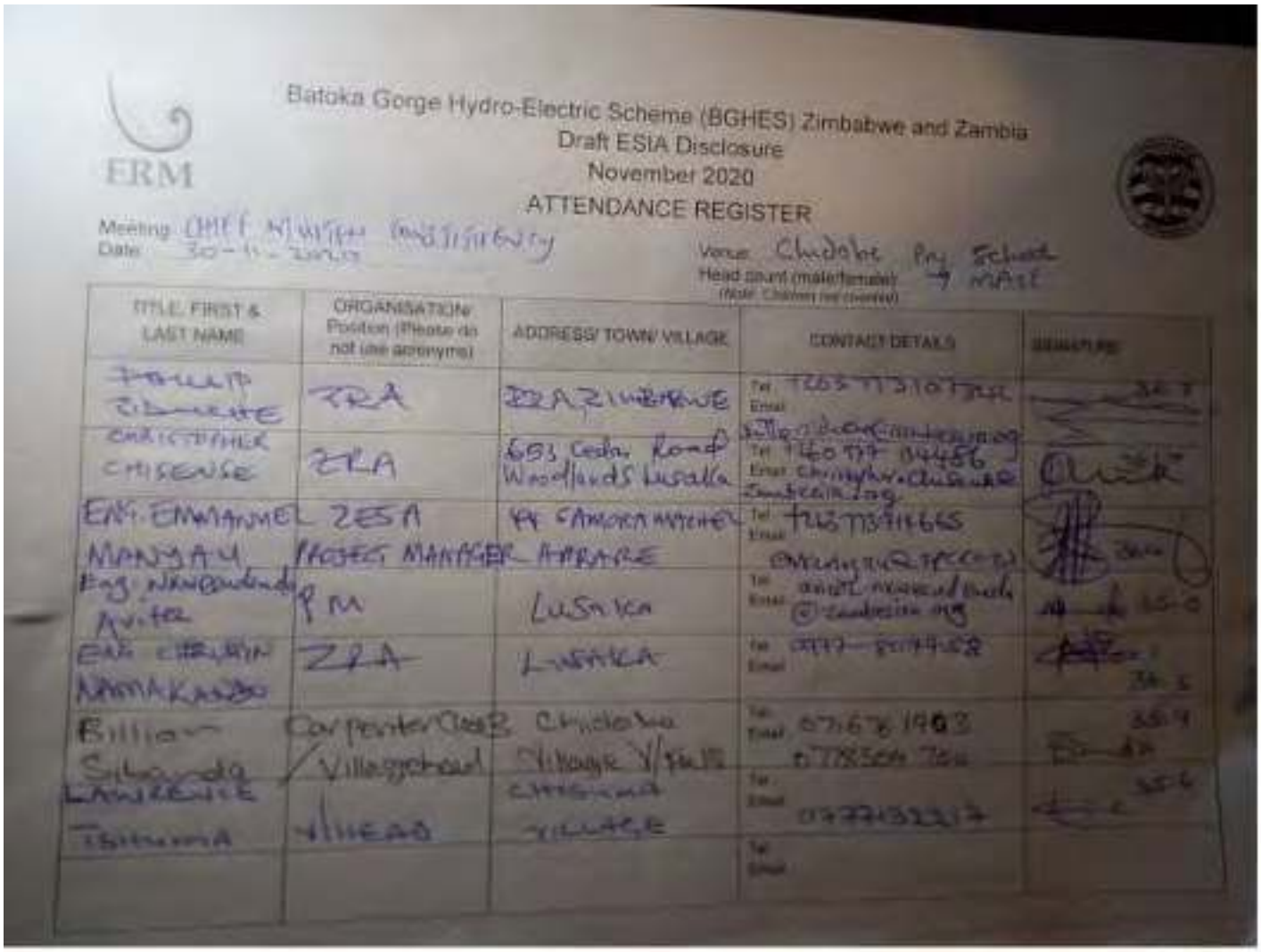
Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: CHIEF MUUTHU CONSTITUENCY
Date: 30-11-2020

Venue: Chidobe Pry School
Head count (male/female): 6 MALE 2 FEMALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Bongani Dlodlo	ERM	Vic Falls	Tel Email: 0775505494	[signature] 35.4
Gary Jones	Greenlee Africa	Dibutibu	Tel Email: 0784012856	[signature] 36.3
Melusi Mpisi	Kompisi	Mond Village	Tel Email: 0772785021	[signature] 36.0
Shinner Nolan	RAZ Chair Person	Sizinda Village	Tel: 0775107255 Email: nolanshinner@gmail.com	[signature] 36.6
Stanford Thebe	V/HEAD	Monde Village	Tel Email: 0772563220	[signature] 35.8
M. Paul Mpala	V/HEAD	MONDE VILLAGE	Tel Email: 0774951867	[signature] 36.7
Sophie Nolan	V/head	Sizinda Village	Tel Email: 0735594616	[signature] 36.2
Sara Nolan	V-head	Chisumo Village	Tel Email: 0775109303	[signature] 36.2



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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

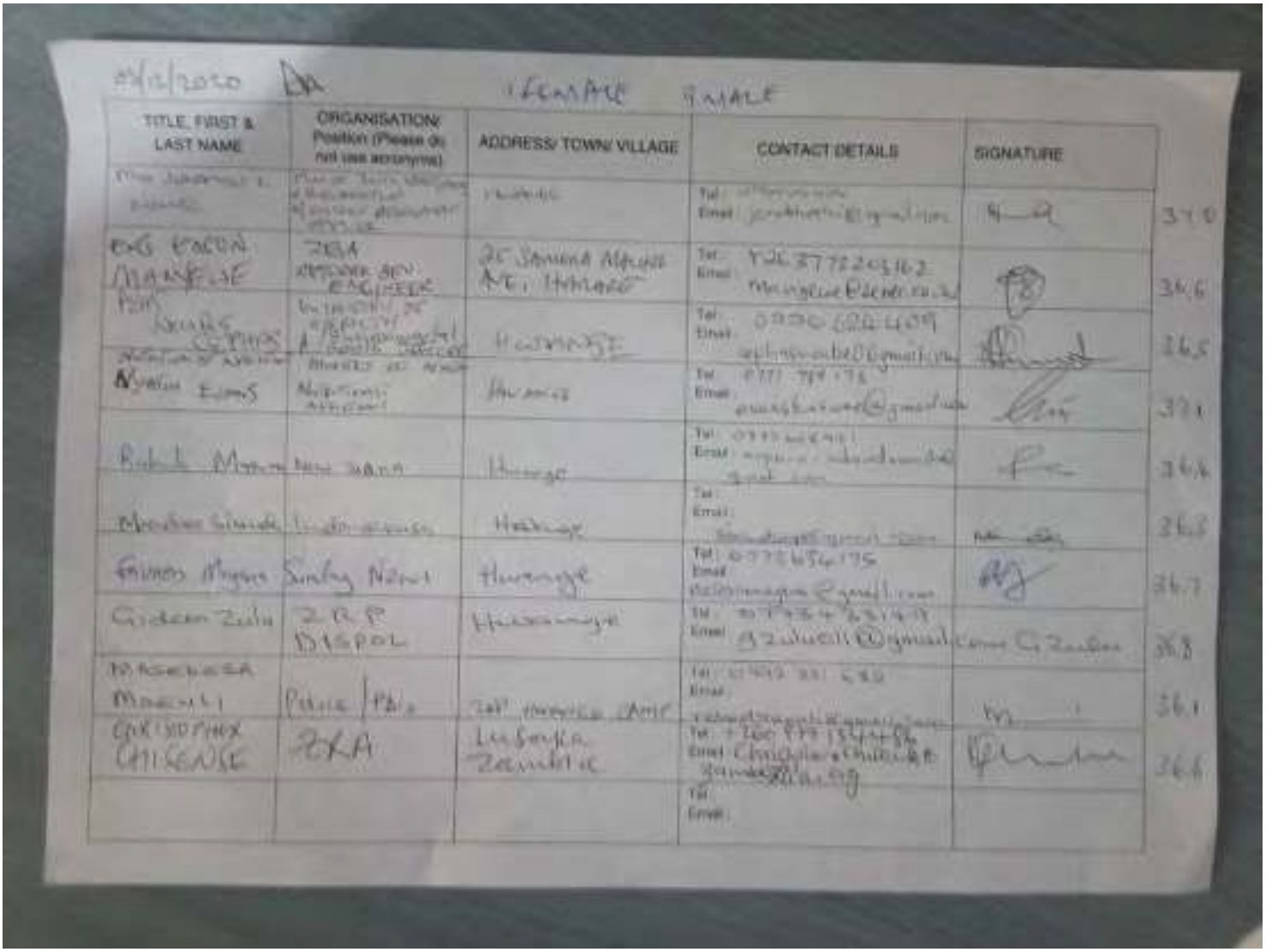
Meeting: CHIEF NYAMPHA CONSTITUENCY
Date: 30-11-2020

Venue: Chidobe Pry School
Head count (male/female): → MALE
(Note: Children not covered)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
[illegible]	ZRA	ZRA ZIMBABWE	Tel: [illegible] Email: [illegible]	[illegible]
CHRISTOPHER CHISENSE	ZRA	653 Cedar Road Woodlands Lusaka	Tel: [illegible] Email: [illegible]	[illegible]
ENG. EMMANUEL MANYAU	ZESA PROJECT MANAGER	44 SAMORA MACHEL AVRARE	Tel: [illegible] Email: [illegible]	[illegible]
Eng. [illegible] Avitar	PM	LUSAKA	Tel: [illegible] Email: [illegible]	[illegible]
ENG. [illegible] NAMAKANDO	ZRA	LUSAKA	Tel: [illegible] Email:	[illegible]
Billian Sibanda	Carpenter Chief / Villagehead	Chidobe Village V/Fall	Tel: 07[illegible] Email: 0778[illegible]	[illegible]
LAWRENCE TSHUMA	V/HEAD	CHISUMA VILLAGE	Tel: 0777132217 Email:	[illegible]
			Tel: Email:	

03/12/2020 BA BA's OFFICE HWANGE 1 DNATE 1 FEMALE

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
Tasara			Tel: Email:	
[illegible]			Tel: Email:	
[illegible]	Black Crystal Consultant	VIC Falls	Tel: Email: 0775585494	
Cherry C [illegible]	ZRA	[illegible]	Tel: Email: 0778773017	
Obedience [illegible]	Forestry Commission	HWANGE	Tel: 0777453007 Email:	
[illegible]	ZIMSTAT	HWANGE	Tel: 0777621[illegible] Email: [illegible]	
INNOCENT S [illegible]	MWACSMED	Hwange	Tel: 0773 931 649 Email: [illegible]	
Zimbabwe [illegible]	AGRITEX	Hwange GVTHILL	Tel: 0776 446 751 Email: [illegible]	
[illegible] M [illegible]	MIN OF INFORMATION	Hwange	Tel: 0716800227 Email: [illegible]	
[illegible]	[illegible]	Hwange	Tel: [illegible] Email: [illegible]	
Malvern [illegible]	[illegible] Dpt	Hwange	Tel: Email: 0782 [illegible] 147	



[illegible]/12/2020 DA 1 FEMALE 9 MALE

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
[illegible]	[illegible]	[illegible]	Tel: [illegible] Email: [illegible]	[illegible]	37.0
ENG EDSON MANYEWE	ZBA [illegible] ENGINEER	25 SAMORA MACHEL AVE, HARARE	Tel: +26 377 2203162 Email: [illegible]	[illegible]	36.6
[illegible]	[illegible]	HWANGE	Tel: 0770 624 409 Email: [illegible]	[illegible]	36.5
[illegible]	[illegible]	HWANGE	Tel: 0771 789 175 Email: [illegible]	[illegible]	37.1
[illegible]	[illegible]	Hwange	Tel: [illegible] Email: [illegible]	[illegible]	36.6
[illegible]	[illegible]	Hwange	Tel: Email: [illegible]	[illegible]	36.5
[illegible]	Sunday News	Hwange	Tel: 0775 654 175 Email: [illegible]	[illegible]	36.7
Gideon Zulu	ZRP DISPOL	Hwange	Tel: [illegible] Email: [illegible]	[illegible]	36.8
MASENESA MOENLI	Police / PAIS	ZRP [illegible] CAMP	Tel: [illegible] Email: [illegible]	[illegible]	36.1
CHRISTOPHER CHISENSE	ZRA	Lusaka Zambia	Tel: +260 [illegible] Email: [illegible]	[illegible]	36.6
			Tel: Email:		

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ERM

ATTENDANCE REGISTER

Meeting: CHIEF MVUMU INSTITUTIONAL
Date: 30-11-2020
Venue: Nyamadzi Sec School
Head count (male/female): MALE = / FEMALE = 2
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
PHIRIRI RUDO	ZRA	KARIBA	Tel: +263773103142 Email:		36.0
PHIRIRI FRANCIS	"	LUSAKA	Tel: Email: +260979739017	36.4	36.3
NKWANDANDA ARTHUR	"	LUSAKA	Tel: 0977320236 Email: 36.2		36.1
TATARA NYAMANDEDZO	ERM	HARARE	Tel: +263772271676 Email: nyamdedzo@gmail.com		36.1
BONGANI DLODLO	ERM	VIC FALLS	Tel: Email:	0775585494	36.3
chief MVUMU	Chief	kazungula	Tel: Email:		36.0
			Tel: Email:		
			Tel: Email:		

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ERM

ATTENDANCE REGISTER

Meeting: CHIEF MVUMU INSTITUTIONAL
Date: 30-11-2020
Venue: Nyamadzi Sec School
Head count (male/female): 8 MALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
JOHN SIMUNZE	SIMUNZE PRIMARY SCHOOL	SIMUNZE PRI	Tel: 0775277647 Email:		36.9°
Jackson Mwanza	V. Head	Nyamadzi village	Tel: 0775258730 Email:		36.5°
JACKSON SIAMUNA	ATTINO NYAMA	NYAMADZI VILLAGE	Tel: 0778603292 Email:		36.1
ENG. CHIKWA NKOMBANO	DEPARTMENT OF ENG. (ZESA)	LUSAKA	Tel: 0977477758 Email:		35.7°
ENG. MANJEKE MANJEKE	DEPARTMENT OF ENG. (ZESA)	25 SAMORA MACHEL AVENUE, HARARE	Tel: +263773 200612 Email:		35.8C
CHRISTOPHER CHISENSE	ZRA	655 Cotton Road Woodlands Lusaka Zambia	Tel: +260979 [illegible] Email:		35°C
ENG. ZIMANI MANYAU	PROJECT MGR ZESA	69 SAMORA MACHEL AVENUE HARARE	Tel: +263773984665 Email:		36.5°C
BWANI CHOMA	GIS EXPERT ZESA	25 SAMORA MACHEL AVE HARARE	Tel: +263 [illegible] Email:		36.1°C

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
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ATTENDANCE REGISTER

Meeting: CHIEF NYAUTHA CONSULTATION
Date: 20/11/2020
Venue: Nyautha Sec School
Head count (male/female): 3 MALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
MR GUIDEON MONO	COUNCILLOR	Kachechete WARD	Tel / Email	
Mr Champion Ndlovu	V/HEAD	Kachechete Ward	Tel 0775527628 / Email	
Rizla Ndlovu	V/Head	KACHECHETE	Tel / Email	
Alisa Moyo	Chief Secretary	Mlindizela	Tel 0775257158 / Email	
Mr Dumisani Ncube	VDC member	BH 127 Kachechete Ward	Tel / Email	
Malcolm Moyo	VDC chairman	Kachechete	Tel / Email 0772529034	
Boyton Mathe		Kachechete Ward	Tel / Email 0735445031	
Mr Peter Sibanda	VDC member	BH 127 Kachechete	Tel / Email 0772654962	

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ERM

ATTENDANCE REGISTER

Meeting: CHIEF NYAUTHA CONSULTATION
Date: 20-11-2020
Venue: Nyautha Sec School
Head count (male/female): 7 MALE 2 FEMALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
[illegible]	—	BH 127	Tel / Email 0774347423	
[illegible]	HOD/HS School	BH 59	Tel / Email	
[illegible]	V/Head	BH 60	Tel / Email	
Richard Moyo	VILLAGE	Jenkins	Tel / Email 0772209218	
Sylvester Kwenda	V/head	Jenkins	Tel / Email 0772932547	
I Sibanda		B.H.59	Tel / Email 0773339591	
[illegible]		BH 57	Tel / Email	
Tchenkwe	–	BH 128	Tel / Email 0773387185	
Andrew Sibanda	V HEAD	B.H24	0775623110	

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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: CHIEF MWANGE MEETING
Date: 01-12-2020
Venue: Chief Mwange Palace
Head count (male/female): TEMPLE 6 MALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
Eng Nkwendadzo Anita	PM - BGHES	Lusaka	Tel: 0977320756 Email: anita.nkwendadzo		355
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Chief Mwange Dr Lusundazi	Local Government	Ward 9	Tel: Email:		358
Mrs Chief Mwange	N/A	Ward 9	Tel: Email:	F Chiwan	359
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ERM

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: CHIEF MWANGE MEETING
Date: 01-12-2020
Venue: Chief Mwange Palace
Head count (male/female): 2 FEMALE 6 MALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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Chaunga Chuma	Village Head	Shashachunda	Tel: Email:	+	354
ENG. EMMANUEL MANYAM	ZESA PROJECT MANAGER	99 SAMORA MACHEL HARARE	Tel: +263 783 444 65 Email: emanyam@zesa.co.zw		355
Andy C Chisenga	ZRA	Lusaka	Tel: Email: 0979973017		356
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Bwalya Cama	BGS Guard ZESA	23 Samora Machel Ave Harare	Tel: +263 774 [illegible] Email: bgsdc@zeds.co.zw		362
EDSON MARMECHE	ZESA NETWORK DEV. ENG	99 SAMORA MACHEL AVE, HARARE	Tel: +263 772 294 062 Email:		363
Eng. CHRISTIAN NHAMKARBO	HARARE-ES ZRA	LUSAKA	Tel: 0977-807758 Email:		364

ERM

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: CHIEF HWANGE MEETING
Date: 02-12-2020

Venue: Chief Hwange Palace
Head count (male/female): 6 MALE 2 FEMALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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NDLOVU Maphenduka	Village Head	Mashala Down	Tel: 0775423223 Email:	[illegible]	36,6
SHOKO TSHOKWANE P	VILLAGE HEAD	ZWABO	Tel: Email: 0782982873	T/SHOKO	37,0
[illegible] Jorgee	Village Head	[illegible]	Tel: Email: [illegible]	[illegible]	36,0

ERM

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: HRDC
Date: 01-12-2020

Venue: HRDC
Head count (male/female): 7 MALE 1 FEMALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: HRDC
Date: 01-12-2020

Venue: HRDC
Head count (male/female): 2 FEMALE 6 MALE
(Note: Children not counted)

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Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

ATTENDANCE REGISTER

Meeting: HRDC
Date: 01-12-2020

Venue: HRDC
Head count (male/female): 7 MALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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03/12/2020 Chief Shena's Palace 2 female 9 m ACT

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[illegible] Bhadio	[illegible] Black crystal	VIC FALLS	Tel: Email: 0775585494	[illegible]	36.4
[illegible]	ZRA	Lusaka	Tel: Email: 0978 731 621	[illegible]	36.6
[illegible]	ACT HEAD MAN	ZHULANDAMARILO JAMBEZI	Tel: Email: 0775320432	[illegible]	36.4
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03/12/2020 Chief ~~[illegible]~~ Shona 5NACE

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Sebastiano Sheko	Chief's clerk	Tombozi	Tel: Email: 0775019587	Sheko	36.1
JIMON CHABUTA	HEADPERSON	NEMANANGA WARD 4.	Tel: 0772382843 Email:	[signature]	36.1
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		

03/12/2020 Jambeni Hall 1 MAIL

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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[illegible] M. [illegible]	V/ HEAD	WORD 3 [illegible]	Tel: Email: 0779169449	[illegible]	36.6
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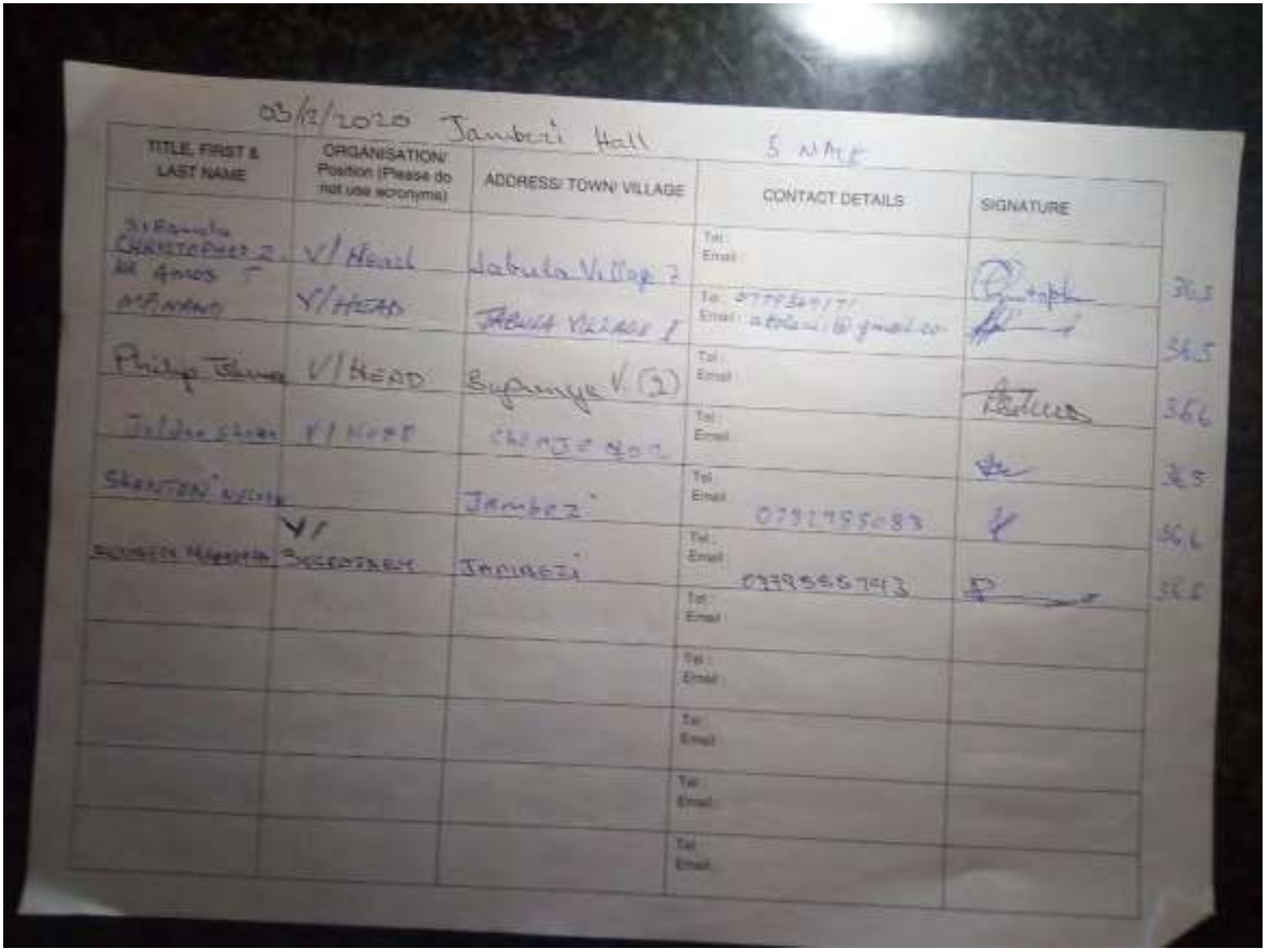
[illegible]	V/Head	[illegible] Village 1	Tel: Email: 0779549972	[illegible]	36.3
[illegible]	V/Head	[illegible] Village 1	Tel: Email: 0779588850	[illegible]	36.8
Benson Nowke	V/Head	Makun	Tel: Email: 0779851866	[illegible]	36.7
[illegible]	V/HD	[illegible] Village	Tel: Email: 0778 133 758	[illegible]	36.8
[illegible]	V/HD	SILIBINDA V	Tel: Email: 0779958648	[illegible]	36.8
[illegible]	[illegible]	[illegible]	Tel: Email: 0775707721	[illegible]	36.8



03/12/2020 Jambezi Hall 5 NAME

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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[illegible]	V/HEAD	CHEMJE NO 2	Tel: Email:	[signature]	36.5
SHANTON [illegible]		Jambezi	Tel: Email: 0791795083	[signature]	36.6
[illegible]	V/ SECRETARY	JAMBEZI	Tel: Email: 0779555743	[signature]	36.6
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		
			Tel: Email:		

03/12/2020 Jambezi Hall (FEMALE 11 MALE

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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Betty	V head	Jambezi	Tel: Email: 0771650585	[illegible]	365
[illegible] Mcube	V/Head	[illegible]	Tel: Email: 0776887908	[illegible]	363
Charles Mcube	[illegible]	Jambezi	Tel: Email: 0779555614	[illegible]	365
[illegible] Mcube	V/HEAD	CHENJIRI ①	Tel: Email: 0778655613	[illegible]	366
Smart Mcube	V/HEAD	JAMBEZI	Tel: Email: 0779759484	[illegible]	365
[illegible]	V/HEAD	CHENAMBI	Tel: Email: 0779369157	[illegible]	363
Tlemba Mcube	V/Head	Makale	Tel: Email: 0778673913	[illegible]	368
[illegible]	V-HEAD	[illegible]	Tel: Email: 0787748876	[illegible]	367
[illegible]	V/Head	Chenambi	Tel: Email: 0779759320	[illegible]	368
[illegible]	V/head	Musanni	Tel: Email: 0779539327	[illegible]	365
Daniel [illegible]	V/Head	Nemawanga	0779555640	[illegible]	[illegible]

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020

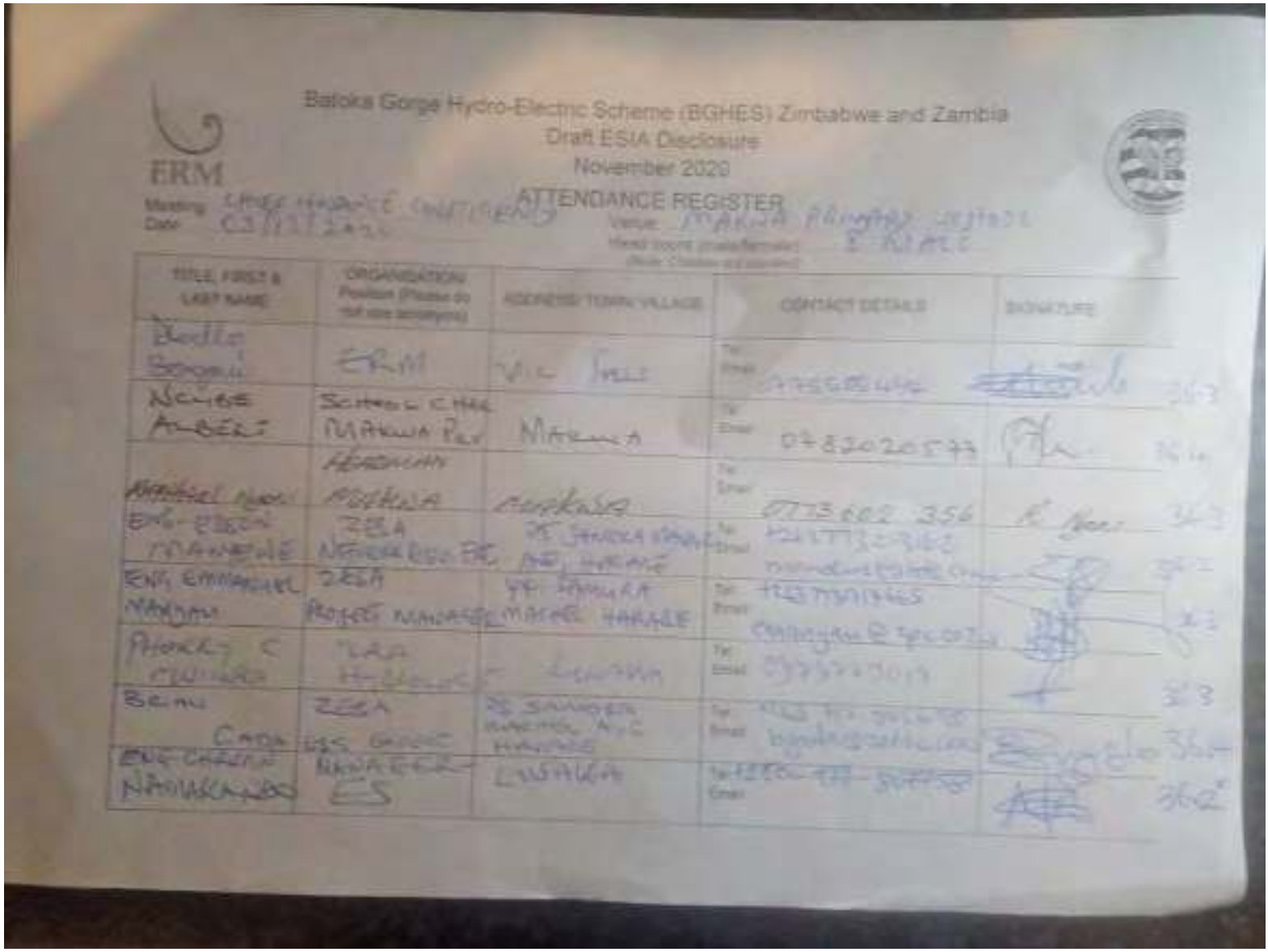
ERM

ATTENDANCE REGISTER

Meeting
Date

Venue
Head count (male/female)
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
[illegible]	ZRA	LUSAKA	Tel [illegible] Email	
[illegible]	ZRA	LUSAKA	Tel [illegible] Email	
[illegible]	ZRA	"	Tel [illegible] Email	
			Tel Email	
			Tel Email	
			Tel Email	
			Tel Email	
			Tel Email	



ERM

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: [illegible]
Date: [illegible]
Venue: MAKWA PRIMARY [illegible]
Head count (male/female): [illegible]
(Note: Children are counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use acronyms)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE
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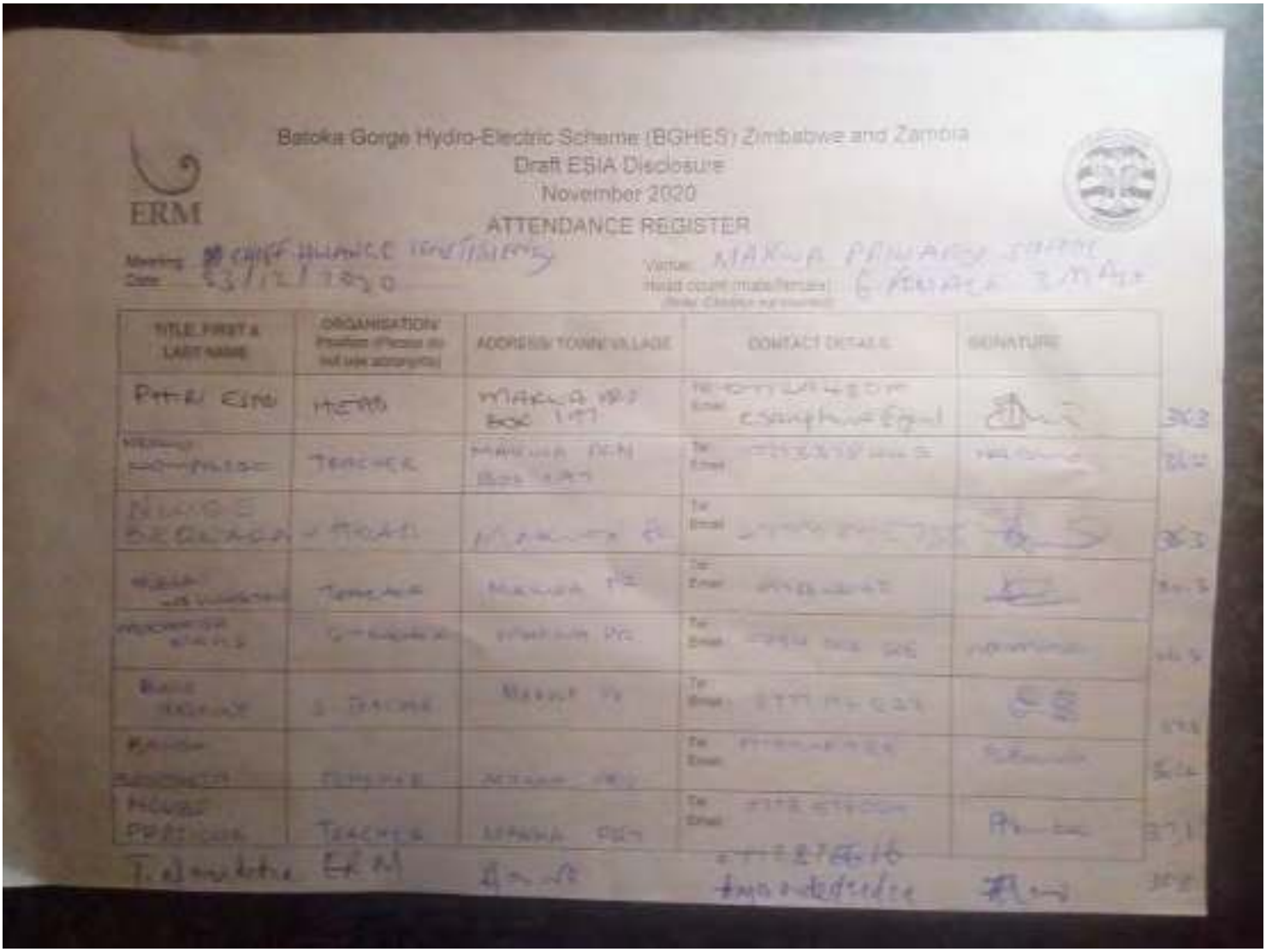
PHOKRY C [illegible]	[illegible]	[illegible]	Tel: [illegible] Email: [illegible]	[illegible]
BRIAN CADA	ZESA [illegible]	[illegible]	Tel: [illegible] Email: [illegible]	[illegible]
ENG. CHRISTIAN NAMUSCANDO	MANAGER ES	[illegible]	Tel: [illegible] Email:	[illegible]



ERM

Batoka Gorge Hydro-Electric Scheme (BGHES) Zimbabwe and Zambia
Draft ESIA Disclosure
November 2020
ATTENDANCE REGISTER

Meeting: CHIEF HWANGE CONSTITUENCY
Date: 23/12/2020

Venue: MAKWA PRIMARY SCHOOL
Head count (male/female): 6 FEMALE 3 MALE
(Note: Children not counted)

TITLE, FIRST & LAST NAME	ORGANISATION/ Position (Please do not use abbreviations)	ADDRESS/ TOWN/ VILLAGE	CONTACT DETAILS	SIGNATURE	
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[illegible]	[illegible]	MAKWA PRI	Tel: [illegible] Email:	[signature]	[illegible]
[illegible]	TEACHER	MAKWA PRI	Tel: [illegible] Email:	[illegible]	[illegible]
[illegible]	TEACHER	MAKWA PRI	Tel: [illegible] Email:	[signature]	371
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Annex (C8.10)

Document

Annex C8.10.1

Document 1

BIRDLIFE ZIMBABWE

BIRDWATCH ZAMBIA

POSITION PAPER ON PROPOSED BATOKA GORGE HYDRO-ELECTRIC SCHEME

DATE: 24 January 2021

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Summary

As organizations that are focused on the conservation of avian biodiversity and the preservation of the environment it occupies, BirdLife Zimbabwe and BirdWatch Zambia are highly opposed to the construction of an impoundment and hydropower scheme on the Batoka Gorge. The project will result in the permanent and un-mitigated submergence of a very rare, restricted and unique habitat that is globally recognised as a site of scenic and world heritage value. Potentially the continued recognition of Victoria Falls/Mosi-oa-Tunya as a UNESCO World Heritage Site will be in jeopardy until such time as a review of the impact of the Batoka Gorge Hydroelectric Scheme and all of its associated infrastructures on the Outstanding Universal Value (OUV) property is ascertained. There are no indications that this review has been undertaken, especially since the World Heritage Committee has published a position that is incompatible with dams with large reservoirs, and furthermore the draft ESIA does not address the impacts of all associated infrastructures. The environmental impact of extensive transmission infrastructure, specifically powerlines and pylons linking hydropower generators to the national grids of affected countries, and development of two large townships at the dam wall site have not been assessed. This deficiency in assessing the impacts of transmission infrastructure on avian biodiversity raises both local and global concern as it potentially affects known and important populations of vulture species, amongst other bird species, that are now categorized as Endangered or Critically Endangered, in terms of conservation status. In this respect, we consider the ESIA to be out-dated as it fails to accurately assess the overall impact of the project in the context

of updated conservation priorities, such as re-categorizations of species conservation status as well as commitments towards multi-lateral environmental agreements (eg. Zimbabwe is signatory to the Convention on Biological Diversity, Ramsar Convention and AEWA). Within the protracted period that has elapsed in completing the ESIA there have been improved alternative sources of energy and energy generation. The Batoka Gorge Hydro-Electric Scheme (BGHES) is not the only significant power generation scheme in the sub-region and the predicted expanded generation capacity of other projects suggests that use of transmission connectors offers a more cost effective and environmentally friendly solution to hydropower, with a quicker turn around. At best the BGHES will only supply power in 9 years, assuming it ever reaches completion. Both Zambia and Zimbabwe have encountered difficulties in financing other hydropower and large dam construction projects which has led to significant delays in completion of these projects. The perceived increased vulnerability of hydropower to the effects of climate change amongst global financial institutions does not improve either Zimbabwe or Zambia`s ability to access finance for this scheme, especially if there are feasible alternatives in repurposing existing power generation facilities or adopting new generation technologies, such as solar. The cumulative downstream effect of construction of another impoundment above Kariba is also not addressed in the ESIA, despite the possible threat it represents to function and productivity of the Kariba fishing industry. In particular, that based on commercial Kapenta (*Limnothrissa miodon*) catch.

In addition to the inadequate assessment of environmental impact of transmission infrastructure, a number of previously identified deficiencies in assessed biological impacts have still not been addressed in the ESIA or public disclosure. Despite a commitment made two years ago to survey the entire length of the Batoka Gorge for Taita Falcon (*Falco fasciinucha*) presence and nesting, this has yet to be initiated. Only the top 27 Km has been surveyed for this species and although much emphasis has been placed on the impact of the project on the Taita Falcon, a promised workshop dedicated to exploring mitigation for the species has also not materialized. The potential environmental impacts of the Batoka Gorge Impoundment on the habitat, ecology and biodiversity of the river and rapids of the upper gorges, closest to the Victoria Falls are classified as having a Major Negative (Red) Impact with no scope for downgrading this categorization through mitigation. Although previously recognized as being an area of exceptional species diversity and biomass, still no effort has been made to identify or quantify the species assemblage that will be affected. The indications are that at least two species of fish, new to science, will be rendered extinct before they are even described. Failure to address these long recognized deficiencies casts doubt over the sincerity and thoroughness of the biological assessment of potential impacts of the B.G.H.E.S. and only serves to further the resolve to ensure that other key aspects, in particular impact of associated transmission infrastructure is assessed in this draft ESIA. We reject the suggestion that this aspect will be the subject of a separate EIA and insist that publically announced commitments be honoured before construction of the dam commences.

Abbreviations and Acronyms

BGHES	Batoka Gorge Hydro Electric Scheme
CESMP	Construction Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
FSL	Full Supply Level
HEP	Hydro Electric Power
IBA	Important Bird and Biodiversity Area
IPP	Independent Power Producer
KBA	Key Biodiversity Area
m asl	Metres above sea level
NP	National Park
NGO	Non-Governmental Organisation
OESMP	Operational Environmental and Social Management Plan
RAM	RAMSAR Advisory Mission
RAMSAR	Convention on Wetlands (named after Ramsar, Iran)
SADC	Southern African Development Community
SAPP	Southern African Power Pool
T&D	Transmission & Distribution
ZRA	Zambezi River Authority

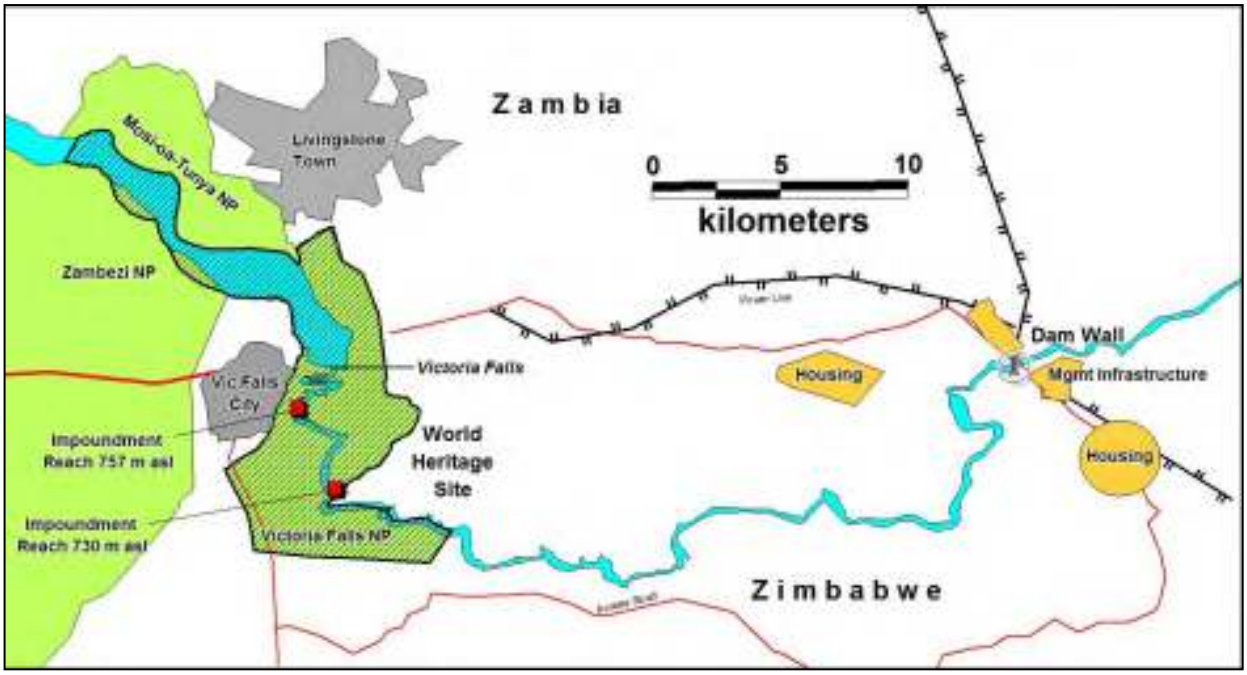
Our Understanding of the Project

This first section outlines our understanding of the project, as a prelude to defining our concerns.

Aspects	**Summary**
Project Rationale	The objective of the proposed BGHES is stated as being: • To increase power generation capacity in both Zambia and Zimbabwe and subsequently mitigate the current power deficits currently experienced in both countries; • To reduce the overall power tariffs in both Zambia and Zimbabwe • Conjunctive operation of both the proposed BGHES and Kariba Complex; • To reduce power outages; and • Contribute to the sustainable and renewable energy Agenda in the two countries thereby reducing reliance on coal fired power stations.
History	• Investigated since 1904 • In 1972 Batoka Gorge was identified as the most suitable site below the falls • Full feasibility in 1993 of current site • 2014 current site feasibility subject to further engineering studies and EISA • Scoping report in 2015 • Amended EISA 2019-2021
Dam, Site and Works	• Dam site at South -17.926464° and East 26.110928°, • 175 m high arch gravity dam wall • Two powerhouses (Zambia and Zimbabwe). Installed capacity of 1,200 MW each - Total 2,400 MW. 6 Turbines per side. • Project townships in both countries. Between 25 and 30 km^2 set aside in each country. In Zimbabwe excision from communal land to urban land. • Full Supply Level (FSL) is 757 m asl. • Area of the dam when full will be 23 km^2 • The reservoir will be 51 km long at FSL of 757 m asl and 45 km long at 730 m asl • Twelve km of the reservoir will be in the World Heritage Site at 757 m asl • Spillway in Zimbabwe through a separate canal that needs to be constructed
Construction	• Expected to take nine years. • First two will require more staff - Approximately 8,000 people employed during construction, dropping to 6,000 after two years
Operation	• Variable operational approach split into two six month periods • February to July operating as normal at 757 m asl. • August to January operating at 730 m asl, almost run of river • The lower operating level will allow a half day rafting experience • 1,500 operational staff required

Aspects	Summary
Transmission	**Zambia** • Mukuni 300 kV transmission line-approximately 22 km to Livingstone • Muzuma 300 kV transmission line-approximately 152 km to Choma **Zimbabwe** • Hwange 2 by 400 kV transmission line-approximately 67 km to Hwange
EIA Study	Three separate draft studies. Initially to be completed by 2015. Significant set of meetings held in 2014/2015 during the scoping phase. More meetings held in late 2018 as part of a stakeholder engagement phase. A final round of disclosure and focus group meeting held on-line in late 2020. **Specialist studies** • Biodiversity (terrestrial and aquatic) • Climate Change (risk review) • Cultural Heritage and Archaeology • Economic Cost-benefit Analysis • Greenhouse Gas Emissions Assessment • Livelihood Restoration • Socio-economic and Health Assessment • Tourism • Water Resource Studies (water quality and environmental flows)

There are sections of the Zambezi that are deemed to be World Heritage Sites. The figure below illustrates the boundaries of the Heritage Sites (black shaded area).



Issues and Concerns

The ESIA carried out by ERM is fully aware and primarily focuses on the main impact of this project which will permanently submerge a very rare, restricted and unique habitat and a site of scenic and world heritage value. There is no scope for substantial mitigation of the environmental and aesthetic impacts of the project and are defined as such in the ESIA. Once the gorges are flooded the habitat and natural ecological function is irretrievably lost. The ESIA report advises that the Governments of Zimbabwe and Zambia need to weigh up and balance the environmental losses as well as other impacts with the perceived gains from the project before making a decision on physical implementation of the project. However, in referring to project documentation (ESIA, CESMP and OESMP), attending of the project public disclosure meetings, and investigating other sources, we believe there are a number of issues, concerns and deficiencies that need to be addressed, or at least require further explanation, in order for the respective governments to reach an appropriately considered and justified decision in terms of national interest, civil society, global heritage and biological conservation.

In the first instance, we believe this ESIA to be incomplete and consequently deficient as it does not address the impact of this proposed project in its entirety. None of the potential environmental impacts of transmission infrastructure connecting the dam to the national grids of the respective countries have been adequately assessed. This transmission infrastructure potentially has serious consequences for avian biodiversity, specifically a number of Critically Endangered and Endangered Vulture species. The ESIA mentions three powerlines, two in Zambia and one in Zimbabwe, that will connect the dam to substations in Hwange (Zimbabwe), Livingstone (Zambia) and Choma (Zambia), however in other reports there is also a suggestion of a further 2 x 400kV lines are to be developed in

Zimbabwe to feed energy intensive platinum operations in the centre of the country. While it was indicated in the technical Public Disclosure meeting that there are intentions to conduct separate ESIAs of the impact of transmission infrastructure, these assessments (for power transmission lines and roads etc.) must be developed in conjunction with the main ESIA and shared for public scrutiny at the same time. Very simply; these ESIAs cannot be separated from the main ESIA. If there is no dam then there is no need for significant transmission infrastructure. The same argument holds true for the superficial treatment of the environmental impact of the townships that will be built to accommodate the estimated 8000 workers to be employed in construction of the dam. The effects of social impacts, such as immigration and subsequent laying off of construction workers on completion of the dam, or changed urbanisation along the margins of the Batoka Gorge as a result of substantial road infrastructure developed for access to these townships, have not received adequate consideration.

While this initial response is registered, the following text addresses the issues and concerns related to the project from our perspectives as national conservation NGO's based in Zambia and Zimbabwe, that are both additionally aligned and partnered to global conservation initiatives.

Scope and Rationale of the Project in a Global context

We question the rationale and perceived benefits of the project in context of global trends and opinion in respect of the greatly increased and prioritised value placed upon environmental resource and biodiversity equity, versus potential value and benefit of generated power and unquantifiable environmental damage.

Protected Areas of Global significance

In the face of development and degradation protected areas have become one of the key instruments for protecting and safeguarding biodiversity and the physical parameters that sustain it, especially water. They are critical for safeguarding species and habitats and act as buffers against climate change and they bring cultural, ecological, spiritual, and scientific benefits to society. The Victoria Falls and the gorges below the falls are a site of global importance and they fall into several categories of protected area that are globally significant.

World Heritage Site

There are three protected areas in the vicinity of the project of which two, Victoria Falls and Mosi-oa-Tunya National Parks are directly impacted through construction of the dam. Victoria Falls/Mosi-oa-Tunya was proclaimed a UNESCO World Heritage Site on the basis that it contains superlative natural phenomena, areas of exceptional natural beauty and aesthetic importance and an outstanding example representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.

The World Heritage Committee has previously requested that the ESIA for the Batoka Gorge Hydroelectric Scheme include "a specific assessment of the impacts of the dam and all of its associated infrastructures, on the Outstanding Universal Value (OUV) of the property, in line with the IUCN's World Heritage Advice Note on Environmental Assessment" (Decision 41 COM 7B.22). The Zimbabwean and Zambian governments' response was to provide assurances that the relevant agencies would review the ESIA to ensure that the impact of the Scheme was ascertained, and any possible detrimental impact on OUV mitigated (2019 State of Conservation Report).

However, the draft ESIA contains no explicit assessment of the impact of the dam and associated infrastructure on OUV. Moreover, the World Heritage Committee has repeatedly requested that the draft ESIA be submitted to the World Heritage Centre for review by the IUCN (Decisions 41 COM 7B.22 and 43 COM 7B.34). This must be done *before* any final decision on this project is taken. The dam will inundate 14 km of the World Heritage Site. Has the draft ESIA been submitted to the World Heritage Centre and reviewed by the IUCN and, if so, what was the outcome of this review and has there been any response from the World Heritage Committee to this document? We note further in this regard that, in addition to the above-mentioned decisions, which are directed specifically towards this project, the World Heritage Committee, in Decision 40 COM 7 (State of Conservation of World Heritage properties), states that "construction of dams with large reservoirs within the boundaries of World Heritage properties is incompatible with their World Heritage status, and urges State Parties to ensure that the impacts from dams that could affect properties located upstream or downstream within the same river basin are rigorously assessed in order to avoid impacts on the Outstanding

Universal Value (OUV)". Any un-mitigatable negative impacts on OUV should be considered a fatal flaw in this project and should result in the applications for authorisation being rejected.. We believe any response from UNESCO to be a matter of public record.

Ramsar Site

Part of the project area affected by the dam is a wetland of international importance, designated under the Ramsar Convention, although the official description seems to be limited to the southern part of the Victoria Falls National Park. Parties to the Ramsar Convention are required to promote the conservation of Ramsar sites and the wise use of all wetlands in their territories (Article 3.1). 'Conservation' in this context has been defined to mean maintenance of a site's ecological character (COP Recommendation 4.2). It is therefore important that the ESIA consider any potential impacts on the ecological character of the Ramsar site concerned. Per Article 3.2 of the Convention, any likely change in the site's ecological character must be reported to the Ramsar Convention's Secretariat.

The Ramsar Advisory Mission (RAM) is one of the most valuable tools available to Contracting Parties to the Ramsar Convention on Wetlands. A RAM is a technical assistance mechanism through which a Contracting Party may request expert advice about how to respond to threats to the ecological character of a Ramsar Site and associated wetland issues. To our knowledge no such RAM has been requested by either Zimbabwe or Zambia and this represents an oversight in the assessment.

Key Biodiversity Area (KBA)/ Important Bird Area (IBA)

There are two Key Biodiversity Areas (KBAs) and Important Bird Areas (IBAs), each located on either side of the Zambian-Zimbabwean border - Mosi-oa-Tunya National Park and Batoka Gorge (Zambia) and Batoka Gorge (Zimbabwe).

On the Zambian side, the site comprises the Mosi-oa-Tunya National Park and the adjacent Batoka Gorge which extends downstream as far as the confluence of the Zambezi with the Kalomo River. At 6,600 ha, the park is Zambia's smallest, but it is the most popular as it flanks a stretch of the Zambezi river just south of Livingstone that includes the Victoria Falls. As well as riparian habitats such as sandbars and fringing forest, there is woodland (mainly mopane) and the immense basalt gorge below the falls (much of which is over 100 m deep). The site is most important for the species occurring in and around the gorge. The Taita Falcon (*F. fasciinucha)* has been recorded with some regularity and is known to nest here—Hartley (1993) estimated that 8–10 pairs occurred in the gorge along 60 km of its length—but it is perhaps not as common as some local tour operators might suggest, possibly due to confusion with other species such as Peregrine (*Falco peregrinus)*. Other breeding species of interest include Black Stork (*Ciconia nigra)*, Verreauxs' Eagle (*Aquila verreauxii*) and African Black Swift (*Apus barbatus)* and, along the river above the falls, White-Backed Night-Heron (*Gorsachius leuconotus)*, African Finfoot (*Podica senegalensis)* and Rock Pratincole (*Glareola nuchalis)*.

On the Zimbabwean side, the Batoka Gorge is recognised as an Important Bird and Biodiversity Area (for the presence of bird species of global conservation concern, for supporting significant congregations of one or more bird species and for holding a good selection of bird species of that are characteristic of that particular biome). The Batoka Gorge is a major breeding site for cliff-nesting raptors, in particular Taita Falcon. Eighteen pairs of Peregrine Falcon have been recorded nesting there. The gorge also holds 35 other raptor species, Black Storks and large numbers of Rock Pratincole,

nesting Hooded Vulture (*Necrosyrtes monachus*) and White-backed Vulture (*Gyps africanus*) which use the gorge as a flyway.

The lake produced by the proposed dam would severely constrain the breeding opportunities for cliff-nesting raptors and given the reduced space (upstream) and the competitive dominance shown by *Falco peregrinus,* it is debatable whether *F. fachiinucha* would survive there. In addition, if Batoka Gorge held a lake rather than a rushing river, then increased access to the lake would be bound to increase, with the consequence of greater disturbance (upstream) to the remaining raptors.

As party to the Convention on Migratory Species and the Agreement on the Conservation of African-Eurasian Migratory Waterbirds, Zimbabwe has international obligations in respect of several of these species. In terms of the southern African population of Black Stork, parties are obliged to take measures to restore this population to a favourable conservation status – including through habitat conservation.

a.

b.

Maps of (a) Mosi-Oa-Tunya National Park and Batoka Gorge KBA and IBA (Zambia) and (b) Batoka Gorge KBA and IBA (Zimbabwe).

Year of most recent IBA criteria assessment: 2001
Populations of IBA trigger species

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Taita Falcon *Falco fasciinucha*	VU	resident	-	present	A1
Coppery-tailed Coucal *Centropus cupreicaudus*	LC	resident	1998	present	A3
Racquet-tailed Roller *Coracias spatulatus*	LC	resident	1998	present	A3
Kurrichane Thrush *Turdus libonyana*	LC	resident	1998	present	A3
Miombo Rock-thrush *Monticola angolensis*	LC	resident	1998	present	A3
Arnot's Chat *Myrmecocichla arnotti*	LC	resident	1998	present	A3
White-breasted Sunbird *Cinnyris talatala*	LC	resident	1998	present	A3
Brown Firefinch *Lagonosticta nitidula*	LC	resident	1998	present	A3
Broad-tailed Paradise-whydah *Vidua obtusa*	LC	resident	1998	present	A3
Black Stork *Ciconia nigra*	LC	resident	-	7 breeding pairs	A4i
Black Stork *Ciconia nigra*	LC	non-breeding	-	20 individuals	A4i
Rock Pratincole *Glareola nuchalis*	LC	non-breeding	-	300 individuals	A4i

Note: This table presents the IBA criteria triggered and the species that triggered then at the time of assessment, the current IUCN Red List category may vary from that which was in place at that time.

Big Dam Projects

Hesitant Implementation. Aside from the established negative environmental impacts, Big Dam projects have a number of associated draw-backs and problems. In developing countries many proposed projects have gone through cycles of proposal, assessment, shelving, re-proposal and re-assessment. While many sites in Africa were proposed in the early 1900s and then again in the 70s, 80s and 90s, few of these have been constructed.

Others, such as Batoka Gorge in Zimbabwe/Zambia are still being reassessed over 100 years after first investigation. The protracted period between conception and commitment to physical development still speaks to ongoing concerns for the cost/benefit of this project, particularly in the light of progress made toward alternative power generation technologies and the scope for improved efficiencies in existing power generation infrastructure (see section on Alternative Energy Sourcing).

A comparative ranking of the environmental impacts of hydroelectric generation of power involving use of large dams or reservoirs is controversial, although considered by some to be amongst the most environmentally damaging forms of power generation. This is assuming they even reach completion!

Funding and Disinvestment. Funding for construction and operation of large dams is often unclear and the BGHES is no exception. These projects represent significant risk and due to their size and long lead times ahead of commissioning. Consequently they are often subject to cost overruns. Long term financial planning can be fickle and difficult to guarantee, but it is the national governments (in this case Zambia and Zimbabwe) that will ultimately pay for the dam. Recently, the Zambian Government has encountered difficulties in the financing of the Lower Kafue Gorge Power Station.

As recognised on pages 10 -69 of the draft ESIA, not all of the criteria in IFC performance Stand 6 can be satisfied by this project. This could present a hurdle to securing additional funding.

Similarly construction of the Tokwe-Mukosi Dam in south-eastern Zimbabwe was halted and almost abandoned due to non-payment, resulting in a delay in completion of over 15 years. So conceivably the worst case scenario is for the B.G.H.E.S. financing to also become problematic leading to delays in completion and possibly abandonment after the gorge had been impacted. Clarity on the financing plan for the B.G.H.E.S., including the nature of the investors is needed, and explicitly; what is the contingency for disinvestment?

The Mphanda Nkuwa Dam (MND) Project in Mozambique, which would have been built on the Lower Zambezi River, has been placed on hold as this Dam Project did not meet any of the seven criteria laid down by the World Commission of Dams (WCD). As with the MND Project, one of the needs assessments indicate a clear need for rural electrification, a necessity the project does not mention at all. Affected communities were not involved in the decision-making process and have unacceptably low levels of information. The options assessment does not present any alternative options such as solar, wind, or natural gas. The project does not address the problems caused by existing dams and further exacerbates these problems. In the case of sustaining rivers and livelihoods the project will further damage the already ecologically fragile lower Zambezi River system and delta.

Long-term Lifespans of dams

While it is argued that hydroelectric projects provide sustainable power generation, the limited lifespans of dams are ignored. Most dams designed and built in the last 100 years have projected lifespans of 50-100 years. Kariba Dam, completed in the 1960's, has a projected lifespan of 140 years and has recently already undergone extensive repairs to meet this lifespan. The lifespan is also dependent on experience and workmanship of the construction contractor. This has been questioned in other ESIA's, such as the Egyptian company being used in construction of the Stiegler's Gorge Project.

Climate change

A 2011 World Bank report states: “Heavy reliance on hydropower creates significant vulnerability to climate change and is a feature that many low and middle-income countries have in common". The Batoka Gorge project is no exception to this. The issue of climate change is addressed in Annex Hof the ESIA, however by its own admission this is a broad, short-term study.

For such a large project, and several others that are also proposed for the Zambezi River, it would be prudent to undertake a comprehensive climate change study, especially since climate change has begun to change precipitation patterns significantly and unpredictably. On the one hand, more frequent droughts will make many hydropower projects uneconomic, while on the other, more extreme rainfall will increase siltation of dams (reducing their useful lifetimes) and increase the risk of dam failures and catastrophic flood releases. River flows are becoming increasingly unpredictable with reduced flows resulting in reduced power outputs, thereby making projects unsatisfactory. Kariba Dam immediately downstream of the proposed dam site, and mainly reliant on Zambezi River flow, has been exactly in that position for the last few years in that water levels have been critically low resulting in severely limited generating capacity. Building a second large dam on the Zambezi increases the risks of over-relying on one river catchment for both Zimbabwe and Zambia.

In any case, the long-term prognosis is that dams are not forever and this will be the case for Batoka as well. Does it really make sense to use expensive and damaging large hydropower schemes as our main power supply systems in the long-term?

Alternative energy sourcing

The main justification for the BGHES is potential output of 2,400 MW, and it is rationalized that alternative energy generation cannot match this output. Notwithstanding previously mentioned drawbacks, at best this output may be achieved only in 9 years and in the interim contributes zero energy to increasing and immediate demand.

The proposed development of the BGHES is not the only significant power generation initiative under consideration in the sub-region. Based on a World Bank study from 2015, the Government of Mozambique estimates to have expanded generation capacity to 3,138 MW by 2022 and 4,163 MW by 2030. A least cost and easily implementable solution for access to energy is that of transmission Interconnectors. Their overall impact on the environment is substantially less than a hydropower plant, with lower capital and operating costs and a noticeably short turn around in terms of implementation. Entering into commercial agreements with their neighbours such as Mozambique, such as those that already exist, to purchase power from them would enable all parties to access excess energy, which is a SADAC strategy, and in this particular scenario, IPPs become the largest group of generators.

Consequently, on the above points alone, we question whether all alternative power generation schemes to offset the need for HEP have been considered and further offer the following for consideration?

Gas-fired generation. With the large gas fields in the Rovuma Basin, Mozambique/Tanzania, the option of channeling gas from these fields to Zimbabwe or Zambia via existing infrastructures should be investigated. The potential for gas to power projects is certainly considerable. In addition, the benefits to industrialise the countries by importing gas forms a strong motivation to consider this option. Furthermore, there are four coal fired power stations in Zimbabwe that could potentially be repurposed. These power plants are already established and supporting infrastructure is already in place. For example, the Hwange coal fired station has been beset by problems related to aging infrastructure and lack of maintenance over the last few decades and repurposing to gas generation is potentially a logical and viable option to improve efficiency and output of this obsolete existing power generation facility. From a T&D perspective and land allocation to the site, repurposing makes sense as well as addressing arising environmental concerns over planned expansion of Hwange coal fields.

Roof-top solar installation. Since much of the high demand resides in the built-up areas of city centres and urban developments, the opportunity to develop and implement wide scale roof top solar power generation schemes is available. Currently this is a practice followed in-country, mostly due to load shedding rather than as a coordinated and systematic approach. Medium to large power users could be incentivized to install sizable installations through a REFIT tariff regime.

Floating solar farms. While still in its infancy, the potential for floating solar farms is evident and the technology is fast growing to suit these environments. Have studies been run to determine the potential of floating PV farms? Surely there is potential for this technology to augment energy generation on sites, such as Kariba, which already has the necessary transmission infrastructure and vast surface area?

Wind generation. While the wind potential may not be huge, there are some areas where some potential could be leveraged. If no wind studies have been performed, then the actual potential is unknown. These should be factored in when considering power generation options.

Upgrade of existing facilities. Hwange power station has long been associated with poor maintenance leading to power outages. Upgrade of this facility would greatly alleviate short-term power shortages in Zimbabwe and would also allow the development and investigation of some of the options discussed above before deciding that a large dam is the only option.

Beneficiation of generated power

Although the ESIA documentation stresses that the project is for the benefit of the host countries, it appears that an agreement has been reached between GE (General Electric) and PowerChina to construct and run the dam on behalf of the Zambezi River Authority (ZRA). The details of this agreement are not clear, in this respect there needs to be transparency to ensure that the beneficiaries are indeed the citizens of the host countries and not the business of exporting power for the benefit of the developers.

Cumulative effects

Secondary benefits, such water storage or development of fisheries are often included in the rationales for construction of Big Dam projects. In the case of BGHES perceived benefits are limited

to only generation of electricity as there is no justification for increased water storage and no mention of possible fisheries development. Presumably for the latter there is none, as the characteristics of the impounded gorge offer little scope for a productive fishery. However the cumulative effect of altered nutrient flows, the Batoka Gorge impoundment is effectively a nutrient trap due to its proposed position, and flow regimes could conceivably have a profound effect on the productivity of the Lake Kariba fisheries, which is Zimbabwe's largest and significant commercial fishery. Inflow regimes and consequent nutrient cycling are well known to affect recruitment and productivity of Kapenta (*Limnothrissa miodon*), a principal species of the commercial catch from the Kariba fishery. In the technical disclosure meeting a question was raised to the assessment of downstream cumulative effect, however this point was quickly discounted on the grounds that Kariba absorbs any cumulative effect. The potential effect of the BHGES on a major fishing industry, and source of livelihood for many, appears to be unconsidered in the ESIA?

Precedent for other Big Dam projects

Zambezi River Authority documentation reveals several other proposed dam sites along the Zambezi (e.g. Devil's Gorge and Mupata Gorge). If the Devil's Gorge proposal should become a reality then the entire system of gorges below the Victoria Falls will be altered forever. Gorges and their unique ecology represent a very minor part of the world's ecosystems and have already been heavily impacted through construction of impoundments despite their outstanding environmental value. Care should be taken before destroying them.

Specific concerns relating to the project ESIA

Effects on Wildlife

Considerable effort has been made towards assessing the potential environmental impacts of the Batoka Gorge Impoundment on the habitat, ecology and biodiversity of this unique system. In some aspects these are classified as having a Major Negative (Red) Impact with no scope for downgrading this categorization through mitigation. Despite the severity of this categorization and acknowledgement in the ESIA that there are still critical information gaps in terms of biological impacts, commitments to address these deficiencies have yet to be undertaken. Specific cases are detailed below. Furthermore, since assessment in the ESIA the conservation status of a number of bird species, including most vulture species and the Black Stork have been reviewed resulting in their re-categorization to Endangered and Critically Endangered. In the light of this observation, it is conceivable that the ESIA is already out of date in its assessment of impacts on such species, particularly in respect of potential impacts on global populations. As previously indicated, further gaps have been identified in terms of the potential risks to avian biodiversity from transmission infrastructure that is not even addressed in the current ESIA.

Moreover, several residual impacts have been assigned lower significance ratings, despite the draft ESIA acknowledging a myriad of uncertainties regarding both the impacts of the project and the effectiveness of mitigation measures. If predictions regarding the effectiveness of mitigation measures cannot be supported by evidence, the precautionary principle should be applied when assessing residual impacts and the significance ratings should not be lowered.

Transmission Infrastructure

If not designed safely, transmission or electricity distribution lines can result in devastating impacts on birds, especially those that are medium and large-bodied, such as raptors and storks. Surprisingly, some "modernized" lines in certain countries (e.g., Mongolia or Morocco) are having a higher negative impact, due to dangerous configurations of pylons, especially those of metal or concrete with metal cross-arms, which are in some cases more dangerous than some older traditional distribution power lines constructed with wood. It is calculated that there are over 65 million km of medium- and high voltage power lines across the world, with this figure rising at a rate of 5% each year (Jenkins et al., 20101). The impact of these linear infrastructures includes the death by collision and electrocution of millions of birds and other animals, such as monkeys and bats, as well as habitat degradation and fragmentation. The environmental risks posed by transmission infrastructure is additionally exacerbated depending on the landscape and location of intended distribution. Probability of negative impact is increased where birds may use transmission infrastructure to perch and nest upon or where there are natural concentrations of flying birds, such as paths of migration and topographic features that influence air currents and consequently flight patterns of birds.

In terms of the B.G.H.E.S., the victims of electrocutions or collisions with transmission infrastructures are potentially an important factor of mortality, threatening endangered species at a regional level or larger scale. Upon these grounds we insist that detailed track, location and technical specifications (including technical drawings) of all transmission infrastructure relating to the project is included within the ESIA, and that these are assessed in terms of their environmental impact. Implications of these potential impacts need to be interpreted in respect of all endangered species, including all vulture species, certain eagles, and other large bird species, such as storks. The superficial and dismissive assessment of "important birds" in this draft of the ESIA relates to only a small portion of the total envisaged transmission infrastructure relating to the project and critically understates potential environmental impact on a suite of endangered bird species.

Taita Falcon

The ESIA places much emphasis on the impact of the project on the Taita Falcon (*Falco fasciinucha*) population that resides in the Batoka Gorge. There has been considerable historical and recent survey effort towards monitoring this population, including one dedicated to a survey of the species commissioned by the principal, however this effort has mostly concentrated on the upper 25-27Km of the Gorge with little in the remainder of the system down to the proposed dam wall site. The principal recognized this deficiency in 2018 and proposed further survey of the lower section of the Gorge at that time. Furthermore the principal also proposed a workshop focusing on the issue of Taita Falcon conservation and detailed discussion of potential mitigation for the species. These commitments were further confirmed in the 2nd technical disclosure meeting (4 December 2020). Two years have elapsed since these proposals were made and no progress has been made in these undertakings and in the face of imminent commencement of construction, is there actually any intention to honour these undertakings, or is it just discourse to pacify detractors? It is reiterated that there is historical record of Taita Falcon nesting sites on the Zambezi River within the lower section of the Gorge. There are also suitable secondary cliff faces away from the main river course that have never been surveyed that may host Taita Falcon nesting sites, as well as other cliff-dwelling raptor species.

The eroded valleys of the lower reaches of the Batoka Gorge also host riparian vegetation that supports at least 1 pair of the recently up-listed Martial Eagle (*Polemaetus belicosus*), but could

support nesting activity of the Critically Endangered Hooded Vulture (*Necrosyrtes monachus*) amongst other species. These areas will be directly and permanently affected by the project as will be inundated by the water level. In this respect, the absence of survey of these areas is a serious deficiency in the ESIA, especially since even the principal has recognized the importance of this aspect of the biological assessment.

It is noted that survey of the lower Batoka Gorge allows the principal to address another deficiency of the ESIA, which is preliminary assessment of potential impact of inundation on sites of archaeological significance and cultural heritage. There is causal relationship between topographical features, specifically cliffs, required by Taita Falcons and distribution of caves that potentially could have been occupied by prehistoric man.

Hydrological Impacts of the Impoundment

The ESIA dedicates a section to the effect of the impoundment on changed river flow regime on aquatic invertebrate macrofauna and fish. Sites were identified and sampled for these aspects of species biodiversity. All of the sample sites were downstream of the location of the proposed dam wall location and none positioned to assess the upstream effect of altered water flow regimes on the ecology of the upper gorges, even though this represents highly unique habitat in terms of location, below an impassible natural barrier (the Victoria Falls), and comprising rapids and riffles of a magnitude and frequency found nowhere else. Efforts to preserve an estimated 9Km of this unique and highly productive habitat by reducing the proposed maximum wall height by 4m are both recognized and commended, but also demonstrate the importance of this section of the river from an environmental impact perspective. However, there has been no assessment of potentially affected biodiversity and biomass, especially aquatic invertebrate macrofauna and fish species, of this apparently unique habitat which will to a large extent be inundated and altered permanently. Has any survey of aquatic invertebrate macrofauna of the Batoka Gorge ever been undertaken? The ESIA report records the finding of a potentially new and undescribed Mormyrid fish species, and the contracted expert, Mr Denis Tweddle, also mentioned in the disclosure meeting the possible existence of yet another undescribed fish species, also of the Family *Mormyridae*, in the river downstream of the proposed dam wall site which host smaller and less dramatic rapids and riffles. In his opinion it seemed that both species may be lost as a result of construction of the impoundment. In light of these findings of unique and probably endemic ichthyofauna there is an obligation to at least describe what species biodiversity, specifically aquatic macrofauna, invertebrate and vertebrate, stands to be lost/exterminated by progressing this project.

Besides, this baseline data on natural function of this ecosystem offers the opportunity to demonstrate mitigation of this 'Category Red' environmental impact if favourable comparison can be made post construction. It is understood that that the 730 m operating level will be 10 km below the falls and the 757m operating level will be 4.5 km below the falls. This still leaves 5-6 km that will be submerged to a depth 25 m for six months of the year at its lowest end.

Recommendations

Thus, from our inputs provided in this document, BirdLife Zimbabwe and BirdWatch Zambia propose the following measures and processes to enhance the protection of the Batoka Gorge OUV as the draft ESIA does not address the impact of the project in its entirety:

1. That clarity on the financing plan for the B.G.H.E.S be provided including the nature of the investors.
2. That the contingency plan for disinvestment be shared with stakeholders
3. That the potential environmental impacts of transmission infrastructure connecting the dams to the national grids of the respective countries be adequately assessed and reported
4. That the ESIA assessing the impact of townships and roads that are proposed to be built be prepared in conjunction with the main ESIA and shared with stakeholders and Government ahead of any approvals made in terms of the development
5. That the draft ESIA be submitted to the World Heritage Centre and reviewed by the IUCN and that the outcome of this review be shared with stakeholders *before* any final decision on this project is taken
6. That the BHGES development be reported to and the ESIA be shared with the Ramsar Convention and that the Governments of Zimbabwe and Zambia request a Ramsar Advisory Mission to assess the threats to the ecological character of the Victoria Falls Ramsar Site and submit their report to be shared with stakeholders before any final decision on this project is taken
7. That the draft ESIA include a full investigation to determine whether commitments made in respect of Multi-lateral Environmental Agreements (MEAs) eg. Convention on Migratory Species, Convention of Biological Diversity and Convention on Africa-Eurasian Migratory Waterbirds (AEWA), Ramsar Convention are being adhered to by Zimbabwe and Zambia (where they are signatories to these MEAs) for key species eg: Black Stork, Hooded Vulture, White-backed Vulture
8. That a comprehensive climate change study be undertaken, especially since climate change has begun to change precipitation patterns significantly and unpredictably
9. That all alternative power generation schemes to offset the need for Hydro Electric Plant be comprehensively investigated
10. That ESIAs be developed for the several other proposed dam sites along the Zambezi (e.g. Devil's Gorge and Mupata Gorge) to understand the cumulative impact before any decision is made for BGHES
11. That the draft ESIA include assessments of vulture species (White-backed Vulture and Hooded Vulture), the Black Stork and Martial Eagle due to their re-categorization to Endangered and Critically Endangered in particular relation to potential impacts on global populations.
12. That the potential risks to avian biodiversity from transmission infrastructure be investigated and addressed in the draft ESIA
13. That the commitment by the ESIA team to facilitate a further Taita Falcon survey of the lower section of the Gorge and that the proposed workshop focusing on the issue of Taita Falcon conservation and detailed discussion of potential mitigation for the species honoured before decision is made for BGHES
14. That the ESIA investigate the effect of altered water flow regimes on the ecology of the upper gorges upstream from the impoundment

15. That a survey of aquatic invertebrate macrofauna of the Batoka Gorge be undertaken. There is an obligation to at least describe what species biodiversity, specifically aquatic macrofauna, invertebrate and vertebrate, stands to be lost/exterminated by progressing this project.
16. That the potential cumulative effect of altered nutrient flows by the BHGES on the major fishing industry in Kariba be investigated and reported before any decision is made on BGHES
17. That the potentially new and probably endemic ichthyofauna Mormyrid fish species in the river downstream of the proposed dam wall site be investigated and be described before a decision is made on the BGHES
18. That SEAs be performed to determine best the energy mix – considering social, economic and environmental factors - to power development in Zimbabwe and Zambia for the twenty-first century.
19. That the ESIA should assess the entire assemblage of raptors (including Critically Endangered vultures) in considering the impacts of the inundation of the gorge.
20. That the feasibility of offsets, and the costs associated with securing and managing these areas be investigated in more detail before a decision is made.

    No decision should be made until such steps have been taken, and that any authorisations granted should not allow construction to commence until offset sites have been secured (ideally through legal designation as protected areas) and sufficient funding set aside for their continued management.

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Document 2

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Management of shared river basins: the case of the Zambezi River☆

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1. Introduction: the Zambezi River Basin and its hydrology

The Zambezi River, lying wholly within the SADC, is the largest watercourse system in the region. Its catchment area is some 1,300,000 square kilometres, occupying the territories of Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe. Out of these riparian states, Zambia, Angola, Zimbabwe, Mozambique and Malawi have the largest share of its basin, with catchment area percentages of 40.7, 18.3, 15.9, 11.4 and 7.7, respectively. The major tributaries are Shire River from the territories of Tanzania, Malawi and Mozambique, the Luangwa, Kafue and Kabompo river basins lying wholly within the territory of Zambia, the Luena/main Zambezi river from the territory of Angola while the Cuando/Chobe River is in the territories of Angola, Namibia and Botswana (see Map 1).

The distribution and occurrence of water resources in the basin is dependent on its rainfall, evaporation and hydrological processes. The rainfall averages 990 mm/a, but varies considerably across the catchment itself (Trolldalen, 1996). The northern parts of the basin (Malawi, Tanzania, northern and north western Zambia) have an average annual rainfall of 1200 mm/a while the southern and south western parts average around 700 mm/a. The atmospheric feedback or evaporation component of the hydrological cycle is also quite variable, with an annual average of 870 mm/a and the local averages varying from 1000 mm/a in the Luangwa, Shire and lower parts of the catchment down to 500 mm/a in the south western areas of the basin. These seasonal and spatial variations in rainfall and evaporation lead to complex runoff patterns with the annual volumes of run-off being relatively small.

The volume of annual renewable water resources in the Zambezi River is estimated to

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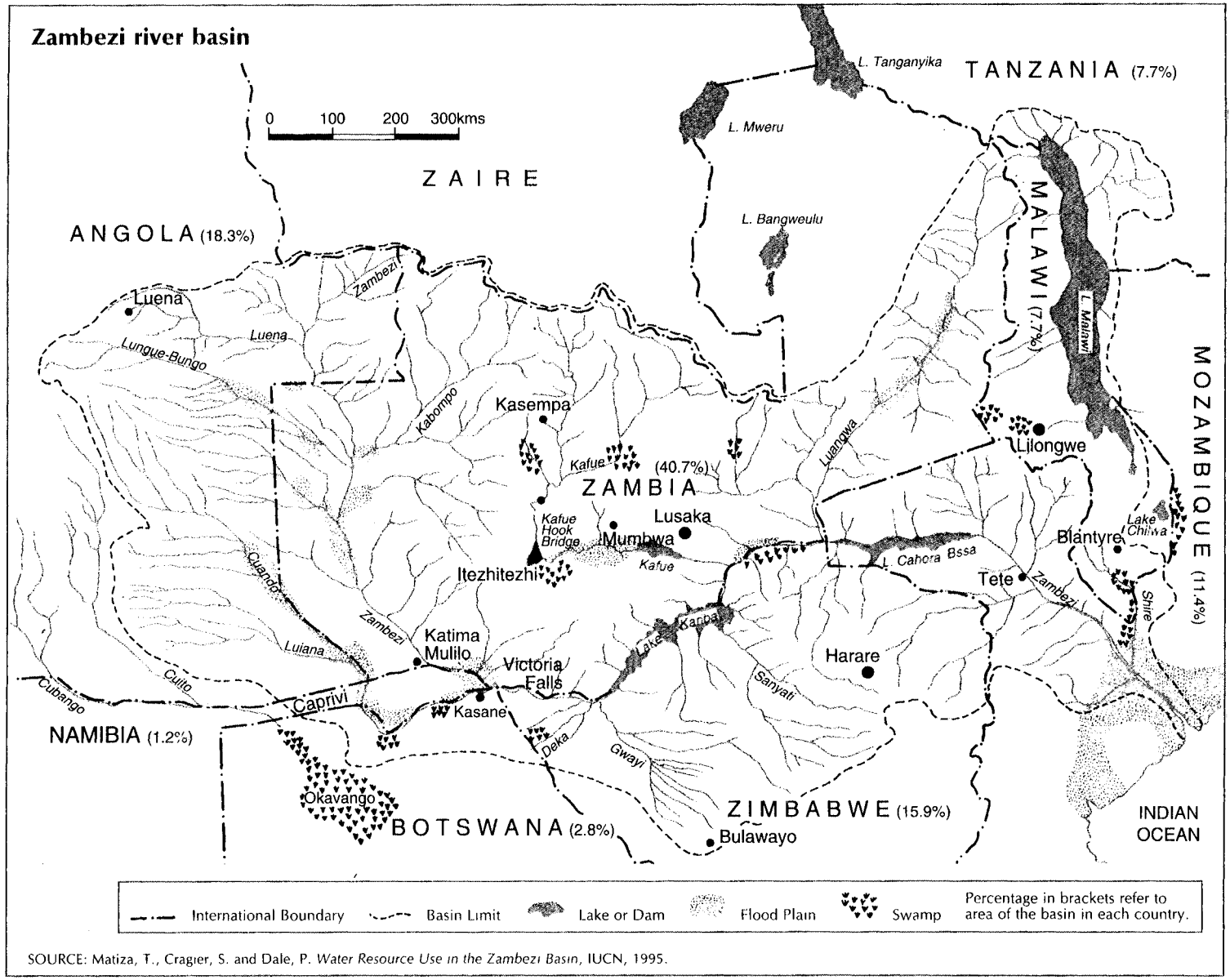

SOURCE: Matiza, T., Cragier, S. and Dale, P. *Water Resource Use in the Zambezi Basin*, IUCN, 1995.

Map 1. Zambezi River Basin, its tributaries, lakes, and riparian states (source: modified from Chenje and Johnson, 1996: xiv).

average some 3600 m^3/s or 87 mm of equivalent rainfall, which is just under 10% of the average rainfall in the basin. The annual and seasonal flows for the Zambezi River and its major tributaries of Shire, Luangwa, Kafue, Kambopo and Luena/Zambezi rivers are presented in Table 1.

The small difference in seasonal flows of the Shire River reflect the reservoir effects generated by Lake Malawi. The less variable flows in the main Zambezi River are also attributed to reservoir effects caused by its long channel storage, reservoirs and lakes. The tributaries of Chobe/Cuando, Luanginga and Lungue Bunguo, Gwayi and Sanyati rivers occupy large proportions of the Zambezi River basin but make little contribution to its flows compared to those listed in Table 1. These rivers are in sub-catchments which are relatively dry.

2. Water resources management

Each riparian country monitors, assesses, plans, develops, conserves and protects water resources of that part of the Zambezi River in its own territory. The utilisation of the water from water resources developments is also done at country level, with little consultation and co-operation among riparian states. Traditionally, riparian states have not seized the opportunities for joint water resources management, except in isolated cases.

2.1. Water resources monitoring and assessment

Data collection and water resources assessments started at the beginning of the century with the recording of water levels of Lake Malawi in 1896, the gauging of the flows of Kafue River near Kafue Town and those of Zambezi River at Victoria Falls started in 1905 and 1907, respectively. However, most hydrometeorological data in the basin began in the 1950s, with continuous records per station, except in Mozambique and Angola where civil wars disrupted the operations of hydrometric stations. The quality of data available is considered fair to good, although the hydrological services continue to deteriorate and data collection programmes are getting poorer due to financial and institutional capacity constraints (World Bank, 1991).

In recent years and with the advent of SADC, attempts have been made to establish joint

Table 1
Runoff of Zambezi River and its main tributaries (m^3/s)[a]

Name	Annual	Wet season	Dry season	Catchment area (km^2)
Zambezi River at sea	3600	5000	1500	1,300,000
Shire River basin	500	550	360	150,000
Luangwa River basin	620	1500	90	144,000
Kafue River basin	350	450	100	152,000
Kambopo River basin	260	400	120	67,000
Zambezi River at Kariba	1350	1500	900	664,000
Zambezi River in Angola	670	900	150	76,000

[a] Source: estimated from ZESCO, 1991.

water resources monitoring and assessment in the Zambezi River. In 1988 or thereabouts, the SADC Energy Sector came up with the 'Hydroelectric Hydrological Assistance' project whose objective was to improve the availability of hydrological data for hydropower development and operations. By 1993, the project had developed a telemetry system for the upper Zambezi River in Zambia and Zimbabwe. The historical data was compiled, processed and stored into a database. The power utilities in Zambia and Zimbabwe are using this database and the telemetry system, especially in forecasting the inflows in Lake Kariba and scheduling dam operations. Unfortunately the monitoring and assessment does not extend outsize Zambia and Zimbabwe, as originally planned.

The 'Development of a Unified Water Resources Quantity and Quality Monitoring System for Zambezi River' was another attempt to have a common monitoring and assessment scheme. This is the ZACPRO 5 project of the Zambezi River Basin Action Plan (ZACPLAN), which aims at the environmentally sound and integrated water resources management for the entire Zambezi River basin. The programme began in 1991 and has not been completed. It recommended a network of hydrometric and water quality monitoring stations which left important tributaries and main river sub-basins without stations. Under the ZACPRO 6 project, this network was significantly updated in 1994 and a basin wide database was established based on data collected from its stations. This notwithstanding, there are no joint monitoring programmes. The stations identified in Angola and some in Mozambique are also not yet operational.

2.2. Historical water resources development perspective

Water resources planning and development has largely been based on national policies, with each country making arrangements and implementing plans for the development of its own utilisation requirements. Most of the development plans are identified and upgraded from the plans of the 1950s by the colonial governments. The Kariba Dam and hydropower plants, for example, were planned and developed in the 1950s under the auspices of the Federation of Rhodesia and Nyasaland, FRN. The Federal Government established the Central African Power Company (CAPCO), which later became Zambezi River Authority (ZRA), to develop, own and operate the Kariba complex.

A similar large water resources development is the Cabora Bassa dam in Mozambique built by the Portuguese in 1974. The building of the Cabora Bassa complex followed after an agrement with South Africa that made provisions for the export of electricity generated from hydropower plants at the dam to the Republic of South Africa.

There have been proposals to collaborate in the development of Lake Malawi, Shire River and lower Zambezi River in the past. The Federation of Rhodesia and Nyasaland, FRN, in collaboration with Portuguese East Africa (Mozambique), developed a plan between 1952 and 1954, where the Lake Malawi levels and Shire River flows would have been stabilised using barrages and dams (Sir Williams, Harclow & Partners, 1954). The stabilisation was intended to benefit hydropower development (on the Shire River), flood protection, irrigation and inland navigation. The navigation component centred on connecting land locked Malawi (then Nyasaland) and interior Mozambique to the sea (Beira) through the Shire and Zambezi rivers. There were proposals for development of inland ports at Bangula on the Shire River and at

Sena on the Zambezi River. Although the project was expected to benefit Mozambique as well, it died with the crumbling of the FRN in the early 1960s.

2.3. Water resources utilisation

2.3.1. Non-consumptive uses

2.3.1.1. Hydropower. There are some 4500 MW of electricity generated from installed hydropower plants at Kariba, Cabora Bassa and Victoria Falls on the main Zambezi, Kafue Gorge on the Kafue River, Mita dam on the Lunsefwa River (a tributary of the Luangwa River). The installed capacity also includes that generated from Nkula and Tedzani on Shire River and a few more small hydropower stations in Malawi. It is also worth noting that an estimated 11,000 MW hydropower potential, mainly on the proper Zambezi River, is not yet developed within the basin. The proposed Batoka Gorge project, which is expected to be developed by ZRA in the near future, has 1600 MW of this potential (Table 2).

The water demand for hydropower generation on the main river is 1700 m^3/s and is likely to double soon with the pending installations at Cabora Bassa, that are expected to increase hydropower generation capacity to 4000 MW. It is quite unlikely that new major abstractions can be accommodated considering the present hydropower water commitments which are also not met due to the inadequate flows. However, alternative sources of electricity may free the committed flows for other uses such as irrigation and water supply. This has to be considered sooner or later, particularly with the mounting pressure to use the Zambezi waters for the benefit of the greater SADC region.

2.3.1.2. Fisheries. At least 200,000 tonnes per annum of fish are harvested within the basin. About 70,000 and 50,000 tonnes per annum come from Lake Malawi and the Zambia part of the Zambezi River basin, respectively. It is important to note that fish is the main source of animal protein for the majority of rural communities of riparian states.

2.3.1.3. Navigation. Passenger and cargo navigation services are mainly practised on Lake Malawi, having ports and boat facilities that handle more than 150,000 tonnes and 300,000 persons per annum, respectively. In fact, because of difficult terrain and inadequate road net-

Table 2
Major hydropower water demands and energy supply in Zambezi River

Hydropower plants	River/tributary	Energy (MW)	Required flow (m^3/s)[a]
Victoria Falls	Zambezi	108	150
Kariba	Zambezi	1266	1300
Kafue Gorge	Kafue	900	265
Cabora Bassa[b]	Zambezi	2000	1700
Nkula/Tedzani	Shire River	204	320

[a] Estimated from SSAHAP regional report.
[b] Installed capacity soon to increase to 4000 MW requiring water demand of 3400 m^3/s.

works around Lake Malawi, Kariba and Cabora Bassa, ships or boats are the only means of transporting goods and passengers for the majority of the lake shore settlements. The lakes of Kariba and Cabora Bassa are also popular for tourists and sports boating. Navigation on the main river itself is, however, limited by shallow depths, rapids and high flow velocities.

The lower Shire and Zambezi rivers were frequently used for navigation since the days of the famous explorer, Dr David Livingstone. Boats and barges used to transport cargo to and from Malawi, all the way to the port of Beira on the Indian Ocean shores, up to the late 1970s. However, these services stopped due to several reasons including the insecurity problems and shallow water depths in the rivers. There are long standing studies to investigate and make the Shire and the lower reaches of the Zambezi River navigable once again.

The Barotse flood plains of the Zambezi River in the Western Province of Zambia, are also navigable especially during the rainy season. Navigation in the Barotse flood plains is the only transport between Mongu, the provincial capital, and the west bank of the river. Navigation is also popular in the area as it is used for the centuries old traditional and cultural evacuation from and reoccupation of the summer and winter residences of the Barotse king, Litunga. It is traditionally known as "Kuomboka".

2.3.1.4. Ecology. The Zambezi River basin is also unique and important as a bio-diversity sanctuary, and therefore a popular destiny for water-related eco-tourism. For example, Lake Malawi has the largest number of fish species found in a single lake in the world, with 400+ identified fish species and more than 200 of these are endemic to the lake. The World Heritage sites such as Lake Malawi National Park, Victoria Falls and Mana Pools on the Zambezi River in Zimbabwe and Zambia are important wetland areas. These not only attract significant numbers of tourists who bring important foreign currency to the riparian countries, but are also important natural heritage monuments for present and future generations. Obviously, the aesthetics of these eco-tourism sites depend on quantity and quality of water resources around them. The Victoria Falls, for example, require at least 1000 m^3/s of flow to maintain spectacular scenes.

2.3.2. Consumptive uses

2.3.2.1. Water supply. The requirements for water supply and sanitation, estimated from the basin and hinterland population of 28 million, is about 3340 million cubic metres per year or 80 m^3/s (average of 250 litres per capita per day). The majority of this water is used by the cities and municipalities of Blantyre, Bulawayo, Harare, Kitwe, Lilongwe, Lusaka, Ndola and Tete. Although surface water resources are the commonest sources of water supply systems, the majority of the population uses ground water sources through boreholes and wells.

2.3.2.2. Irrigation. It is estimated that some 200,000 hectares have been developed for irrigation and about 7 million hectares can be irrigated within the basin. The current water demand and commitments for irrigation requirements should range between 200 and 400 m^3/s at peak abstraction times. The smallholder farmers, private estates and public irrigation schemes irrigate cereals (mainly rice, wheat and maize), vegetables, sugar plantations and tea. Notable large irrigation fields with at least 10,000 hectares each, are sugar plantations in Malawi and

Zambia. These fields draw more than half of the annual irrigation water. Besides, the irrigation abstractions in Mozambique downstream of Cabora Bassa are likely going to increase as the country forges ahead with reconstruction and development programmes which may include reopening the irrigation districts of Tete and Zambezi Provinces.

2.3.2.3. Inter-basin transfer. A number of inter-basin water transfers from the Zambezi River to the southern regions of SADC, that include irrigation requirements, are being contemplated currently. Yet there are un-exploited irrigable tracks of land along the river, for example the Kafue flats, Gwembe and Lusito valleys near Lake Kariba and the lower Zambezi and Shire flood plains, that can be developed as viable irrigation schemes. It is ironical that the riparian states import grain from South Africa! There is a need, therefore, for better water demand management and rationalisation through strategic planning, economic pricing of water, substituting trade in food (not water), considering opportunity costs in water allocation and creating regional (not national) self sufficiency and security in food and electricity. This approach, accompanied by trade and industrial development liberalisation and freer movement of economic activities, products and services, would go a long way in reducing the local effects of growing water scarcity.

3. Water resources and environment and management practices

There is no doubt that water resource developments have improved the economy of the riparian states. However, the construction and operations of both the Kariba and Cabora Bassa dams have had environmental impacts. The legal agreements for the development of these dams did not address issues of environmental impacts. As a result, adverse impacts of the dams were not effectively mitigated.

The Kariba and Cabora Bassa reservoirs or lakes have stabilised the annual flow fluctuations, significantly attenuating the flood flows and raising minimum flows. However, the abrupt blockage of the river flow during the filling up of the reservoirs resulted in rapid attenuation of the discharge, with detrimental effects on the ecology and ecosystem downstream. For example the closure of Zambezi River flows during the filling up of the Cabora Bassa reservoir in 1974 resulted in the rapid and dangerous reduction of the discharge from 3200 plus to just less than 300 m^3/s within a few days. This rapid draw-down obviously caused significant environmental changes, including fish, in the lower Zambezi and Shire rivers.

The impounding of the waters in the Kariba reservoir covering a large area of 2400 km^2, impacted adversely on the riparian population, fauna and flora. The negative social and economic aspects of resettlements, loss of animals and relocation of those that survived vs the benefits of the Kariba complex are still controversial today among environmentalists and supporters of development.

The blockage of free passage, up and down the river, to migrating fish by dams, such as the two Kariba and Cabora Bassa dams, had environmental impacts as well. The flow regulations resulting from the reservoirs or lakes and requirements for hydropower generation have also altered the ecology and ecosystem of the wetlands downstream of the dams. For example, the Mana Pools downstream of Kariba are considered to have changed their ecological balance

and productivity, including fish. However, the creation of the two artificial lakes have undoubtedly increased fisheries development activities, particularly with the introduction of the exotic fish stocks like *kapenta*. Since then, the fishing business has become one of the major spin-offs from the construction of these dams.

3.1. Water resources degradation and pollution

Poverty, population pressure and poor land use practices have led to widespread catchment degradation, water resources degradation and pollution. As a consequence, there are some serious soil erosion and increased flash runoff problems, with rivers flooding more frequently and their hydrographs receding or drying faster than before.

The prevalent flash runoff diminishes groundwater recharge, increases sediment loads and sometimes induces excessive leaching of agrochemicals into streams and rivers. Efforts to deal with the land and associated water resources degradation and pollution problems are frustrated by the fact that the poor do not choose to degrade the environment. Their poverty does not give them any other choice than to grow food by whatever means, or indiscriminately fell trees or burn coal to sell for 'survival'. They can not even afford to invest in good land husbandry practices. Yet the degradation and pollution is not only an environmental loss but has an economic cost which someone has to pay directly or indirectly.

Further, there are incidences of domestic, trade, industrial and mining related pollution, including DDT and heavy metals, in the basin. Pollution, although confined within particular riparian states, is a serious problem in the Kafue River, around and immediately down-stream of the Kitwe and Kafue towns in Zambia, for example. Traces of DDT and heavy metals have been detected in Lake Kariba. Eutrophication is also becoming very common to the extent that river reaches, reservoirs and lakes are experiencing water weed problems throughout the basin. For example, Lake Chivero, that provides water supply to Harare City in Zimbabwe, has had serious problems with water weeds since 1991. The problems may get worse unless the nutrient levels are significantly reduced and effective measures for the control of water weeds at basin level are in place.

3.2. Droughts and water scarcity

The main challenge in the common management of the Zambezi River basin, is the sustainable water resources management that guarantees security in water supply and sanitation services, food and electricity supply from limited and vulnerable but considerably competed for water resources. It is equally important that other uses and water dependent services are also satisfied. Sustainable management is complicated by persistent droughts, extreme variation of the occurrence and distribution of water resources, high population growth, absolute poverty, desertification, and sometimes floods.

Unlike the hydrology of temperate regions, about 90% of runoff from the catchment areas and sub-tributaries occurs in less than six months of the year. This leads to general water scarcity in dry seasons. The persistent droughts have made seasonal variation in runoff quite severe in recent years. The high population growth and urbanisation rates are rapidly increasing water demand and subsequently amplifying the effects of droughts or floods. The

pressure of population and urbanisation have also aggravated water resources degradation or pollution. All of these have exacerbated the threats of water scarcity, challenges for equitable water resources allocation and environmental insecurity in the basin.

The persistent droughts, particularly during the 1980s and 1990s, have had significant adverse impacts in southern Africa. As a result, there are considerable challenges in strategic and sustainable planning and management of the basin's water resources. The dam of Lake Kariba has not spilled since 1982 and its hydropower plants cannot generate at full capacity resulting in power shortages, particularly in the 1990s. In Zimbabwe, droughts further caused severe water scarcity for municipal water supplies in cities like Harare and Bulawayo. In fact there are proposals to abstract water from the Zambezi River for greater Bulawayo water supply, as a mitigation measure against future recurrence of such droughts. In Malawi, water levels of Lake Malawi reached the lowest levels in 1995 since 1931. The phenomenon is raising fears that the situation may return to the 1915–1935 period when the lake was so low that the outflow into the Shire River ceased (Box 1).

In the future, the impact of drought will become worse than experienced in the 1990s as population, industrialisation, urbanisation and the need for expanded agriculture/irrigation, water supply and sanitation services, etc., continue to rapidly grow. These persistent and chronic droughts should, therefore, be considered as 'normal situation' in strategic planning and management of water resources rather than being emergency situations.

Box 1. Droughts and water scarcity amid floods in Zambezi River riparian states

The effects of drought on water scarcity in the basin states have been devastating. Equally important are the effects of occasional floods. The examples below illustrate these effects.

Zimbabwe. During the drought of 1991/1992, the country's agriculture production fell by 40% and 50% of its population had to be given relief food and emergency water supplies, through massive deep drilling programmes, since many rural boreholes and wells dried up. Urban water supplies were severely limited with unprecedented rationing. Electricity generation at Kariba fell by 15% causing severe load shedding. As a result its GDP fell by 11% (David Gray, Personal Communication).

Malawi. During 1978–1986 Lake Malawi levels were very high, causing severe flooding along the lake shore and Shire River. Tourists and permanent settlements and infrastructure were damaged and navigation facilities severely impaired. However, since 1990 the lake levels have been dropping and reached the lowest point in December 1995 since 1931! During the same period, the Shire River flows, although regulated, recorded its lowest discharge since 1955. As a result the berth at ports along the lake are very shallow and some cargo ships have been aground since 1992. The hydropower plants, waterworks for Blantyre city and irrigation abstractions for a 10,000 hectare sugar plantation have been severely hampered. Siltation at the Nkuwa Barrage has exacerbated problems. Removal of the silt and rehabilitation of the barrage will cost US $3 million.

Population dynamics and poverty have complicated water scarcity, water resources degradation and pollution. The basin has an estimated population of about 28 million with growth rates averaging 3%, and with densities as high as 240 per km^2 in some rural areas of Malawi. Some 20 million people, out of this 28 million, live under absolute poverty (SADC-ELMS, 1994). Population management may offer solutions to water scarcity problems. Relocation of the population and family planning issues may just be as relevant in water resources management and water scarcity mitigation as the identification and development of dam sites, reservoirs, water supply systems, etc.

4. Issues for shared management of the Zambezi River Basin

4.1. Existing agreements and joint water resources management schemes

The emerging water scarcity, degradation and pollution problems are trans-boundary and require common basic policy, legal and institutional arrangements. The internationalisation of water resources management started with the establishment of the Central African Power Company (CAPCO) in the 1950s, which later became Zambezi River Authority (ZRA), prompted by the need to develop hydropower potential along that part of the river common to Zambia and Zimbabwe. The need arose because the development of hydropower at Kariba required construction of a dam which would span across the river, taking up pieces of land in both countries. It also required joint development and management of those Zambezi River waters common to both countries. A number of legal agreements between Zambia and Zimbabwe or previous governments were prepared, negotiated and adopted. The last agreement culminated in the enactment of two identical Zambezi River Authority Acts of parliament in 1987, one for Zambia and the other for Zimbabwe.

The operations of the water resources improvements, too, have caused misunderstandings. The controversy caused by lake shore flooding around Lake Malawi during the early 1980s, can demonstrate this. Malawi was suspected of deliberately blocking the Shire River with the barrage at Liwonde to raise lake levels and inundate the shore areas, particularly in Tanzania. The misunderstandings were only cleared when hydrologists from Tanzania and Malawi jointly visited the mouth of and along Shire River in 1989. It was realised that the barrage would have been over topped if closed at high lake levels and that the extreme high rainfall in the catchment was the main cause of lake shore flooding.

Another example is the agreement between Malawi and Tanzania over the development of the Songwe River basin. This river drains into Lake Malawi and marks the border between the two countries. The Songwe River experience severe flooding and meandering in its 30-km very fertile and densely populated flood plain. These floods displace people every year and whenever a piece of land is cut off to the other side of the river the residents change nationality, as per a 1901 border agreement. The two governments reviewed the situation and adopted a plan in 1991, which calls for the joint stabilisation of the river that would involve construction of dams, levees and other accessory works necessary to canalise the flows in the flood plain. The project benefits will also include hydropower, irrigation, tourism, fisheries and environmental management.

On a basin scale, the riparian states[1] requested UNEP in 1985 to assist them put up the Zambezi River Basin Action Plan (ZACPLAN). The plan was expected to establish mechanisms for common management of the Zambezi River. The ZACPLAN project document agreement was eventually developed and adopted in 1987 by the riparian countries. It became a SADC programme in the same year. The Kingdom of Lesotho was given the responsibility of co-ordinating its implementation.

The ZACPLAN comprised 19 projects which were supposed to be completed by 1996 but only four have been financed and implemented. It is, however, unfortunate that none has been completed. The core project of the plan was 'The Development of an Integrated Water Management Plan'. This project has four components consisting of water resources data base development; sector studies, which would form the basis for water allocation among various water dependent or affecting sectors; development of an integrated water management plan; and implementation (initiation) of the plan. The data base development project was completed in Maseru in 1995 and the resulting operational database system was transferred from Lesotho to ZRA in Lusaka, in 1996. The sector studies are being implemented at ZRA, too. However, the future of the last phases are unclear. This is due to lack of decision on which institution to host their implementation. There is also lack of leadership in the finalisation of the project document, which was principally accepted in early 1995 for funding by Nordic countries.

4.2. Ground and surface water resources management issues

Ground water issues do not get much recognition, despite the wide use of boreholes and shallow wells as sources of water supplies, particularly in rural communities. Little is known about ground water movement, yields and recharge mechanisms. Compared to surface water resources, ground water data and information is very meagre at national and regional levels. Although there are chances of trans-boundary aquifers in the Kalahari sandstone and Katanga formations, no studies have been carried out to establish this and propose mechanisms for the efficient and sustainable management and utilisation of these groundwater bodies. Such studies may also shed light on the inter-relationship between surface and ground water systems in the region. The studies can also clarify whether the Okavango and Zambezi rivers are hydrologically one watercourse system.

It is also worth noting that the likelihood of ground water resources over-exploitation, degradation, pollution and reduced opportunities for recharge is not taken seriously. This is particularly a concern in urban areas, for example in Lusaka, and high populated rural communities where groundwater is used extensively. Mining activities, too, contribute to depletion of groundwater resources. Lack of ground water data and research make it difficult to manage ground water efficiently.

There have been lack of co-ordinated and strategic development, operation and utilisation of water resources improvements. This has tended to cause conflicts of interest among users and environment. In fact the floods in the Shire and lower Zambezi River occur almost every year,

[1] All riparian states participated in the initiation of the ZACPLAN except Angola and Namibia. Namibia, however, was represented by the UN, as it was not yet independent.

causing loss of lives, damage to property and render several thousands of people (from Malawi and Mozambique) homeless, without food and drinking water supply. These floods cost millions of US dollars in providing relief items to flood victims, repairing and rehabilitation of damaged infrastructures and properties. The existing Flood Warning System for Lower Shire, developed and operated by Malawi, is very limited despite its benefits both to Malawi and Mozambique. The flood control schemes, too, have not been developed in spite of their possibility and derived benefits. Besides, there are no operational arrangements to use the existing dams and barrages for flood control. Such schemes and their operational procedures can only be developed, implemented and operated jointly by and with full co-operation of involved or affected river basin states.

4.3. Prospects for common policy and legal agreement

One of the ZACPLAN projects was the establishment of a basin treaty for common management of Zambezi River. However, during the course of developing the basin treaty, it was decided by SADC to prepare and adopt a SADC Protocol on Shared Watercourse Systems instead. This Protocol, signed in 1995, is regarded as the pillar for setting up an enabling environment in equitable allocation and management of water resources in the shared basins within SADC. It recognises the SADC Treaty and its policy. It further calls for the establishment of a monitoring unit, river basin commissions, authorities and water boards for the implementation and enforcement of the provisions of the Protocol. Despite its signing by the SADC Summit in August 1995, the Protocol is not yet operational. It is awaiting ratification of the Protocol by riparian sates. There are, however, some countries with reservations against the provisions of the Protocol but these are not expected to prevent it from being ratified. The clauses can be amended as soon as the Protocol is operational.

The need for a dedicated agreement on the common management of the Zambezi River continues to be pursued by the riparian countries. A new basin agreement is under preparation. The progress is very slow because of problems with institutional arrangements that can effectively co-ordinate, facilitate and supervise the preparation of the agreement. The follow up of progress and supervision of the ZACPLAN programmes is considered weak as it relies on meetings of the Water Resources Technical Committee and higher SADC committees.

In fact the decision to assign the day to day responsibilities for the co-ordination and implementation of the ZACPLAN to SADC-ELMS in Maseru, in the first place, may not have been the best sustainable option. It meant giving these responsibilities to a country which is more than 1500 km away from the basin with no social and economic benefits and interest in the ZACPLAN. It appears the political will and commitment to follow the original ZACPLAN agreement, agreed by the riparian ministers in 1998, faded away. For example, the original plan of setting up a competent basin institution and capacity building inside the basin to be entrusted with day to day co-ordination and implementation of the ZACPLAN was not pursued. No institution and capacity building have been identified or established or developed for this purpose.

The political will, commitment and enthusiasm of the days when the programme was being initiated should have been encouraged by the donor support for some of the ZACPLAN projects. However, the riparian countries have not met to review the problems in the

programme implementation since 1987. As *stakeholders*, their meetings would have given the riparian countries the opportunities to seriously review themselves the ZACPLAN implementation and direct remedial measures for speeding up and completion of the projects. These negative developments should be reversed through ZACPLAN awareness campaigns that give details on the issues at stake, the objectives of the programme, its activities, outputs and how these would benefit stakeholders at national and regional level.

4.4. Lack of enabling environment for the Zambezi River common management

The lack of basin wide common policy, legal and institutional arrangements is obviously one of the main constraints in the management of the common Zambezi River. Despite the inception of ZACPLAN in 1987 and subsequent implementation of a few of its projects, no basin common policy, treaty or institution has been established to facilitate the ZACPLAN process as originally proposed. There is also lack of awareness of international water management issues, their importance and required capacity in the joint and integrated monitoring, assessment, planning, development, conservation and protection of water resources in the Zambezi River basin. Although there is likelihood of water related conflicts, there are no mechanisms for their settlement or management within the Zambezi River basin.

In conclusion, the above water resources management issues cannot be solved by one riparian country alone, as they are trans-boundary. The lack of reliable and adequate data is hindering effective and strategic planning and management of both surface and ground water resources and water related environmental management. The data collection programmes and data dissemination mechanisms in the riparian states are deficient and need attention (World Bank, 1991). The unco-ordinated and disintegrated water resources development and management schemes need consolidation to promote equitable allocation and sustainable development of water resources.

In the development of policy, legal and institutional arrangements, it must be noted that the institutional weaknesses have been blamed for the failures of water resources management programmes, including the slow progress in the implementation of ZACPLAN.[2] However, the socio-economic importance of the Zambezi River among its riparian states and the opportunities that exist within and in SADC, make it absolutely necessary to urgently and effectively address the remaining policy, legal and institutional capacity constraints.

5. Recommended reforms in the management of the Zambezi River basin

In line with the aspirations of SADC, the policies and strategies for the management of the Zambezi River basin should be converging towards economic integration with joint and cross border water resources investments between or among the riparian countries.

Within the agreed policy and legal framework, an agreement should specify the basic roles and responsibilities of each country and stakeholders in the water resources management

[2] UNEP 1993 and Nordic 1991 and 1995 evaluation mission reports on the implementation of ZACPLAN.

including the management of flow regulations, abstraction rates or water rights, water degradation and pollution control. It should also specify the rights and obligations of riparian states and basin institutions in the advancement of integrated and joint water resources management. The translation of the policy into a legal agreement should include defining institutional mechanisms for the implementation and fulfilment of the objectives of the policy, the SADC Protocol on Shared Watercourse systems and the ideals of SADC related to water resources management at basin level. There is no doubt that there should be a Zambezi River Commission or similar institution under the basin agreement. The question is how it should be constituted?

Fig. 1 shows a schematic diagram of the recommended institutional set up for Zambezi River Basin Commission and affiliate agencies, River Authorities and River Water Boards. Although the Commission is an overall basin institution, its structure should be lean and flexible but strong, through its linkages with river authorities and water boards. The linkages between these institutions should balance stakeholder interests and consolidate their participation in water resources management. The exact relationship and functioning of these basin institutions should be developed in detail during the drafting of the basin agreement. However, the relationship should be flexible enough to allow updating as dictated by the advancement of the co-operation, integration and economic development in the basin and SADC region.

The Commission would be responsible to all the riparian countries for the administration of the river basin agreement and executing basin wide operations mandated to it by the said agreement. Its functions should include promotion and support of the establishment of the river authorities (water resources development agencies). These should be responsible to the

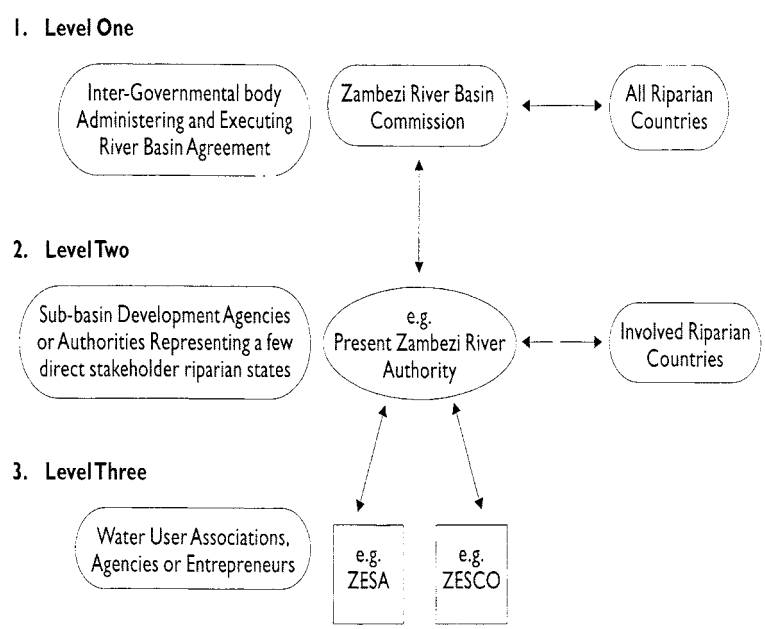

Fig. 1. Schematic diagram for SADC and Zambezi River basin institutions.

direct stakeholder riparian countries, for financing, planning, development and operation of the water resources improvements in a particular reach or sub-basin common to the countries involved. The river authorities should only be established for each sub-basin or reach that *has the demand or potential and economic viability for joint water resources developments and operations*.

For them to be effective, the river authorities should not be involved in the utilisation of the water resources improvements or their waters. This approach would facilitate their impartiality and effectiveness in the allocation and distribution of water and related services to Water Boards (user associations, agencies or entrepreneurs). The Water Boards may be for irrigation district boards that represent or serve several farmers, navigation boards (particularly for Lake Malawi, Shire River and lower Zambezi) or the power and water supply and sanitation boards or a combination. These boards may be for one or more countries who have agreed to work together in the utilisation of water resources improvements. The river authorities should promote and assist in the establishment of river water boards, with the full involvement of stakeholder agencies. The overall approach, therefore, can maximise demand driven stakeholder participation, strategic planning and development and equitable allocation of Zambezi River waters.

As an interim measure, it is strongly recommended that a Steering Committee of senior officials drawn from each riparian state and SADC Water Sector be set up as soon as possible. The Steering Committee should review, develop and manage the process of drafting and adoption of the detailed basin legal agreement and institutional structures proposed above. The recommended basin treaty should be presented to the *riparian countries* at an appropriate forum for negotiations and adoption. The agreement can be submitted to SADC and adopted as an annex to the SADC Protocol on Shared Watercourse Systems.

6. Common management of the Zambezi River

The Commission, through the executive branch, should co-ordinate and assist in the joint mobilisation of resources (financial, human and institutional) for the implementation of approved regional (basin) programmes and projects. The promotion of joint and cross border water resources development investments, following principles of equitable allocation and Dublin principles on water and sustainable development. This should include preparation and dissemination of cost sharing guide lines for joint projects. It should also promote the participation of all relevant stakeholders in water resources development, management and utilisation at both national and regional levels.

The executive branch, once established, should take over and lead the implementation of ZACPLAN, particularly the development and implementation of an agreed integrated water resources management plan for the entire basin. It should co-ordinate, establish and run unified and co-ordinated basin-wide water resources research, including that on appropriate development and management technology, the collection, processing, analysis and dissemination of surface and ground water resources data and information, drought and flood forecasts and warnings among riparian states, the river authorities and water utility boards, etc. The services of SADC–HYCOS, a project whose activities include for automatic data

collection, transmission and dissemination throughout the region, and the ZACBASE, a database developed under ZACPRO 6 of ZACPLAN, would be indispensable to the executing agency.

The existing ZACPLAN project entitled ZACPRO 6: Development of an Integrated Water Resources Development Plan for Zambezi River should be completed urgently. This is necessary for the provision of mechanisms for basin wide water resources database and data exchange, water resources monitoring and assessment and agreed development and management plans. The existing water resources database developed in Phase I of the ZACPRO 6 should be operationalised to allow periodic and timely data updating and dissemination to riparian countries. The SADC–HYCOS and upper Zambezi telemetry system in Zambia and Zimbabwe should be supplemented by new programmes to complete operationalisation of the adopted basin network of hydrometric and water quality monitoring stations used in ZACBASE. The joint monitoring and assessment, using the database, should provide the basis for equitable allocation, protection, conservation and utilisation of water resources in all riparian countries. These are required for sustainable, equitable and environmentally sound utilisation of the waters of the Zambezi River and are very important for conflict management emerging from competing demands on the water.

The management of the Zambezi River, particularly those aspects related to international water resources management, including conflict management, preparation, dissemination and publicising international water resources management issues and public awareness campaigns, should be co-ordinated and implemented by the Commission's executive branch or executing agency. The flow regulations and large reservoir and barrage operations, flood control, river flow forecasting and warning for floods and droughts or low flows should be directly co-ordinated by the branch.

References

Chenje, M., & Johnson, P. (1996). *Water in southern Africa*. Maseru/Harare: SADC/IUCN/SARDC.

SADC-ELMS (1994). *Proposed SADC policy and strategy for environment and sustainable development*. Maseru: SADC-ELMS.

Sir, Williams, Harclow, & Partners (1954). *The control and development of Lake Nyasa and the Shire River*. London: Sir Williams, Harclow and Partners.

Trolldalen, J. M. (1996). *Challenges in management of shared water basins — Zambezi River Basin in southern Africa and implementation of ZACPLAN*. Norway: Lobo Grafisk AS.

World Bank. (1991). *Sub-Saharan Africa Hydrological Assessment Project Report*. SSAHAP. Washington DC: World Bank.

ZESCO. (1991). Compendium of selected hydrometeorological data relevant to hydroelectric sector in Zambezi Basin. SADC AAA3.4 Project. ZESCO, Lusaka.

Further reading

Hall, W. A., & Dracup, J. A. (1979). *Water resources systems engineering*. New York: McGraw-Hill.

International Law Association (1991). *Draft articles on law on the non-navigational uses of international watercourses*. The Hague: International Law Association.

Loucks, D. P. et al. (1981). *Water resources systems planning and analysis*. Englewood Cliff, New Jersey: Prentice-Hall Inc.

Mekong Secretariat (1993). *Study on principles and criteria for allocation, use, conservation and development of international water resources*. Bangkok: Policy and Planning Division, Mekong Secretariat.

Scovati, T., & Treves, T. (1992). *World Treaties for the Protection of the Environment, Chapter Three: Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes (Helsinki, 1992)*. Milan: Arti Grafiche Decembrio S.r.l.

Shela, O. N. (1996). *Hydrological forecasting for water resources management*. A report for World Meteorological Organisation, Geneva.

SADC (1992). *Declaration, treaty and protocol of southern African development community*. Gaborone: SADC Secretariat.

SADC-ELMS (1995). *Protocol on shared watercourse systems*. Maseru: SADC-ELMS.

SADC-ELMS. (1996). *Proceedings of the Workshop on The Development of an Integrated Water Resources Management Plan for the Zambezi River Basin, 2–6 May, Livingstone, Zambia, Maseru*.

WMO (1992). The Dublin Statement and the Report on International Conference on Water and the Environment. In *Development issues for the 21st Century, 26–31 January, Dublin*.

WMO/UNESCO .(1991). *Report on water resources assessment*. Progress in the Implementation of Mar del Plata Action Plan and Strategy for the 1990s. Geneva: WMO/UNESCO.

World Bank (1993). *Water resources management — a World Bank policy paper*. Washington, DC: World Bank.

World Bank (1994). *International river basin organisations in sub-Saharan Africa — a performance perspective, final draft*. Washington, DC: African Division.

World Bank (1995). *Directions in development — towards sustainable development for water resources management*. Washington, DC: World Bank.

World Bank (1996). *African water resources — challenges and opportunities for sustainable development*. Washington, DC: World Bank.

World Bank/U.N.D.P (1990). *Sub-Saharan Africa hydrological assessment reports*. Washington, DC: World Bank/UNDP.

Annex C8.10.3

Document 3

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Article

Hydropower Production in Future Climate Scenarios; the Case for the Zambezi River

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Abstract: Climate change remains a threat to water resources projects in southern Africa where impacts resulting from changes in climate are projected to be negative and worse than in most other regions of the world. This work presents an assessment of the impacts of climate change on water resources and hydropower production potential in the Zambezi River Basin. Future climate scenarios projected through the five General Circulation Model (GCM) outputs are used as input in the impact assessment. The future projected climate scenarios are downscaled to find local and regional changes, and used in the Hydrologiska Byråns Vattenbalansavdelning (HBV) hydrological model to assess climate change impacts on water resources in the river basin. According to the simulations, air temperature and potential evaporation are projected to increase, while rainfall is projected to decrease. The Zambezi hydropower system is likely to be affected negatively as a result of future climate changes. Increasing air temperature leading to increased evaporation, and reduced rainfall, both contribute to a decrease in resulting river flows and increased reservoir evaporation. Consequently, the decrease in water resources will lead to decreased hydropower production potential, by 9% in 2020s, 18% in 2050s and 28% in 2080s in the hydropower system, for a medium emission scenario, A1B.

Keywords: climate change; impacts; water resources; hydrology; hydropower production; Zambezi; Zambia; Mozambique; Malawi; Zimbabwe; Africa

1. Introduction

Climate change impacts present challenges of different dimensions to the development and management of water resources. In many parts of the world, especially Africa, water supply systems are already stressed and impacts of climate change will further complicate management of most of the systems. Across Africa, decrease in annual discharge will significantly affect present surface water supplies in large parts of the continent by the end of the century [1]. Southern Africa, due to its dependency on rain-fed water systems for food production, has been projected to be one of the regions of the world that will be negatively affected by climate change [2]. It follows therefore that water resource projects ought to consider climate change impacts for future planning, and management. Moreover, much of southern Africa depends on hydropower as a main source of electricity such that any changes in the water resources may result in changes in electricity supply. Timmermann et al. observed that climate change impacts are rarely explicitly considered in water resources planning, operations and management [3]. Although the available water resources in the Zambezi Basin, in general, exceed the demand at present, this situation may change as a result of the increase in population, more industrial and mining development, increased irrigated food production, a higher standard of living of the population, including the environmental water demand of the system. There

are more than 28 relatively large dams with a storage capacity in excess of 12 million m^3 in the Zambezi River Basin, built for domestic, industrial, and mining water supply, irrigation and power generation. Kariba is the largest (160,000 million m^3) and Cahora Bassa the second largest (52,000 million m^3).

Historical observations of rainfall and temperature show that Africa in general is warming at the rate of about 0.05 °C per decade, with slightly larger warming in the June–November seasons than in December–May season [4]. The future projections for temperature in the region show increasing temperatures over the entire region. Temperature is expected to increase by 2–5 °C [5–7] by the end of the 21st century. These higher temperatures will increase the rate of evapotranspiration. Hewitson and Crane observed drying trends for the months of October–December (western side of southern Africa) and for January–March period. However an increase in precipitation to the south eastern part of the region was observed [8].

The Climate Systems Analysis Group (CSAG) and the University of Cape Town (South Africa), has developed comprehensive future climate projection scenarios for the southern African region. The future climate scenarios are based on GCMs used in the fourth report of the International Panel on Climate Change (IPCC—AR4), and recently using the IPCC—AR5 GCMs. The general direction of change—increasing temperatures and reduced precipitation—appears to be consistent [9,10]. These projections are likely to impact the water resources and hence the hydropower systems in the region.

There have been a few studies around the southern African region regarding climate change and its impact on water resources. Some of the most recent studies focused on the Zambezi River Basin [11,12], on the Okavango delta in Botswana [13–15], the Pungwe River Basin in Zimbabwe and Mozambique [16] and on the entire Zambezi River Basin, a risk assessment of the river system [17] and more recent Water Supply and Demand Scenarios for the Zambezi River Basin [18]. The Southern African Development Community (SADC) through the Global Carbon Capture and Storage Institute provides hydropower and hydrology simulations with quantification of elasticity [19]. Most of these studies indicate that the temperature is rising while precipitation is likely to reduce in the 21st century. Most of the studies highlight that impacts of these changes are reduced water resources (river flows in most rivers) in the southern African region as indicated through the following publications [2,20–29]. The southern African region has not yet been extensively studied as far as the climate change impacts on hydropower production potential are concerned.

On a global scale, the impacts of climate change on hydropower have been analyzed and the results indicate that at a global scale the impacts are minimal and slightly positive [30,31]. However, on the regional level of the southern Africa, there are negative impacts [2,30,31]. This is mainly due to declining river flows as observations already indicate. Other studies have suggested that also flow regulation and irrigation can alter local freshwater conditions. This can result in consistent effect like increasing evapotranspiration and decreasing temporal runoff variability from flow regulation [32]. In the southern African region, power is beginning to be pooled together through the Southern African Power Pool (SAPP) and more interconnections are planned to strengthen and improve the power exchange [33,34].

The objective of this study is to evaluate impacts of climate change on water resources in Zambezi River Basin and its implications on hydropower production potential. The following major hydropower projects were included: Victoria Falls, Kariba, Kafue, Cahora Bassa and Shire River. The Kariba hydropower system comprises of two hydropower plants on both sides of the dam wall. The hydropower plants lie in two countries, Zambia and Zimbabwe. In this study, these plants are analyzed as a unit. The study investigates the impacts of changes based on the changes in river flows. As such, the climate change is the main driver of change. The landscape drivers of change like land and water use and water storage can counter the effect of climate change [32], highlighting the importance of knowing the land and water use for future developments in the region from these related activities.

The process of assessing impacts of climate change involves selecting or defining possible future climate. Likely, future climate scenarios are generated by General Circulation Models (GCMs) and are the main tools for researchers [31,35–37]. The procedure in general is that GCMs simulations of

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2. Study Area

The Zambezi River lies in south central Africa within 8°42′ and 21°35′ south and 18°11′ and 36°17′ east. It is Africa's fourth largest river after the Nile, the Congo and the Niger Rivers. The basin has a total area of about 1,390,000 km^2. The Zambezi River Basin is the largest of the African river systems flowing into the Indian Ocean (Figure 1). It is shared by eight countries and supports a population of more than 40 million people. The main economic activities within the riparian states are mining, agriculture, tourism, fisheries, and manufacturing. Most of these activities depend mainly on the electricity produced in the hydropower plants of the basin, as well as on other sources of energy (primarily coal and oil).

Figure 1. Zambezi River Basin with major sub basins. The red indicates the catchment that contributes to Victoria Falls and the green indicates the catchment that contributes to Kariba hydropower plants.

2.1. Climate and Hydrology

The Zambezi basin lies in the unimodal rainfall zone and therefore there is not much difference in rainfall pattern between the different parts of the basin except the reduction in amounts from north to south. Generally rainfall start in the September—November (SON) season, peaks in the December–February (DJF) season and ends in the March–May (MAM) season as illustrated in Figure 2. The June–August (JJA) season is dry though some of the northern parts of the basin may receive rainfall, also as early as August. The average annual rainfall over the upper catchment is 1100–1300 mm, with considerably higher rainfall near the Zambezi source area in Angola while in the southern low rainfall

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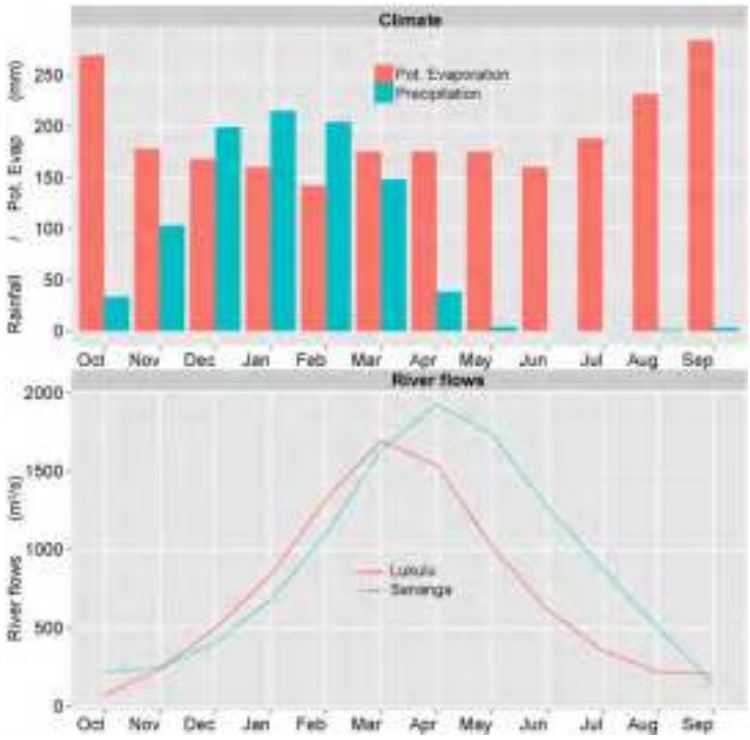

Figure 2. Climate and Hydrology in the Zambezi River Basin. The (**top**) is the mean monthly Rainfall and potential evaporation. The (**bottom**) plot is mean monthly runoff at Lukulu before the Barotse plains and Senanga after the Barotse plains, both are upstream of Victoria Falls.

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Table 1. Mean monthly and annual rainfall (mm) for some selected stations in Zambezi River Basin. For location of individual stations, see Figure 1.

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Annual
Mwinilunga	91	209	264	239	213	255	96	10	1	0	2	17	1396
Zambezi	48	135	228	239	208	170	42	3	0	0	0	0	1074
Kabompo	37	193	219	243	209	166	43	5	1	0	0	3	1120
Kaoma	34	111	217	210	192	128	42	3	0	0	0	4	943
Senenga	37	87	188	221	187	121	25	3	0	0	0	1	870
Kalabo	29	86	213	255	177	178	51	0	0	0	0	2	992
Livingstone	24	75	168	178	143	85	20	3	0	0	0	2	700
Sesheke	25	82	159	175	169	98	23	4	0	1	0	3	738
Choma	15	45	105	160	165	89	14	2	0	0	0	6	603
Hwange	20	52	116	135	111	57	27	5	0	0	0	4	527
Gweru	35	96	159	139	125	56	29	8	0	0	2	9	661
Harare	40	93	183	191	176	99	37	7	0	1	1	7	840

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The mean temperature over the basin is highest (26 °C) during the SON and DJF seasonal as shown in Figure 2. The hottest month is October, and sometimes November–December just before the rains begin. The dry season of JJA is also the cold season, and mean temperatures can be as low as 15 °C, while the MAM season is cool.

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The largest natural lake in the basin is Lake Malawi (28,750 km²). The largest artificial lakes (reservoirs) are Kariba (5180 km²) and Cahora Bassa (2660 km²). Other important reservoirs with large surface areas are the Kafue Dam (89 km²) and the Mazvikadei Dam (865 km²). The Zambezi River major swamps, the Barotse, the Eastern Caprivi, the Kafue, the Busanga, and the Lukanga, covering an area of 20,000 km², the Kafue Dam (89 km²) and the Itezhi-Tezhi Dam (865 km²). The Zambezi River major

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of 20,000 km^2 at high flood periods. The mean annual discharge at the mouth of Zambezi River is 4200 m^3/s (130 km^3/year) as it enters the Indian Ocean. The main contributions to Zambezi river flow are from the tributaries grouped as, Upper Zambezi upstream of Victoria falls (25%), Kafue River (9%), Luangwa River (13%), and Shire River (12%) adding to a total of 60% of the Zambezi river discharge.

Figure 2 shows the climate (rainfall and evaporation regimes) on the top plot. The lower plot shows the annual runoff pattern in upper Zambezi, and the effect of the flood plains on flows. Runoff in the upper Zambezi is highest in period of March–May. Mean annual runoff from the region is about 26.8 × 10^9 m^3 providing an average annual flow of 850 m^3/s.

The peak runoff typically reaches Lukulu by February-March but this runoff takes one and half months to pass through the Barotse Flood plains and peak discharge near the downstream outlet (Senanga) is often delayed until April or early May. Flood-waters recede slowly from the Barotse flood plains during the six-month dry season, with high evaporation losses throughout the year.

2.2. Hydropower

The hydropower facilities are listed in Table 2. At present, the basin has 4833 MW of installed hydropower generation capacity along the main trunk Zambezi River and the two main tributaries Kafue and Shire. In addition there are a few smaller hydropower plants not included in this analysis and in Table 2. Potential plans for additional power plants and upgrading or expansion shows that the current average hydropower production of 31,598 GWh/year could be increased.

Table 2. List of existing hydropower plants and their characteristics within the studied part of the Zambezi River Basin.

Name	River	Plant Type	Capacity MW	Generation GWh/year	Discharge m^3/s
Victoria Falls A	Zambezi	RoR	8	52	11
Victoria Falls B	Zambezi	RoR	60	390	64
Victoria Falls C	Zambezi	RoR	40	260	43
Kafue Gorge	Kafue	Storage	900	5900	252
Kariba North	Zambezi	Storage	720	3282	744
Kariba South	Zambezi	Storage	750	3420	756
Nkula A + B	Shire	RoR	124	582	246
Tedzani I + II + III	Shire	RoR	92	502	276
Kapichira	Shire	RoR	64	210	135
Cahora–Bassa	Zambezi	Storage	2075	17,000	2260
Sum			4833	31,598	

3. Methodology

Assessment of climate change impacts on water resources and hydropower can be carried out at various levels of detail with different approaches. The main steps in the analysis we have done here for the Zambezi case are shown in Figure 3.

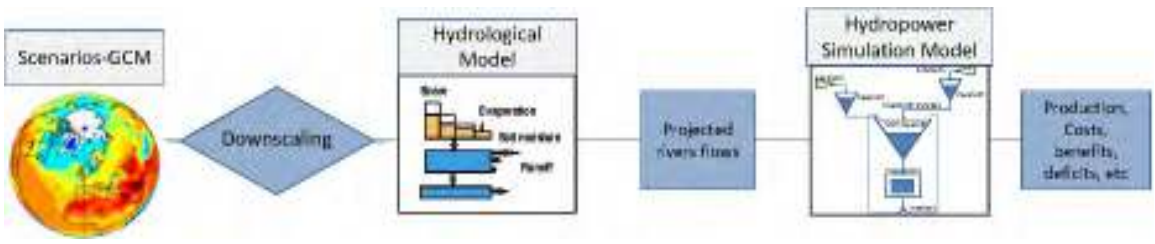

Figure 3. Main steps and methods used in assessing the impacts from future climate scenarios to hydropower production in Zambezi River.

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Global Climate Models (GCMs) driven by future emission scenarios are the main tools used to develop future climate scenarios. It is common to use results from several different GCMs each with different emission scenarios to develop future climate scenarios. Next, by the process of downscaling, local future climate scenarios can be established for specific climate stations in the catchment. Statistical downscaling involves regression between GCMs outputs and local observations, resulting in projected future local climate for specific stations.

The first step was to access the data from several global circulation models. GCM simulations are produced by large international climate research centers worldwide (Table 3) and the resulting data are published on servers where free downloads can be made. In total there were 24 GCMs available during the fourth assessment report (AR4) by IPCC. This number of GCMs was too large for practical use, so it was necessary to select a few GCMs to be used during this analysis. The selection process employed the Taylor diagram method to compare the GCM data and observed data from Climate Research Unit (CRU) [18], and the five models Coupled Global Climate Model.

(CGCM3.1), Commonwealth Scientific and Industrial Research Office (CSIRO3.0), Max Planck Institute for Meteorology global Model, (ECHAM5), Community Climate System Model (CCSM3.0) and Hadley Centre Coupled Model (HACDM3) models were selected for further analysis. For more information about these models, see Table 3. Though there were many emission scenarios available, only three scenarios (A2, A1B, B2) were selected. These scenarios cover a wide range, both low (B2), middle (A1B) and high (A2) emission scenarios. This decision also reduced the number of future ensembles of the climate variables generated.

Table 3. List of selected GCMs (AR4, 2007) used in this study [23].

Model	Institute	City, Country
CGCM3.1/T47	Canadian Centre for Climate Modelling and Analysis (CCC)	Victoria, Canada
CSIRO3	Commonwealth Scientific and Industrial Research Office (CSIRO)	Melbourne, Australia
CCSM3	National Center for Atmospheric Research (NCAR)	Boulder, CO, USA
ECHAM5	Max Planck Institute (MPI)	Hamburg, Germany
HADCM3	Hadley Centre for Climate Prediction and Research, UK met. Office UKMO	Exeter, UK

In the Rest of This Paper the Middle Emission Scenario A1B is Used, Unless Otherwise Stated

Future climate within different regions in the basin were projected by downscaling the GCM results using the Empirical Statistical Downscaling (ESD) method of statistically downscaling [41,42]. Here, linear multiple regression is used to establish a statistical relationship between monthly values from station observations and the gridded GCM data outputs.

The simulated data from the five GCMs were used for downscaling to stations within the catchments and the mean/median of these results used as the future climate variables. The downscaling method used mainly daily data, in some cases data with monthly time step. For downscaling, the clim.pact package [41,42] was used to evaluate the expected changes on temperature and precipitation. The results of the downscaling were derived for the three future periods of 30 years. The reference period sometimes referred to as current period, is the 1961–1990 and the three future periods are called 2020s, 2050s and 2080s, representing 2011–2039, 2040–2069, and 2070–2099 respectively.

In order to provide corresponding scenarios of future runoff, results from downscaling of GCMs were applied in hydrological models to transform climate into runoff. The projected future climate scenarios were computed using change factors (see Section 5.2) between the historical period and future periods. This was done to reduce some systematic biases. In this approach, differences in relevant climate variables—typically precipitation, temperature and evapotranspiration—were extracted from the control and scenario simulations of the climate model and processed before being transferred onto an observed time series. The change factors (sometimes called the delta changes) are a common transfer method used [20].

Hydrological modelling was then used to transform the future climate scenarios to future river flows. The hydrological model was calibrated using the observed runoff data during the period representing 1961–1990. The study used five GCM models and the SRES emission (A2, A1B, B2) scenarios to project climate scenarios of temperatures and precipitation. The downscaling was performed at a monthly time step such that the generated output was monthly time series of downscaled mean monthly temperature (°C) and monthly precipitation amount (mm/month).

The HBV model was used for translating the climate scenarios, temperature, evaporation and precipitation, to hydrological changes. The HBV is a conceptual lumped rainfall runoff model originally developed for operational runoff forecasting [44,45]. It has also been used extensively to perform impact studies for climate change assessments [46]. The model, depicted in Figure 4 uses precipitation, air temperature and potential evaporation as input and is usually runs on a daily time-step. The model contains routines for snow accumulation and melt, soil moisture, and groundwater response. Potential evaporation was estimated based on temperature and precipitation series by the Hargreaves method, which is a modified Thornthwaite method [36,47,48].

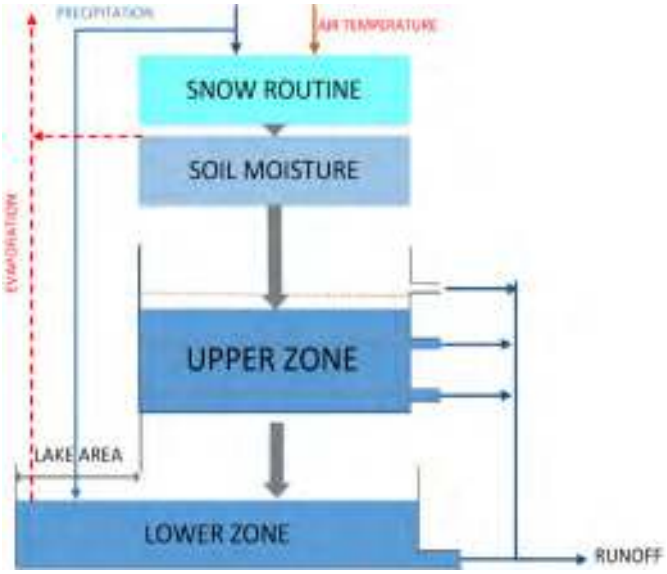

Figure 4. The simplified structure of the HBV rainfall-runoff hydrological model [11].

Typically calibration of HBV involves running the model and comparing the simulated results against river flow observations to obtain optimal performance. The model parameters were calibrated to fit the observed runoff at Victoria Falls gauging stations for the period 1962–2010 (hydrological years). The calibration was performed with a combination of manual calibration (manual adjustment of parameters and weighting of precipitation stations) and automatic calibration. Inflows to the ungauged catchments constituting (mid-Zambezi) were estimated based on the calibrated model for the upper-Zambezi using scaling techniques.

In order to analyze the impact of changed flows on hydropower productions, a model that describes the hydropower system is required to simulate the system with future flows. While it is sometimes tempting to assume that the changes in runoff directly relate to changes in hydropower production, this assumption should be used only in large (regional or global) areas analysis or run-of-river systems. However, where there is storage and other user demands it is necessary to carry hydropower simulations to ascertain the changes that may result from computed changes in runoff. Since the basins selected all have reservoirs with varying sizes, the hydropower production simulations were deemed necessary. In this case the results of the hydrological simulations (river flows) were inputs into the hydropower simulations by an energy model. The energy model was used to highlight changes that are likely to occur given the changes in the river flows.

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The nMAG hydropower simulation model was used to assess the impacts of climate change on hydropower potential. The nMAG model setup for Zambezi hydropower system is shown in Figure 5. The nMAG model was developed at NIS [49] from 1984–2004 and was primarily intended for operation simulation to estimate the production and economic benefit of the hydropower system under varying hydrological condition. In addition, it is capable of simulating reservoir operation

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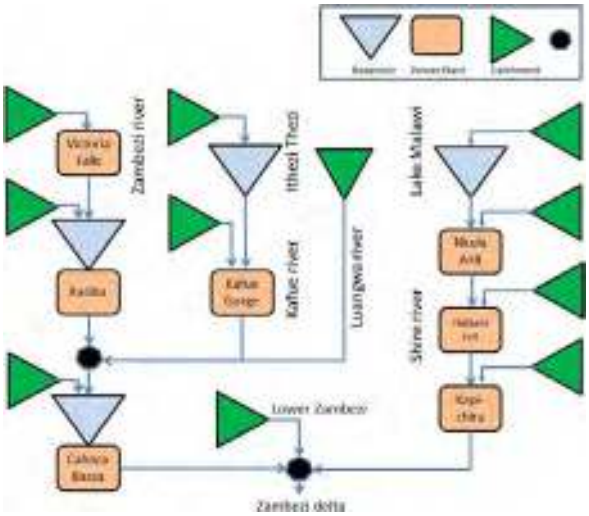

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4. Data

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The GCMs results for the five different models (Table 3) and three different emission scenarios (B2, A1B and A2) were obtained from the Intergovernmental Panel on Climate Change IPCC data centre, the Program for Climate Model Diagnosis and Inter-comparison (PCMDI) [2,50]. The data access is free through its data portal [50] by user registration.

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Most of the observed historical precipitation and temperature datasets were obtained from Global Historical Climatological Network (GHCN) [51]. Additional datasets, Zambian station data was obtained from the Zambian Meteorological Department. All the stations used in the analysis lie within the Zambezi River Basin. Observed temperature and precipitation data for the different climate stations (Table 1) were used as observed data (predictands) in the downscaling process.

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The discharge data were obtained from the Department of Water Affairs, Ministry of Energy and Water Development in Zambia. The annual and monthly discharge data were inspected and selected based on the continuity in data and position within the Zambezi Basin. The discharge data was used in the calibration of the hydrological model. This data set came with some gaps and therefore required some filling in for the missed values. The main gauging stations along the Zambezi River with data were Zambezi River at Kabompo, Zambezi River at Senanga and Zambezi River at Victoria Falls.

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The hydrological description of the basin was derived based on Geographical Information systems (GIS) analysis of the basin. The data required was the basin area, sub basins, slope, and elevation zones among many parameters. Data for hydropower plants and their description was obtained from Zambia Electricity Supply Corporation (ZESCO), the electricity utility company in Zambia and from various reports. The hydropower system data required included reservoir size (i.e. Electricity Supply Corporation (ZESCO), the electricity utility company in Zambia and from

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5. Results

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5.1. Current Climate

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Our initial step was to have a general understanding of trends in the historical observations. The maximum temperature observations indicate that there has been a general increasing trend in temperature, as can be seen from Figure 6. This trend could be seen in all the climate stations within the basin, although rate differs slightly from station to station. The locations of meteorological stations can be seen in Figure 1.

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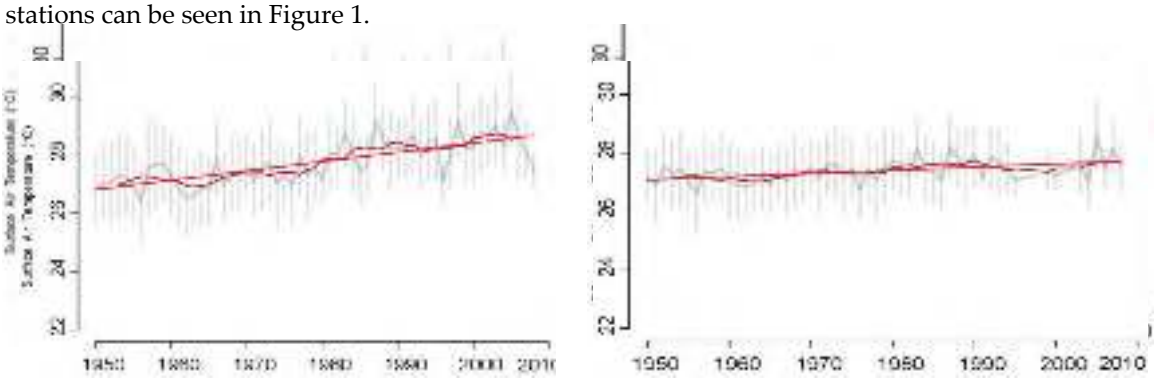

(**a**) (**b**)

Figure 6. Observed trends (1950–2010) in observed annual maximum temperature at two climate stations within the Zambezi Basin: Mongu (**a**) and Mwinilunga (**b**). The y–axis is the temperature in degree Celsius (°C). The brown line represents the 5-year moving average while the red line is the simple linear trend line.

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The rainfall observations from climate stations indicate that there has been a slight decreasing trend in rainfall as can be seen from Figure 7. The rate of decrease differs from station to station, with some stations showing no trend and even a positive trend on some stations. Jaramillo and Destouni in their supplementary materials also showed similar decreasing trends of rainfall in the upper Zambezi river basin [52,53].

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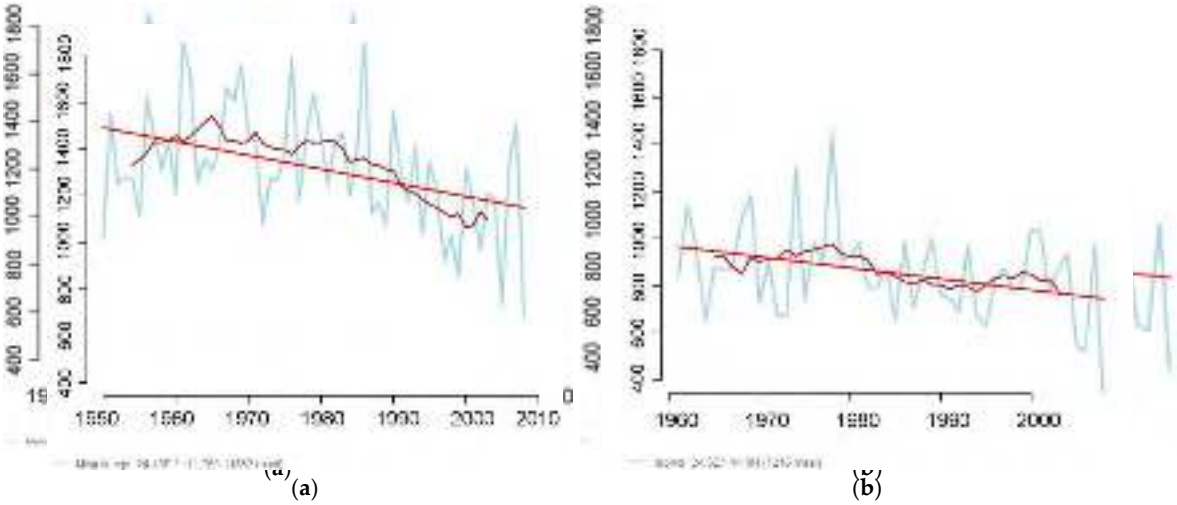

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Figure 7. Observed trends (1950–2010) in annual rainfall at two of the climate stations within the Zambezi Basin, Mwinilunga (**a**) and Kaoma (**b**). The y–axis is the annual rainfall in mm. The brown line represents the 5-years moving average while the red line is the simple linear trend line.

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5.2. Future Climate

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The downscaled GCM outputs of precipitation and temperature for period up to the end of the 21st century were taken from results of downscaling. The future changes are grouped into three distinct periods, namely, the 2020s (2010–2039), the 2050s (2040–2069) and the 2080s (2070–2099). For each station an ensemble of time series are generated with different GCMs and emission scenarios. In order to disaggregate the local climate projection into a daily time step, delta change factors from the downscaling process were calculated and added to daily time series of observation records. Calculations of change factors were based on the difference between the climatology of selected projection intervals (2020s, 2050s and 2080s) and a reference (baseline) period (1961–1990) using the Equations (1) and (2). Change factors for temperature were determined by:

$$\Delta T_{i,j,k} = \overline{T}_{i,j,k} - \overline{T}_{ref,k} \tag{1}$$

where ΔT = Temperature change factor (°C), $\overline{T}$ = Monthly mean temperature (°C), i = GCM, j = projection period, and k = month, *ref* = reference period. Similarly, the equation for estimating precipitation change factors reads:

$$\Delta P_{i,j,k} = \frac{\overline{P}_{i,j,k} - \overline{P}_{ref,k}}{\overline{P}_{ref,k}} * 100 \tag{2}$$

where ΔP = Precipitation change factor (%), $\overline{P}$ = Mean monthly precipitation (mm/month), i = GCM, j = projection period, *ref* = reference period and k = month.

5.3. Temperature

The mean temperature results from downscaling shows an increasing trend in the future, and this is again consistent in most of the stations; though it varies in magnitude. The mean minimum temperature results show that there is a likely average increase in temperature of 1.2 °C by the 2020s, 2.0 °C by the 2050s and 2.7 °C by the 2080s for the A2 scenario. The temperature results for the A1B and B2 scenarios also show an increasing trend in the future, though slightly lower. This is consistent for most of the stations. The mean temperature results from downscaling are shown in Table 4 for five individual GCMs and three emission scenarios. The results indicate that there are some differences between models and as mentioned earlier among emission scenarios. However, the general trends, all positive, are consistent in all the models and emission scenarios.

Table 4. Downscaling results for temperature in Zambezi Basin. Values in the table represent the Delta change (°C) relative to the reference period 1961–1990.

	2010–2039			**2040–2069**			**2070–2099**		
	A2	**A1B**	**B2**	**A2**	**A1B**	**B2**	**A2**	**A1B**	**B2**
CCCMA-CGCM3	1.4	1.1	0.9	2.0	1.3	0.9	2.8	2.2	1.3
CSIRO-MK3	1.0	0.9	0.6	1.9	1.2	0.8	2.6	2.0	1.2
MPI-ECHAM5	1.3	1.1	0.9	2.2	1.4	1.1	2.9	2.3	1.4
NCAR-CCSM3	1.2	0.9	0.7	2.1	1.2	0.9	2.7	2.1	1.3
UKMO-HADCM3	1.1	0.9	0.6	2.0	1.2	0.8	2.6	2.2	1.1
Average	1.2	1.0	0.7	2.0	1.3	0.9	2.7	2.2	1.3

5.4. Rainfall

The result for downscaling of precipitation are shown in Table 5. Most of the GCMs agree, and in general, there is a reduction in precipitation. The magnitude of change varies from month to month and from model to model and also from station to station not in shown the table. There are reductions in rainfall amounts in most stations. The stations with higher rainfall amounts in the northern part of the basin show some slight increases in rainfall amounts, while the stations in the southern part of the basin show decreasing amounts of rainfall. In summary, the basin is likely going to experience higher temperatures and reduced rainfall in general.

Table 5. Downscaling results for rainfall Zambezi Basin. Values in the table represent the Delta change (%) relative to reference period.

	2010–2039			2040–2069			2070–2099		
	A2	**A1B**	**B2**	**A2**	**A1B**	**B2**	**A2**	**A1B**	**B2**
CCCMA-CGCM3	−6	−4	−2	−14	−9	−4	−11	−6	−4
CSIRO-MK3	−4	−2	1	−8	−5	−1	−9	−5	−3
MPI-ECHAM5	−6	−4	−2	−18	−12	−7	−32	−21	−14
NCAR-CCSM3	−2	0	1	−6	−3	−1	−17	−10	−7
UKMO-HADCM3	−6	−4	−2	−12	−5	−3	−26	−16	−11
Average	−5	−2	−1	−12	−7	−3	−19	−12	−8

5.5. River Flows

5.5.1. Model Calibration

The hydrological model calibration was assessed by a combination of manual and numerical criteria, using plots of observed and simulated flows, together with Nash-Sutcliffe R2 parameter corrected for water balance deviation. The observed runoff at Victoria Falls (pump station) was used for this calibration for the period from 1989 to 2002 which had reasonable daily data coverage for both the runoff and rainfall and temperature. Optimal model parameters were determined by automatic model calibration, see Table 6 for the final parameters. Some model calibration result for Zambezi at Victoria Falls is shown in Figure 8. The average R2 value is 0.78 for the entire calibration period with accumulated volume difference of −11 mm, we consider this to be a reasonable good fit, see Table 6.

Table 6. HBV calibration parameters for Zambezi River at Victoria Falls. Dev. denotes the difference in observed total runoff and the simulated runoff during the calibration period.

Description	Parameter	Value	Units
Rain Correction	*PKORR*	0.94	-
Elevation Correction	*HPKORR*	0	-
Field Capacity	*FC*	288	mm
Beta	*BETA*	0.31	-
Evaporation threshold	*LP*	50	mm
Fast Drainage	*KUZ2*	0.03	mm/day
Slow Drainage	*KUZ1*	0.01	mm/day
Threshold	*UZ1*	51	mm
Percolation	*PERC*	2.7	mm
Drainage Coefficient	*KLZ*	0.01	mm/day
Model fit	*R2*	0.78	
Deviations	Q_{dev}	−11	mm

The results are reasonably good, although the model fit towards the 1990s was not so impressive. The likely reason for this poor calibration is the deterioration of data quality towards the 1990s. The HBV-model was also calibrated and used for Kafue River at Kafue Hook Bridge. The model

performance was slightly lower here, with $R2 = 0.75$. Also here, there was a tendency for decreasing model fit towards the 1990s.

The HBV-model was also set up for the mid Zambezi, however, because there was no runoff data available for mid-Zambezi to calibrate the model, parameters from upper-Zambezi were used. Models with the same parameters were also used for other catchments which did not have runoff data for calibration.

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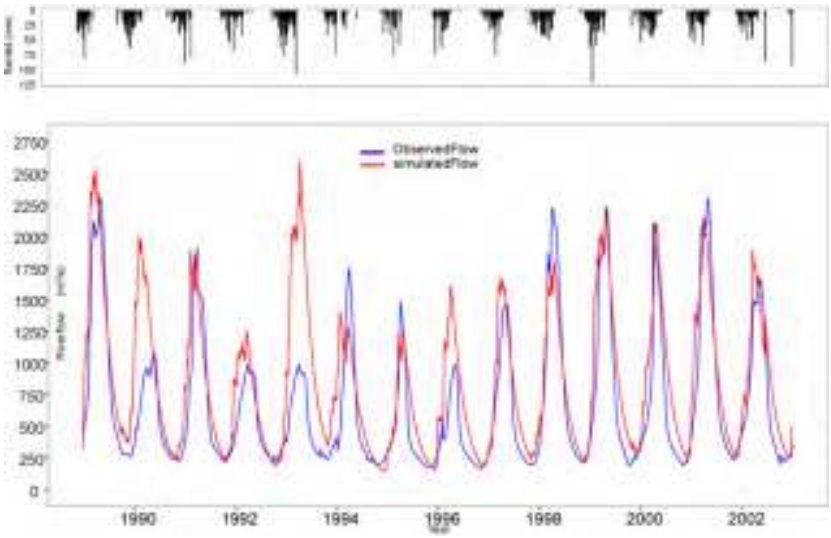

Figure 8. Calibration of Hydrological Model. HBV Calibration Results—Zambezi Basin at Victoria Falls gauging station. The HBV hydrological model was set up with several (5) sub basins. The discharge observations were only available at Victoria Falls (Pump station).

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The hydrological modelling of the Shire River Basin is carried out in a different way. The Shire catchment is different because of its configuration, that is, the bigger portion of the catchment is Lake Malawi, (open water surface) and has many small rivers that flow into Lake Malawi, most of these have no discharge observations. The only discharge observations obtained were for outflow of the Lake Malawi at Liwonde barrage. The modelling is based on the water balance calculations. The method uses estimates of total precipitation (direct rainfall on the lake), evaporation, and runoff from rivers flowing into the lake compared to the outflow from the lake through the Shire River. The difference between the incoming precipitation on the lake plus inflow and evaporation is called "freewater". It is computed and correlated to the outflow. Using this method, the short non-continuous discharge data at the outflow of the Lake Malawi was extended.

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Under various climate change scenarios precipitation and evaporation from the reference period were recomputed by using the corresponding delta-change values, and new runoff series computed.

5.5.2. Simulating Future Runoff

In order to get the runoff series in the future, the calibrated models were run using the future temperature, precipitation and evapotranspiration. For each of the future periods of 30 years, input data to the HBV-models were based on rainfall, temperature and potential evapotranspiration for the reference period, with corresponding Delta change corrections as given in Tables 4 and 5. For further analysis and comparison the simulated flow series is used as representative for the present hydrology (1990s). By using the simulated flow instead of the observed flow, the change in flow will be related only to the change in climate.

5.5.2. Simulating Future Runoff

In order to get the runoff series in the future, the calibrated models were run using the future temperature, precipitation and evapotranspiration. For each of the future periods of 30 years, input data to the HBV-models were based on rainfall, temperature and potential evapotranspiration for the reference period, with corresponding Delta change corrections as given in Tables 4 and 5. For further analysis and comparison the simulated flow series is used as representative for the present hydrology (1990s). By using the simulated flow instead of the observed flow, the change in flow will be related only to the change in climate.

In Table 7 and Figure 9, with Victoria Falls as an example, it can be seen that the runoff for this part of the river decreases in the future. From the current runoff data, using emission scenario A1B, the runoff decreases by 4% in the 2020s, 11% by the 2050s and 16% by the 2080s. Runoff can further decrease even more due to the increasing evapotranspiration from the river basin once the other reservoirs for new hydro power projects that are developed in the basin [53] The changes in runoff based on the hydrological simulations for each period is summarized below in Figure 9.

In Table 7 and Figure 9, with Victoria Falls as an example, it can be seen that the runoff for this part of the river decreases in the future. From the current runoff data, using emission scenario A1B, the runoff decreases by 4% in the 2020s, 11% by the 2050s and 16% by the 2080s. Runoff can further

Table 7. Monthly flow changes in Zambezi River at Victoria Falls. All figures in % of flow in the reference period 1961–1990. Emission scenarios A2, A1B and B2.

Period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Annual
A2													
2020s	96	89	92	99	103	88	90	87	90	94	101	104	94
2050s	88	86	88	89	90	71	85	83	82	89	93	92	86
2080s	84	80	83	82	84	59	71	76	76	83	83	86	79
A1B													
2020s	102	91	92	99	103	94	90	87	90	97	124	119	96
2050s	99	89	90	97	99	90	86	83	82	93	111	110	89
2080s	90	86	88	94	95	88	81	79	76	88	83	86	84
B2													
2020s	109	93	94	99	100	90	89	88	91	97	114	111	98
2050s	104	90	91	96	98	88	83	85	84	94	108	104	94
2080s	90	86	89	93	95	85	80	79	76	90	95	86	87

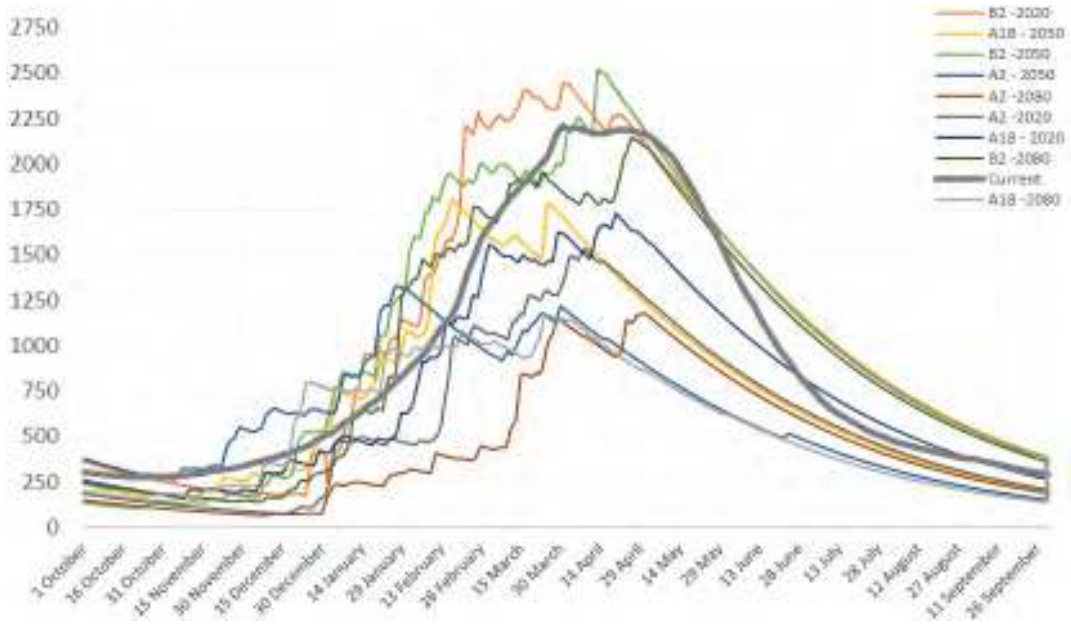

Figure 9. Average annual flow regimes in Zambezi River at Victoria Falls gauging station for the reference period 1961–1990 and for projected future periods for different emission scenarios. The y axis is flow in m^3/s.

Figure 9. Average annual flow regimes in Zambezi River at Victoria Falls gauging station for the reference period 1961–1990 and for projected future periods for different emission scenarios. The y axis is flow in m^3/s.

For the current period, temperature and rainfall from the six stations were used to drive the model. Future climate variables were then used to drive the model to obtain future runoff series. The results shown in Figure 9 highlight that runoff will decrease by 12% in the 2050s, 17% by the 2050s and 23% by the 2080s. Figure 9 summarize the changes in future periods in Zambezi River basin on a monthly basis.

Table 7. Monthly flow changes in Zambezi River at Victoria Falls. All figures in % of flow in the reference period 1961–1990. Emission scenarios A2, A1B and B2.

Period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Annual
A2													
2020s	96	89	92	99	103	88	90	87	90	94	101	104	94
2050s	88	86	88	89	90	71	85	83	82	89	93	92	86
2080s	84	80	83	82	84	59	71	76	76	83	83	86	79
A1B													
2020s	102	91	92	99	103	94	90	87	90	97	124	119	96
2050s	99	89	90	97	99	90	86	83	82	93	111	110	89
2080s	90	86	88	94	95	88	81	79	76	88	83	86	84
B2													
2020s	109	93	94	99	100	90	89	88	91	97	114	111	98
2050s	104	90	91	96	98	88	83	85	84	94	108	104	94
2080s	90	86	89	93	95	85	80	79	76	90	95	86	87

5.6. Hydropower Generation

The hydropower generation at Victoria Falls (A, B, C) were combined into one system (108 MW) although these vary in some detailed features such as total head. Similarly, Kariba North and South Bank Power stations were combined into one system (1470 MW). Cabora Bassa hydropower is the last downstream in the series of hydropower plants simulated, this was also simulated as a unit. The nMAG setup model for Zambezi was first run on the reference period inflows with the observation runoff data or the HBV simulation data for the period 1960–1990 and the results compared to the records of power production. The model simulated the past years well.

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The results of the simulations, shown in Table 8, show that the hydropower system at Victoria Falls does not change much over the simulated periods as it only uses a small percentage of the total volume of flow with some restrictions. It was not possible to get more information about how these restrictions would change with changes in total flow. The current restrictions are seasonally-based. However, the results of hydropower production simulations at Kafue, Kariba Shire and Cabora Bassa hydropower systems indicate that there will be a reduction in the production potential.

Table 8. Changes in production at selected groups of hydropower stations in the Zambezi basin for different emission scenarios.

	Period	Annual Inflow		% Change in Inflow for Scenarios			Annual Generation	% Change in Generation for Scenarios		
		m^3/s	mill.m^3	A2	A1B	B2	GWh	A2	A1B	B2
Victoria Falls	Current	1053	33207				702			
	2020s	1018	32211	−7	**−3**	0	702	0 *	**0 ***	0 *
	2050s	988	31215	−13	**−6**	−4	702	0 *	**0 ***	0 *
	2080s	891	28226	−20	**−15**	−13	702	0 *	**0 ***	0 *
Shire	Current	372	11731				1095			
	2020s	357	11262	−5	**−4**	−1	964	−9	**−7**	−4
	2050s	346	10910	−9	**−7**	−5	920	−14	**−9**	−8
	2080s	327	10324	−14	**−12**	−9	810	−21	**−14**	−12
Kafue	Current	287	9050				5034			
	2020s	253	7964	−15	**−12**	−6	4631	−17	**−8**	−8
	2050s	238	7512	−19	**−17**	−10	4128	−23	**−18**	−13
	2080s	221	6969	−26	**−23**	−15	3322	−37	**−34**	−19
Kariba	Current	1350	42500				7404			
	2020s	1296	40871	−6	**−4**	−1	6812	−9	**−8**	−3
	2050s	1161	36613	−15	**−14**	−5	6071	−19	**−18**	−8
	2080s	1094	34485	−24	**−19**	−10	5109	−30	**−31**	−13
Cahora Bassa	Current	2372	74800				17000			
	2020s	2253	71060	−11	**−5**	−2	15470	−12	**−9**	−4
	2050s	2158	68068	−21	**−9**	−6	13940	−21	**−18**	−9
	2080s	1826	57596	−34	**−23**	−15	12540	−32	**−26**	−15
Sum Zambezi	**Current**	2744	**86531**				**31235**			
	2020s	2610	**82322**	−10	**−5**	−2	**28579**	−12	**−9**	−4
	2050s	2504	**78978**	−16	**−9**	−6	**25761**	−20	**−18**	−9
	2080s	2154	**67920**	−26	**−22**	−14	**22483**	−31	**−28**	−15

* Assuming no change in generation since only a small part of the flow is used in the power plants.

Although there is a lot of detailed results from the simulations for the hydropower plants in the system, only the main five power plant groups in the overall Zambezi system will be summarized. This can be found in Table 8, for different emission scenarios and different periods.

As can be seen in Table 8, the expected changes in the Zambezi hydropower system varies somewhat depending on the choice of time and emission scenario used. Using the A1B (middle) emission scenario, the current production levels are likely to be reduced by 9% by 2020s, 18% by 2050s and 28% by the 2080s. Figure 10 highlights these variations in changes depending on the choice of scenario. Using the A2 ("aggressive") emission scenario, the current production levels are likely to be reduced by 12% by 2020s, 20% by 2050s and 31% by the 2080s. The reductions can be attributed

to reduced rainfall amounts and increased evaporation, resulting in reduced runoff and increased evaporation losses in the reservoirs. The installation of more reservoirs for new hydropower plants in the future may even reduce more runoff [52,53].

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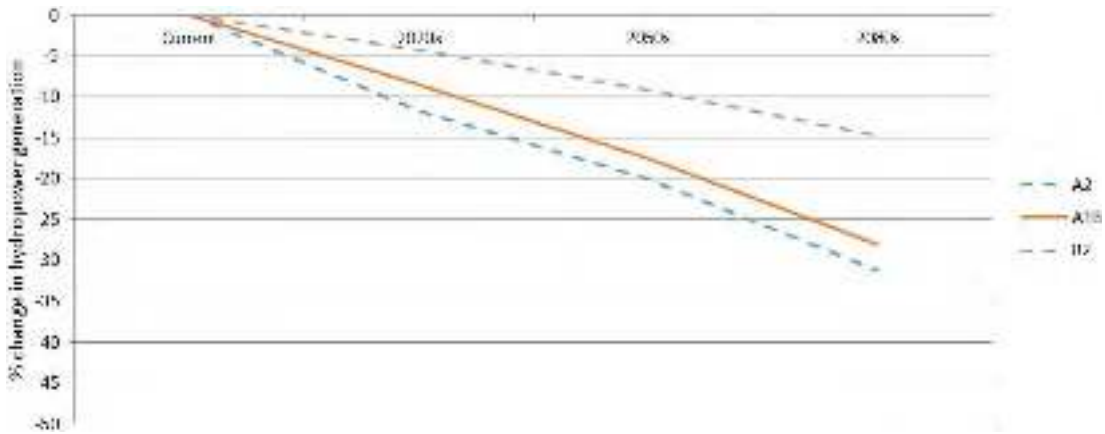

Figure 10. Change in generation capacity (%) for the Zambezi hydropower system for three different emission scenarios (A2, A1B and B2). Computed values for the 2020s, 2050s and 2080s compared to current climate (1961–1990).

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6. Conclusions

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The hydropower production system of southern African region is likely to be strongly affected by changes in climate. These results show that the future climate within and around the Zambezi catchment will get drier with temperatures higher than those in the current period. The temperature projections in the basin indicate an increase up to 2.7 °C by end of the century.

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The rainfall analysis and projections show a decrease in the future precipitation which seem to continue the trend seen for current observations. The resulting effect of these climate changes on water resources is a gradual decrease in river flows, from 14% to 26%, towards the end of the century, depending on emission scenarios.

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As a result of these changes, the water resources available for hydropower generation also decrease, and this will have a significant impact on the hydropower production potential. The results show that there could be a decrease up to 15%–31% in the hydropower production potentials towards the end of the century, again depending on emission scenario. Increased reservoir evaporation is a significant driver of the change in generation, in addition to the change in inflows. Sedimentation is another challenge for many reservoirs, but for the major reservoirs in Zambezi catchment, Lake Malawi, Kariba and the Cahora Bassa, the sedimentation rate is not as high and due to their sizes, it will take very long time for the reservoir volume to be affected by sedimentation.

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This change is an indication that there will be large negative impacts on the hydropower system, and power deficits are likely with the current generation capacities, unless measures are taken. The scenarios presented in this study should serve as indications of direction of change and how large these could be, rather than exact predictions of the impacts of climate change in the basin.

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We feel that these results, like many other impact studies, highlight the fact that planning, development and operation of water resource projects, especially the hydropower stations, need to take into account the impact of a changing climate and the changing land use and water use in this region. Ignoring the impacts resulting from changing climate could result in uneconomical and unsustainable development and operation of water related projects.

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References

1. Tyson, P.D.; Cooper, G.R.J.; McCarthy, T.S. Millennial to multi-decadal variability in the climate of southern Africa. *Int. J. Climatol.* **2002**, *22*, 1105–1117. [CrossRef]
2. Kumar, A.; Schei, T.; Ahenkorah, A.; Caceres, C.; Rodriguez, J.; Devernay, M.; Freitas, M.; Hall, D.; Killingtveit, Å.; Liu, Z. IPCC special report on renewable energy sources and climate change mitigation—Chapter 5 hydropower 2011: Hydropower. In *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*; Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Eds.; International Panel on Climate Change (IPPC): Potsdam, Germany, 2011.
3. Timmermann, A.; Lorenz, S.; An, S.I.; Clement, A.; Xie, S.P. The effect of orbital forcing on the mean climate and variability of the tropical pacific. *J. Clim.* **2007**, *20*, 4147–4159. [CrossRef]
4. Hudson, D.A. Southern African climate change simulated by the genesis GCM. *S. Afr. J. Sci.* **1997**, *93*, 389–403.
5. Joubert, A.M.; Kohler, M.O. Projected temperature increases over southern Africa due to increasing levels of greenhouse gases and sulphate aerosols. *S. Afr. J. Sci.* **1996**, *92*, 524–526.
6. Hulme, M.; Conway, D.; Kelly, P.M.; Subak, S.; Downing, T.E. *The Impacts of Climate Change on Africa*; Working Paper—Centre for Social and Economic Research on the Global Environment; Centre for Social and Economic Research on the Global Environment: Norfolk, UK, 1995.
7. Shongwe, M.E.; van Oldenborgh, G.J.; van den Hurk, B.; van Aalst, M. Projected changes in mean and extreme precipitation in Africa under global warming. Part II: East Africa. *J. Clim.* **2011**, *24*, 3718–3733. [CrossRef]
8. Hewitson, B.C.; Crane, R.G. Consensus between GCM climate change projections with empirical downscaling: Precipitation downscaling over South Africa. *Int. J. Climatol.* **2006**, *26*, 1315–1337. [CrossRef]
9. Lumsden, T.G.; Schulze, R.E.; Hewitson, B.C. Evaluation of potential changes in hydrologically relevant statistics of rainfall in southern Africa under conditions of climate change. *Water SA* **2009**, *35*, 649–656. [CrossRef]
10. Hewitson, B.C.; Tadross, M.A.; Sarr, A.; Jain, S.; Mdoka, M.; Jack, C.; McKellar, N.; Walawege, R. *The Development of Regional Climate Change Scenarios for Sub-Sahara Africa*; Assessment of Impacts and Adaptation to Climate Change Project, Technical Report AF07; START Secretariat: Washington, DC, USA, 2005.
11. Vorosmarty, C.J.; Moore, B. Modeling basin-scale hydrology in support of physical climate and global biogeochemical studies: An example using the Zambezi River. *Surv. Geophys.* **1991**, *12*, 271–311. [CrossRef]
12. Yamba, F.; Walimwipi, H.; Jain, S.; Zhou, P.; Cuamba, B.; Mzezewa, C. Climate change/variability implications on hydroelectricity generation in the Zambezi river basin. *Mitig. Adapt. Strateg. Glob. Chang.* **2011**, *16*, 617–628. [CrossRef]
13. Hughes, D.A.; Andersson, L.; Wilk, J.; Savenije, H.H.G. Regional calibration of the pitman model for the Okavango River. *J. Hydrol.* **2006**, *331*, 30–42. [CrossRef]
14. Andersson, L.; Wilk, J.; Todd, M.C.; Hughes, D.A.; Earle, A.; Kniveton, D.; Layberry, R.; Savenije, H.H. Impact of climate change and development scenarios on flow patterns in the Okavango River. *J. Hydrol.* **2006**, *331*, 43–57. [CrossRef]

15. Folwell, S.; Farqhuarson, F. *The Impacts of Climate Change on Water Resources in the Okavango Basin*; IAHS Press: Wallingford, UK, 2006; pp. 382–388.
16. Andersson, L.; Samuelsson, P.; Kjellström, E. Assessment of climate change impact on water resources in the Pungwe river basin. *Tellus A* **2011**, *63*, 138–157. [CrossRef]
17. Global Carbon Capture and Storage (Global CCS) Institute. Climate Change and Zambezi Hydropower Production. 2016. Available online: https://hub.globalccsinstitute.com/publications/risky-climate-southern-african-hydro-assessing-hydrological-risks-and-consequences-zambezi-river-basin-dams/climate-change-and-zambezi-hydropower-production#table_4 (accessed on 20 June 2016).
18. Randall, S.-F.; Francis, Y.; Hartley, W.; Harald, K.; Bernard, T.; Imasiku, N.; Arthur, C.; Boaventura, C. *Water Supply and Demand Scenarios for the Zambezi River Basin Report*; University of Cape Town: Cape Town, South Africa, 2014.
19. New, M.; Jones, P.D.; Hulme, M. ISLSCP II Climate Research Unit CRU05 Monthly Climate Data. In *ISLSCP Initiative II Collection*; Hall, F.G., Collatz, G., Meeson, B., Los, S., de Colstoun, B.E., Landis, D., Eds.; Oak Ridge National Laboratory Distributed Active Archive Center: Oak Ridge, TN, USA, 2011.
20. Arnell, N.W.; Hudson, D.A.; Jones, R.G. Climate change scenarios from a regional climate model: Estimating change in runoff in southern Africa. *J. Geophys. Res.* **2003**, *108*. [CrossRef]
21. Bates, B.C.; Kundzewicz, Z.W.; Wu, S.; Palutikof, J. *Climate Change and Water*; Technical Report; Intergovernmental Panel on Climate Change: Geneva, Switzerland, 2008.
22. Hulme, M.; Doherty, R.; Ngara, T.; New, M.; Lister, D. African climate change: 1900–2100. *Clim. Res.* **2001**, *17*, 145–168. [CrossRef]
23. Joubert, A.M.; Hewitson, B.C. Simulating present and future climates of southern Africa using general circulation models. *Prog. Phys. Geogr.* **1997**, *21*, 51–78. [CrossRef]
24. Mwendera, E.J. Available water for hydropower generation in Swaziland. *Phys. Chem. Earth* **2006**, *31*, 952–959. [CrossRef]
25. Matondo, J.I.; Msibi, K.M. Estimation of the impact of climate change on hydrology and water resources in Swaziland. *Water Int.* **2001**, *26*, 425–434. [CrossRef]
26. Richard, Y.; Fauchereau, N.; Poccard, I.; Rouault, M.; Trzaska, S. 20th century droughts in southern Africa: Spatial and temporal variability, teleconnections with oceanic and atmospheric conditions. *Int. J. Climatol.* **2001**, *21*, 873–885. [CrossRef]
27. Semazzi, F.H.M.; Burns, B.; Neng-Huei, L.; Jae-Kyung, S. A GCM study of the teleconnections between the continental climate of Africa and global sea surface temperature anomalies. *J. Clim.* **1996**, *9*, 2480–2497. [CrossRef]
28. Semazzi, F.H.M.; Song, Y. A GCM study of climate change induced by deforestation in Africa. *Clim. Res.* **2001**, *17*, 169–182. [CrossRef]
29. Lubini, I.E.; Kitoko, L.S.; Lamfel, F.; Muyingi, H.N. Southern Africa can contribute to solving the global warming problem with its huge hydropower potential. In Proceedings of the 8th IEE International Conference on AC and DC Power Transmission (ACDC 2006), London, UK, 28–31 March 2006; pp. 210–214.
30. Hamududu, B.; Killingtveit, A. Assessing climate change impacts on global hydropower. *Energies* **2012**, *5*, 305–322. [CrossRef]
31. Hamududu, H.B. Impacts of Climate Change on Water Resources and Hydropower Systems in central and southern Africa. Ph.D. Thesis, Department of Hydraulic and Environmental Engineering, Faculty of Engineering Science and Technology, Norwegian University of Science and Technology, Trondheim, Norway, 2012.
32. Jaramillo, F.; Destouni, G. Developing water change spectra and distinguishing change drivers worldwide. *Geophys. Res. Lett.* **2015**, *41*, 8377–8386. [CrossRef]
33. Harrison, G.P.; Whittington, H.W. Vulnerability of hydropower projects to climate change. *IEE Proc. Gener. Transm. Distrib.* **2002**, *149*, 249–255. [CrossRef]
34. Siamachoka, E.M.; Murty, A.S. Variability of African flow regimes—The Zambezi river basin above Lake Kariba as a case study. In *Waterpower '99: Hydro's Future: Technology, Markets, and Policy*; American Society of Civil Engineers (ASCE): Reston, VA, USA, 1999; p. 10.
35. Bergstrom, S.; Carlsson, B.; Gardelin, M.; Lindstrom, G.; Pettersson, A.; Rummukainen, M. Climate Change Impacts on Runoff in Sweden—Assessments by Global Climate Models, Dynamical Downscaling and Hydrological Modelling. *Clim. Res.* **2001**, *16*, 101–112. [CrossRef]

36. Lettenmaier, D.P.; Wood, A.W.; Palmer, R.N.; Wood, E.F.; Stakhiv, E.Z. Water resources implications of global warming: A U.S. regional perspective. *Clim. Chang.* **1999**, *43*, 537–579. [CrossRef]
37. Linder, K.P.; Gibbs, M.J.; Inglis, M.R. *Potential Impacts of Climate Change on Electric Utilities*; Technical Report; ICF, Inc.: Washington, DC, USA, 1987.
38. Landman, W.A.; Mason, S.J.; Tyson, P.D.; Tennant, W.J. Statistical downscaling of GCM simulations to streamflow. *J. Hydrol.* **2001**, *252*, 221–236. [CrossRef]
39. Benestad, R.E. Empirical-statistical downscaling in climate modeling. *EOS Trans. Am. Geophys. Union* **2004**, *85*, 417–422. [CrossRef]
40. Benestad, R.E. Climate change scenarios for northern Europe from multi-model IPCC AR4 climate simulations. *Geophys. Res. Lett.* **2005**, *32*, 1–3. [CrossRef]
41. Benestad, R.E.; Hanssen-Bauer, I.; Chen, D.D. *Empirical-Statistical Downscaling*; World Scientific: Oslos, Norway, 2008.
42. Wilby, R.L.; Dawson, C.W.; Barrow, E.M. SDSM—A decision support tool for the assessment of regional climate change impacts. *Environ. Model. Softw.* **2002**, *17*, 147–159. [CrossRef]
43. Wilby, R.L.; Harris, I. A framework for assessing uncertainties in climate change impacts: Low-flow scenarios for the river Thames, UK. *Water Resour. Res.* **2006**, *42*, W02419. [CrossRef]
44. Bergstrom, S. *Development and Application of a Conceptual Runoff Model for Scandinavian Catchments*; Department of Water Resources Engineering, Lund Institute of Technology, University of Lund: Lund, Sweden, 1972.
45. Bergstrom, S. *The HBV Model—Its Structure and Applications*; SMHI Reports RH, No. 4; Swedish Meteorological and Hydrological Institute (SMHI): Norrkoping, Sweden, 1992.
46. Bergström, S.; Johan, A.; Noora, V.; Bertel, V.; Bergur, E.; Sveinbjörn, J.; Liga, K.; Jurate, K.; Diana, M.B.; Stein, B.; et al. *Modelling Climate Change Impacts on the Hydropower System; Climate Change and Energy Systems Impacts, Risks and Adaptation in the Nordic and Baltic Countries*; Technical Report; Nordic Council of Ministers: Copenhagen, Denmark, 2012.
47. Hargreaves, G.H.; Allen, R.G. History and evaluation of Hargreaves evapotranspiration equation. *J. Irrig. Drain. Eng.* **2003**, *129*, 53–63. [CrossRef]
48. Thornthwaite, C.W. An approach toward a rational classification of climate. *Geogr. Rev.* **1948**, *38*, 55–94. [CrossRef]
49. Killingtveit, A. *nMAG, User Manual*; Department of Hydraulic and Environmental Engineering, NTNU: Trondheim, Norway, 2004.
50. Program for Climate Model Diagnosis and Intercomparison (PCMDI). Available online: http://cmip-pcmdi.llnl.gov/cmip5/data_portal.html (accessed on 10 June 2010).
51. Global Historical Climate Network (GHCN). Available online: http://www.ncdc.noaa.gov/ghcnm/v3.php (accessed on 10 June 2009).
52. Beilfuss, R. Assessing hydrological risks and consequences for Zambezi River Basin dams. In *A Risky Climate for Southern African Hydro*; International Rivers: Berkeley, CA, USA, 2012.
53. Jaramillo, F.; Destouni, G. Local flow regulation and irrigation raise global human water consumption and footprint. *Science* **2015**, *350*, 1248–1251. [CrossRef] [PubMed]

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Annex C8.10.4

Document 4

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September 2013

Free, Prior and Informed Consent of Indigenous Peoples

"At the national level, the Declaration has inspired new legislation and mechanisms for dialogue with indigenous peoples. Despite these positive signs, the promise of the Declaration is far from being universally fulfilled. (…) Rights of indigenous peoples are frequently the first victims of development activities in indigenous lands, often pursued with no regard to the principle of free, prior and informed consent and other guarantees of the Declaration."

Ms. Navi Pillay, United Nations High Commissioner for Human Rights, August 2013. Foreword to the Manual for National Human Rights Institutions.

What is free, prior and informed consent?

The Declaration on the Rights of Indigenous Peoples requires States to consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them (article 19). States must have consent as the *objective* of consultation before any of the following actions are taken:

- The adoption of legislation or administrative policies that affect indigenous peoples (article 19)
- The undertaking of projects that affect indigenous peoples' rights to land, territory and resources, including mining and other utilization or exploitation of resources (article 32).

In certain circumstances, there is an obligation to *obtain* the consent of the indigenous peoples concerned, beyond the general obligation to have consent as the objective of consultations. For example, the Declaration explicitly requires States to obtain consent of indigenous peoples in cases of:

- The relocation of indigenous peoples from their lands or territories (article 10)
- The storage or disposal of hazardous materials on indigenous peoples' lands or territories (article 29)

Furthermore, indigenous peoples who have unwillingly lost possession of their lands, when those lands have been "confiscated, taken, occupied or damaged without their free, prior and informed consent" are entitled to restitution or other appropriate redress (article 28).

Normative foundations of the requirement for free, prior and informed consent

The principle of free, prior and informed consent is linked to treaty norms, including the right to self-determination affirmed in common Article 1 of the International Human Rights Covenants. When affirming that the requirement flows from other rights, including the right to develop and maintain cultures, under article 27 of the International Covenant on Civil and Political Rights (ICCPR) and article 15 of the International Covenant on Economic Social and Cultural Rights (ICECSR), the treaty bodies have increasingly framed the requirement also in light of the right to self-determination.

The principle of non-discrimination is also relevant. In its 1997 General Recommendation No 23 on indigenous peoples, the Committee on the Elimination of Racial Discrimination (CERD), calls on States parties to ensure that indigenous peoples have equal rights to participate in public life and stresses that no decisions relating directly to indigenous peoples are to be taken without their informed consent. With specific reference to land and resource rights, the Committee calls for restitution in situations where decisions have already been taken without the prior and informed consent of the affected indigenous peoples. It has also highlighted the obligation of States to ensure that the right of indigenous peoples to free, prior and informed consent is respected in the planning and implementation of projects affecting the use of their lands and resources. More recently, the Committee on Economic, Social and Cultural Rights (CESCR) has further expanded on free, prior and informed consent in general comment No. 21. In its interpretation of cultural rights, the Committee outlines that the right to participate in cultural life includes the right of indigenous peoples to restitution or return of lands, territories and resources traditionally used and enjoyed by indigenous communities if taken without the prior and informed consent of the affected peoples. It also calls on States parties to "respect the principle of free, prior, and informed consent of indigenous peoples in all matters covered by their specific rights" and to "obtain their free and informed prior consent when the preservation of their cultural resources, especially those associated with their way of life and cultural expression, are at risk".

What is the exact meaning of free, prior and informed consent?

- *Free* implies that there is no coercion, intimidation or manipulation.
- *Prior* implies that consent is to be sought sufficiently in advance of any authorization or commencement of activities and respect is shown to time requirements of indigenous consultation/consensus processes.
- *Informed* implies that information is provided that covers a range of aspects, including the nature, size, pace, reversibility and scope of any proposed project or activity; the purpose of the project as well as its duration; locality and areas affected; a preliminary assessment of the likely economic, social, cultural and environmental impact, including potential risks; personnel likely to be involved in the execution of the project; and procedures the project may entail. This process may include the option of withholding consent. Consultation and participation are crucial components of a *consent* process.

Who should be consulted?

The issue as to from whom the State can seek consent is critical. In this regard, several communities around the world are working on establishing their own protocols on how outsiders should communicate with them to obtain their free, prior and informed consent. The consent of indigenous peoples should be determined in accordance with their customary laws and practices. This does not necessarily mean that every single member must agree, but rather that the consent process will be undertaken through procedures and institutions determined by indigenous peoples themselves. Indigenous peoples should specify which representative institutions are entitled to express consent on behalf of the affected peoples or communities.

Verifying free, prior and informed consent

In addition, mechanisms and procedures should be established to verify that free, prior and informed consent has been sought. In order for these mechanisms to function properly, indigenous peoples must be included in their development. States are to provide effective mechanisms for redress when the free, prior and informed consent of indigenous peoples has not been sought.

The work of OHCHR

OHCHR gives expert guidance on the practical application of the requirement of free, prior and informed consent of indigenous peoples to various key stakeholders ranging from Parliamentarians to national human rights institutions. For example:

- OHCHR has supported the development of specific laws on the rights of indigenous peoples, which clarified the content of the principle of free, prior and informed consent of indigenous peoples in the Republic of Congo and Indonesia. It has also produced training modules and provided technical assistance and expert advice to ensure that national regulations' initiatives comply with existing international standards on free, prior and informed consent in countries such as Bolivia, Mexico, Peru and Ecuador.

- OHCHR has worked closely with the indigenous experts and United Nations agencies involved in the UN Indigenous Peoples' Partnership (UNIPP) to ensure that all UNIPP country programmes are not merely about indigenous peoples, but also designed and implemented in true partnership with indigenous peoples and States.

- In September 2013, OHCHR launched a Manual for National Human Rights Institutions (NHRIs) together with the Asia-Pacific Forum of National Human Rights Institutions (APF) on the UN Declaration on the Rights of Indigenous Peoples, which benefited from inputs from indigenous peoples and contained practical guidance on how NHRIs can help operationalize the standards concerning free, prior and informed consent of indigenous peoples.

- OHCHR also supports the mandates of the Special Rapporteur on the Rights of Indigenous Peoples and the Expert Mechanism on the Rights of Indigenous Peoples, which have been advocating for the respect of the principle of free, prior and informed consent in their communications, reports, expert advice and thematic studies.

Through its Indigenous Peoples and Minorities Section and field presences, OHCHR continued to build indigenous peoples' capacities to strengthen their own institutions with a view to making respect for the principle of free, prior and informed consent a reality for indigenous peoples.

Normative standards and further reading

- UN Declaration on the Rights of Indigenous Peoples (2007)
- Indigenous Peoples and the UN Human Rights System, OHCHR fact sheet No 9 Rev 2 (2013)
- UNDG Guidelines on Indigenous Issues (2008)
- UN Guiding Principles on Business and Human Rights (2011)
- UN-REDD Programme Guidelines on Free, Prior and Informed Consent (2013)
- Reports of the Expert Mechanism on the Rights of Indigenous Peoples and the Special Rapporteur on the Rights of Indigenous Peoples to the Human Rights Council
- Reports of the Working Group on the issue of human rights and transnational corporations and other business enterprises (2013)

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Annex C8.10.5

Document 5

INTERNATIONAL RIVERS
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The Spectacular Batoka Gorge. Source: The Lowdown magazine.

Batoka Gorge Dam, Zambezi River

FLOODING OUT A NATURAL WONDER

The governments of Zambia and Zimbabwe are moving forward with plans to build the Batoka Gorge Dam, not far downstream from the magnificent Victoria Falls on the Zambezi River. Batoka is a large gorge of immense beauty, carved by the Zambezi into the strata of basalt rock over hundreds of thousands of years. The huge hydropower dam (it would be one of Africa's tallest) would create a large reservoir that would impact a UNESCO World Heritage Site, reduce river-based tourism, and drown habitat for endangered bird species.

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The main driver for the dam is to supply power to both Zambia and Zimbabwe. The development of the project will be under the auspices of the Zambezi River Authority (ZRA), a joint body tasked with overseeing development of the Zambezi River stretch shared by the two countries. Two power stations will be constructed (one on the north and the other on the south bank), with a combined capacity of 1,600MW.

According to the available project information, the Batoka hydropower project will have a 181-meter-high dam wall that will hold back 1,680 million cubic meters of water, covering an area of approximately 26 square kilometers. The reservoir will be long and narrow, stretching to just about 1km from the plunge pool of the Victoria Falls. This project is estimated to cost US$4 billion and will take 10-13 years to complete. The preferred option being advanced is the Build-Own-Operate-Transfer (BOT) approach, involving private sector developers. Both the World Bank and the African Development Bank have expressed interest in funding the project, although there is no formalized commitment at the time of this writing.

The gorge is popular with boaters. Photo courtesy The Lowdown magazine

WORLD HERITAGE STATUS

Victoria Falls is recognised the world over as one of the seven natural wonders of the world. It draws millions of people from all over the world and has been a major tourist attraction for more than half a century. In 1989 it was designated a UNESCO World Heritage Site in recognition of its magnificence and in order to afford it world protection.

ENVIRONMENTAL IMPACTS

Although the Batoka Gorge dam site has been under consideration for over 70 years, the first environmental impact assessment for the project was carried out in 1993. The study recommended further environmental studies that were then carried out in 1998. The dam will not inundate land since it will be confined to a long narrow gorge, but will flood all the rapids upstream and reduce the riverine natural habitat. The low settlement density in the area will minimize the number of people that need to be resettled.

The gorge is a habitat for a number of rare bird species, and the project is expected to have major impacts on local endangered species. Birdlife International lists the Batoka Gorge as an 'Important Bird Area' on the basis of its conservation importance. Four species of note breed in the gorge, including the Taita falcon (a small, agile endangered raptor). Another 34 raptor species are also found in the gorge, including rare birds of prey such as Verraux's eagle (previously known as the black eagle).

SOCIAL AND ECONOMIC IMPACTS

Even though the dam is not associated with much human displacement, the social impacts will be significant. The Victoria Falls rapids represent one of the world's best rafting spots, according to the International Rafting Federation. Water sports such as rafting and jet-boating, and land-based tourism to view the gorge scenery and Victoria Falls have created a huge tourism market, contributing to the economies of both countries as well as creating steady, long-term employment for thousands of local people. It is feared that the reservoir may not create the same amount of tourism-related benefits. Jobs resulting from dam construction will be short-term and most local people will not qualify for the highly skilled jobs associated with the project.

It is doubtful that the local communities will benefit much from the dam. The narrow and deep nature of the reservoir may not sustain large populations of fish needed to form a viable fishery. There is no information yet on how surrounding rural communities could benefit, nor have plans been advanced for connecting them to the resultant electricity grid.

IMPACT OF CLIMATE CHANGE

The Zambezi River basin has one of the most variable climates in the world. Its already extreme range of conditions is predicted to experience the worst potential effects of climate change among 11 major African river basins. An extensive report on the hydrological risks to Zambezi River dams by Beilfuss (2012) showed that climate change

is expected to increase variability and vulnerability of the basin. Harrison & Whittington (2002) carried out some climate modeling on the proposed Zambezi dams and found that the Batoka Gorge Dam is likely to lose 6-22% production due to declining rainfall as aresult of a warming climate in the basin. In his 2012 report on the hydrological risks of planned Zambezi dams (Batoka included), Beilfuss reported that these dams are unlikely to deliver the expected services over their lifetime.

In addition to the economic risks from climate change, dam safety is a growing concern on the heavily dammed and hydrologically unpredictable Zambezi. Climate change threatens to bring more extreme floods and other changes to river flow that are not being taken into consideration in dam design or operation. Adding to that, dam safety risks from deferred maintenance, and the difficulties of managing multiple large dams during large flood events could put millions of people at risk in the Zambezi Basin. In early 2014, news broke that the river's largest dam, the half-century-old Kariba Dam (upstream from the Batoka site), was facing structural problems, setting off alarm bells throughout the basin. The governments of Zambia and Zimbabwe are reportedly scrambling to fund $250 million in safety upgrades to the Kariba dam wall.

CURRENT STATUS OF DEVELOPMENT

In December 2012, the Zambezi River Authority put out bids for investors interested in entering a BOT deal for the Batoka project. In April 2013 they announced that six international investors had been shortlisted. The ZRA also advertised for tenders for a new Social and Environmental Impact assessment in 2013, to be funded by the World Bank. At the time of writing these studies were underway.

The Batoka Gorge Dam project needs to incorporate internationally accepted standards for project development. Affected communities in Livingstone and Victoria Falls and other interested citizens should be fully consulted and notified of project plans at all stages. There is also need for a comprehensive energy needs and options assessment in order to come up with the best, least destructive energy development strategies.

In addition, development in the Zambezi basin needs to be better integrated. A basin-wide Cumulative Social and Environmental Impact Assessment should be carried out before the dam project proceeds to the next stage. The Zambezi basin offers numerous ecosystem services that are being compromised by the dam developments. A basin-wide analysis would provide adequate understanding of and accounting for these services.

Batoka Gorge, carved by the mighty Zambezi. Photo courtesy The Lowdown magazine

Climate change predictions have profound implications for future dams in the Zambezi Basin. The river is expected to have a 25-40% reduction in flow by 2050. When climate considerations are incorporated, the financial risks of Batoka Gorge Dam may make it uneconomic.

The Batoka project would be the third large hydropower development on the Zambezi River mainstem, after Kariba and Cahora Bassa, and the tenth large reservoir on the Zambezi system. The existing dams have already exerted huge impacts that include degradation of coastal mangroves; reduction in freshwater and prawn fisheries, floodplain agriculture, floodplain water supply and wildlife carrying capacity; and biophysical impacts such as the downcutting channels in the delta and reduction of the water table level. An additional dam would worsen these impacts. The project's social and environmental impact assessment scope is confined only to the project area. A Cumulative Social and Environmental Impact Assessment is the best tool to identify and manage the incremental impacts caused by an additional dam to the basin and especially downstream of all these developments.

IS BATOKA THE BEST SOLUTION FOR ZAMBIA AND ZIMBABWE'S ENERGY NEEDS?

Batoka is a huge investment for the poor nations of Zambia and Zimbabwe, andits risks are very high. With climate change already affecting the Zambezi basin, the dam's predicted revenue may never be realized. Zambia is very dependent on hydropower for its electricity supply. To minimize these risks, a comprehensive climate risk and options assessment must be conducted to ensure that the economic benefits are realistically assessed.

Zambia's current power production of 1,800MW is reported to have a shortfall ofjust 75MW during peak hours; this amount can be easily made up by upgrading existing power plants such as Kariba and Itezhi Tezhi, and instituting long-term energy efficiency measures. It is understood that Zambia will have a capacity of 3,000 MW in 2015 without including Batoka scheme, allowing it to export excess power.

Zimbabwe has a deficit estimated to be about 800MW. While Zimbabwe needs the power most, there are several cheaper options that will not involve destroying natural heritage and creating unsustainable debt for the country. The options include energy efficiency measures as well as promoting renewable energy options. An options assessment for energy in both countries is necessary.

These nations should think twice before condemning a beautiful gorge to destruction for the sake of less than 2,000 MW of power. There are cheaper, more sustainable options available for development.

Besides the rare bird species that will lose their ancestral habitats, local people around Victoria Falls and Livingstone in Zambia and Zimbabwe will be casualties as they lose their source of livelihood. The gorges and Victoria Falls have been asource of income to many through the tourism industry. The loss of the $4 million a year rafting industry and the jobs it brings must be weighed as well. For Zimbabwe, the additional debt that comes with such a costly project will create a huge burden for the country.

RESOURCES

UNESCO, "Mosi-oa-Tunya/Victoria Falls" http://whc.unesco.org/en/list/509

The Travel Guide to Victoria Falls, "Batoka Gorge Dam: Dam proposal threatens white-water rafting on the Zambezi" http://www.victoriafalls-guide.net/batoka-gorge-dam.html

The Lowdown Magazine. "Our Gorgeous Gorge" May 2013 http://www.lowdownzambia.com/2013/05/31/our-gorgeous-gorge

Beilfuss, Richard, 2012. "A Risky Climate for Southern African Hydro. Assessing Hydrological Risks and Consequences for Zambezi River Basin Dams." http://www.internationalrivers.org/node/7673

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Annex D

Heritage Impact Assessment Methodology

Those sites both directly and indirectly impacted can be rated according to magnitude and sensitivity of impact. Magnitude refers to the extent that the site may be impacted in terms of area that will be damaged and changes to current access to the site. Sensitivity considers the site's uniqueness; its local/national/international significance; the community values that it carries; and its scientific importance in terms of research potential. *Table 1.1* combines these attributes to provide a 'Rating Significance' from which relevant mitigation proposals are established.

Table 1.1 Means by which to Determine Cultural Heritage Site significance[1]

			Cultural Heritage Site Sensitivity		
			Low	Medium	High
Definitions			**Defining Characteristic(s):** Site is not specifically protected under local, national, or international laws or treaties; Site can be moved to another location or replaced by a similar site, or is of a type that is common in surrounding region; site has limited or no cultural value to local, national, or international stakeholders; and/or site has limited scientific value or similar information can be obtained at numerous sites. (Replicable Cultural Heritage)	**Defining Characteristic(s):** Site is specifically or generically protected by local or national laws but laws allow for mitigated impacts; Site can be moved or replaced, or data and artifacts recovered in consultation with stakeholders; Site has considerable cultural value for local and/or national stakeholders; and/or Site has substantial scientific value but similar information can be obtained at a limited number of other sites. (Non-replicable Cultural Heritage)	**Defining Characteristic(s):** Site is protected by local, national, and international laws or treaties; Site cannot be moved or replaced without major loss of cultural value; Legal status specifically prohibits direct impacts or encroachment on site and/or protection zone; Site has substantial value to local, national, and international stakeholders; and/or Site has exceptional scientific value and similar site types are rare or non-existent. (Critical Cultural Heritage)
Magnitude of Impact	Negligible	No discernible change in the physical condition, setting, or accessibility of the site.	Negligible	Negligible	Negligible
	Small	Small part of the site is lost or damaged, resulting in a loss of scientific or cultural value; Setting undergoes temporary or permanent change that has limited effect on the site's perceived value to stakeholders. Stakeholder/public or scientific access to site is temporarily impeded; and/or Historic building suffers minor, reparable, structural damage.	Negligible	Minor	Moderate
	Medium	A significant portion of the site is lost or damaged, resulting in a loss of scientific or cultural value; Setting undergoes permanent change that permanently diminishes the site's perceived value to stakeholders; Site becomes inaccessible for the life of the Project to stakeholders including traditional users or researchers; and/or Historic building suffers major structural damage that is not reparable.	Minor	Moderate	Major
	High	The entire site is damaged or lost, resulting in a nearly complete or complete loss of scientific or cultural value; Setting is sufficiently impact to cause site to lose nearly all or all cultural value or functionality; Site becomes permanently inaccessible to stakeholders including traditional users or researchers; and/or Historic building suffers major structural failure.	Moderate	Major	Major

[1] ERM , 2012, Annex B – 5: p. 15

Annex E

Grievance Redress Mechanism

Table 1.1 Definition of Key Terms

Term	Definition
Affected Party(ies)	Stakeholders who are affected by the company or operation, both positively and negatively. Within this it is possible to distinguish between those that are directly affected and indirectly affected by the company or operation.
Environmental and Social Impact Assessment	Process of evaluating and addressing potential social and environmental impacts resulting from ZRA's Project and identifying any mitigation or corrective measures that will enable the project to meet the requirements of the World Bank Operational Standards, IFC Performance Standards and applicable Zambian and Zimbabwean laws and regulations.
Grievance	An issue, concern, problem, or claim (perceived or actual) that an individual or community group wants a company or contractor to address and resolve.
Grievance Database	System for logging and monitoring all grievances received, including any records of communication/consultation and details of grievance settlement.
Facilities / Operation(s)	A location or activity that is operated by ZRA or its contractors for the purpose of the Project. Locations could include the dam, construction camps, permanent villages, power houses, switchyard, access roads transmission lines, and offices including corporate head offices etc.
Records of communication / consultation	Records of communication / consultation may include key e-mails, letters, newsletters, memorandums, complaints, opportunities for improvement, records of distribution/attendance, records of formal and informal meetings and records of commitments.
Stakeholder	Persons or groups that are directly or indirectly affected by a project as well as those that may have interests in a project and/or the ability to influence its outcome, either positively or negatively. This can refer to shareholders, lenders, employees, communities, industry, governments and international third parties.
Stakeholder engagement	An umbrella term encompassing a range of activities and interactions between ZRA and stakeholders (two way communication) over the life of a project that are designated to promote transparent, accountable, positive, and mutually beneficial working relationships.
Vulnerable Groups	Individuals or groups within the project area of influence who could experience adverse impacts more severely than others based on their vulnerable or disadvantaged status. This vulnerability may be due to an individual's or group's ethnicity, gender, language, religion, political views, dependence on natural resources, sickness or disability or other factors.

1 GRIEVANCE REDRESS MECHANISM

1.1 INTRODUCTION

The Zambezi River Authority (ZRA) is a statutory body and was established in 1987. It is jointly and equally owned by the Governments of Zambia and Zimbabwe. It is responsible for overseeing the development of the Zambezi River, which runs through the two countries. The ZRA, alongside the Governments of Zimbabwe and Zambia, is proposing to develop the Batoka Gorge Hydro-Electric Scheme (BGHES) on the Zambezi River at Batoka Gorge.

The BGHES will provide up to 2,400 MW. It will help the Governments of Zambia and Zimbabwe to address power shortages being faced by the two countries and the region as a whole.

The proposed BGHES is anticipated to impact both directly and indirectly, positively and negatively on communities in the Project area and upstream and downstream of the proposed scheme. These impacts can potentially affect the lives of people living and working in these communities, thus giving rise to grievances. These potential grievances may relate to any aspect of the Project. They might be felt and expressed by a variety of parties including individuals, groups, communities, entities, or other parties affected or likely to be affected by the social or environmental impacts of the Project.

1.2 PURPOSE

The purpose of this Grievance Redress Mechanism is to outline the Zambezi River Authority's (ZRA) approach to accepting, assessing, resolving and monitoring grievances from those affected by ZRA's, and its Contractors', activities in relation to the BGHES. The aim is to identify and manage grievances from individual stakeholders or stakeholder groups. Timely redress or resolution of such grievances is vital to ensure successful implementation of the project

Grievances can encompass minor concerns as well as serious or long-term issues. They might be felt and expressed by a variety of parties including individuals, groups, communities, entities, or other parties affected or likely to be affected by the social or environmental impacts of the Project. It is essential to have a robust and credible mechanism to systematically handle and resolve any complaints that might arise in order that they do not escalate and present a risk to operations or the reputation of the company (nationally or internationally). If well-handled, an effective grievance redress mechanism can help foster positive relationships and build trust with stakeholders.

This Grievance Redress Mechanism has been considered in parallel to the Stakeholder Engagement Plan (SEP) (refer to *Annex B* of the main ESIA

document) due to the inter-relationship between these two planning mechanisms. It has been designed to meet the legal requirements of both Zambia and Zimbabwe and the requirements of the International Finance Corporation (IFC) in relation to grievance management.

The mechanism for addressing employee grievances is not addressed through this mechanism, which is solely to manage the interface with external stakeholders.

1.3 SCOPE

This Grievance Redress Mechanism will be applied to stakeholder complaints and grievances, perceived or actual, which relate to the activities of the ZRA and its Contractors' undertaken in relation to the BGHES.

A complaint or grievance is an issue, concern, problem, or claim (perceived or actual) that an individual stakeholder or community group has related to ZRA and its contractors' operations and activities. The mechanism does not impede access to judicial or administrative resolutions.

1.4 APPLICATION

This Grievance Redress Mechanism provides guidance to all ZRA employees and Contractors on receiving, registering, assessing and resolving community complaints or grievances emanating from ZRA's operations and activities in relation to the BGHES. The fundamental objective of this mechanism is to:

- Provide a predictable, transparent, and credible process to all parties for resolving grievances, resulting in outcomes that are seen as fair, effective, and lasting;
- Build trust as an integral component of broader community relations activities; and
- Enable more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

To maximise the effectiveness of the Grievance Redress Mechanism, ZRA shall uphold the following values during implementation and operation of the system:

- Commitment to fairness in both process and outcomes;
- Freedom from reprisal for all involved parties – within ZRA and in the external stakeholder group;
- Clear operating rules, and accountability;

- Validity of all complaints submitted;
- Culturally accessible and applicable;
- Accessible to vulnerable groups of stakeholders; and
- Confidentiality if requested.

1.5 *NOTIFICATION*

ZRA (Chief Executive) will proactively inform affected communities and the wider stakeholder group of the details of the Grievance Redress Mechanism. This will include information about where people can go and who they can talk to if they have a grievance. This information shall be widely and regularly publicised, throughout the duration of the public consultation exercise, through meetings and the distribution of fliers.

ZRA will provide the information in a format and languages that are readily understandable by the local population and/or orally in areas where literacy levels are low during routine stakeholder engagement.

1.6 *ROLES, RESPONSIBILITIES AND RESOURCES*

Implementation of the Grievance Redress Mechanism for the BGHES will be the ultimate responsibility of the Grievance Manager. The Grievance Manager will be supported by a wider team. The various roles of the ZRA Grievance Management Team are detailed below:

Grievance Manager

The Grievance Manager will:

- Implement the Grievance Redress Mechanism procedure and management system providing guidance on solutions to complaints and grievances in consultation with the relevant departments and ensure consistency of redress for all grievances received in relation to the BGHES.
- Promote the Grievance Redress Mechanism to maintain momentum and ensure company wide and community commitment to, and understanding of, its implementation and operation.
- Involvement in the investigation of grievances and the agreement of redress as well as overseeing interaction between various ZRA Departments and contractors as well as the senior managers as required.

All ZRA Departments and Contractors

ZRA Departments and Contractors will:

- Receive and acknowledge any issue, concern, complaint or grievance from the community, verbally or in writing. They will record the issue and report it to the Grievance Manager in compliance with the Grievance Redress Mechanism procedure.
- Involvement in the investigation of grievances as required depending on the nature and severity of the grievance and as directed by the Grievance Management team.

ZRA Chief Executive

The ZRA Chief Executive will:

- Ensure that this Grievance Redress Mechanism procedure is applied through all ZRA and Contractor departments and levels that are undertaking activities related to the BGHES.
- Apply necessary controls to minimise risks that could result in stakeholder grievances.
- Contribute to the resolution and sign off of any grievances which have international repercussions.

The following resources will also need to be in place:

- An auditable system for receipt, recording and tracking of the process (for example a grievance log, database etc.) shall be in place.

- Dedicated budget for resourcing management of Grievance Redress Mechanism and addressing grievances through financial or in-kind compensation as and when needed.

1.7 THE GRIEVANCE PROCESS

A Grievance Redress Mechanism must be a simple process whereby stakeholders can submit their complaints free of charge and, if necessary, anonymously or via third parties. It should allow complaints to be submitted in more than one format.

The following steps outline the process that may be followed to resolve a grievance. This process is presented in a diagram in *Figure 1.1* and all grievance forms are contained in *Appendix A.*

Figure 1.1 Grievance Process

Process	Description	Time
1. Receive and Log Grievance	• Face to face meeting with Stakeholder • Phone, fax, letter or email • Recorded by ZRA staff • Completion and submission of grievance form • Record grievance in Grievance Form and log on Grievance Database	1 day
2. Acknowledge Grievance	• Receipt of grievance acknowledged through appropriate communication medium, but to be recorded in writing	5 days
3. Assess and Investigate	• ZRA to assess and assign grievance significance • Consult with relevant parties • May require site visits and discussions with other stakeholders	7 days
4. Grievance Resolution	Identify further action required Response provided to complainant including, if necessary an indication of additional time and resources required to resolve grievance	28 days after receipt of grievance
5. Sign-off	• Confirm with complainant that grievance can be closed, or determine what follow-up is necessary. • If the grievance is to be closed, grievance sign-off is required	37 days after receipt of grievance
6. Monitor	• Record final sign-off of grievance according to significance • If grievance cannot be closed return to step 2 to re-assess or recommend whether third-party arbitration is necessary	37 days – 3 months, dependent on significance

The process of reporting a grievance should be easily accessible and un-intimidating to any stakeholder. The preferable channels for reporting grievances can be discussed with the community as part of community engagement.

Following the establishment of the channels above, the method for addressing grievances is systematic and is divided into six key steps. These are as follows:

- Step 1: Receive and log grievance;
- Step 2: Acknowledge grievance;
- Step 3: Assess and Investigate;
- Step 4: Grievance Resolution;
- Step 5: Sign-off on grievance; and
- Step 6: Monitor.

1.7.1 *Step 1: Receive and Log Grievance*

Grievances can be submitted in writing, telephonically or presented verbally to the Grievance Manager using the following details:

Name: The Project Manager – BGHES
Phone number: +260 211 228401/2, +260 211 227970/1 or +260 211 238665
Email: zaraho@coppernet.zm and Batoka@zaraho.org.zm
Address: Kariba House, 32 Cha Cha Cha Road, P.O Box 30233, Lusaka, Zambia.

The grievance is received by the ZRA or a Contractor representative and is forwarded to the Grievance Manager.

All grievances shall be logged using the Stakeholder Grievance Form *(Appendix A)*. ZRA will log, document and track all grievances received within the secure ZRA grievance database system (refer to *Appendix B* for an example of a grievance database). Grievances shall be assigned a case number and records of communication/consultation shall all be attached with the relevant entry and filed. The database shall be monitored regularly for recurring grievances so that appropriate mitigation can be developed. Refer to *Box 1.1* for tips on receiving grievances. As a minimum the following information shall be recorded:

- Case number;
- Complainant's name and contact details; (1)
- Date of complaint;
- Details of complaint;
- History of other complaints / queries / questions (if known);
- Resolutions discussed and agreed with the party(ies) in question;
- Actions implemented (including dates); and
- Outcome of the actions implemented.

(1) Name and contact details are necessary for interaction around the resolution of the grievance. Anonymous submissions will be permitted, but the party submitting should understand that direct response will not be possible.

Box 1.1 Tips for Receiving a Grievance

- Regardless of who receives the grievance, it needs to be forwarded to Grievance Manager for attention.
- The grievance redress mechanism should make it possible to lodge a grievance in any appropriate format (written, verbal, telephonic, email, post etc.). Consideration should be given to capturing concerns raised informally or indirectly (e.g., through perception studies, media reports, social media, etc.).
- It is important that the process is easily accessible and not intimidating to stakeholders.
- Regardless of the form of the complaints, all need to be addressed with the same sincerity and seriousness.
- The Grievance Manager will be required to be in touch with the complainant at least once per month to provide feedback on the grievance.

1.7.2 Step 2: Acknowledging Receipt of a Grievance

ZRA shall acknowledge receipt of any grievance as soon as possible, but up to seven days from the date it was submitted and shall inform the complainant about the timeframe in which a response can be expected. A Grievance Receipt Form (*Appendix A*) shall be signed and a copy provided to the complainant. Refer to *Box 1.2* for tips on acknowledging grievances.

Box 1.2 Tips for Acknowledging a Grievance

- Literacy levels should be taken into consideration when providing the complainant with the acknowledgment of receipt, and verbal acknowledgement should accompany a written acknowledgement.
- Where appropriate acknowledgement should be provided through the Grievance Manager.

1.7.3 Step 3: Assess and Investigate Grievance

The following steps shall be performed in a timely manner to avoid delaying resolution of a grievance:

1. Obtain as much information as possible from the person who received the complaint, as well as from the complainant to gain a first-hand understanding of the grievance.
2. Undertake a site visit, if required, to clarify the parties and issues involved. Gather the views of other stakeholders including ZRA employees, if necessary and identify initial options for settlement that parties have considered.
3. Determine whether the grievance is eligible.
    - Eligible grievances include all those that are directly or indirectly related to ZRA's BGHES Project and that fall within the scope of the Grievance Redress Mechanism as outlined above.
    - Ineligible Complaints may include those that are clearly not related to ZRA BGHES Project or its contractors' activities, whose issues fall outside the scope of the Grievance Redress Mechanism

procedure or where other ZRA or community procedures would be more appropriate to address the grievance.

4. If the grievance is deemed ineligible it can be rejected however a full explanation as to the reasons for this must be given to the complainant and recorded in the Grievance Database.
5. If the grievance is eligible, determine its severity level using the significance criteria in *Box 1.3*. This will help to determine whether the grievance can be resolved immediately or requires further investigation and whether senior management will need to be informed of the grievance.
6. If the grievance concerns physical damage, (e.g. crop, house, community asset) take a photograph of the damage and record the exact location as accurately as possible.
7. Inform the complainant of the expected timeframe for resolution of the grievance.
8. Enter the findings of the investigation in the Grievance Database.

ZRA will aim to resolve any grievances within 30 days from the date that it was received. This timeframe can be extended to 60 days for more complex grievances (e.g. level 4 grievances), if required. (Please see point 6 on assessing grievance significance).

Box 1.3 ***Significance Rating Criteria***

Significance Level	Type of Grievance	Responsibilities
Level 1	A grievance that is isolated or 'one-off' and essentially local in nature and restricted to one complainant. Note: Some one-off grievances may be significant enough to be assessed as a Level 4 grievance e.g. when a national or international law is broken (see Level 4 below)	Grievance Manager
Level 2	A grievance that extends to the local community or region and has occurred more than once, which is judged to have the potential to cause disruption to ZRA operations or to generate negative comment from local media or other local stakeholders	Project Executive
Level 3	A grievance which is widespread and repeated or has resulted in long term damage and/or has led to negative comment from local media, or is judged to have the potential to generate negative media and local stakeholder comments (e.g. damage to a sacred site or flooding of local school)	Project Executive
Level 4	A one-off complaint, or one which is widespread or repeated and , **in addition,** has resulted in a serious breach of ZRA policies, Zambian or Zimbabwean or International Law and/or has led to negative national/international media attention, or is judged to have the potential to generate negative comment from the media or other key stakeholders (e.g. failure to pay compensation where appropriate, e.g resettlement)	ZRA Chief Executive

1.7.4 Step 4: Grievance Resolution

All grievances shall be dealt with on a case by case basis. However, all will require further discussions with complainants and community members that seek to jointly identify and select measures for grievance settlement. This will

help to increase ownership of solutions and to mitigate perceptions that resolutions unfairly benefit ZRA.

- An incident investigation team may be tasked with seeking resolution to the grievance. This may entail a dialog or series of dialogs between affected parties to find a solution to the grievance. Alternatively, it may entail investigating the underlying cause of the grievance and action any changes required to internal systems to prevent a recurrence of a similar grievance.

- An Incident Investigation Report will be completed within 28 days (considered good practice).

- During the 28 days of dialog or investigation, the Grievance Manager will co-ordinate conflict resolution activities necessary to contain and resolve any actual or potential conflicts arising from the reported grievance, refer to *Box 1.2* for tips for resolving grievances. If the case is complex and the stated resolution timeframe cannot be met, an interim response will be provided (oral or written) that informs the stakeholder of the delay, explains the reasons, and offers a revised date for next steps.

Where possible, grievances will be addressed directly by ZRA. The resolution proposal shall be respectful and considered, including rationale for the decision and any data used in reaching it. If wider consultation is necessary, grievances will be forwarded to a third party. This third party should be neutral, well-respected, and agreed upon by both ZRA and the affected parties. These may include public defenders, legal advisors, local or international NGOs, or technical experts. In cases where further arbitration is necessary, appropriate government involvement will be requested.

As a last resort, aggrieved parties have a right to take legal action. This is a more formal rights based approach that shall only be taken if all other approaches have failed or when there are serious conflicts about facts and data. The final decision will be taken by the arbitrator or courts based on compliance with laws, policies, standards, rules, regulations, procedures, past agreements or common practice.

Box 1.2 Tips for Resolving Grievances

- Grievance verification is especially important when the grievance is about another stakeholder or group of stakeholders. For example the community may make claims against a contractor that need to be investigated before acted upon.
- A regular forum to discuss grievances could be in the form of a monthly meeting where general and Risk Level 1 grievances are discussed. This forum can be constituted more frequently or as is needed especially in the case of Risk Level 2 and 3 grievances. This is particularly relevant to phases of the project that are likely to result in the highest degree of impact (e.g., construction).
- It is important to be transparent about the mechanism to resolve the issue. The appropriate level of action may require further consultation. Also, the issue may be symptomatic of a bigger issue. When this arises, both the symptom and the cause need to be addressed and resolved. For example, a complaint about job seekers setting up informal housing near the site may be raised as an issue related to informal housing but may also be symptomatic of an issue around influx of people and associated negative impacts.
- There are instances where grievances cannot be resolved in 28 days. In these cases, monthly updates must be given to the stakeholders who raised the grievance to provide them a report on progress.

1.7.5 Step 5: Sign-off on Grievance

- The Grievance Manager will seek sign-off from the complainant(s) that the grievance has been resolved.

- In instances where the stakeholder is not satisfied with actions taken, the grievance will either:
    1. Be escalated to senior management and a decision will be taken either to implement supplementary actions or to consider initiating an appeal process;
       OR
    2. The Grievance Manager will approach a neutral or third party to assist in mediating and resolving the grievance;
       OR
    3. The Grievance Manager will approach the host country's judiciary to further address the grievance.

- Following this process, the Grievance Manager will again approach the stakeholder to obtain sign-off on actions implemented.

- The staff member who signs off the complaint should have sufficient knowledge about the topic to provide assurance.

- Once sign-off has occurred, this should be recorded in the Grievance Log.

1.7.6 Step 6: Monitoring and Reporting

ZRA management will monitor grievances routinely as part of the broader management of the Project. This entails good record keeping of complaints raised throughout the life of the construction and operation of the Project. On receipt of grievances, electronic notification to management must be

distributed. Grievance records must be made available to management at all times.

Monthly internal reports will be compiled by the Grievance Manager and distributed to the management team. These grievance reports will include:

- The number of grievances logged in the proceeding period by level and type.
- The number of stakeholders that have come back after 30 days stating they are not satisfied with the resolution.
- The number of grievances unresolved after 60 days by level and type.
- The number of grievances resolved between ZRA and complainant, without accessing legal or third party mediators, by level and type.
- The number of grievances of the same or similar issue.
- ZRAs' responses to the concerns raised by the various stakeholders.
- The measures taken to incorporate these responses into project design and implementation.

These reports and other records will be made available for external review if required.

An appropriate grievance report should be part of ZRA's annual reporting. Annual reports will be made available to the public. A hard copy will be located at the ZRA offices, and an electronic copy will be made available online.

Appendix A

Stakeholder Grievance Forms

STAKEHOLDER GRIEVANCE LOG

To be completed by ZRA personnel (if grievance being submitted in person) or person submitting complaint

Grievance Record			
Reference No: (for official use)			
Anonymous:	**Yes**	**No**	
Full Name:			
Contact Information: **Please mark how you wish to be contacted (letter, telephone, e-mail).**			☐ **Address/village/traditional authority and ward:** _____ _____ _____ _____ _____ ☐ **Telephone:** _____ ☐ **E-mail:** _____
Preferred Language for communication			
Description of Incident or Grievance:			What happened? Where did it happen? Who did it happen to? What is the result of the problem?
Date of Incident/Grievance			
			☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?			
Additional Comments:			

GRIEVANCE RECORD – TO BE USED AS PART OF THE DATABASE

Grievance Record			
Grievance Number:	Date Submitted:	Target Date for Resolution:	
Name:			
Address and Contact Details			
Grievance Received By:			
Name of Grievance Coordinator:			
Description of Grievance:			
Assessment of Grievance Level:		Notification to CEO or other senior management?	Y/N

Actions to Resolve Grievance			
Delegation to:			
Action	**Who**	**When**	**Completed Y/N/Date**
Response/Resolution:			
Strategy to Communicate Response:			
Sign-Off:			
Date:			

Conclusion			
Is complainant satisfied?	Y/N	Comments from Grievance Coordinator	
Grievance Closed?	Y/N	Grievance Resubmitted?	Y/N
Signature of CEO:		Date:	
Date:		New Grievance Number:	

GRIEVANCE RECEIPT FORM – TO BE USED TO ACKNOWLEDGE GRIEVANCES SUBMITTED

Grievance Receipt Form		
Grievance Number:	Date Submitted:	Target date for initial meeting to address grievance:
Name:		
Address and Contact Details		
Grievance Received By:		
Name of Grievance Coordinator:		
Contact details of Grievance Coordinator	Telephone: Email: Address:	

Annex B

Grievance Tracker

BGHES: Grievance Tracker

Number	Date	Recipient	Complainant (Stk Name and Title)	Description of Grievance	Priority	Step (1-6)	Action	Responsible for resolution	Status (Open/Closed)	Findings	Resolution	Date of Close out	Additional Comments/Follow up
EXAMPLE: 1234	2018/01/17	CLO	Mr A. Smith	Claim of crop damage due to increased dust on land plot close to Project area	Medium	Step 4	Investigate and Resolve grievance	CLO	Open	TBC	TBC	Grievances should be resolved with	TBC

Annex F

Biophysical Baseline Data

-Water Abstraction Data
-Water Quality Data
-Biodiversity Species Lists

F1 WATER ABSTRACTION DATA

Table F1.1 Zambian Side

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
Buleyamalima Cooperative	Sinazongwe	Buleyamalima	Lake Kariba		73.6	Irrigation	-17.1245	27.54056
Blue Water Fisheries	Sinazongwe	Buleyamalima	Lake Kariba	N/A	0	Crocodile Farming	-17.131222	27.54536
Crochide	Sinazongwe	Sinazongwe	Lake Kariba	21	0	Domestic/ Crocodile Farming	-17.1646111	27.531078
Zambeef	Sinazongwe	Sinazongwe	Lake Kariba	86400	2000	Irrigation	-17.22533	27.463139
Lwiimbo Lwa Zambezi Safris Limited	Sinazongwe	Siansowa	Lake Kariba	10	0	Domestic	-17.45036	27.38158
Maaze Holdings	Sinazongwe	Siansowa	Lake Kariba	80	0	Domestic	-17.45069	27.38681
Zongwe Farming Enterprises	Sinazongwe	Siansowa	Lake Kariba	3500	0	Crocodile Farming	-17.45303	27.38158
Siatwinda Irrigation Scheme	Sinazongwe	Siatwiinda	Lake Kariba	0	69	Irrigation	-17.43933	27.31672
Luchinze Crocodiles	Maamba	Lunchinze	Lake Kariba	200	0	Crocodile Farming	-17.34756	27.400972
Lakar Fishing Limited	Maamba	Sialwala	Lake Kariba	0.5	0	Kapenta Fisheries	-17.28597	27.41256
Maamba Collieries	Maamba	Sialwala	Lake Kariba	6000	0	Domestic/ Mining	-17.28564	27.411667
Adria F. C	Chipepo	Chipepo	Lake Kariba	0.04	0	Domestic	-16.79458	27.88252
Chipepo High School	Chipepo	Chipepo	Lake Kariba	721	0	Domestic	-16.80136	27.872417
Southern Water & Sewerage-L/Stone	Livingstone	Livingstone	Zambezi River	0.5	0	Domestic	-17.88519	25.840139
Sun International (Z) Ltd	Livingstone	Livingstone	Zambezi River		0	Domestic	-17.9132941	25.86153

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
Zesco (Victoria Falls Power Station)	Livingstone	Livingstone	Zambezi River	610	0	Domestic/ Power generation	-17.932941	25.86153
SWASCO (Kazungula)	Kazugula	Kazugula	Zambezi River		0	Domestic	-17.78922	25.26683
Mambova Investments	Kazugula	Mambova	Zambezi River	4	0	Domestic	-17.74886	25.18844
Mililo Mr	Kazugula	Kazugula	Zambezi River	1	0.5	Irrigation	-17.79486	25.27375
Next Trading Pty Ltd	Kazugula	Kazugula	Zambezi River	1	0	Domestic	-17.79817	25.28031
Katombora Reformatory School	Kazugula	Kazugula Road	Zambezi River	174	1.25	Domestic/ Irrigation	-17.83594	25.40583
Royal Chuundu	Kazugula	Kazugula Road	Zambezi River	5	0	Domestic	-17.84319	25.41756
Mystique Investments	Kazugula	Kazugula Road	Zambezi River	2.6	0	Domestic	-17.83969	25.45367
Islands of Siankaba	Kazugula	Kazugula Road	Zambezi River		0	Domestic	-17.83347	25.57367
Cool Amarula	Kazugula	Kazugula Road	Zambezi River	12600	440	Irrigation	-17.785	25.57367
Kubu Zambezi	Livingstone	Kazugula Road	Zambezi River	4	0	Domestic	-17.83025	25.64756
Water Berry Lodge	Livingstone	Kazugula Road	Zambezi River	120	0	Domestic/ Fish Farming	-17.83281	25.63547
L/stone Tobacco Farm	Livingstone	Kazugula Road	Zambezi River		60	Irrigation	-17.81756	25.62806
Zambezi Farm (Nkwazi Golfing & Housing Estates)	Livingstone	Kazugula Road	Zambezi River	2	0	Domestic	-17.82589	25.62725
Amoret Farm	Livingstone	Kazugula Road	Zambezi River			No Activity	-17.82975	25.63678
Kayube Estate	Livingstone	Kazugula Road	Zambezi River	500	10	Domestic/ Irrigation	-17.82056	25.65719
Nzou Farming Ltd	Livingstone	Kazugula Road	Zambezi River	2250	45	Irrigation	-17.7975	25.67692
Chundu farm	Livingstone	Kazugula Road	Zambezi River	500	10	Domestic/ Irrigation	-17.80417	25.67667
Chundukwa Adventures	Livingston	Kazugula Road	Zambezi		0	Domestic/	-17.80917	25.67231

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
	e		River			Irrigation		
Natural Mystic	Livingstone	Kazugula Road	Zambezi River	2	0	Domestic/ Irrigation	-17.80619	25.68906
Tongabezi Lodge	Livingstone	Kazugula Road	Zambezi River		0	Domestic/ Irrigation	-17.81975	25.70753
River Club	Livingstone	Kazugula Road	Zambezi River	30	0	Domestic/ Irrigation	-17.8215	25.70544
Zambezi Nkuku	Livingstone	Kazugula Road	Zambezi River	20	0	Poultry Farming	-17.83597	25.71858
Bindi Meadow Farms	Livingstone	Kazugula Road	Zambezi River	1	300	Irrigation	-17.82792	25.70394
No Name farm	Livingstone	Kazugula Road	Zambezi River		0	Domestic	-17.82375	25.73614
Dicks Land Farm	Livingstone	Kazugula Road	Zambezi River	1	0	Domestic	-17.83452	25.73303
Masilelo Farm	Livingstone	Kazugula Road	Zambezi River		0	Domestic	-17.83633	25.7373469
Thorn Tree	Livingstone	Kazugula Road	Zambezi River		0	Domestic	-17.84331	25.75542
Zambezi Elephant Trails	Livingstone	Kazugula Road	Zambezi River		0	Domestic	-17.83931	25.75567
Suffi & Chuma	Livingstone	Kazugula Road	Zambezi River		0	Domestic	-17.84111	25.77133
Elephant Trails	Livingstone	Livingstone	Zambezi River		0	Domestic	-16.47583	
Mubuyu Christian Academy	Siavonga	Matinangala	Lake Kariba	14	0	Domestic	-16.48369	28.66253
Fisherman's Cove Lodge	Siavonga	Matinangala	Lake Kariba	4	0	Domestic	-16.48561	28.660111
Sandy Beach	Siavonga	Matinangala	Lake Kariba	2	0	Domestic	-16.47875	28.66508
Brayshaw Mr (Baobab Bay)	Siavonga	Matinangala	Lake Kariba	2	0	Domestic	-16.50961	28.67347
Island Fishing Industries	Siavonga	Matinangala	Lake Kariba	3	0	Domestic	-16.51094	28.70278
Siavonga Kapenta Industries	Siavonga	Matinangala	Lake Kariba	3	0	Domestic	-16.51289	28.70308
Deef Six	Siavonga	Matinangala	Lake		0	Domestic	-16.52069	28.701

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
			Kariba					
Kaliolio Crocodile Farm	Siavonga	Matinangala	Lake Kariba	200	0	Crocodile Farm	-16.52772	28.70342
Animal Proteins	Siavonga	Kanyelele	Lake Kariba	40	0	Domestic	-16.52306	28.69347
MacWil	Siavonga	Kanyelele	Lake Kariba	4	0	Domestic	-16.52286	28.70322
Kariba Enterprises	Siavonga	Kanyelele	Lake Kariba		0	Domestic	-16.53261	28.70222
Sumbu Crocodile Ltd	Siavonga	Kanyelele	Lake Kariba	400	0	Crocodile Farm	-16.53658	28.68486
A.M Motors	Siavonga	Kanyelele	Lake Kariba	2	0	Domestic	-16.537	28.68214
Nyaminyami Adventures Trust	Siavonga	Kanyelele	Lake Kariba	2	0	Domestic	-16.53722	28.68203
Tune Enterprises	Siavonga	Kanyelele	Lake Kariba	16	0	Domestic	-16.53125	28.68408
Lake Harvesters Ltd	Siavonga	Kanyelele	Lake Kariba	7	0	Domestic	-16.53172	28.68669
King Kapenta	Siavonga	Kanyelele	Lake Kariba	15	0	Domestic	-16.52661	28.68803
Harvest Help	Siavonga	Kanyelele	Lake Kariba	2	0	Domestic	-16.54178	28.68989
New Hotel Under Construction	Siavonga	Kanyelele	Lake Kariba		0	Domestic	-16.53975	28.68894
Gary Wade Mr.	Siavonga	Kanyelele	Lake Kariba	5	0	Domestic	-16.53642	28.68972
Lake Kariba Inns	Siavonga	Siavonga	Lake Kariba	150	0	Domestic	-16.54211	28.70444
Lake Safari Lodge	Siavonga	Siavonga	Lake Kariba	40	0	Domestic	-16.53506	28.70828
Southern Water and Sewerage Co.-Siavonga	Siavonga	Siavonga	Lake Kariba	135	0	Water Supply	-16.05402	28.71358
Transcontinental (Z) Pty Ltd	Siavonga	Siavonga	Lake Kariba	30	0	Domestic	-16.53744	28.70792
Manchinchi Bay Lodge	Siavonga	Siavonga	Lake Kariba	30	0	Domestic	-16.53653	28.72506
Eagles Rest	Siavonga	Siavonga	Lake	18	0	Domestic	-16.53486	28.72897

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
			Kariba					
Zefa Lodge	Siavonga	Siavonga	Lake Kariba	10	0	Domestic	-16.53492	28.72647
Piete Liebernbugy	Siavonga	Siavonga	Lake Kariba	3	0	Domestic	-16.53494	28.7245
Countrey Mr	Siavonga	Siavonga	Lake Kariba	3	0	Domestic	-16.53478	28.72447
O'Donnel Mr	Siavonga	Siavonga	Lake Kariba	4	0	Domestic	-16.53472	28.72458
Moonga Petrol	Siavonga	Munyama	Lake Kariba	1	0	Domestic	-16.53044	28.44697
Harvest Help (Munyama)	Siavonga	Munyama	Lake Kariba	10	0	Domestic	-16.53356	28.44617
Musika Farm	Siavonga	Munyama	Lake Kariba	3	1	Irrigation	-16.53367	28.44792
Kasenzi Mr	Siavonga	Munyama	Lake Kariba	5	1	Irrigation	-16.53392	28.44923
Chiboola Lodge	Siavonga	Manchisi	Lake Kariba	4	0	Domestic	-16.50861	28.51678
Robby Mr	Siavonga	Manchisi	Lake Kariba		0	Domestic	-16.50972	28.51806
Lotri Bay Lodge (Dubler Mr)	Siavonga	Manchisi	Lake Kariba	5	0	Domestic	-16.50475	28.53447
Mine Under Development (Munyama)	Siavonga	Munyama	Lake Kariba			Mining	-16.46653	28.52164
Chirundu Farm Bream	Chirundu	Chirundu	Zambezi River	2000	10	Irrigation	-15.99069	28.87708
Bayabaya Farm	Chirundu	Chirundu	Zambezi River		10	Irrigation	-15.93922	29.00103
Wild Tracks	Chirundu	Gunduza	Zambezi River	15	0	Domestic	-15.94086	29.00492
Karageojiadis Andy	Chirundu	Gunduza	Zambezi River	1	0	Domestic	-15.94225	29.00792
Kwalata	Chirundu	Gunduza	Zambezi River	4	0	Domestic	-15.94197	29.00894
Chiawa Lodge	Chiawa	Chilimanga	Zambezi River			Domestic	-15.908	29.03819
Mulders Camp	Chiawa	Chiyata	Zambezi	2	0	Domestic	-15.8044	29.16061

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
			River					
Mvuu Lodge	Chiawa	Lower Zambezi GMA	Zambezi River	2	0	Domestic		
Kayila Lodge	Chiawa	Lower Zambezi GMA	Zambezi River	14	0	Domestic	-15.7897	29.18417
Lusitu Irrigation Scheme	Lusitu	Kabuyu	Zambezi River	2178	26	Irrigation	-16.14256	28.847
Southern Water & Sewarage - Lusitu Sub Centre	Lusitu	Lusitu Sub Centre	Zambezi River			Water Supply	-16.15092	28.84228
Lower Zambezi Irrigation (Teacher)	Lusitu	Chisamu	Zambezi River	800	1.5	Irrigation	-16.18103	28.8325
Luangwa District Council	Luangwa	Luangwa Boma	Zambezi River	480	0	Water Supply		
Yexley Lodge	Luangwa	Amoro Village	Zambezi River	5	0	Domestic	-15.64656	30.28956
RedCliff Zambezi Lodge	Luangwa	Kavalamanja	Zambezi River	10	0	Domestic	-15.64308	30.27558
Butete Bay Lodge	Siavonga	Butete	Lake Kariba	8	0	Domestic	-16.50011	28.58492
Hambayi Mr (Pa Scale)	Siavonga	Gwena	Lake Kariba		0	Domestic	-16.49969	28.609
Dedrick Chris (Kalembula)	Siavonga	Gwena	Lake Kariba	2	0	Domestic	-16.49781	28.61881
Grill Joseph	Siavonga	Gwena	Lake Kariba		0	Domestic	-16.49833	28.61667
Hapunda Mr	Siavonga	Gwena	Lake Kariba		0	Domestic	-16.49944	28.61694
Mackintosh Mr	Siavonga	Gwena	Lake Kariba		0	Domestic	-16.49889	28.62222
Fish Eagle	Siavonga	Matinangala	Lake Kariba	5	0	Domestic	-16.51708	28.70706
Casilli Gillan	Siavonga	Siavonga	Lake Kariba	5	0	Domestic	-16.53558	28.71906
Leisure Bay	Siavonga	Siavonga	Lake Kariba	40	0	Domestic	-16.53939	28.71922
Sobeki Canoe Enterprises	Siavonga	Namomba	Zambezi River	2	0	Domestic	-16.36894	28.84592
New Lodge Under Construction	Siavonga	Namomba	Zambezi	2	0	Domestic	-16.35964	28.8395

Water User Name	Location	Area/Village	Water Resource	Quantity of Water (m³/day)	Area Irrigated (ha)	User Category	Southing	Easting
			River					
Masau Camp	Siavonga	Namomba	Zambezi River	2	0	Domestic	-16.35681	28.83761
Musokwe Camp	Siavonga	Namomba	Zambezi River	1	0	Domestic	-16.35589	28.83689
Prise Joshua	Siavonga	Mulopa	Zambezi River	1	0	Domestic	-16.32883	28.82664
Walker Mr	Siavonga	Kariba Store (Manyepa)	Zambezi River	50	6	Irrigation	-16.30847	28.81736
Mubuyu Farm	Siavonga	Kariba Store (Manyepa)	Zambezi River	10	0	Domestic	-16.30114	28.81844
Gunduza Titus	Lusitu	Gunduza	Zambezi River	5	1	Irrigation	-16.20139	28. 83561
Nalumbu Farms (Sinyangwe Mr)	Lusitu	Matiyaunga	Zambezi River	50	10	Irrigation	-16.21436	28.83083
Dooks	Lusitu	Matiyaunga	Zambezi River	2	0	Domestic	-16.22742	28.83742
Lodge under construction	Lusitu	Matiyaunga	Zambezi River	0	0	Domestic	-16.24042	28.85222
Dooks Banana plantation	Lusitu	Matiyaunga	Zambezi River		2	Irrigation	-16.23858	28.84358
Southern Water & Sewerage Chirundu	Chirundu	Chirundu	Zambezi River	1628	0	Domestic	-16.03258	28.84539
Machembele Farm	Chirundu	Chirundu	Zambezi River	100	10	Irrigation	-16.02583	28.86353
Kapululila High School	Chirundu	Chirundu	Zambezi River	40	0	Domestic	-15.96278	28.89058
Kapululila Cooperative	Chirundu	Chirundu	Zambezi River		81	Irrigation	-15.95586	28.90594
Chakanaka Investments	Chiawa	Mafungautsi	Zambezi River	3000	165	Irrigation	-15.93189	28.95094
Mafungautsi	Chiawa	Mafungautsi	Zambezi River	8	0	Domestic	-15.93583	28.92281
Kiambi Safaris	Chiawa	Mafungautsi	Zambezi River	NA	0	Domestic	-15.93683	28.92528
Kanyemba Lodge	Chiawa	Mafungautsi	Zambezi River	20	0	Domestic	-15.93767	28.93203

Table F1.2 Zimbabwean Side

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
ZINWA	Victoria Falls	Zambezi River	17496	Industrial	17.8259	25.30162	319990	8028210
ZINWA	Kazungula	Zambezi River	1513	Industrial	17.85506	25.38541	328916	8025111
Safari Lodge	Victoria Falls	Zambezi River	600	Domestic	17.91733	25.81922	374944	8018545
Elephant Hills	Victoria Falls	Zambezi River		Domestic	17.91023	25.83028	376151	8019363
Spencer's Creek	Victoria Falls	Zambezi River	710	Domestic	17.90116	25.82055	375036	8020366
A' Zambezi Hotel	Victoria Falls	Zambezi River	50	Domestic	17.90117	25.8217	375183	8020302
Imbabala Lodge	Kazungula	Zambezi River	1	Domestic	17.81838	25.28448	318176	8029086
Kazungula W.L Safari	Kazungula	Zambezi River	1	Domestic	17.84243	25.32797	322816	8026456
ZINWA	Katombora	Zambezi River	400	Industrial	17.85506	25.38541	328916	8025111
Matetsi Game Reserve	Katombora	Zambezi River	5	Environ	17.86957	25.50198	341285	8023606
Hwange Coilliery Co.	Hwange	Zambezi River	320,841	Industrial	18.08001	26.69286	467495	8000941
ZESA (Hwange)	Hwange	Zambezi River	2,000,000	Industrial	18.074	26.67306	465358	8001588
Sundowner	Hwange	Zambezi River	3	Domestic	18.07617	26.69948	468202	8001361
Olive Beadle Fishing	Hwange	Zambezi River	205,000	Domestic	18.02854	26.79477	478274	8006647
Msuma Fishing Resort	Hwange	Zambezi River	40	Domestic	18.01855	26.82633	481616	8007758
Breamland Lodge	Hwange	Zambezi River	1	Domestic	18.02545	26.80262	479113	8006981
Mlibizi Hotel	Mlibizi	Lake Kariba	650,000	Domestic	17.93902	27.07431	507875	8016560
Mlibizi Zambezi Resort	Mlibizi	Lake Kariba	650,000	Domestic	17.94334	27.07281	507706	8016084
Mubuyu Lodge	Mlibizi	Lake Kariba	40	Domestic	17.93469	27.0752	507967	8017039
Stand 65	Mlibizi	Lake Kariba	5	Domestic	17.93511	27.07442	507881	8016995
Happy Days Stand 64	Mlibizi	Lake Kariba	5	Domestic	17.93492	27.07386	507822	8017018

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Stand 63	Mlibizi	Lake Kariba	5	Domestic	17.93484	27.07413	507853	8017023
Stand 171	Binga	Lake Kariba	2	Domestic	17.58506	27.3584	538043	8055688
Stand 172	Binga	Lake Kariba	2	Domestic	17.58513	27.35847	538037	8055678
Stand 177	Binga	Lake Kariba	2	Domestic	17.58665	27.36074	538273	8055511
Stand 180	Binga	Lake Kariba	5	Domestic	15.58849	27.36171	538376	8055306
Stand 174	Binga	Lake Kariba		Domestic	17.58497	27.35931	538177	8055675
Stand 175	Binga	Lake Kariba	5	Domestic	17.58605	27.35992	538186	8055579
Stand 176	Binga	Lake Kariba	5	Domestic	17.58608	27.36062	538272	8055570
Stand 178	Binga	Lake Kariba	5	Domestic	17.58724	27.36094	538293	8055437
Stand 179	Binga	Lake Kariba	5	Domestic	17.5872	27.36155	538350	8055466
Stand 180	Binga	Lake Kariba	5	Domestic	17.58769	27.36188	538398	8055394
Stand 173	Binga	Lake Kariba	5	Domestic	17.58567	27.35925	538121	8055618
Taita	Binga	Lake Kariba	5	Domestic	17.5887	27.36201	538413	8055285
Plot 415	Binga	Lake Kariba	5	Domestic	17.58152	27.37198	539470	8056077
Plot 416	Binga	Lake Kariba	5	Domestic	17.58045	27.37134	539381	8056154
National Foods	Binga	Lake Kariba	5	Domestic	17.5803	27.37166	539434	8056212
Plot 441	Binga	Lake Kariba	2	Domestic	17.57935	27.37229	539506	8056316
Plot 418	Binga	Lake Kariba	2	Domestic	17.57938	27.37181	539451	8056308
Igloo	Binga	Lake Kariba	1	Domestic	17.57876	27.3717	539442	8056377
The Willows	Binga	Lake Kariba	1	Domestic	17.57823	27.371	539366	8056436
Stand 423	Binga	Lake Kariba	5	Domestic	17.57742	27.37063	539332	8056526
Stand 427	Binga	Lake Kariba	5	Domestic	17.57545	27.37079	539347	8056750

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Stand 443	Binga	Lake Kariba	-	Domestic	17.57433	27.37232	539510	8056867
Stand 447	Binga	Lake Kariba	5	Domestic	17.57327	27.37449	539741	8056985
Stand 451	Binga	Lake Kariba	5	Domestic	17.5711	27.37483	539775	8057224
Stand 428	Binga	Lake Kariba	2	Domestic	17.57067	27.3789	539216	8057278
Stand 400	Binga	Lake Kariba	3		17.57819	27.37231	539507	8056429
Kulizwe Lodge	Binga	Lake Kariba	15		17.58814	27.35802	537981	8055339
Coventry	Binga	Lake Kariba	42	Domestic	17.6012	27.34414	536511	8053900
Sundown vila	Binga	Lake Kariba	5	Domestic	17.60774	27.3524	537387	8053181
Zinwa	Binga	Lake Kariba		Industrial	17.61469	27.33967	536030	8052411
Ambush Alley	Binga	Lake Kariba		Domestic	17.62665	27.32761	534752	8051088
Zambezi Fisheries	Sinamwenda	Lake Kariba	1	Domestic	17.12299	27.86763	592298	8106634
C.E.F (Bartanai Fisheries)	Sinamwenda	Lake Kariba	2	Domestic	17.1228	27.86759	592290	8106654
Chete Hunting Safaris	Chete	Lake Kariba	4	Domestic	17.34574	27.61634	565484	8082091
Chiobora Fishing Camp	Chibuyu	Lake Kariba	1	Domestic	17.11653	27.87879	593479	8107342
Mujeri Fishing Camp	Chibuyu	Lake Kariba	1	Domestic	17.08773	27.92965	598917	8110500
Chalala Fishing Camp	Chalala	Lake Kariba	4	Domestic	16.839	28.29297	637757	8137805
C.C.F (Gustrady)	Chalala	Lake Kariba	20	Domestic	16.84049	28.28822	637249	8137647
Balanced Foods	Chalala	Lake Kariba	2	Domestic	16.84015	28.28999	637430	8137691
Big Brother Enterp	Chalala	Lake Kariba	0.3	Domestic	16.839	28.28926	637359	8137806
Zambezi Fisheries	Chalala	Lake Kariba	6	Domestic	16.83767	28.28581	636994	8137955
Matemba fisheries	Chalala	Lake Kariba	20	Domestic	16.83738	28.28355	636750	8137991
Angelus Fisheries	Chalala	Lake Kariba	10	Domestic	16.83705	28.28248	636639	8138029

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Deepland	Chalala	Lake Kariba	2	Domestic	16.83854	28.28672	6367090	8137858
Nyami Nyami D. C	Chalala	Lake Kariba	9	Domestic	16.83935	28.30168	638682	8137760
Brooklyn	Chalala	Lake Kariba		Domestic	16.82456	28.3212	640775	8139382
Bumi Hills	Bumi Hills	Lake Kariba	130	Domestic	16.80891	28.34836	643672	8141091
Bumi Hills (Workers' Quarters)	Bumi Hills	Lake Kariba	2	Domestic	16.80852	28.35996	644916	8141129
Kamativi National Service Camp	Mlibizi	Lake Kariba	5	Domestic	17.93333	27.07495	507939	8017188
Stand No. 5	Mlibizi	Lake Kariba	30	Domestic	17.9331	27.07546	507986	8017217
Stand No. 6	Mlibizi	Lake Kariba	50	Domestic	17.93167	27.07523	507966	8017374
Stand No. 4	Mlibizi	Lake Kariba	30	Domestic	17.93192	27.07606	508054	8017347
Stand No. 58	Mlibizi	Lake Kariba	20	Domestic	17.93429	27.07668	508118	8017084
Billy Knox	Mlibizi	Lake Kariba	40	Domestic	17.94243	27.07743	508201	801 6179
Sunover Beach	Mlibizi	Lake Kariba	60	Domestic	17.94361	27.08044	508517	8016051
Equinn	Mlibizi	Lake Kariba	20	Domestic	17.94404	27.08146	508626	8016002
Goba Lodge (Stand 136)	Mlibizi	Lake Kariba	5	Domestic	17.94536	27.08373	508865	8015855
Sinyman (Stand 138)	Mlibizi	Lake Kariba	5	Domestic	17.94599	27.08329	508819	8015787
Barner (Stand 139)	Mlibizi	Lake Kariba	5	Domestic	17.9461	27.0829	508779	8015773
Blume (Stand 140)	Mlibizi	Lake Kariba	5	Domestic	17.94615	27.08293	508779	8015768
Vandenbergh (Stand 167)	Mlibizi	Lake Kariba	5	Domestic	17.95322	27.07988	508457	8014989
Zinwa-(Binga)	Binga	Lake Kariba	734	Domestic	17.61547	27.34575	536637	8055324
Binga Crocodile Farm	Binga	Lake Kariba	2,000	Croc. Farm	17.58579	27.35657	537942	8055702
Binga Rest Camp	Binga	Lake Kariba	15	Domestic	17.58956	27.35955	533154	8055192
Chilila Lodge	Binga	Lake Kariba	42	Domestic	17.60101	27.41275	543800	8053914

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Masumu River Lodge	Binga	Lake Kariba	30	Domestic	17.59158	27.42187	544774	8054954
Sijarira Game Park	Sijarira	Lake Kariba	3	Domestic	17.51192	27.49453	552499	8063747
Chete Game Park	Chete	Lake Kariba	1	Domestic	17.34318	27.62317	566211	8082372
Zinwa	Chirundu	Zambezi River	600	Domestic	16.03966	28.85337	68290	8225792
Chirundu Croc. Co.	Chirundu	Zambezi River		Croc. Farm	16.00194	28.90284	703623	8229920
Rama Fish Farm	Chirundu	Zambezi River		Croc. Farm	16.01634	28.88918	702140	8228337
Jecha Camp	Chirundu	Zambezi River	5	Domestic	16.02713	28.87695	700822	8227154
Tiger Safari Chirundu	Chirundu	Zambezi River	4	Domestic				
Tiger Safari Office	Chirundu	Zambezi River	2	Domestic	16.03736	28.85667	698640	8226039
Oromerod Chirundu	Chirundu	Zambezi River	5	Domestic	16.05021	28.85113	698043	8224626
Ian Stydorm	Chirundu	Zambezi River	4	Domestic	16.05089	28.85264	698200	8224556
Kamugore Lodge	Chirundu	Zambezi River	2	Domestic	16.05088	28.8529	698226	8224550
Chinhoyi Inns	Chirundu	Zambezi River	1	Domestic	16.05113	28.85331	6982270	8224524
Motima Lodge	Chirundu	Zambezi River	1	Domestic	16.05151	28.85379	698316	8224484
Nero Lodge	Chirundu	Zambezi River	2	Domestic	16.05264	28.8543	698362	8224365
Rifa Education Camp	Chirundu	Zambezi River	4	Domestic	16.06988	28.870188	700051	8222428
Mana Pools N. Park	Mana Pools	Zambezi River	45		15.72359	29.36092	753002	8260226
Chikwenya Safaris	Chikwenya	Zambezi River	4.5	Domestic	15.67515	29.57243	775743	8265328
G-Camp	Chikwenya	Zambezi River	4	Domestic	15.64267	29.724	792048	8268720
Shamashanga Safari	Chikwenya	Zambezi River	3	Domestic	15.64252	29.72809	792485	8268724
H-Camp	Chikwenya	Zambezi River	0.5	Domestic	15.61293	29.82244	802655	8271871
Tafika 1 Camp	Chikwenya	Zambezi River	10	Domestic	15.61484	29.85145	805764	8271629

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Tafika 2 Camp	Chikwenya	Zambezi River	0.5	Domestic	15.61547	29.85805	806470	8271544
Kapirinengu	Kapirinengu	Zambezi River	10	Domestic	15.62437	29.9131	812371	8270476
Big Five	Kapirinengu	Zambezi River	10	Domestic	15.6462	29.98759	820333	8267946
Chipfuti Safaris	Kapirinengu	Zambezi River	4	Domestic	15.64551	29.98862	820436	8268031
Kanyemba D.D F	Kanyemba	Zambezi River	10	Domestic	15.6505	30.3728	218334	8267960
Chinembiri Fishing Camp	Kanyemba	Zambezi River	3.5	Domestic	15.65211	30.36694	217712	8267796
Swainsons Safaris	Kanyemba	Zambezi River	0.5	Domestic	15.65739	3034841	215740	8267185
Arijiboar Irrigation	Kanyemba	Zambezi River	10	Domestic	15.66409	30.35826	216797	8266457
Maturi Camp	Kanyemba	Zambezi River	4	Domestic	15.64565	30.39158	220350	8268543
Kanyemba Police Camp	Kanyemba	Zambezi River	10	Domestic	15.64269	30.39764	221003	8268850
Raston Investment	Kanyemba	Zambezi River	5	Domestic	15.64139	30.39987	221232	8269022
Donza Donza Camp	Kanyemba	Zambezi River	1	Domestic	15.64043	30.40146	221409	8269138
Bruster Fishing Camp	Kanyemba	Zambezi River	20	Domestic	15.63907	30.40367	221636	8269288
Kanyemba Fishing Lodge	Kanyemba	Zambezi River	1	Domestic	15.63407	30.4081	222112	8269845
Kanyemba Zambezi Lodge	Kanyemba	Zambezi River	10	Domestic	15.63244	30.40987	222294	8270027
Tiger Odyssey	Kanyemba	Zambezi River	6	Domestic	15.62974	30.41252	222580	8270313
Gatche Gatche Irrigation Scheme	Gatche Gatche	Lake Kariba	2	Domestic	16.73624	28.93164	705926	8148624
Trek and Hunt Safari	Gatche Gatche	Lake Kariba	3	Domestic	16.73863	28.93592	706391	8148353
Chipungu Safairis	Gatche Gatche	Lake Kariba	15	Domestic	16.73962	28.94182	707019	8148233
UME lake Croc Farm	Ume	Lake Kariba	2100000	Croc. Farm				
UME lake Croc Farm	Ume	Lake Kariba	28000	Domestic	16.8511	28.43076	652460	8136390
Tashinga National Park	Ume	Lake Kariba	5	Domestic	16.81805	28.45206	654724	8140002

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Ume Camp	Ume	Lake Kariba	2	Domestic	16.82688	28.42918	652272	8139043
Umbabala Camp	Ume	Lake Kariba	2	Domestic	16.83224	28.43493	652889	8138449
Tiger Bay Hotel	Ume	Lake Kariba	40	Domestic	16.91344	28.4503	654458	8129447
Bullembe Safaris (Ume Camp)	Ume	Lake Kariba	6	Domestic	16.96097	28.44073	653356	8124228
CWF	Kariba	Lake Kariba	60	Crocodile Farm	16.56893	28.95078	708148	8157122
Charara Estate	Kariba	Lake Kariba	60	172ha	16.56032	28.95531	708656	8168077
NAUZ	Kariba	Lake Kariba	30	Lodges	16.54872	28.95264	708370	8169355
Wild Heritage	Kariba	Lake Kariba	30	Lodges	16.56021	28.93459	706431	8168102
Ceruti	Kariba	Lake Kariba	30	Lodges	16.5509	28.9498	708063	8169117
Lamb's Lay	Kariba	Lake Kariba	10	Lodges	16.55208	28.94885	707974	8169005
Vundu Vay	Kariba	Lake Kariba	10	Lodges	16.55367	28.94721	707790	8168812
James Hilsgome	Kariba	Lake Kariba	5	Lodges	16.55367	28.94701	707757	8168812
Dawn View	Kariba	Lake Kariba	10	Lodges	16.55315	28.94752	707824	8168869
Trish Corks	Kariba	Lake Kariba	5	Res	16.55399	28.94644	707706	8168772
Hanga	Kariba	Lake Kariba	5	Lodges	16.55449	28.94622	707681	8168720
Detoit	Kariba	Lake Kariba	5	Lodges	16.55423	28.94585	707636	8168746
Dundly & Una	Kariba	Lake Kariba	5	Res	16.55453	28.94536	707587	8168718
Loury & Merle	Kariba	Lake Kariba	5	Res	16.55497	28.94545	707597	8168675
Avaolon	Kariba	Lake Kariba	10	Lodges	16.55544	28.94465	707528	8168584
Victor 4	Kariba	Lake Kariba	10	Lodges	16.55548	28.94432	707481	8168613
Ton Laundram	Kariba	Lake Kariba	1	Lodges	16.55604	28.94362	707406	8168558
Nzou Lodges	Kariba	Lake Kariba	8	Lodges	16.55617	28.94034	707042	8168541
Old Hararians	Kariba	Lake Kariba	30	Lodges	16.55671	28.94166	707194	8168479

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Carribea Bay	Kariba	Lake Kariba	256	Hotel	16.53416	28.79952	692040	8171122
Nyanyana	Kariba	Lake Kariba	15	Parks	16.54678	28.87937	700549	8169650
Lake Croc	Kariba	Lake Kariba	1085	Crc Farm	16.54721	28.87354	699930	8169603
Zinwa	Kariba	Lake Kariba	15	Domestic	16.53893	28.86623	699157	8170527
Bream Farm	Kariba	Lake Kariba	432	Fish Farm	16.53011	28.86.67	698582	8171500
Lake Harvest	Kariba	Lake Kariba	48	Fish Farm	16.52499	28.85511	697982	8172077
UZLKRS	Kariba	Lake Kariba	5	UZ	16.52509	28.84106	696478	8172082
Lomagundi	Kariba	Lake Kariba	30	Lodges	16.52534	28.83735	696094	8172056
Cutty Sark	Kariba	Lake Kariba	30	Hotel	16.53394	28.81848	694060	8171125
Breazes	Kariba	Lake Kariba	30	Hotel	16.53251	28.81567	693772	8171280
Municipality	Breazes	Lake Kariba	12500	Domestic	16.53636	28.81124	693287	8170875
Municipality	Zambezi	Lake Kariba	11000	Domestic	16.53136	28.75743	687555	8171471
Sanyati	Kariba	Lake Kariba	60	Lodges	16.81728	28.76779	688380	8139812
Spurwing	Kariba	Lake Kariba	80	Hotel	16.72741	28.69291	680482	8149834
Forthergill	Kariba	Lake Kariba	20	Hotel	16.70215	28.66635	677670	8152650
Eagles View	Binga	Lake Kariba	-		17.59027	27.386321	538538	8055108
Stand Under development	Binga	Lake Kariba			17.57132	27.37752	540062	8057192
Stand Under development	Binga	Lake Kariba			17.57337	27.37569	539867	8056978
Jonathan Brighton	Binga	Lake Kariba			17.58819	27.37044	539296	8055339
Stand 399 Under dev.	Binga	Lake Kariba			17.58833	27.36943	539202	8055320
Bay Lodge	Binga	Lake Kariba			17.59258	27.35382	537541	8054854
Croc Farm	Binga	Lake Kariba	nf		17.5924	27.35359	537516	8054875

Water User Name	Location	Source	m3/day	Category	Southing	Easting	X	Y
Nyati Fisheries	Chalala	Lake Kariba	nf	Domestic	16.83866	28.28992	637428	8137845
D.D.F (Filling Station)	Chalala	Lake Kariba			16.83755	28.28461	636864	8137967
Bumi Enterprises	Chalala	Lake Kariba	nf	Domestic	16.8376	28.28095	636480	8137975
Njovana	Chalala	Lake Kariba	nf	Domestic	16.83651	28.27959	636308	8138090
D.D.F Rest Camp	Bumi Hills	Lake Kariba	nf	Domestic	16.81063	28.34304	643115	8140910
Mr. Gift (Under Deve.)	Mlibizi	Lake Kariba		Domestic	17.94297	27.07831	508294	8016122
Zinwa	Mlibizi	Lake Kariba	nf	Industrial	17.94326	27.08887	509411	8016090
Proposed Irrigation Scheme).	Mlibizi	Lake Kariba			17.96289	27.09398	509938	8013915
Zambezi Primary Sch	Zambezi Mission	Lake Kariba	10 nf		17.88034	27.16868	517867	8023050
Ben Downs	Chirundu	Zambezi River	Borehole		16.05175	28.85426	698366	8224460
John Gibson (Under dev.)	Kanyemba	Zambezi River			15.63637	30.4059	221878	8269585
Msampakaruma F. Camp	Ume	Lake Kariba	na	Domestic	16.8442	28.40712	649918	8137145

F2 WATER QUALITY MONITORING DATA

Table F2.1 Summary of Water Quality Monitoring Data, 1997/98 (ZRA, 1998)

Parameter	Zambezi River at Batoka HES Site					
	Sep 97	Oct 97	Nov 97	Dec 97	Jan 98	Feb 98
Flow (m3/s) [1]	183	152	157	231	579	1,052
pH	7.41	8.48	7.3	6.9	6.7	6.9
Cond (µS/cm)	109	103	80	89	79	55
BOD (mg/l)	9.8	83.5	20.2	45.7	10.1	10.2
Turb NTU	4.7	2.4	4.8	3.9	5.3	13.0
TDS (mg/l)	50	55	50	45	40	30
PO_4 (µg/l)	1.5	1.1	2.1	2.3	2.1	3.4
l)		17.6	14.4	24.2	22.7	35.0
NO_3 (µg/l)	18.3	17.1	17.8	15.3	3.3	12.2
TN (µg/l)	-	1474	2115	800	229	761
Cu (mg/l)	nd	nd	Nd	nd	-	-
Ni (mg/l)	nd	nd	Nd	nd	-	-
Pb (mg/l)	nd	0.12	0.15	nd	-	-
Zn (mg/l)	nd	nd	Nd	nd	-	-
Mn (mg/l)	nd	nd	Nd	nd	-	-
Mg (mg/l)	5.4	5.9	5.5	3.8	-	-
Ca (mg/l)	10.9	9.6	9.8	14.2	-	-
Fe (mg/l)	0.1	0.01	0.1	nd	-	-
K (mg/l)	1.5	1.5	1.9	1.6	-	-
Na (mg/l)	2.2	1.9	1.8	2.4	-	-
Cd (mg/l)	nd	nd	Nd	nd	-	-
Cr (mg/l)	nd	0.03	Nd	nd	-	-
Hg (mg/l)	nd		Nd	nd	-	-
SO_4 (mg/l)	-	103.0	14.7	-	-	-
Total coliforms (MPN/100ml)	1100+	1100+	80	1100	122	75

Data source: Batoka Gorge HES Feasibility Report – Further EIA Studies, ZRA (Civil Consult (Pvt) Ltd and Soils Incorporated (Pvt) Ltd, May 1998)
nd – not detected
[1] Average daily flow taken from ZRA gauging record at Victoria Falls on date of sampling.

Table F2.2 Summary of Water Quality Monitoring Data, 1997/98 (ZRA, 1998)

Parameter	Zambezi River at A'Zambezi River Lodge (u/s Victoria Falls)						Zambezi River at Rapid 11 (d/s Victoria Falls)					
	Sep 97	Oct 97	Nov 97	Dec 97	Jan 98	Feb 98	Sep 97	Oct 97	Nov 97	Dec 97	Jan 98	Feb 98
Flow (m3/s) [1]	183	152	157	231	579	1,052	183	152	157	231	579	1,052
pH	7.36	7.88	7.1	7.2	6.7	6.8	7.23	-	7.3	7.1	6.7	6.9
Cond (µS/cm)	93	102	91	86	75	55	94	103	82	83	84	55
BOD (mg/l)	20.1	58.5	20.2	20.3	20.3	20.3	40.5	58.5	20.2	25.4	40.8	20.3
Turb NTU	3.9	2.7	4.3	2.8	5.3	8.0	3.8	2.6	5.0	4.3	7.0	10.0
TDS (mg/l)	50	50	45	40	40	30	50	70	50	45	50	30
PO_4 (µg/l)	1.2	1.9	2.1	1.4	2.5	3.6	2.4	1.3	2.3	2.1	2.5	4.2
TP (µg/l)		11.5	14.9	14.7	8.9	24.2		17.8	13.5	17.2	22.1	29.9
NO_3 (µg/l)	4.2	3.5	7.1	5.4	5.2	4.4	9.0	8.4	10.4	12.6	6.2	8.6
TN (µg/l)		1543	2780	460	446	774		1536	2206	363	485	649
Cu (mg/l)	nd	nd	nd	nd	-	-	nd	nd	nd	nd	-	-
Ni (mg/l)	nd	nd	nd	nd	-	-	nd	nd	nd	nd	-	-
Pb (mg/l)	0.2	0.06	0.09	0.03	-	-	0.03	0.12	0.23	nd	-	-
Zn (mg/l)	nd	nd	nd	nd	-	-	nd	nd	nd	nd	-	-
Mn (mg/l)	nd	nd	nd	nd	-	-	nd	nd	nd	nd	-	-
Mg (mg/l)	5.6	6.0	6.9	1.2	-	-	5.6	8.5	6.7	3.6	-	-
Ca (mg/l)	11.0	10.8	11.1	8.2	-	-	11.4	13.3	9.9	12.6	-	-
Fe (mg/l)	0.1	0.01	0.1	nd	-	-	0.1	0.01	0.1	nd	-	-
K (mg/l)	1.4	1.5	2.0	0.7	-	-	1.4	1.4	1.9	1.5	-	-
Na (mg/l)	2.2	1.8	2.2	0.7	-	-	1.9	2.0	1.9	2.2	-	-
Cd (mg/l)	nd	nd	nd	nd	-	-	nd	nd	nd	nd	-	-
Cr (mg/l)	nd	0.02	nd	nd	-	-	nd	0.05	nd	nd	-	-
Hg (mg/l)	nd	nd	nd	nd	-	-	nd	nd	nd	nd	-	-
SO_4 (mg/l)	-	34.5	24.6	-	-	-	-	75.0	24.6	-	-	-
Total coliforms (MPN/100ml)	460	350	60	250	54	460	>1100	>1100	250	>1100	93	>1100

Data source: Batoka Gorge HES Feasibility Report – Further EIA Studies (Civil Consult (Pvt) Ltd and Soils Incorporated (Pvt) Ltd, May 1998)
nd – not detected
[1] Average daily flow taken from ZRA gauging record at Victoria Falls on date of sampling.

Table F2.3 Summary of Water Quality Monitoring Data, 2003/04 (ZRA, 2005)

Parameter	Zambezi River at Big Tree, u/s Victoria Falls			
	July 2003	October 2003	February 2004	May 2004
Flow (m3/s) [2]	1,100	231	905	3,534
T (°C)	19.9	26.4	28.3	20.2
pH	7.63	6.93	7.5	6.4
TSS (mg/l)	3	<0.5	8.62	5.23
Cond. (µS/cm)	82	117	86.6	36
Alkal. (mg/l)	36.4	50.43	43.7	8.99
Major elements:				
Cl- (mg/l)	1 .04	6 .35	1.82	0.63
NO3- (mg/l)	<dl	0 .05	< dl	< dl
SO4-- (mg/l)	6 .61	31.64	2.43	0.27
K (mg/l)	0 .65	1.13	1.9	0.44
Na (mg/l)	2 .37	3.29	3.3	1.73
Ca (mg/l)	8 .45	9.59	13.6	3.68
Mg (mg/l)	2.82	3.53	17.2	6.25
Al (µg/l)	0.42	0.52	399	49.55
Si (mg/l)	23.37	6.7	8.5	3.44
Trace elements:				
As (µg/l)	0.332	0.381	0.87	0.4
Cd (µg/l)	0.0009	0.093	0.003	0.001
Co (µg/l)	0.137	0.123	0.48	0.12
Cr (µg/l)	0.451	0.594	1.35	0.41
Cu (µg/l)	0.212	0.263	2.38	0.58
Fe (µg/l)	268	180	108	262
Mn (µg/l)	10.8	29.1	24.89	5.64
Ni (µg/l)	0.353	0.696	1.32	0.2
Pb (µg/l)	0.076	0.0527	0.32	0.1
Ti (µg/l)	11.3	8.24	83.76	17.88
V (µg/l)	0.6	0.49	3.96	0.91
Zn (µg/l)	2.76	9.99	4.63	3.19
Hg (µg/l)	0.032	n/a	dl	0.007
Pesticides:				
PCB (µg/L)	-	-	< 0.070	-
2,4-D (µg/L)	-	-	< 0.100	-
DDT (µg/L)	-	-	< 0.022	-
Endosulfan (µg/L)	-	-	< 0.010	-

Glyphosate (µg/L)	-	-	< 0.050	-
Methoxychlor (µg/L)	-	-	< 0.050	-
Aldrin (µg/L)	-	-	< 0.020	-
Dieldrin (µg/L)	-	-	< 0.010	-
Endrin (µg/L)	-	-	< 0.010	-
Heptachlor (µg/L)	-	-	< 0.010	-

Data source: Pollution Monitoring and Management on the Zambezi River, ZRA and FFEM/AFD Technical Report: Water Quality Analyses (BRLi, March 2005)
[1] Average monthly flow taken from ZRA gauging record at Victoria Falls (precise sampling date not known).

Table F2.4 Water Quality Monitoring Data for Zambezi River at Big Tree (ZRA, January 2015)

STATION NAME: BIG TREE (VIC FALLS)
LOCATION
ELEVATION

DATE		PARAMETER												
dd/mm/yy	Station ID	Temp, °C	pH	EC, µS/cm	DO, mg/L	TSS, mg/L	TDS, mg/L	Total Alkalinity, mg/L as CaCO3	Turbidity, NTU	Total Phosphorus, µg/l	Ammonia, µg/L NH-N	Ortho P, µg/l	Chlorophyll, µg/L	Cl, mg/L
08/02/10	VicFalls	29.2	7.38	23	8.14	19	15.41	40.8	23					
17/03/10	VicFalls	27.7	7.51	52	6.45	21	34.8		27					
14/04/10	VicFalls	25.7	7.05	36.00	6.31	9.00	24.1	20.3	7.0	40				
28/05/10	VicFalls	22.1	6.44	36	6.98	7	24.1	19.3	5					
29/06/10	VicFalls	18.3	6.86	52	8.6	5	34.8	52.4	6	160				
21/08/10	VicFalls	19.4	7.56	86	7.88	6.00	57.6	49.0	4.35					
27/09/10	VicFalls	23.3	7.94	100	8.05	3	67.0	51.8	4	176				
26/10/10	VicFalls	29.7	8.54	109	9.4	4	73.0	55.5	4.25	96				
24/11/10	VicFalls	28.4	7.88	113	6.22	5	75.0	77.2	5.1	96				
29/12/10	VicFalls	27.5	8.56	100	12.2	6	67.0	51	5.87	128				
29/01/11	VicFalls	25.9	7.28	68	6.81	12	45.56	32.2	15	144	46.62			
28/02/11	VicFalls	25	7.26	47	6.41	8	31.49	24.2	9.44	112	22.09			
22/03/11	VicFalls	28.1	7.5	96	5.95	7	24.12	19.1	8.09	192	106.2			
30/04/11	VicFalls	26.1	6.91	96	5.88	8	24.12	20.1	8.4	192	20.85			
21/05/11	VicFalls	22.1	7.23	95	8.06	5	23.45	23.7	4.06	304	31.57			
28/06/11	VicFalls	17.5	7.28	52	9.84	6	34.84	29.6	4.84	144	50.66			
26/07/11	VicFalls	17.3	7.44	63	10.68	6	42.21	39.8	4.96	98	20.43			
30/08/11	VicFalls	21.8	6.87	87	9.2	2	58.29	57.6	3.81	112	39.81			
29/09/11	VicFalls	23.3	7.76	97	7.48	5	64.99	59.2	2.68	176	28.44			
28/10/11	VicFalls	29.9	8.2	106	7.24	5	71.02	60.1	5.2	336	57.91			
29/11/11	VicFalls	27.3	8.86	100	9.12	6	67	54.8	4.8	480	56.15			
29/12/11	VicFalls	28.2	7.14	99	7.5	6	66.33	59.1	5.32	20	27.25			
28.01.12	VicFalls	26.5	6.18	67	6.72	16	44.89	44.5	12	70	187.46			
16.02.12	VicFalls	28.1	7.5	62	6.62	16	46.5	43	16.3	90	24.77	60	3.8	
29-03-12	VicFalls	27.4	7.19	38	6.27	7	28.5	88.9	5.1	60	26.42	50		
25-04-12	VicFalls	24	6.23	75	7.16	11	56.25	30	5.74	30	4.15	10	1	
23-05-12	VicFalls	22.1	7.22	26	7.02	4	19.5	28.5	3.2	20	9.91	10	<0.1	
30-06-12	VicFalls	19.1	7.75	41	9.95	5	30.75	51.9	3	40	20.64	10	<0.1	
13.07.12	VicFalls	18.3	8.11	81	9.68	10	60.75	90.3	5.12	20	18.17	10	0	
28.08.12	VicFalls	21.8	8.12	69	8.38	4	69.75	63.2	10.3	40	19.98	10	0	
20.09.12	VicFalls	25.7	8.07	84	9.05	6	63	66.1	5.3	40	40.76	20	0	
18.10.12	VicFalls	26.1	7.61	96	7.58	4	72	71.5	5.2	40	46.45	20	12.1	
16.11.12	VicFalls	26.6	7.91	94	8.02	2	70.5	61.4	1.5	50	45.63	20	1.5	
12.12.12	VicFalls	27.5	7.79	88	7.91	4	66	40.6	5.6	20	28.22	3	10	
18.01.13	VicFalls	26.9	7.35	64	6.83	15	48	41.4	16.4	30	50.35	10	9	
08.02.13	VicFalls	27.7	7.24	53	5.84	15	39.75	36.6	18.8	40	31.25	10	10.6	1.28
25.03.13	VicFalls	27.7	7.54	23	6.18	2	17.25	28.8	1.9	20	30.52	10	<0.1	<0.44
19.04.13	VicFalls	25.2	7.43	0.18	6.75	2	1.42	33.6	2.1	30	35.44	10	4.6	<0.44
16.05.13	VicFalls	22.1	6.86	27	7.33	3.5	10.28	29.1	2.3	30	22.22	10	<0.1	<0.44
24.06.13	VicFalls	18.4	7.28	49	8.65	3.5	36.80	41.9	4.2	20	11	10	4.5	0.35
07/10/2013	VicFalls	19	7.37	63	9.19	4	47.25	51	5.1	30	33	10	5.3	0.39
30/08/13	VicFalls	22.1	7.35	74	8.47	3.5	55.5	58.3	5.5	7	6	3	3.8	1.97
28/9/2013	VicFalls	26.9	7.1	83	8.3	3	62.25	55.4	8.5	8.8	10.91	5	3.8	1.88
26/10/13	VicFalls	26.7	7.56	82	7.84	3.5	61.5	61.8	2.6	7.7	10.9	3	<0.1	2.12
22/11/13	VicFalls	27.7	7.85	80	7.78	2.75	60	69.8	5	7	15.6	2	2.3	2.53
16/12/13	VicFalls	27.9	7.86	98	8.34	5	73.5	56.1	11.2	9.7	15	<2	5.3	2.42
30/01/14	Vicfalls	27.6	7.13	6.22	7.15	5.6	46.65	45.4	17.4	12.12	21.8		8.3	1.68
02/12/2014	Vicfalls	26.9	6.88	43	6.92	15	<100	37.9	16.9	<4.7	24.3		9.1	1.18
22/03/14	Vicfalls	28	8.55	4.3	6.25	13.2	<100	32.5	15.6	<4.7	<15.3		21.8	0.99

F3 BIODIVERSITY SPECIES LISTS AND THREATENED STATUS CLASSIFICATIONS

Figure F3.1 Quick Reference Guide, Summary of the IUCN 1994 Red List Categories

EX	Extinct	A taxon is Extinct when there is no reasonable doubt that the last individual has died.
EXW	Extinct in the Wild	A taxon is Extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.
CR	Critically Endangered	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
EN	Endangered	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
VU	Vulnerable	A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.
LR	Lower Risk	A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category are separated into two subcategories:
LR-nt	Lower Risk-Near Threatened	Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
LR-lc	Lower Risk-Least Concern	Taxa which do not qualify for Conservation Dependent or Near Threatened.
DD	Data Deficient	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

Criteria for the *Critically Endangered*, *Endangered* and *Vulnerable* Categories

	Critically Endangered	Endangered	Vulnerable
A Declining Population Population decline rate at least	80% in 10 years or 3 generations	50% in 10 years or 3 generations	20% in 10 years or 3 generations
	using either or based on **a** direct observation **b** an index of abundance appropriate for the taxon **c** a decline in area of occupancy, extent of occurrence and/or quality of habitat **d** actual or potential levels of exploitation **e** the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites	**1** population reduction observed, estimated, inferred, or suspected in the past **2** population decline projected or suspected in the future	
B Small Distribution and Decline or fluctuation Either Extent of Occurrence or Area of Occupancy and two of the following three: **1** either severely fragmented or known to exist at *x* locations **2** continuing decline at in any of the following:	< 100 km² < 10 km² *x* ≤ 1 any rate	< 5,000 km² < 500 km² *x* ≤ 5 any rate	< 20,000 km² < 2,000 km² *x* ≤ 10 any rate
	a extent of occurrence **b** area of occupancy **c** area, extent and/or quality of habitat **d** number of locations or subpopulations **e** number of mature individuals		
3 fluctuating in any of the following:	≈ 1 order of magnitude	≈ 1 order of magnitude	≈ 1 order of magnitude
	a extent of occurrence **b** area of occupancy **c** number of locations or subpopulations **d** number of mature individuals		
C Small Population Size and Decline Number of mature individuals and one of the following two: **1** rapid decline rate of at least **2** continuing decline and either a fragmented or **b** all individuals in a single sub-population	< 250 25% in 3 years or 1 generation any rate all sub-pops < 50	< 2,500 20% in 5 years or 2 generations any rate all sub-pops < 250	< 10,000 10% in 10 years or 3 generations any rate all sub-pops < 1,000
D Very Small or Restricted Either **1** number of mature individuals or **2** population is susceptible	< 50 (not applicable)	< 250 (not applicable)	< 1,000 area of occupancy < 100 km² or number of locations < 5
E Quantitative analysis Indicating the probability of extinction in the wild to be at least	50% in 10 years or 3 generations	20% in 20 years or 5 generations	10% in 100 years

For more detailed information on the IUCN categories, see the Appendices:

For detailed information on the IUCN 1994 categories, see Appendix 1.
For detailed information on the IUCN 1994 categories in Portuguese, see Appendix 2.
For detailed information on the IUCN 2001 categories, see Appendix 3.
For guidelines on applying the 1994 categories, see Appendix 4.
For guidelines on applying the 2001 categories at a national level, see Appendix 5.

Table 3.1 Bat Species Potentially Occurring in the Vicinity of the Batoka Gorge

Family / Species		Common Name	Threat. Status	Presence
EMBALLONURIDAE				
	Taphozous mauritianus	Mauritian Tomb Bat	LC (unk)	x
HIPPOSIDERIDAE				
	Hipposideros caffer	Sundevall's Roundleaf Bat	LC (dec)	Both
	Hipposideros vittatus	Striped Leaf-nosed Bat	NT (dec)	x
MOLOSSIDAE				
	Otomops martiensseni	Large-eared Giant Mastiff Bat	NT (dec)	x
	Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC (unk)	1998
	Chaerephon ansorgei	Ansorge's Free-tailed Bat	LC (stable)	x
	Chaerephon bivittatus	Spotted Free-tailed Bat	LC (stable)	x
	Chaerephon chapini	Pale free-tailed Bat	LC (unk)	x
	Mops condylurus	Angolan Free-tailed Bat	LC (unk)	x
	Tadarida fulminans	Malagasy Free-tailed Bat	LC (stable)	x
	Mops midas	Midas Free-tailed Bat	LC	x
	Chaerephon nigeriae	Nigerian Free-tailed Bat	LC (unk)	x
	Chaerephon pumilus	Little Free-tailed Bat	LC (unk)	Museum
	Tadarida ventralis	African Giant Free-tailed Bat	DD (unk)	~
NYCTERIDAE				
	Nycteris hispida	Hairy Slit-faced Bat	LC (sta)	x
	Nycteris macrotis	Large-eared Slit-faced Bat	LC (unk)	x
	Nycteris thebaica	Egyptian Slit-faced Bat	LC (unk)	Both
	Nycteris woodi	Wood's Slit-faced Bat	NT (dec)	~
PTEROPODIDAE				
	Epomophorus crypturus	Peters's Epauletted Fruit Bat	LC (unk)	Both
	Epomops dobsonii	Dobson's Epauletted Fruit Bat	LC	~
	Rousettus aegyptiacus	Egyptian Fruit Bat	LC (stable)	1998
RHINOLOPHIDAE				
	Rhinolophus blasii	Blasius's Horseshoe Bat	NT	x
	Rhinolophus darlingi	Darling's Horseshoe Bat	LC (unk)	x
	Rhinolophus fumigatus	Rüppell's Horseshoe Bat	LC (unk)	x
	Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	LC (unk)	1998
	Rhinolophus clivosus	Geoffroy's Horsehoe Bat	LC	1998
	Rhinolophus landeri	Lander's Horseshoe Bat	LC	x
	Rhinolophus swinnyi	Swinny's Horseshoe Bat	NT	x
MINIOPTERIDAE				
	Miniopterus natalensis	Natal Long-fingered Bat	LC (unk)	x
VESPERTILIONIDAE				
	Eptesicus hottentotus	Long-tailed Serotine Bat	LC (unk)	x
	Glauconycteris variegata	Variegated Butterfly Bat	LC (unk)	Museum
	Kerivoula argentata	Damara Woolly Bat	LC (unk)	1998
	Kerivoula lanosa	Lesser Woolly Bat	LC (unk)	x
	Laephotis botswanae	Botswana Long-eared Bat	LC	x
	Nycticeinops schlieffeni	Schlieffen's Twilight Bat	LC (unk)	Museum
	Hypsugo anchietae	Anchieta's Pipistrelle	LC (unk)	x
	Neoromicia capensis	Cape Serotine Bat	LC (sta)	Both
	Neoromicia nana	Banana Bat	LC	Museum
	Pipistrellus rusticus	Rusty Pipistrelle	LC (unk)	x
	Neoromicia zuluensis	Zulu serotine	LC (unk)	x
	Pipistrellus rueppellii	Rüppell's pipistrelle	LC	x
	Scotophilus dinganii	Yellow-bellied House Bat	LC (unk)	Museum
	Scotophilus leucogaster	White-bellied House Bat	LC (unk)	Museum
	Scotophilus viridis	Green House Bat	Not Evaluated	x

Key to Threat. Status population trends: dec = decreasing; unk = unknown

Key to Presence: x = Likely to occur; ~ = Low likelihood of occurrence; Museum = Confirmed present by Livingstone Museum records; 1998 = Confirmed present from

Family / Species	Common Name	Threat. Status	Presence
Additional 1998 studies; Both = Confirmed present by both sources.			

Table 3.2 ***Frog Species Potentially Occurring or Recorded in the Vicinity of the Batoka Gorge***

Species Name	Common Name	Threat. Status	Population Trend	1998 ESIA	Kaizen TFCA
Amietia angolensis	Common River Frog	LC	stable		
Amietophrynus [Bufo] garmani	Olive Toad	LC	unknown	reported	x
Amietophrynus [Bufo] gutturalis	Guttural Toad	LC	increasing	x	x
Amietophrynus [Bufo] lemairii	Yellow Swamp Toad	LC	unknown		x
Amietophrynus [Bufo] maculatus	Flat-back Toad	LC	stable	reported	x
Breviceps adspersus	Common Rain Frog	LC	unknown		x
Breviceps mossambicus	Mozambique Rain Frog	LC	unknown		
Breviceps poweri	Power's Rain Frog	LC	unknown		
Bufo kavangensis	Kavango Pygmy toad	LC	unknown		x
Cacosternum boettgeri	Boettger's Dainty Frog	LC	unknown		x
Chiromantis xerampelina	Grey Foam-nest Treefrog	LC	unknown	x	x
Hemisus guineensis	Guinea Snout-burrower	LC	unknown		x
Hemisus marmoratus	Marbled Snout-burrower	LC	unknown	x	x
Hildebrandtia ornata	African Ornate Frog	LC	unknown		x
Hylarana darlingi	Edible Frog	LC	unknown		x
Hyperolius acuticeps		LC	unknown		
Hyperolius benguellensis		LC	unknown		
Hyperolius marginatus		LC	unknown		x
Hyperolius nasutus	Sharp-snouted Reed Frog	LC	stable	x	x
Hyperolius parallelus		LC	unknown		
Hyperolius rhodesianus		LC	unknown		x
Hyperolius viridiflavus (aposematicus)	Common Reed Frog	LC	unknown		x
Kassina senegalensis	Common Bubbling Kassina	LC	unknown	x	x
Leptopelis bocagii	Bocage's Frog	LC	unknown	x	x
Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC	stable	x	x
Phrynobatrachus natalensis	Natal Dwarf Puddle Frog	LC	stable	reported	x
Phrynomantis bifasciatus	Banded Rubber Frog	LC	unknown	x	x
Poyntonophrynus (Bufo) fenoulheti	Fenoulhet's Pygmy Toad	LC	unknown	x	x
Ptychadena anchietae	Plain Grass Frog	LC	unknown	reported	x
Ptychadena guibei	Guibe's Ridged Frog	LC	unknown	x	x

Species Name	Common Name	Threat. Status	Population Trend	1998 ESIA	Kaizen TFCA
Ptychadena mascareniensis	Mascarene Grass Frog	LC	stable		x
Ptychadena mossambica	Mozambique Ridged Frog	LC	unknown	x	x
Ptychadena oxyrhynchus		LC	stable		x
Ptychadena porosissima	Three-striped Ridged Frog	LC	unknown	x	x
Ptychadena subpunctata	Spot-bellied Ridged Frog	LC	unknown	x	x
Pyxicephalus adspersus	African Bullfrog	LC	decreasing		
Pyxicephalus edulis	African (Edible) Bullfrog	LC	unknown		x
Schismaderma carens	African Red Toad	LC	unknown	x	x
Strongylopus fasciatus	Striped Stream Frog	LC	unknown		
Tomopterna cryptotis	Common Sand Frog	LC	stable	x	x
Tomopterna marmorata	Marbled Sand Frog	LC	unknown	reported	x
Xenopus laevis	Common Platanna	LC	increasing	x	x
Xenopus muelleri	Muller's Platanna	LC	unknown	x	x
Xenopus petersii	Peters' Platanna	LC	unknown		x

Table 3.3 Mammal Species Potentially Occurring in the Vicinity of the Batoka Gorge

Order	Species	Common Name	Red List status
CARNIVORA			
	Canis adustus	Side-striped Jackal	LC
	Canis mesomelas	Black-backed Jackal	LC
	Lycaon pictus	African Wild Dog	EN
	Otocyon megalotis	Bat-eared Fox	LC
	Acinonyx jubatus	Cheetah	VU
	Caracal caracal	Caracal	LC
	Felis silvestris	Wild Cat	LC
	Leptailurus serval	Serval	LC
	Panthera leo	African Lion	VU
	Panthera leo	African Lion	VU
	Panthera pardus	Leopard	NT
	Atilax paludinosus	Marsh Mongoose	LC
	Bdeogale crassicauda	Bushy-tailed Mongoose	LC
	Helogale parvula	Dwarf Mongoose	LC
	Herpestes ichneumon	Eyptian Mongoose	LC
	Herpestes sanguineus	Slender Mongoose	LC
	Ichneumia albicauda	White-tailed Mongoose	LC
	Mungos mungo	Banded Mongoose	LC
	Paracynictis selousi	Selous' Mongoose	LC
	Rhynchogale melleri	Meller's Mongoose	LC
	Crocuta crocuta	Spotted Hyaena	LC
	Proteles cristata	Aardwolf	LC
	Aonyx capensis	African Clawless Otter	LC
	Ictonyx striatus	Striped Polecat	LC
	Lutra maculicollis	Spotted-necked Otter	LC
	Mellivora capensis	Honey Badger	LC

Order	Species	Common Name	Red List status
	Poecilogale albinucha	African Striped Weasel	LC
	Civettictis civetta	African Civet	LC
	Genetta genetta	Common Genet	LC
	Genetta maculata	Rusty-spotted Genet	LC
CETARTIODACTYLA			
	Aepyceros melampus	Impala	LC
	Connochaetes taurinus	Blue Wildebeest	LC
	Damaliscus lunatus	Tsessebe	LC
	Hippotragus equinus	Roan Antelope	LC
	Hippotragus niger	Sable Antelope	LC
	Kobus ellipsiprymnus	Waterbuck	LC
	Oreotragus oreotragus	Klipspringer	LC
	Ourebia ourebi	Oribi	LC
	Raphicerus campestris	Steenbok	LC
	Raphicerus sharpei	Sharpe's Grysbok	LC
	Redunca arundinum	Southern Reedbuck	LC
	Sylvicapra grimmia	Common Duiker	LC
	Syncerus caffer	African Buffalo	LC
	Tragelaphus oryx	Common Eland, Eland	LC
	Tragelaphus scriptus	Bushbuck	LC
	Tragelaphus strepsiceros	Greater Kudu	LC
	Giraffa camelopardalis	Giraffe	LC
	Hippopotamus amphibius	Hippopotamus	VU
	Phacochoerus africanus	Common Warthog	LC
	Potamochoerus larvatus	Bushpig	LC
CHIROPTERA			
	Taphozous mauritianus	Mauritian Tomb Bat	LC
	Hipposideros caffer	Sundevall's Roundleaf Bat	LC
	Hipposideros vittatus		NT
	Otomops martiensseni	Large-eared Free-tailed Bat	NT
	Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC
	Tadarida ansorgei	Ansorge's Free-tailed Bat	LC
	Tadarida bivittata	Spotted Free-tailed Bat	LC
	Tadarida chapini	Chapin's Free-tailed Bat	LC
	Tadarida condylura	Angolan Free-tailed Bat	LC
	Tadarida fulminans	Malagasy Free-tailed Bat	LC
	Tadarida nigeriae	Nigerian Free-tailed Bat	LC
	Tadarida pumila	Little Free-tailed Bat	LC
	Tadarida ventralis	African Giant Free-tailed Bat	DD
	Nycteris hispida	Hairy Slit-faced Bat	LC
	Nycteris macrotis	Large-eared Slit-faced Bat	LC
	Nycteris thebaica	Egyptian Slit-faced Bat	LC
	Nycteris woodi	Wood's Slit-faced Bat	LC
	Epomophorus crypturus	Peters's Epauletted Fruit Bat	LC
	Rousettus aegyptiacus	Egyptian Fruit Bat	LC
	Rhinolophus darlingi	Darling's Horseshoe Bat	LC
	Rhinolophus fumigatus	Rüppell's Horseshoe Bat	LC
	Rhinolophus hildebrandti	Hildebrandt's Horseshoe Bat	LC
	Eptesicus hottentotus	Long-tailed House Bat	LC
	Glauconycteris variegata	Butterfly Bat	LC
	Kerivoula argentata	Damara Woolly Bat	LC
	Kerivoula lanosa	Lesser Woolly Bat	LC
	Laephotis wintoni	De Winton's Long-eared Bat	LC
	Miniopterus natalensis	Natal Long-fingered Bat	LC
	Myotis tricolor	Cape Hairy Bat	LC
	Myotis welwitschii	Welwitch's Bat	LC

Order	Species	Common Name	Red List status
	Nycticeinops schlieffeni	Schlieffen's Twilight Bat	LC
	Pipistrellus anchietae	Anchieta's Pipistrelle	LC
	Pipistrellus capensis	Cape Serotine	LC
	Pipistrellus rendalli	Rendall's Serotine	LC
	Pipistrellus rusticus	Rusty Pipistrelle	LC
	Pipistrellus zuluensis		LC
	Scotophilus dinganii	African Yellow Bat	LC
	Scotophilus leucogaster	White-bellied Yellow Bat	LC
EULIPOTYPHLA			
	Atelerix frontalis	Southern African Hedgehog	LC
	Crocidura cyanea	Reddish-gray Musk Shrew	LC
	Crocidura fuscomurina	Tiny Musk Shrew	LC
	Crocidura hirta	Lesser Red Musk Shrew	LC
	Crocidura mariquensis	Swamp Musk Shrew	LC
	Crocidura olivieri	Olivier's Shrew, African Giant Shrew	LC
	Suncus lixus	Greater Dwarf Shrew	LC
HYRACOIDEA and LAGOMORPHA			
	Heterohyrax brucei	Yellow-spotted Hyrax	LC
	Lepus microtis	African Savanna Hare	LC
MACROSCELIDEA			
	Elephantulus brachyrhynchus	Short-snouted Elephant Shrew	LC
	Elephantulus myurus	Eastern Rock Elephant Shrew	LC
PERISSODACTYLA			
	Equus quagga	Burchell's Zebra	LC
	Ceratotherium simum	White Rhinoceros	NT
	Ceratotherium simum	White Rhinoceros	NT
	Diceros bicornis	Black Rhinoceros	CR
	Diceros bicornis	Black Rhinoceros	CR
PRIMATES			
	Chlorocebus pygerythrus	Vervet	LC
	Papio ursinus	Chacma Baboon	LC
	Galago moholi	Southern Lesser Galago	LC
PROBOSCIDEA			
	Loxodonta africana	African Elephant	VU
RODENTIA			
	Fukomys damarensis	Damara Mole Rat	LC
	Fukomys damarensis	Damara Mole Rat	LC
	Graphiurus microtis	Small-eared Dormouse	LC
	Hystrix africaeaustralis	Cape Porcupine	LC
	Acomys spinosissimus	Spiny Mouse	LC
	Aethomys chrysophilus	Red Rock Rat	LC
	Aethomys namaquensis	Namaqua Rock Rat	LC
	Dasymys incomtus	African Marsh Rat	LC
	Gerbilliscus brantsii	Highveld Gerbil	LC
	Gerbilliscus leucogaster	Bushveld Gerbil	LC
	Gerbilliscus validus	Savanna Gerbil	LC
	Lemniscomys rosalia	Single-striped Grass Mouse	LC
	Mastomys natalensis	Natal Multimammate Mouse	LC
	Mus indutus	Desert Pygmy Mouse	LC
	Mus minutoides	Pygmy Mouse	LC
	Pelomys fallax	Creek Groove-toothed Swamp Rat	LC
	Thallomys paedulcus	Acacia Rat	LC
	Cricetomys gambianus	Northern Giant Pouched Rat	LC
	Dendromus melanotis	Gray Glimbing Mouse	LC

Order	Species	Common Name	Red List status
	Dendromus mystacalis	Chestnut Climbing Mouse	LC
	Dendromus nyikae	Nyika Climbing Mouse	LC
	Saccostomus campestris	Pouched Mouse	LC
	Steatomys parvus	Tiny Fat Mouse	LC
	Steatomys pratensis	Fat Mouse	LC
	Pedetes capensis	Springhare	LC
	Paraxerus cepapi	Smith's Bush Squirrel	LC
	Thryonomys gregorianus	Lesser Cane Rat	LC
	Thryonomys swinderianus	Greater Cane Rat	LC
TUBULIDENTATA and PHOLIDOTA			
	Orycteropus afer	Aardvark	LC
	Smutsia temminckii	Temminck's Ground Pangolin	LC

Annex G

Biodiversity, Social and Cultural Heritage Baseline Data Collection Methodologies

G1 INTRODUCTION

This *Annex* provides the methodologies for the collection of baseline data related to Biodiversity, Social and Cultural Heritage. These methodologies were developed in line with the IFC Performance Standards.

G2 BIODIVERSITY STUDY – TERRESTRIAL ECOLOGY

Ecological studies for the Batoka Gorge ESIA process and surrounding areas were conducted and reported in 1993 and May 1998. These studies provided sub-reports on vegetation, wildlife and fisheries, were compiled to a high standard and provide a good baseline for the conditions at that time. Aspects that have changed since that time, such as the status of wildlife populations, crocodiles, and the status of key species of concern (e.g. Taita Falcons) have been addressed in detail in the current study. Habitat maps have also been extended to cover the entire area of influence in a consistent manner.

G2.1 GAP ANALYSIS

ERM conducted a Gap Analysis on the 1998 Additional Studies. This Gap Analysis concluded that these sub-reports presented useful ecological data for the Project Area and surrounds over various seasons, and provided a comprehensive description of the diversity of floral and faunal species occurring there. Many species are identified and the seasonality of the site has been well represented. However, to meet international standard requirements and the IFC Performance Standard 6 in particular, the following broad data gaps were identified and needed to be addressed:

- **Conservation Issues** - Impacts on protected areas in their various forms and within the vicinity of the project area have not been comprehensively assessed during previous studies.

- **Habitat Assessment** – important habitats were identified, but were mapped over a limited area, which focussed largely on the Zimbabwean side. The habitats within the extent of the transmission lines were not described or assessed. There was no assessment of the transformation and habitats required a classification as Modified, Natural or Critical Habitat. Landuse changes, such as expansion of cultivation areas needed to be reflected in an up-to-date mapping exercise. The current report has aimed to address this gap through a consistent mapping of habitats over the entire area of influence.

- **Faunal Assessment** – a comprehensive representation of faunal species was presented, but landuse alterations and decimation of wildlife since the previous studies were conducted, were expected to have impacted the presence of wildlife. An overview of the current state of the large wildlife was therefore needed. An updated assessment of the state of Taita Falcons, Rock Pratincole and other sensitive bird species was needed, and an assessment of how the construction of a dam may affect these populations was required. The Batoka Gorge contains numerous caves, crevices and adits which provide roosting sites for several species of bats. Bat migrations have been observed and are thought to be feeding on

emerging aquatic invertebrates. Currently little is known about the species or their migrations, and a data search was needed.

G2.2 FIELD STUDIES

Data on surrounding conservation areas was sourced based on the extent and state of protected areas within the project area from the Zambian Wildlife Agency (ZAWA) and the Zimbabwe National Parks and Wildlife Agency (NPWA).

Field surveys were conducted collaboratively between Black Crystal and ERM. An Ecological Area of Influence was determined covering both Zambia and Zimbabwe, and habitats within that area mapped from available aerial imagery. The various habitat units in Zambia and Zimbabwe were ground-truthed by Black Crystal in September 2014, their dominant species composition and levels of transformation were assessed.

Faunal data were sourced from the Zimbabwe Falconer's Club, CAMPFIRE associations, the Livingstone Natural History Museum, local safari hunters and the Crocodile Farmer's Association.

The fish communities have been well described for the project area, but other aspects of the aquatic ecology have received little attention. The Present Ecological State (PES) of the aquatic habitats is an important component of an IFC-compliant ecological assessment. The PES is an important reference against which to maintain downstream conditions post construction of the dam wall, and has been assessed as part of an Environmental Flow assessment at two sites downstream of the proposed dam wall. The PES was assessed based on hydrology, geomorphology, vegetation sampling, aquatic macro-invertebrates sampling, expected fish response to harvesting levels and expected crocodile population response to current conditions.

The Aquatic ecology content in this document has been extracted from the Additional studies report presented in May 1998. The Fisheries report was compiled by John Munshell based on fieldwork he conducted in the Batoka Gorge in 1997/1998. The following methods were used at that time:

- Fieldwork involved the sampling of two pools in November 1997. Pool one was deep (>6m) and the total area was 30m². The second pool (Pool Two) was small (10m²) and shallower (<1m). A third site which had been identified was not successfully sampled. The nets were set there overnight and raised the following morning for a total of seven days but no fish were caught using gillnets.

- A fish toxicant (rotenone) was used in the pools. These pools were isolated since the Zambezi was at low flow during the time of the sampling in November. There was no need to use a block net since the whole pool was poisoned.

- Examination of catches of local fishermen were recorded in November 1997 and March 1998. There were 10 part-time fishermen in the Batoka Gorge. A few occasional fishermen also visited the gorge. No professional fishermen were identified in the area. The fishermen used hand-nets and rod line to catch fish. Each fisherman has three hand-nets and four rod lines. Their catches were also examined.

- In February 1998 the Zambezi River was flowing quite fast and the pools that had been previously sampled were all covered. It was impossible to do any sampling in the Batoka Gorge. A tributary of the Zambezi flowing into the Batoka Gorge, DibuDibu, was sampled using the fish toxicant. The sampling areas that the National Museum in Zimbabwe had sampled were revisited.

G4 ENVIRONMENTAL FLOW ASSESSMENT

G4.1 OBJECTIVES

The objectives of the EF assessment were:

- to evaluate the present day condition (i.e. the present structure and functioning) of the Zambezi River from upstream of BGHES to Kariba Dam;
- to evaluate how the condition of the river could change under different operational scenarios for the proposed BGHES.

G4.2 SCOPE OF WORK

Southern Waters', who conducted the Environmental Flow Assessment (EFA) on behalf of ERM, had the following Scope of Work:

- Delineate the river within the study area and select representative sites for the EF assessment.
- Provide input to the selection of scenarios for the EF assessment.
- Collect/collate primary and secondary data for the configuration of the DRIFT EF assessment model.
- Incorporate the hydrological data provided by ERM into the DRIFT model and select ecologically-relevant flow indicators.
- Model and incorporate the ecohydraulic relationships based on survey data from EF Sites 1 and 2 into the DRIFT model.
- Select of discipline indicators for the DRIFT model.
- Set up, populate and calibrate the DRIFT Decision Support System.
- Simulate of scenarios.
- Present results in a report.

The Scope of Work was restricted to an assessment of the riverine biophysical aspects of the BGHES, and did not include an assessment of the consequent social and economic impacts of the project.

All of the local and international EF team members visited the Zambezi River upstream and downstream of the proposed BGHES between the 1 and 5 of September 2014. Thereafter (27 -31 October 2014), the population and calibration of the DRIFT Decision Support System was completed in a workshop situation in Cape Town.

G4.3 THE EF ASSESSMENT PROCESS

DRIFT (Downstream Response to Imposed Flow Transformations) is an holistic EF assessment approach (Brown *et al.* 2013) that, in this project, was applied at the level of the direct influence of the proposed BGHES. This is

essentially the Zambezi River from the location of the proposed BGHES weir to Kariba Dam. The objective was to describe the present condition of the river ecosystem and then, through scenarios, to predict how this could change with different design and operation of the BGHES.

Changes in the hydrological regime drive the assessment process. Each scenario would change flow conditions along the river in a different way, with possible different repercussions for the river system. Once these hydrological changes have been simulated, then the DRIFT software provides predictions of the consequent changes in the biotic and abiotic aspects of the river.

G5 SOCIAL STUDIES

A Social Area of Influence (SAoI) was determined though consideration of likely project impacts with the aid of available aerial imagery. A selection of communities (social study communities) were chosen in the SAoI for primary data collection purposes. Social study communities were chosen through random sampling by grouping communities together with likely similar Project impacts (eg impacts associated with transmission lines, impacts associated with access roads, impacts associated with restricted access to the Zambezi River and impacts associated by land take). Communities were chosen randomly from within these groupings and were chosen to provide a representative understanding of the social environment across the SAoI. Downstream impacts are not yet fully understood and although the parties that could be impacted on by changes to flow regime have been identified, baseline data was not been gathered for these communities. In addition, due to the lack of clarity on whether the transmission line from the dam site to Choma is to be included as part of the project in Zambia, communities along this proposed line were also not targeted at this stage.

G5.1 SECONDARY DATA COLLECTION

Secondary data was reviewed on the social-economic profile of both Zambia and Zimbabwe for the national level context, as well as for the provinces and districts in which the proposed project will fall under. No data could be found for the local level / communities that the proposed project is likely to impact. As a result, these communities formed the target for primary data collection. Secondary data was sourced from various organisations, including the government statistical offices, development agencies, and NGOs.

G5.2 PRIMARY DATA COLLECTION ACTIVITIES

Primary data was obtained from:

- focus group discussions with males and females;
- key informant interviews;
- household surveys; and
- site observations

Tools were prepared to guide all primary data collection activities. Village heads were notified by a member of the field team prior to the data collection activities were due to take place. They were informed of the purpose of the data collection exercise and were asked for permission for the exercises to go ahead.

G5.2.1 *Focus Groups Discussions (FGDs)*

Semi-structured meetings were held with men and women (including male and female youth) to gain a good understanding of the socio-economic baseline in the local communities. In order to select participants for the focus groups and to capture the views of vulnerable groups (such as the elderly and those with disabilities), the field team, aided by the village head, gathered the community and requested for volunteers including representatives from the respective vulnerable groups. After volunteers had nominated themselves, the team selected a sample, generally ranging from 6-10 participants. Using this method, the field team were able to select various age groups and less able community members to participate in meetings.

Figure G5.1 Pictures of FGDs

Source: ERM Social Survey. Left – Female FGD Borehole 126, Zimbabwe. Right: Male FGS, Chibule, Zambia

G5.2.2 *Key Informant Interviews (KIIs)*

Key informants are individuals who have knowledge of a specific subject or are informed members of the community, such as government representatives, local leaders /village heads, religious leaders, school teachers, healthcare professionals, NGOs, etc.

The objectives of the key informant interviews were to solicit information regarding the local community, to identify potential impacts and mitigation measures and to discuss community needs.

Figure G5.2 Pictures of KIIs

Source: ERM Social Survey. Left – Nurse at Mukuni Health Clinic, Zambia. Right – CAMPFIRE officers, Zimbabwe

G5.2.3 Household Surveys

In Zambia and Zimbabwe, a household (HH) is defined as a person or group of persons related or unrelated who live together and make common cooking arrangements (i.e. sharing a cooking pot).

Household surveys was conducted to collect quantitative information including demographics, livelihoods and land use, income and expenditure, health at the household level. The field team used a random sampling strategy to select households for inclusion. On average, 30% of households per village were selected for inclusion as part of the household survey (calculations were based on population figures given by the village head). Data from the household surveys were entered into an excel database for analysis.

Figure G5.3 Pictures of Household Survey

Source: ERM Social Survey. Left – HH survey In Chisuma, Zimbabwe. Right – Administering HH survey N'gandu, Zambia.

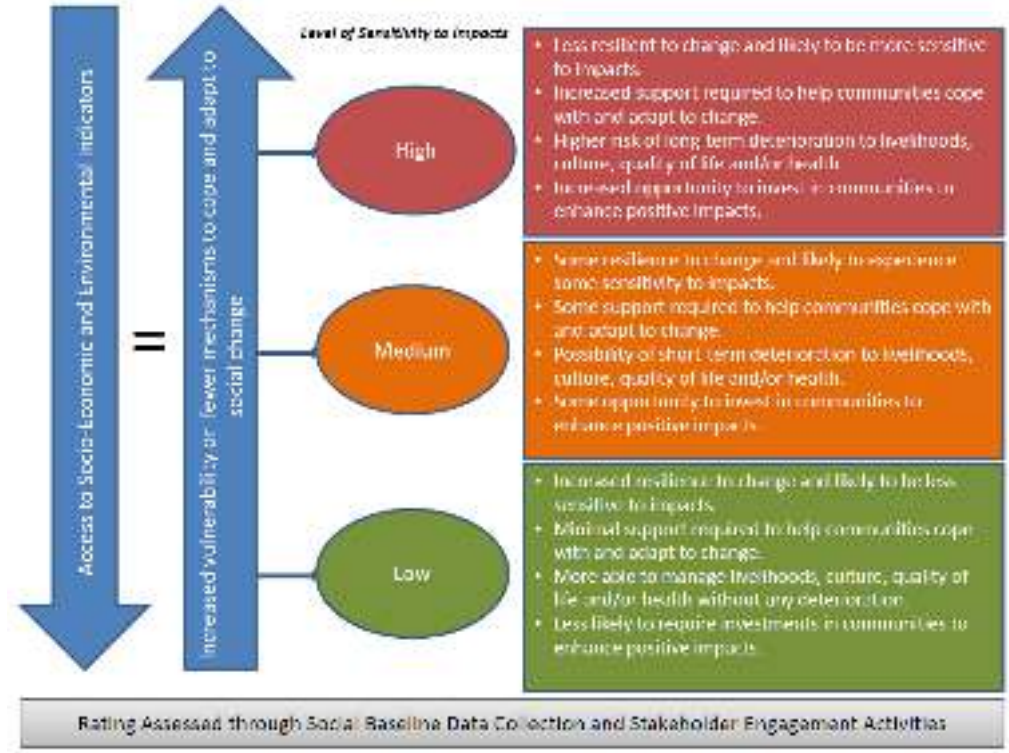
G5.3 VULNERABILITY ASSESSMENT METHODOLOGY

"*Vulnerability' describes the reduced ability of some communities or households to cope with the events and stresses to which they are exposed*."(1)

Vulnerability of receptors to social impacts is dependent on the level of resilience of individuals to cope with socio-economic or bio-physical change. Vulnerable groups are more susceptible to negative impacts or have a limited ability to take advantage of positive impacts. Resilience is based on having access to the necessary resources (e.g. financial credit, assets such as crops, shelter, etc) and physical/mental capacity (e.g. strength to relocate, skills to rebuild a business, etc) to cope with change. *Figure G5.4* shows how resilience to cope with change relates to vulnerability and therefore sensitivity to impacts.

(1) Green, P. (2008) *From Poverty to Power*. Oxford, UK: Oxfam. p 201

Figure G5.4 Vulnerability and Resilience to Change



Below is a framework that has been used in order to assess aspects considered during the identification of vulnerable groups.

Table G5.1 Characteristics that Underpin Vulnerability

Access / Status	Aspects to be considered	Sensitivity Indicators
Human Receptors' (individuals, groups, households, communities etc) access to:		
Livelihoods	• Diversity of livelihoods • Legality of livelihood • Productivity of livelihood	• Reliance on one principal livelihood • Principal livelihoods are relatively unproductive • Principal livelihoods are unsustainable, fragile or illegal.
Resources	• Water • Non-Timber Forest Products • Land	• Access limited to few resources • Resource shortages are frequent and serious • Resources available are legally protected and use is illegal
Services and infrastructure	• Health • Education • Transport • Recreation • Savings and support networks • Fair Policing and Security	• Minimal access to key services and infrastructure • Provision of key services and infrastructure is poor.

Access / Status	Aspects to be considered	Sensitivity Indicators
Participation in political and civil institutions and decision making	• Freedom of association • Freedom from corruption	• Minimal ability to participate in orthodox governance and decision making systems • Subject to high levels of corruption • Restrictions on rights of association, ability to participate freely in governance
Community and social inclusion and cohesion	• Security • Freedom from inter and intra community cohesion	• Subject to marginalisation and discrimination. • Subject to violence and conflict.
Human Receptors' (individuals, groups, households, communities etc) status:		
Health	• Health status including malnutrition, infectious diseases, disability etc	• Acute illness • Chronic illness • Maternal mortality • Child mortality.
Knowledge, skills and education	• Levels of knowledge skills and education • Ability to participate in orthodox economic and social systems.	• Literacy • School attendance • Education levels achieved
Financial resources	• Income generation • Savings	• Income levels relative to expenditure • Ability to pay for food, key services, resources and infrastructure
Labour rights	• Forced labour • Child labour • Right to association • Health and safety standards • Minimum wage etc	• Subject to forced labour / slavery, indentured labour • Subject to children labour • Subject to inadequate occupational H&S and accommodation standards
Independent cultural identity	• Desire to maintain strong independent cultural identity. • Desire to avoid all socio-cultural change	• Desire to maintain strong independent cultural identity • Desire to avoid all socio-cultural change

G6 CULTURAL HERITAGE STUDIES

The cultural heritage baseline has been developed through an analysis of both primary and secondary data. ERM commissioned Richard Mbewe of the Zambian National Heritage Conservation Commission (NHCC) and Rob Burrett, associate researcher at the Natural History Museum of Zimbabwe and of Black Crystal Consultants to undertake primary data collection. ERM drew together the reports submitted by both of the consultants in order to develop a consolidated cultural heritage baseline chapter.

G6.1 SECONDARY DATA COLLECTION

Secondary data was reviewed for information relating to cultural heritage resources in the Project area of both Zambia and Zimbabwe. This included analysis of previous environmental studies undertake for the proposed Batoka Gorge Hydroelectric Scheme, as well as other published reports on heritage in the two countries. In Zambia, the archaeological register (housed by the National Heritage Conservation Commission) and in Zimbabwe, the records of the Archaeological Survey of Zimbabwe (housed in the Zimbabwe Museum of Human Sciences, Harare) were also reviewed in order to gain a deeper understanding of the regional cultural heritage baseline.

G6.2 PRIMARY DATA COLLECTION

Following the review of secondary data, field reconnaissance was conducted in both Zambia and Zimbabwe for the Project footprint (2).

The key objectives of the field studies were to:

- Undertake interviews with key informants from local communities to identify sites of intangible value. This included discussions with chiefs and their representatives.
- Revisit the cultural heritage sites already recorded as part of the 1993 and 1998 studies in order to collect precise GPS readings and additional information on the site context and content. (GPS readings collected as previous studies were incomplete).
- Take digital photographs of cultural heritage sites.
- Investigate spatial gaps in the Project footprint. In Zambia these included the area around the proposed dam and the edges of the plateau beside the

(2) Note: primary data collection was not undertaken for the transmission lines. The locations of the transmission line routings are not yet known (although a 3km wide corridor is currently being explored) hence, transmission line data was sourced solely from a review of secondary data.

Gorge to the west. In Zimbabwe, it included areas west of the Gorges Lodge, east of Kasikiri village, and in the vicinity of the dam wall.

Maps were developed for the Project Area with Project infrastructure imposed on them and areas of high and medium cultural sensitivity were highlighted for priority investigation. In Zambia the field reconnaissance was undertaken from 14 to 19 February 2015 and in Zimbabwe, from 15 to 24 August 2014.

In both countries field / pedestrian transects were used as sampling methods to identify cultural heritage sites.

G6.3 SURVEY LIMITATIONS

The surveys undertaken in support of this assessment have provided a clear and robust characterisation of the cultural heritage resources of the area, enabling the identification of significant impacts to be identified. However, give the preliminary nature of the BGHES designs at this point – as well as practical and logistical constraints to the ESIA surveys (eg gorge access, minefields) - they should not be understood as a definitive documentation of the heritage resources likely to be affected by the development. It is important to make it clear that additional archaeological investigation and documentation of traditional sites will be essential ahead of the commencement of construction in order to avoid unintended impacts.

Annex H

Climate Change Risk Review

H1 CLIMATE CHANGE RISK REVIEW

H1.1 INTRODUCTION

A high-level climate risk assessment was undertaken of the Batoka Gorge Catchment to understand the likely implications of future climate change on the Gorge, and specifically on water availability, which has direct implications for the functioning of the proposed BGHES. The assessment included a review of publically available reports and scientific papers, as well as an analysis of downscaled climate data for the catchment to look specifically at water availability.

H1.2 HISTORIC CLIMATE

H1.2.1 *Overall*

The Zambezi River Basin is subjected to one of the most variable climates of any major river basin in the world, experiencing extreme conditions across the catchment through time (1). A high level summary of temperature, precipitation and flooding patterns in the Basin is discussed below.

H1.2.2 *Temperature*

Temperature variation across the Basin across seasons is not high (i.e. estimated to be in the region of 4 °C) (2). The coolest temperature is experienced in July and winter temperatures range from 13 °C (higher elevation areas to the south) to 23 °C (lower elevation areas in the delta) (3). Mean daily temperatures in the summer months range between 23 °C in the highest elevation areas, to 31 °C for the lower parts of the Zambezi valley (4). Temperatures are warmest along the border of Zambia and Zimbabwe.

H1.2.3 *Precipitation*

Average annual rainfall in the Basin is approximately 950 mm/year, although this average is unevenly distributed with the northern and eastern portions of the Basin receiving the highest proportion of rainfall (5). For example, annual rainfall varies from more than 1600 mm in the northern highland areas to approximately 550 mm in the southern portion of the basin (6).

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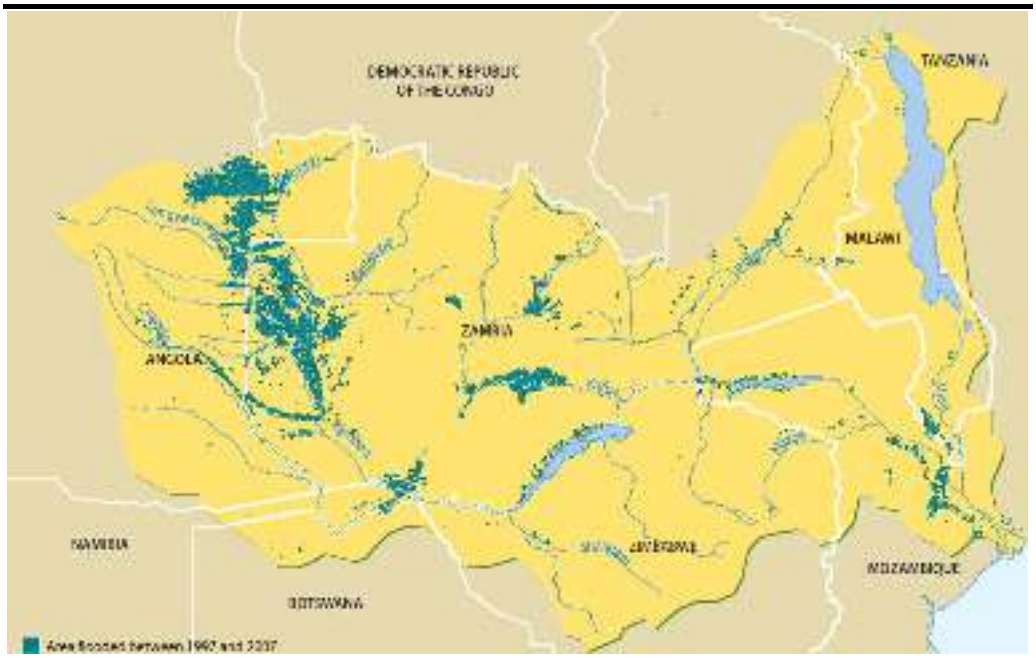
(1) Beilfuss, Richard. 2012. A risky climate for southern African hydro: Assessing hydrological risks and consequences for Zambezi river basin dams. International River.
(2) Schlosser, C. Adam; Strzepek, Kenneth (2013): Regional climate change of the greater Zambezi River Basin: A hybrid assessment, WIDER Working Paper, No. 2013/040.
(3) SADC/SARDC and others 2012. Zambezi River Basin Atlas of the Changing Environment. SADC, SARDC, ZAMCOM, GRID-Arendal, UNEP. Gaborone, Harare and Arendal.
(4) Ibid.
(5) Ibid.
(6) Beilfuss, Richard. 2012. A risky climate for southern African hydro: Assessing hydrological risks and consequences for Zambezi river basin dams. International River.

The Zambezi River Basin experiences robust seasonality with regards to precipitation, with a dry season from June to August (average precipitation of less than 0.05 mm/ day), and a wet season from December to February (average precipitation of more than 5 mm/day) [7].

Flooding is problematic in the Basin, occurring nearly every decade resulting in numerous socio-economic impacts. Between 1997 -2001, the Basin has experienced extreme floods during the rainy seasons of 1999 – 2000, 2005 - 2006 and 2007 [8]. Tropical cyclones originating in the Indian Ocean are the main driver behind the flood cycles. The areas of the Basin flooded between 1997 and 2007 are shown in *Figure H1.1* below.

Figure H1.1 Flooding in the Zambezi River Basin between 1997 and 2007 [9]



H1.2.4 Drought

Multi-year droughts are observed in the Basin, with implications for river flows and hydropower production. For example, the effect of the 1991/92 drought on hydropower potential in the Kariba Dam resulted in a regional impact that included a reduction of GDP of US$ 102 million, US$ 36 million reduction in export earnings and the loss of 3 000 jobs [10].

(7) Schlosser, C. Adam; Strzepek, Kenneth (2013): Regional climate change of the greater Zambezi River Basin: A hybrid assessment, WIDER Working Paper, No. 2013/040, ISBN 978-92-9230-617-5.
(8) SADC/SARDC and others 2012. Zambezi River Basin Atlas of the Changing Environment. SADC, SARDC, ZAMCOM, GRID-Arendal, UNEP. Gaborone, Harare and Arendal.
(9) SADC and ZRA 2007. Rapid Assessment Report: Integrated Water Resources Management Strategy for the Zambezi River Basin. SADC Water Division. Gaborone.
(10) Beilfuss, Richard. 2012. A risky climate for southern African hydro: Assessing hydrological risks and consequences for Zambezi river basin dams. International Rivers.

H1.3 PROJECTED FUTURE CLIMATE CHANGE AND POSSIBLE IMPLICATIONS

H1.3.1 *Overall*

The Zambezi River Basin has been classified by the Intergovernmental Panel on Climate Change (IPCC) as the river basin to be subjected to the 'worst' potential effects of climate change among 11 major African river basins reviewed. This classification is largely based on the climate change-induced increased temperature and decreased precipitation in the Basin [(11)], which is discussed below.

The literature suggests that there are four main ways in which climate change can affect hydropower operations, namely [(12)]:

- Reduced reservoir inflows as a result of a projected decline in Basin runoff and more prolonged drought conditions. This will reduce overall power output.

- Increased risks in the form of uncontrolled releases and dam safety risks due to a projected increase in extreme flooding events, following higher rainfall intensity and more frequent tropical cyclones.

- A potential reduction in the reliability and predictability of hydropower production due to both a delayed onset of the rainy season, and general reduction in the water budget.

- A likely decline in reservoir capacity and risks to flood management operations because of the projected increase in rainfall and flooding intensity increasing sediment loads to reservoirs.

H1.3.2 *Temperature*

Overall, temperatures in the Basin are expected to increase as a result of climate change, the degree to which differs across studies. Beilfuss (2012), for example, report a projected warming trend of 0.3 – 0.6 °C per decade until the end of the century [(13)]. Beck and Bernauer (2011) report on an annual temperature increase in the Basin of as great as 2.9 °C [(14)]. Temperature increases will likely result in concomitant increases in evaporation rates, with implications for water availability (see sub-section on 'water availability' below). In addition, climate change is expected to result in prolonged dry periods and enhanced drought conditions (driven largely by the increased temperatures and reduced rainfall, discussed below) [(15)].

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(11) Ibid.
(12) Ibid.
(13) Ibid.
(14) How will combined changes in water demand and climate affect water availability in the Zambezi river basin? Global Environmental Change: 21: 1061 -1072.
(15) Beilfuss, Richard. 2012. A risky climate for southern African hydro: Assessing hydrological risks and consequences for Zambezi river basin dams. International Rivers.

H1.3.3 Rainfall

Across the Basin, rainfall is expected to decline by 10 - 15% by the end of the century [16]. In addition to this, alterations in the seasonal rainfall patterns are projected (including a delay in the onset of the rainy season, which is corroborated by evidence provided in the 'water availability' section below), with implications for hydropower generation [17].

Climate change is expected to result in tropical cyclones of increased intensity, with higher peak wind speeds and heavier rainfall (as a result of increasing sea surface temperatures), with implications for the flooding regime in the Basin [18].

Even in the absence of changes in temperature, the projected reduction in rainfall will have consequences for river and lake levels [19].

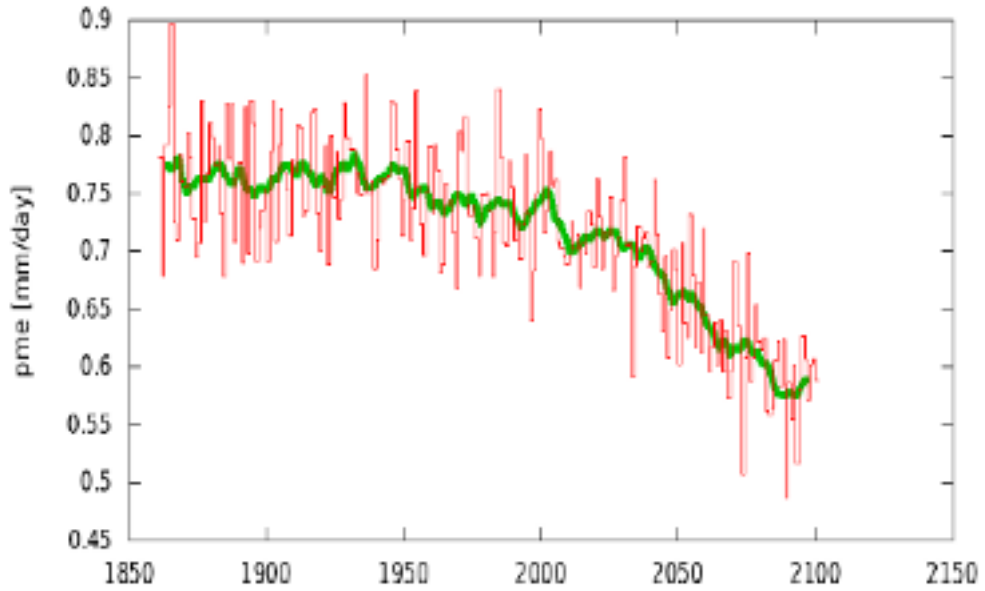
H1.3.4 Water Availability [20]

Precipitation minus evaporation (P-E) was used as a proxy to determine the water budget of the Bakota Gorge catchment (i.e. water availability and annual river flow). Note that this does not take into account subsurface flow and groundwater, which are both expected to be a small and probably constant fraction of the water budget. P-E was determined using the ensemble mean of multiple models [21] supporting the latest (5th) IPCC assessment (IPCC, 2013 [22]).

The best estimate of projected P-E is a reduction of approximately 1.7% per decade compared to the baseline climatology (1980-2010) (*Figure 1.2*).

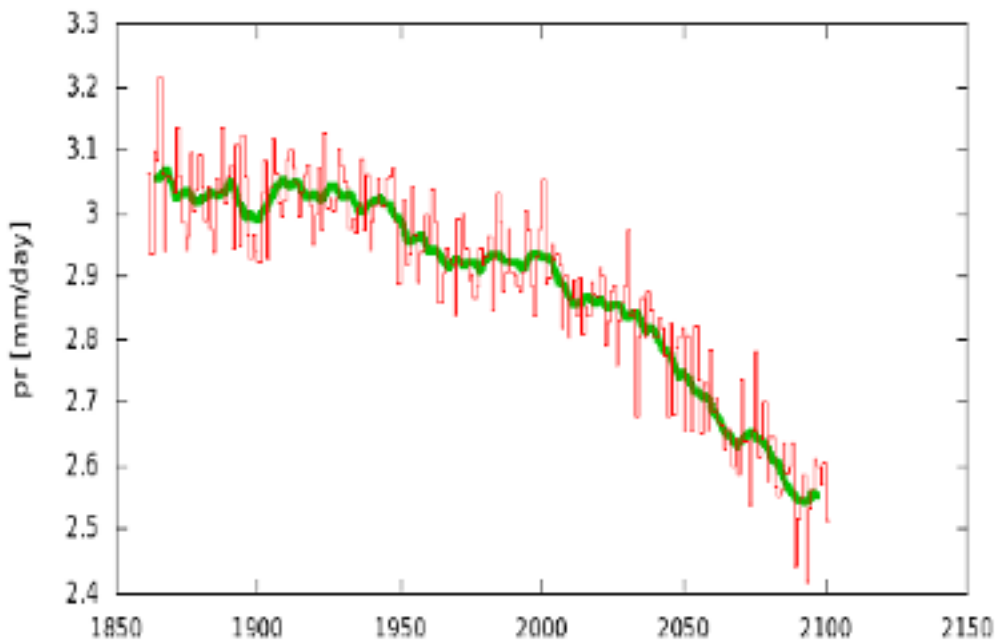
Figure 1.2 Annual Mean Precipitation Minus Evaporation (mm/day) of Multi-model Mean for Scenario 1850-2100. Solid Line is the 10 Year Moving Average.

(16) Ibid.
(17) Ibid.
(18) Emanuel, K., Sundararajan, R. and Williams, J. 2008. Hurricanes and global warming: Results from downscaling IPCC AR4 simulations. Bulletin of the American Meteorological Society. Vol.89 (3), 347.
(19) SADC/SARDC and others 2012. Zambezi River Basin Atlas of the Changing Environment. SADC, SARDC, ZAMCOM, GRID-Arendal, UNEP. Gaborone, Harare and Arendal.
(20) Analysis conducted by Professor Ralf Toumi of the Imperial College London. Results presented here are based on the multi-model mean of the CMIP5 program used by the 5th Assessment of the Intergovernmental Panel on Climate Change (IPCC, 2013). The greenhouse gas emission scenario is a business as usual case (called RCP8.5) which is in line with current emission and causes a radiative forcing of 8.5 Wm-2 by 2100.
(21) The ensemble mean of multiple models involves running parallel model simulations of multiple climate models to include the impact of model differences. Variations in the results of the different models utilised provide some indication of the level of uncertainty inherent in the results (IPCC, 2007).
(22) IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.



If climate change was accelerated (e.g. if 2100's climate was experienced by the 2050s) then the worst case scenario of a reduction in the water budget of approximately 3.5% per decade is likely. A lower rate of climate change (i.e. 2030's climate by the 2050s) would suggest a reduction in the water budget of approximately 0.9% per decade. The reduction in the water budget is driven largely by projected declines in precipitation levels (*Figure* ***1.3***) with a best estimate decline of 1.2% per decade and a high /low of -2.4%/-0.6% per decade, respectively.

Figure 1.3 ***Annual Mean Precipitation (mm/day) for Multi-model Mean for 1850-2100. Solid Line is the 10 Year Moving Average.***



There is a strong seasonality of the water budget. The seasonal peak of available water in the Batoka Gorge is from November to March. Climate change projections indicate a reduction in both P-E and precipitation during the peak months (*Figure* ***1.4*** and

Figure ***1.5***). The largest relative decrease during the seasonal peak is projected for November, implying a future delay in the onset of the peak season. The end of the peak season is only slightly earlier as the March decline is more modest compared to November. This suggests an overall shortening of the rainfall season as well as decline in water volumes during the season. In addition, a deficit in water budget is expected between April and September, with excess evaporation over precipitation. The seasonal deficit is projected to decline largely as a result of an overall reduction in available water. The monthly precipitation trends highlight declines in all months with large relative declines exceeding 50% by 2100 in already dry months.

H1.4 CONCLUSIONS AND RECOMMENDATIONS

Based on the assessment, the following recommendations have been made:

- Undertake a more in-depth climate risk assessment looking to:
    - Ground-truth the P-E analysis using historical flow records in order to test the relationship and confirm the use of P-E as a proxy;
    - Bolster this analysis with additional downscaled climate change data to improve the understanding of the likely future changes in climate; and
    - Identify possible adaptation measures where possible (i.e. measures to reduce the risk).
- Based on the analysis of future water availability, it is recommended that planners take into account both the potential worst case scenario of an up to 3.5% reduction in the water budget per decade compared with baseline climatology (subject to additional studies) and the projected shortening of the peak flow season into their water budget calculations.
- Undertake a greenhouse gas (GHG) inventory in order to review:
    - The potential GHG emissions associated with land use change in the project area as a result of the BGHES (i.e. flooding will remove/ reduce vegetation in the area);
    - The potential GHG emissions associated with the operation of the BGHES (and possible mitigation measures to reduce GHG emissions); and
    - The GHG emission benefits associated with hydropower.

Figure 1.4 ***Monthly Mean Precipitation Minus Evaporation (mm/day) of Multi-model Mean for Scenario 1850-2100. Solid Line is the 10 Year moving average.***

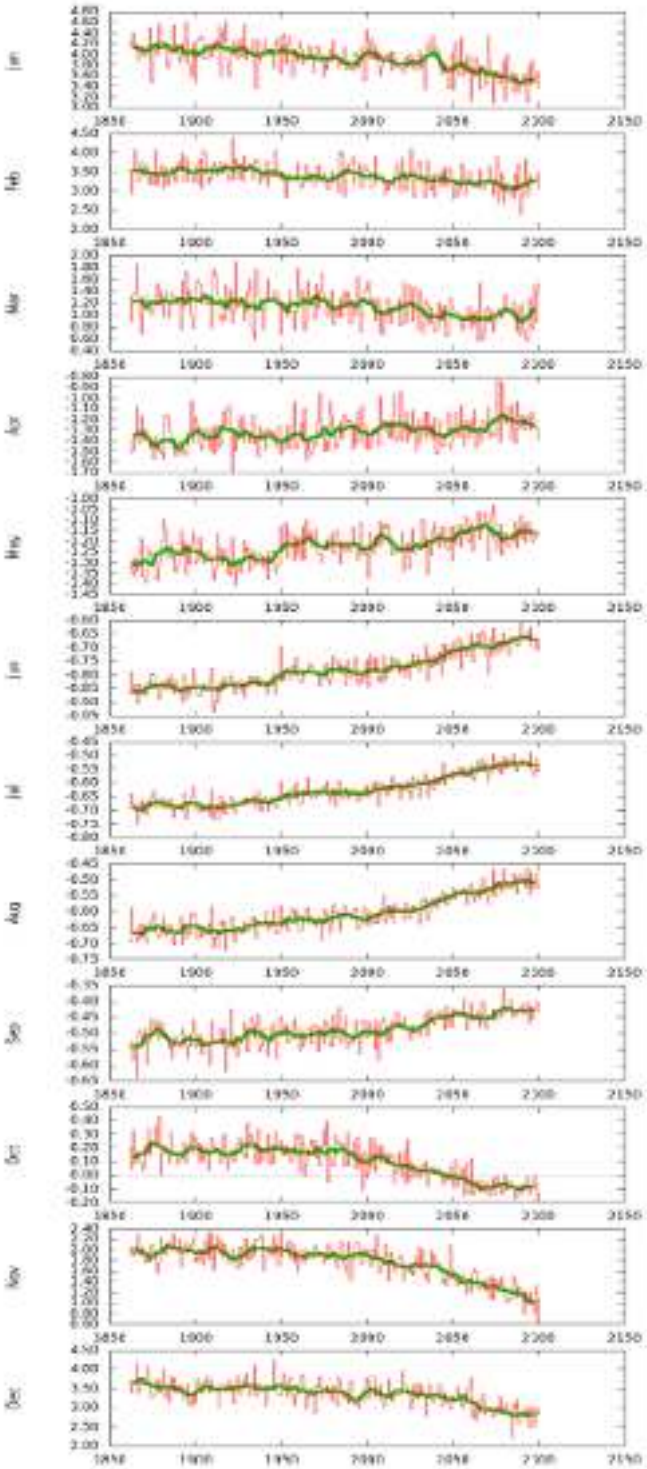
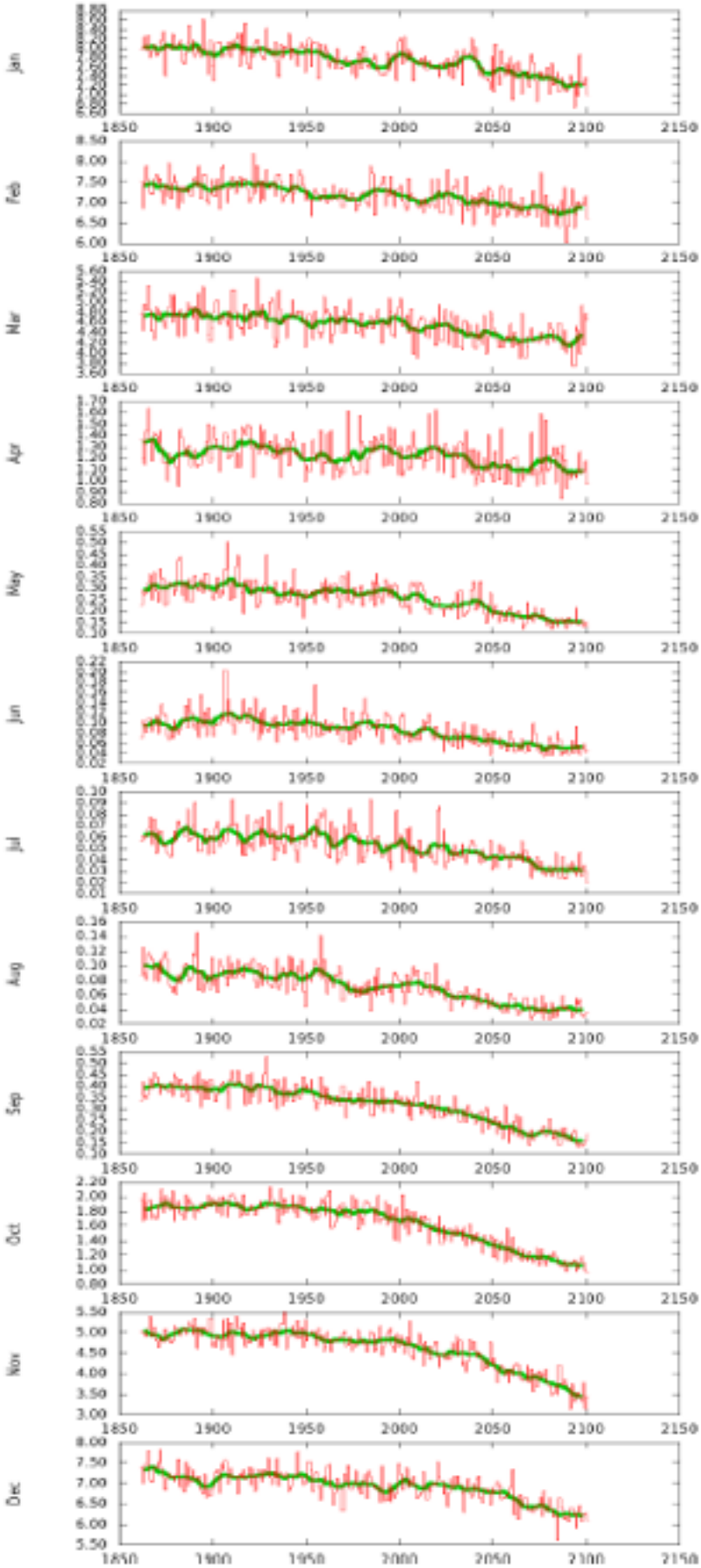


Figure 1.5 *Monthly Mean Precipitation (mm/day) for Multi-model Mean for 1850-2100. Solid Line is 10 Year Moving Average.*



Annex I

Water Quality Modelling Specialist Study

1 MODELLING FOR IN-RESERVOIR AND DOWNSTREAM TEMPERATURES, DISSOLVED OXYGEN, AND NUTRIENTS

ERM modelled temperatures, dissolved oxygen, and nutrients to assess potential changes in these parameters within Batoka Reservoir and in the Zambezi River downstream of the BGHES. Several models and computations were used, each of which required hydrologic and climatological inputs as well as information on the morphometry of the reservoir and river and dimensions and locations of hydropower facilities. The hydrologic record was used to select three years for simulation and to generate nine scenarios that represent potential hydropower operating schemes. In addition, there were two alternate powerhouse intake elevations to consider, resulting in 54 analyses (= 3 years x 9 release scenarios x 2 intake elevations). Models, inputs, and results are discussed in the following sections.

1.1 INFLOW AND OUTFLOW HYDROGRAPHS

A very long inflow record was available at Victoria Falls, however, corresponding outflow hydrographs ("release rates") were not provided by the engineer, Studio Pietrangeli (SP). ERM and Southern Waters defined three hydropower operating schemes and four minimum release rates ("environmental flows") in order to generate hourly outflow rates for use in the models and computations. The combination of a hydropower operating scheme and environmental flow constitutes an analysis.

1.2 SELECTION OF WATER YEARS FOR ANALYSIS

Zambezi River flow data at Victoria Falls are available at daily intervals from 1924 to 2012. These flows were measured at Big Tree Station (ID ZGP25, http://www.zaraho.org.zm/hydrology/river-flows). ERM focused its analysis on three years selected from the historical flow record. These three years will be referred to as "study years" and are described as follows:

- 1931 represents the median flow year (average annual flow = 1101 m^3/s; rank = $\frac{45}{89}$)
- 1957 represents the extreme high flow year (average annual flow = 2328 m^3/s; rank = $\frac{1}{89}$)
- 1995 represents the extreme low flow year (average annual flow = 390 m^3/s; rank = $\frac{89}{89}$)

As used here, "year" means the hydrologic water year October to September. For example, study year 1931 starts on 1 October 1931 and ends on 30

September 1932. Daily flows for each of the study years were used to generate nine release scenarios as described in the following sections.

1.3 SCENARIOS

The following assumptions were made in generating all three release scenarios:

- The reservoir is initially full in 1924 (water elevation = 762 m ASL).
- Minimum flow is met regardless of inflow and drawn from reservoir storage if necessary.

Other assumed used in developing the scenarios are presented below.

1.3.1 *Scenario 1*

Base case of straight-through, run-of-river operations with no specified minimum flow or release pattern other than to match outflows to inflows at all times throughout the day. This approach results in no net change in storage volume in the reservoir over each day.

1.3.2 *Scenario 2*

Release rates were peak over a three-hour period every morning and a three-hour period every evening with reservoir volume balanced over a 24-hour period to achieve this outcome. Peak flows were determined using the following method:

1. Calculated when there was excess volume determined from the difference between daily inflows and daily minimum-release-outflows
2. Excess volume is initially used to fill the reservoir of any missing volume to full-supply-level
3. If any excess volume remains, divide amount evenly between the six-hours of peaking to generate peak flows
4. If these peak flow values are larger than the maximum allowed powerhouse flow of 2550 m^3/s, the excess volume is used to increase the minimum-release-outflow condition throughout the remaining hours of the day
5. If all the previous conditions are fulfilled with excess volume remaining, the remainder is discharged through the spillway

These methods ensure that outflows are managed so that there is no net change in storage volume over a day. Scenario 2 was run with four variations of the minimum release:

- A: Minimum release = 94 m^3/s.

- B: Minimum release = 180 m^3/s.
- C: Minimum release = 216 m^3/s.
- D: Minimum release = 255 m^3/s.

1.3.3 Scenario 3

Outflows peak over a three-hour period every morning and a three-hour period every evening during ***weekdays*** with reservoir storage balanced over the weekly period to achieve this result. Weekends are generally straight-through, run-of-river, as in Scenario 1. Peak flows were determined using a similar method as shown in Scenario 2:

1. Calculated when there was excess volume determined from the difference between weekly inflows and weekly minimum-release-outflows
2. Excess volume is initially used to fill the reservoir of any missing volume to full-supply-level
3. If any excess volume remains, divide amount evenly between the six-hours of peaking throughout five-days to generate peak flows
4. If these peak flow values are larger than the maximum allowed powerhouse flow of 2550 m^3/s, the excess volume is used to generate peak flows over the weekend
5. Remaining excess volume is then used to increase the minimum-release-outflow condition throughout the remaining non-peak flow hours
6. If all the previous conditions are fulfilled with excess volume still remaining, the remainder is discharged through the spillway

Scenario 3 was run with four variations in the minimum release, as shown for Scenario 2.

1.4 ALTERNATIVE DESIGNS

Four alternative designs of the hydropower facilities were provided by SP designated Alternatives 1 through 4. Alternative 1 specifications was described in the Batoka Gorge Hydro Electric Scheme Feasibility Study created for the Zambezi River Authority in 1993 (ZRA 1993), whereas Alternatives 2 through 4 specifications were developed by SP directly. With respect to the three structures of interest to the modeling (spillway, hydropower intake and low level intake), elevations were identical across Alternatives 1 through 3. Accordingly, only Alternatives 1 and 4 were modeled, which differed in the hydropower intake elevation. Results for Alternative 1 represent Alternatives 2 and 3 as well.
The elevations for the Alternatives are listed below in Table 1.

Table 1 Design Alternatives for Batoka

Structure and Elevation [m ASL]	Alternatives 1, 2 and 3	Alternative 4
Spillway	762.0	762.0
Hydropower intake (centerline)	730.4	651.6
Low level intake (centerline)	619.5	619.5

2 IN-RESERVOIR TEMPERATURE AND DISSOLVED OXYGEN MODELLING

In-reservoir temperature and dissolved oxygen modeling was performed with a commonly-used time-varying, three-dimensional hydrodynamic and water quality model, the Generalized Environmental Modeling System for Surfacewaters (GEMSS). GEMSS is an integrated system of three-dimensional hydrodynamic and transport modules embedded in a geographic information and environmental data system. GEMSS was developed in the mid-80s as a hydrodynamic platform for transport and fate modeling of many types of constituents introduced into waterbodies. The hydrodynamic platform ("kernel") provides three-dimensional flow fields from which the distribution of various constituents can be computed. The constituent transport and fate computations are grouped into modules. GEMSS modules include those used for thermal analysis, water quality, sediment transport, particle tracking, oil and chemical spills, entrainment, and toxics. For Batoka Reservoir both temperature and dissolved oxygen were modelled.
For Batoka Reservoir, GEMSS requires two types of data: (1) spatial data to define the extent and shape of the reservoir and the locations, configurations and dimensions of the hydropower structures and (2) time-varying forcing function data to define inflow rates, temperatures and dissolved oxygen concentrations, outflow rates, and meteorological data to compute surface heat exchange, wind shear and reaeration.

2.1 MODEL DOMAIN AND GRID

High-resolution LIDAR data were acquired from SP to create a digitized representation of the reservoir. After using ArcGIS to process the LIDAR data into a bathymetric shape file, a three-dimensional grid was constructed using the grid generation module of GEMSS. Figure 1 shows the grid. Each grid cell has the following properties: a length of 200 m, width of 150 m, and layer thickness of 5 m. At the reservoir's maximum depth of 170 m, the model grid has 34 layers.

Figure 1 *GEMSS model grid with elevation contour*

Areas and volumes of model grid generated by GEMSS were compared to values presented in Annex 11 of the Feasibility Study (ZRA 1998) to confirm the accuracy of the model grid. Comparisons are shown in Figure 2 (area) and Figure 3 (volume). Small discrepancies are introduced during the process because bottom elevations are averaged over the 200 m x 150 m horizontal grid cells; however, the model grid still closely matches the area and volume values given in Annex 11 of the Feasibility Study (ZRA 1998).

Figure 2 *Area-Elevation comparison*

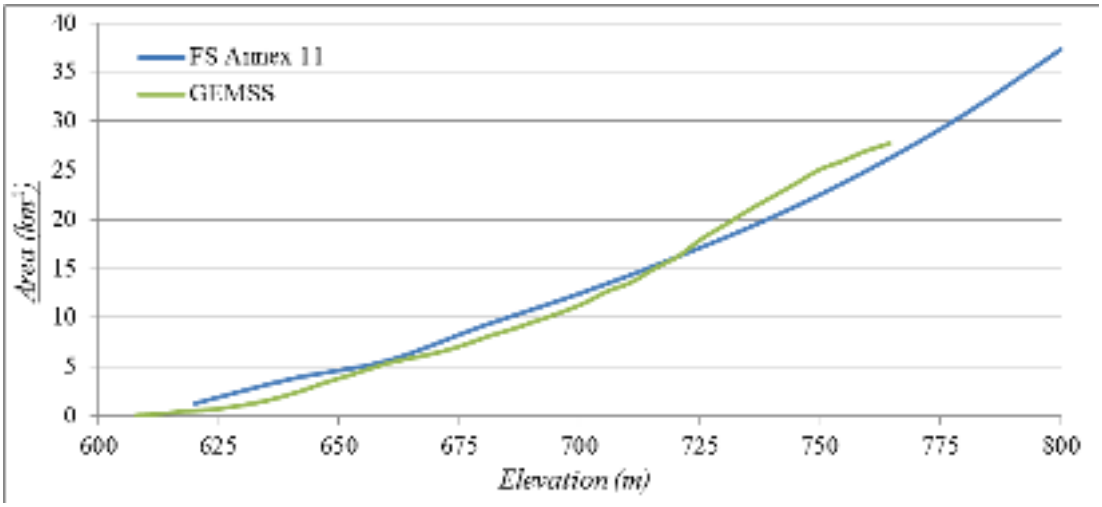
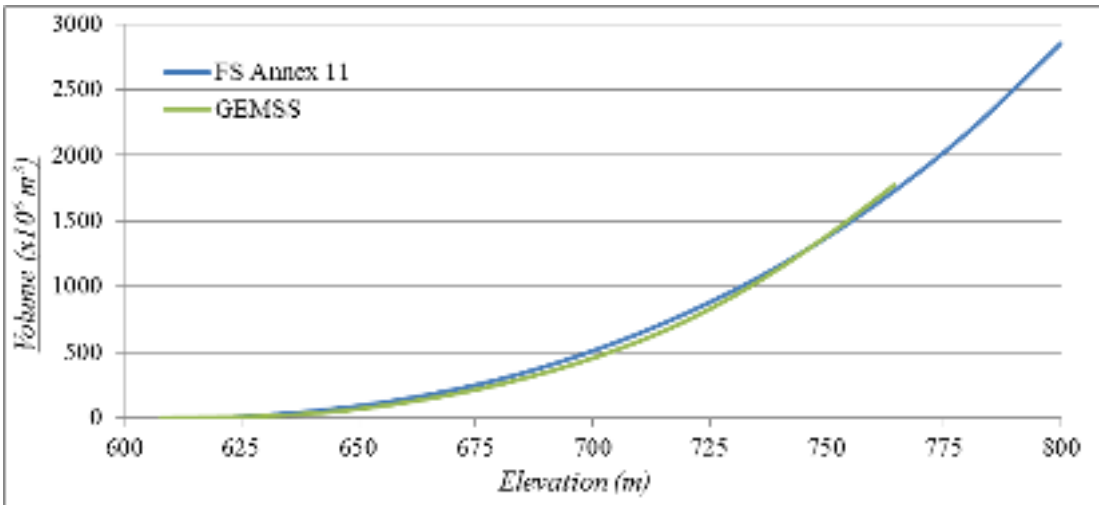


Figure 3 *Volume-Elevation comparison*



Batoka Reservoir has a storage volume of approximately 1.77 x 10^9 m^3 and a surface area of 27.86 km^2 at a water surface elevation of 762 m ASL. The average water depth of the full reservoir is 69.3 m, and the maximum depth is 170 m.

2.2 *HYDROPOWER STRUCTURES*

The elevations of hydropower structures specified in Section 1.4 were mapped onto the grid. If at any time during the simulation, the water surface elevation falls below the elevation of the hydropower intake, water is withdrawn through the low level outlet. Similarly, if water elevation rises above that of the full level, water is released from the spillway.

2.3 *CLIMATOLOGICAL DATA*

Meteorological data at 6-hour intervals for years 1994–2014 were obtained using NCEP CFS Reanalysis (http://cfs.ncep.noaa.gov/cfsr/) and Version 2 (http://cfs.ncep.noaa.gov/). This dataset provided wind speed and direction, air and dew point temperature, air pressure, relative humidity, solar radiation, and cloud cover. However, the 6-hour interval for solar radiation was not adequate to capture the peak and trough that occur at noon and midnight, respectively. Instead, 15-minute interval solar radiation data were derived from known solar positions at 15-minute intervals and interpolated air temperature and humidity by using the method described in Al Riza et al. (2011) and Spokas and Forcella (2006). Cloud cover was then derived from solar radiation via an expression reported in Tennessee Valley Authority (1972).

In summary, the meteorological data used as input contains the following variables:

- at 6-hour intervals: air and dew point temperature, barometric pressure, wind direction and speed, and relative humidity
- at 15-minute intervals: solar radiation and cloud cover.

The meteorological dataset is quite satisfactory inasmuch as it includes all the parameters necessary to represent diurnal heating and cooling.

2.4 *INFLOW TEMPERATURES AND DISSOLVED OXYGEN CONCENTRATIONS*

Measurements of water temperature were taken during four sampling periods – July 2003, October 2003, February 2004, and May 2004 at Victoria Falls as listed in ZRA (1998). [1]
To produce a continuous inflow temperature record for input to the model, the Victoria Falls measurements were used to calibrate water temperatures calculated by the MetGen module of GEMSS. MetGen uses meteorological data to calculate water temperature based on surface heat exchange and the change in heat storage in an insulated cylinder of constant depth. The *initial response temperature* and *water column depth* were varied until the response temperature calculated by the module closely matched the Victoria Falls measurements, as seen in Figure 4.
The computed inflow temperatures were used estimate inflow dissolved oxygen concentrations based on the assumption that inflow concentrations are at saturation values.

Figure 4 ***Response Temperature calibration using measured values***

2.5 *MODEL RESULTS*

Results can be found in the attached PowerPoint slide deck. For all study years and all simulation times, reductions in reservoir storage were able to

(1) [1] After completion of the modelling, additional water quality data were provided by the client. An analysis of the new dataset (consisting of temperatures, dissolved oxygen concentrations, and nutrients) relative to the data used in this report is provided in the Annex.

maintain the requested minimum flow conditions regardless of scenario chosen. Generally, the results show that the reservoir becomes thermally stratified under low inflow conditions and, as a result, the outflow from the lower powerhouse intake (Alternative 4) is a few degrees cooler for a period of a few months at the beginning of the hydrological year. However, under average and high flow conditions (December onwards), the reservoir becomes vertically mixed as larger inflows are passed through the powerhouse outlet. The vertically mixed condition causes outflow temperature to be similar for the design alternatives and for natural river conditions. As shown in ZRA (1998), these effects do not significantly change with scenario, i.e. with different peaking and minimum outflow requirements.

GEMSS was also used to calculate dissolved oxygen in the reservoir as a balance between sediment oxygen demand (assumed to be 0.5 g m^{-2} s^{-1}) and reaeration (calculated using the Wanninkohf 1991 relationship, appropriate for lakes). The Zambezi River at the head of the reservoir was assumed to enter at the saturation value for dissolved oxygen corresponding to its temperature.

A similar stratification effect is evident for dissolved oxygen, whereby there is a small lag between natural and reservoir conditions due to the stratification in the reservoir as inflows begin to rise. However, unlike thermal stratification, there is negligible difference between the two reservoir configurations in downstream dissolved oxygen concentrations.

3 *DOWNSTREAM TEMPERATURE AND DISSOLVED OXYGEN EFFECTS*

The downstream recovery of temperature and dissolved oxygen values that are lower than natural river values when released from the reservoir were calculated for low inflow periods. These periods occur during low flows when the reservoir becomes stratified, the following relationships were used, as described in Section 2.5.
For temperature:

$$T = E + (T_{out} - E)e^{-kx/du}$$

Where

T	=	temperature [C]
E	=	equilibrium temperature [C]
T_{out}	=	temperature at x=0 (dam outlet) [C]
k	=	kinematic coefficient of surface heat exchange [m/s]
x	=	distance downstream [m]
u	=	velocity [m s-1]

For dissolved oxygen

$$C = C_S - (C_S - C_0)e^{-k_a x/u}$$

Where

C = DO concentration [mg/l]
C_0 = DO concentration at x=0 (dam outlet) [mg/l]
C_s = DO saturation concentration calculated with the O'Connor-Dobbins relationship [mg/l]
k_a = reaeration coefficient [1/s]
x = distance downstream [m]
u = river velocity [m/s]

These equations were not applied to the time-varying release temperatures and dissolved oxygen values computed with the three-dimensional model. Instead, a selection of cases was run for steady-state conditions to test sensitivity to various input parameters.
In all cases, recovery to the two environmental flow stations (EF1 25.2 km downstream of the dam and EF2 64.0 km downstream of the dam) was very slow, meaning that the release values are maintained for very long distances downstream. This outcome is a function of the high velocities and narrow widths of the Zambezi downstream of the dam.

4 *IN-RESERVOIR NUTRIENT MODELLING*

This section focuses on the anticipated trophic status of the proposed Batoka Reservoir. The construction of the dam is expected to affect the quality of water in the resulting reservoir as well as the quality of the water downstream. A model of the water quality index of the reservoir was used to assess its eutrophication potential and help inform the causes of any elevated trophic levels. The model used for this study is the US Army Corps of Engineers BATHTUB model. Comparisons of the anticipated trophic status of the reservoir are conducted under varying flow and nutrient loading conditions.

4.1 *INFLOW NUTRIENTS*

Due to the limited amount of water quality data available for the Zambezi River, data collected from ZRA (1998) were used for this study. Data collection occurred monthly from September 1997 until February 1998 at two locations of interest: "Rapid 11" (R11) and "A'Zambezi River Lodge" (Aza). Location R11 measurements are just downstream of Victoria Falls and represent the inflow conditions with the existing nutrient loads from all sources upstream of Batoka Study Area. Location Aza measurements are upstream of two tourist settlements, one at Victoria Falls and another at

Livingstone, and are assumed to represent inflow conditions that would occur if improved wastewater controls were functional at these settlements. Based on measurements at these two locations, nitrogen concentrations generally decrease with increasing flow, indicative of constant sources diluted by flow in the river. In contrast, the phosphorus concentrations generally increase with flow, indicative of the dominance of runoff based sources of phosphorus.

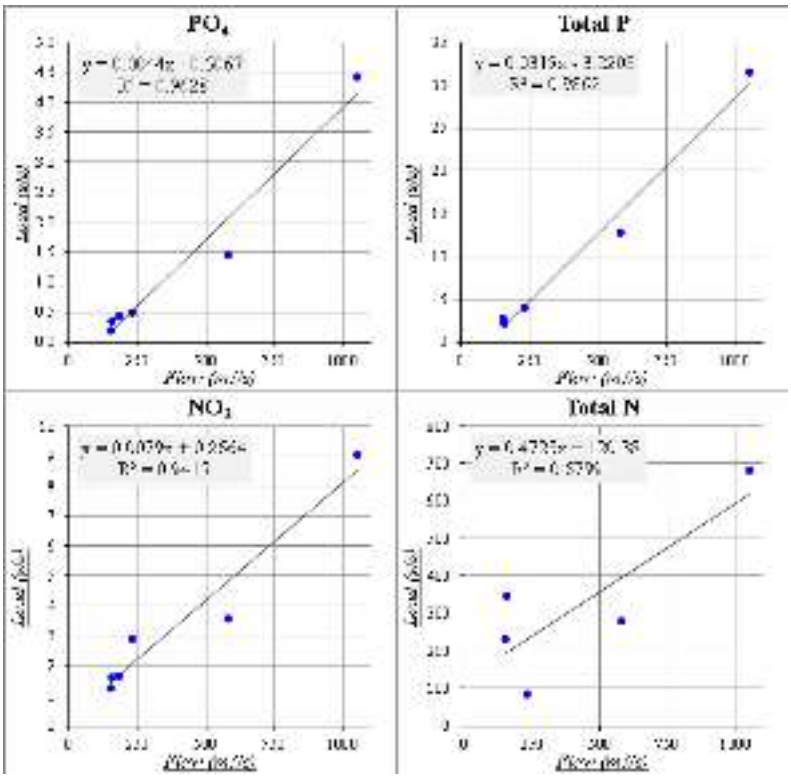
The data can further be analyzed for the Nitrogen:Phosphorus (N:P) ratio shown in Table 2. The limiting nutrient for algal production can be estimated based on the N:P ratio. A typical N:P ratio for algae is approximately 7.2; ratios greater than that indicate phosphorus is limiting, while smaller values indicate nitrogen is limiting. For the Batoka Gorge watershed, the area was found to be phosphorus limited.

Table 2 ***Nitrogen to Phosphorus Ratio for R11 and Aza locations***

	N:P Ratio	
Date	**R11**	**Aza**
10/27/1997	86.3	134.2
11/24/1997	163.4	186.6
12/17/1997	21.1	31.3
01/23/1998	21.9	50.1
02/27/1998	21.7	32.0

These nitrogen and phosphorus concentrations can then be used to generate rating curves of mass loading for each parameter. These curves are shown in Figure 5 for Location R11; the same procedure was applied to Location Aza (also shown in Figure 5). The mass loading rate was linearly regressed to provide estimates of loadings for each study year. The resulting regression lines match the loading data well, with high R^2 values.

Figure 5 *Location R11 mass load rating curves for P and N*



The regression equations were then applied for the annual average flows of the study years to determine their respective average concentrations of TN, TP, PO_4, and NO_3. It should be noted that the study years of 1931 and 1957 have flows that are above those corresponding to the measurements in the ZRA report and, are therefore extrapolations beyond the regression range. Atmospheric phosphorus was applied as an additional loading rate using data listed in Tamatamah et al. (2005) from Lake Victoria (only phosphorus was considered because it was determined to be the limiting nutrient).

4.2 *TROPHIC STATUS CALCULATIONS*

Carlson's Trophic State Index (TSI) (Carlson, 1977) is the method used to quantify the trophic status of the reservoir. Developed by Dr. Robert Carlson of Kent State University, these scores provide a measure of potential algal biomass using an index that is comparable between waterbodies and between present and projected conditions. Table 3 relates TSI value ranges to their respective trophic status and includes attributes of the various trophic states.

Table 3 TSI values and the corresponding trophic status in freshwater lakes

TSI Value	Trophic Status	Attributes
< 30	Oligotrophic	Clear water, low production, oxygenated hypolimnion.
30 – 50	Mesotrophic	Moderately clear water, possible anoxia in summer.
50 – 70	Eutrophic	Low transparency, anoxic hypolimnion in summer.
> 70	Hypereutrophic	Dense algae and macrophytes, noticeable odor, fish kills possible.

BATHTUB provides three TSI scores which are dependent on total phosphorus, chlorophyll-a, and Secchi depth. While these variables are related chemically and biologically in lakes, due to the lack of available chlorophyll-a and Secchi depth data, only TSI-phosphorus (TSI-TP) was utilized. The results can be found in Table 4.

Table 4 Summary Table of Model TSI-TP Scores

Data Location and Study Year	TP (mg/m^3)	TSI-TP Score	Trophic Status
Aza 1931	21.7	46.4	Mesotrophic
Aza 1957	23.1	48.4	Mesotrophic
Aza 1995	16.8	41.2	Mesotrophic
R11 1931	29.0	49.9	Mesotrophic
R11 1957	30.5	51.8	Eutrophic
R11 1995	23.6	44.9	Mesotrophic

As mentioned previously, data from Location Aza represents an "improved wastewater control" level of nutrient loading and data from Location R11 represents values of nutrient loading with minimal wastewater treatment. Table 4 also shows the estimated total phosphorus (TP) reservoir concentrations and, as expected, data from Location R11 shows higher TP concentrations than from Location Aza. Almost all the results are mesotrophic when using the Carlson TSI table shown in Table 3. Due to the positive correlation of TP concentration with flow rate, years with higher annual flow have larger TSI scores. The two locations with the highest annual flow, 1957, have the largest TSI scores out of the six results. Using R11 1957, a combination that includes both untreated wastewater discharge and a high annual flow rate, the reservoir is predicted to be eutrophic. The findings of the 1998 feasibility study (ZRA 1998) also indicated that the reservoir would be mesotrophic-eutrophic based on the 1997-98 observations.

The effect of the wastewater treatment can be determined by calculating the percent decrease in TSI score from Scenario R11 to Scenario Aza, these values are listed below:

- 1931 results in a 7% decrease in TSI-TP
- 1957 results in a 7% decrease in TSI-TP
- 1995 results in a 8% decrease in TSI-TP

These changes show the importance of wastewater treatment in controlling eutrophication. It should be noted, however, that even under improved wastewater treatment conditions the proposed reservoir is still predicted to be mesotrophic indicating that other sources (such as non-point source runoff) may be dominant.

5 *REFERENCES*

Carlson, R.E. 1977. A trophic State Index for lakes. Limnology and Oceanography. 22:361-369.

http://www.zaraho.org.zm/hydrology/river-flows

Tamatamah, R. A., Hecky, R. E., and Duthie, H. C. 2005. "The atmospheric deposition of phosphorus in Lake Victoria (East Africa)", in Biogeochemistry, Vol. 73, No. 2 (Apr., 2005), Springer Publisher, pp. 325-344.

Tennessee Valley Authority. 1972. Heat and Mass Transfer Between a Water Surface and the Atmosphere. Water Resources Research Laboratory Report No. 14., TVA Report No. 0-6803. Norris, TN. April.

Zambezi River Authority (ZRA). 1993. Batoka Gorge Hydro Electric Scheme Final Report – September 1993.

Zambezi River Authority (ZRA). 1998. Batoka Gorge Hydro Electric Scheme Feasibility Report. May.

APPENDIX: ASSESSMENT OF ADDITIONAL WATER QUALITY DATA

Additional water quality data at multiple stations were provided by the client after completion of the water quality simulations published in the main report. The new data consist of once-monthly water quality data – a total of 23 different parameters including temperature, dissolved oxygen, total phosphorous, ammonia, and nitrite – taken during the period February 2010 until March 2014 at 13 stations. This memo evaluates the new data with respect to the data used in the published simulation results.

Water quality data were used in the simulations to characterize temperatures, dissolved oxygen and nutrients (primarily phosphorus) of Zambezi waters entering Batoka Gorge Reservoir. Temperatures and dissolved oxygen were used for the three-dimensional, seasonal simulations of Batoka Reservoir; nutrients were used in the eutrophication assessment of the reservoir. Of the newly provided data, only data measured at Big Tree Station (BTS) located at Victoria Falls are useful as these represent the Zambezi closest to the proposed reservoir.

Temperatures, dissolved oxygen and nutrients will be discussed, comparing values used in the main report to those newly provided.

TEMPERATURE

Figure 6 ***Once-monthly temperature data from Big Tree Station, Victoria Falls***

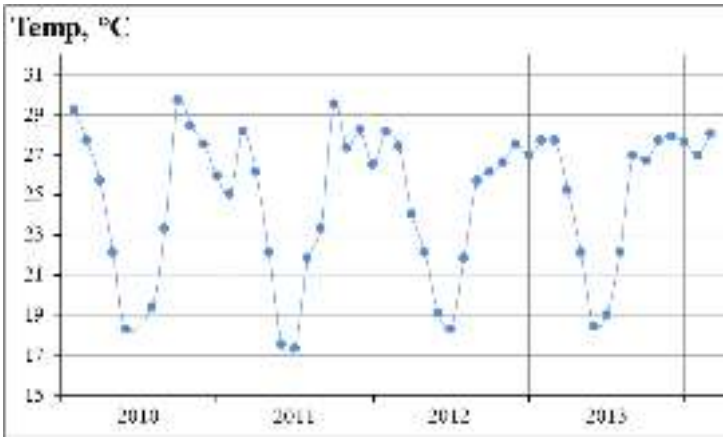


Figure 6 shows temperature data taken at BTS from February 2010 to March 2014. These data show consistent peaks and troughs that reflect seasonal changes.

Initially, the only inflow temperatures available for the GEMSS in-reservoir modeling were the four samples taken at Victoria Falls – July 2003, October 2003, February 2004, and May 2004 at Victoria Falls as listed in the Zambezi River Authority 1998 Report (ZRA 1998). In order to provide hourly inflow temperatures for the in-reservoir modeling, inflow temperatures were

computed from meteorological data for the three study years (1931, 1957, and 1995) and calibrated to the four temperature observations. Because meteorological data were only available in the region for the period 1994 to 2014, meteorological data from an available year were used. The year was chosen by matching as closely as possible the annual average flow in the simulation year with the annual average flow for a year in the available meteorological record. Specifically:

- 2009 (rank 9) meteorological data was used for study year 1957 (rank 1)
- 1997 (rank 44) meteorological data was used for study year 1931 (rank 45)
- 1995 (rank 89) meteorological data was used for study year 1995 (rank 89).

Figure 7 shows temperatures for water years 2011, 2012, and 2013 (October through September) from the BTS data, and the temperatures used to characterize the Zambezi River inflow temperatures for the 1931, 1957, and 1995 simulation years published in the main report. These temperatures were calculated using MetGen, the GEMSS module that utilizes meteorological data and surface heat exchange calculations to estimate water temperatures.

Figure 7 ***Comparison of calculated and measured inflow temperatures***

The computed temperatures were calibrated to measurements of water temperature taken during four sampling periods at Victoria Falls as listed in ZRA 1998. The *initial response temperature* and *water column depth* were varied until the response temperature calculated by the module closely matched the Victoria Falls measurements, as seen previously in Figure 4 in the main report.

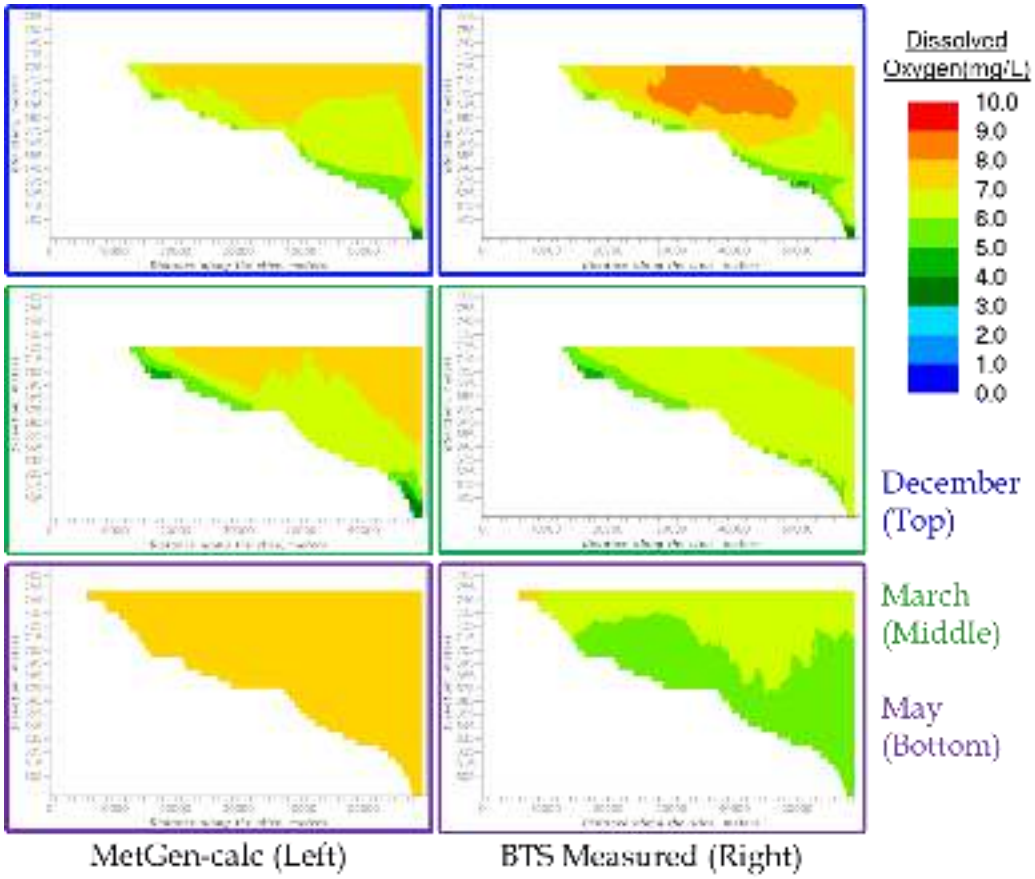
The inflow temperatures calculated using MetGen captured seasonal temperature fluctuations relative to the new dataset, with somewhat higher values for the months of January through March, and slightly lower values for the months of September and October.

GEMSS was rerun utilizing the 2011 inflow temperatures for the following conditions:

- Alternative 4 (powerhouse intake at 650 m)
- Scenario 3D outflows (weekly peaking and an environmental flow of 255 m^3/s)
- 1995 inflows (the year with the lowest ranked, annually-averaged flow in 89 years).

These conditions constitute the most extreme case for comparison to the 1995 simulation presented in the main report. Specifically, these inflow temperatures show the largest differences between the newly acquired data and the calibrated MetGen values used for the main report. These comparisons are shown in Figure 8.

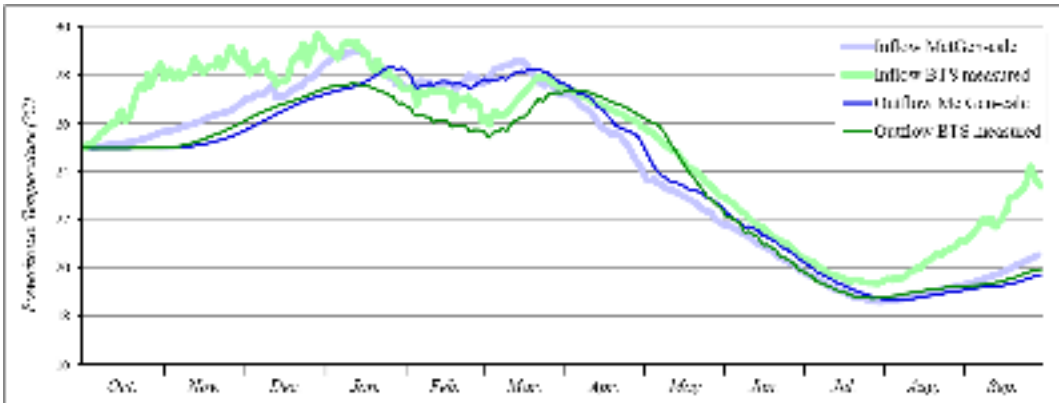
Figure 8 ***Model generated thalweg slices determined from calculated and measured inflow temperatures***



The left column shows vertical contours along the thalweg from the original modelling. The right column shows vertical temperature contours generated using BTS measured inflow temperatures. The top row shows the month of December, the middle row shows the month of March, and the bottom row shows the month of May. These months were chosen because December had approximately no difference between measured and the values calculated with MetGen, March had greater MetGen values, and May had greater measured values.

Additionally, Figure 9 shows inflow temperatures used as model input along with the resulting temperatures from the powerhouse outflow.

Figure 9 *Comparison of model inflows and outflows using calculated and measured inflow temperatures*

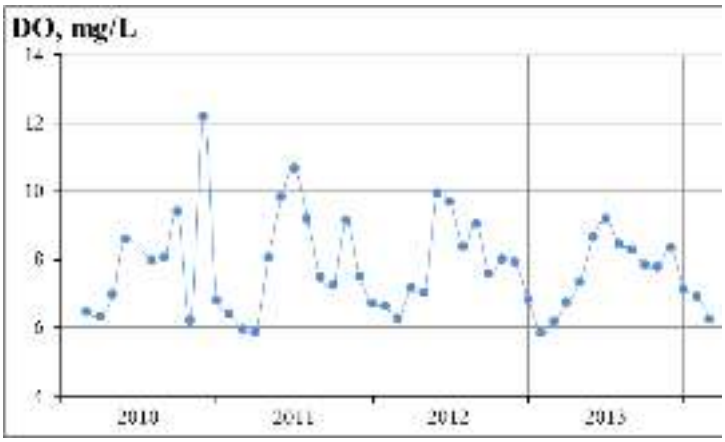


Looking at Figure 8 and Figure 9 there is little or no difference in temperatures along the thalweg and in outflow temperatures for the month of December. In March, there is a ~2°C difference in outflow temperatures between BTS measured values and the lower MetGen-calculated values; this difference corresponds to a similar ~2°C difference in inflow temperatures. The opposite temperature difference is seen in May, where BTS measured values are greater than calculated values.

DISSOLVED OXYGEN

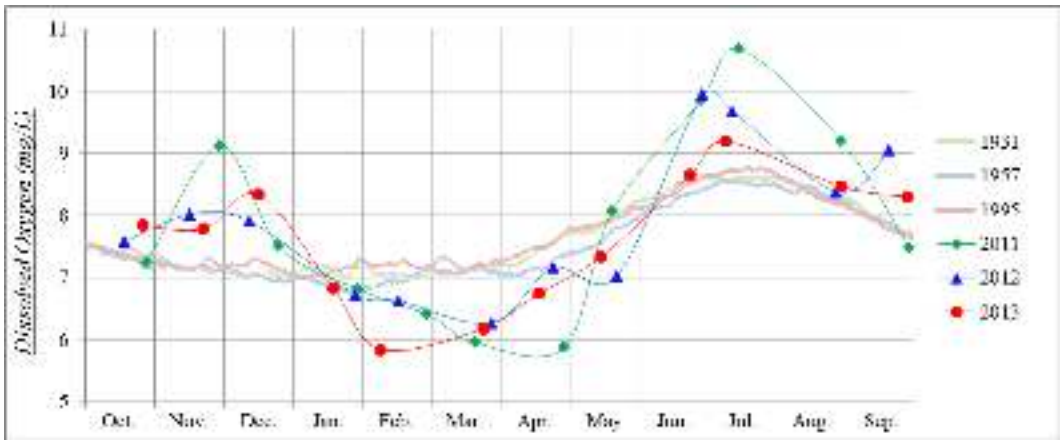
Figure 10 shows dissolved oxygen (DO) data that was taken at BTS from February 2010 until March 2014.

Figure 10 *Once-monthly DO data from Big Tree Station, Victoria Falls*



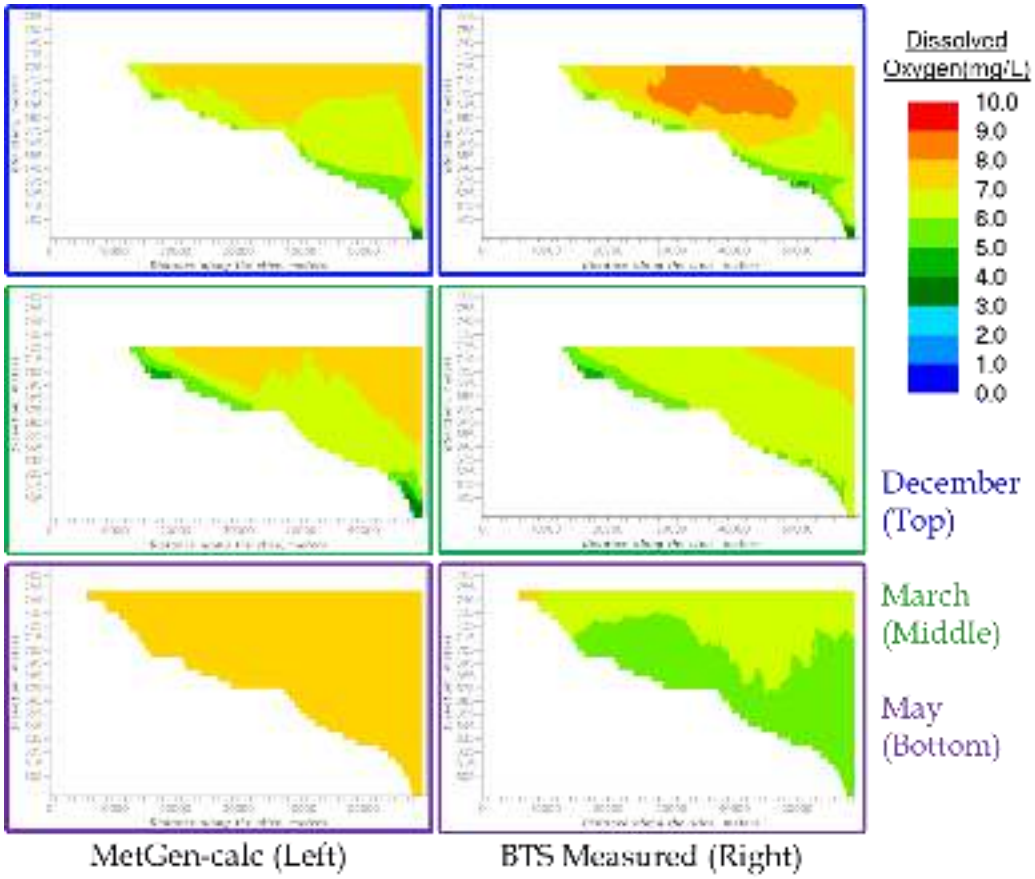
From 2011 onwards, this data has consistent peaks and troughs reflecting seasonal changes. The figure below shows the DO values for water years 2011, 2012, and 2013 (October through September) from the BTS data, and DO values used to characterize the Zambezi River inflow DO values for 1931, 1957, and 1995 simulation years published in the main report. The 1931, 1957, and 1995 inflow DO values were calculated with MetGen by assuming DO saturation at the calculated Zambezi River temperatures.

Figure 11 Comparison of calculated and measured inflow DO values



As shown in Figure 11 the assumption of saturation at calculated inflow temperatures did not capture the peaks and troughs present in the BTS dataset. GEMSS was rerun utilizing 2011 inflow DO values and the same conditions used for the temperature comparisons. 2011 was chosen for this simulation as it shows the largest differences in DO between measured and calculated values. Model result thalweg slices are shown in Figure 12.

Figure 12 ***Model generated thalweg slices determined from calculated and measured inflow DO***



The contour plots in the left column of Figure 12 were generated by GEMSS using MetGen-calculated inflow DO concentrations. The plots in the right column were generated using BTS-measured inflow DO concentrations. The top row shows the month of December, the middle row shows the month of March, and the bottom row shows the month of May. These months were chosen to match the temperature comparison months.

Additionally, Figure 13 shows the inflows used as model input along with the resulting flows from the powerhouse outflow at the end of model simulation.

Figure 13 *Comparison of model inflows and outflows using calculated and measured inflow DO values*

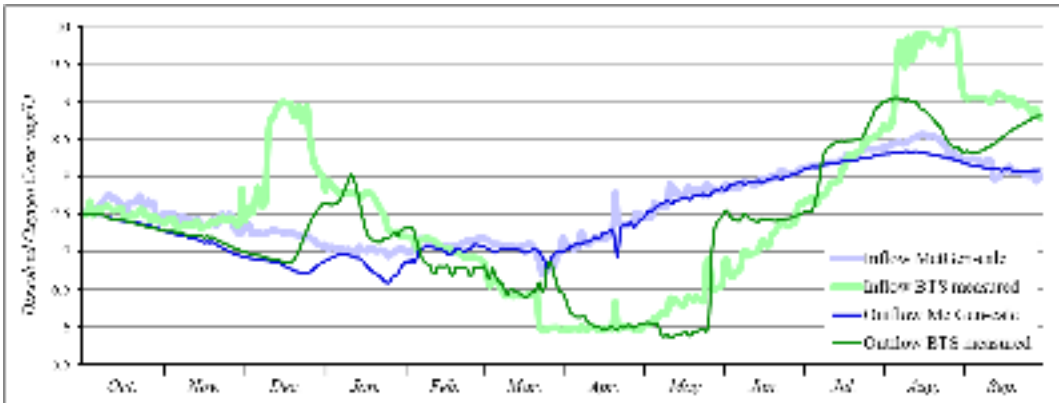
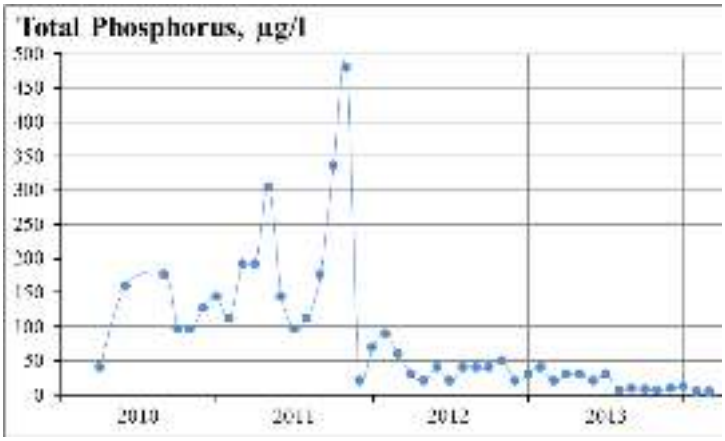


Figure 8 and Figure 9 show that is little difference in DO distributions and outflow DO for the month of March. In December, there are greater DO values near the middle of the reservoir using the BTS measured values than the calculated DO values. The opposite effect is seen in May, where BTS measured values are lower than the calculated values.

TOTAL PHOSPHOROUS

The following figure shows the total phosphorous (TP) data that were taken at BTS from February 2010 until March 2014.

Figure 14 *Once-monthly TP data from Big Tree Station, Victoria Falls*



It was judged that only post-2012 data were useful, given the unexplainable, large variations in phosphorus concentration in 2010 and 2011. The TP average

from January 2012 to March 2014 is 28.95 µg/L (which 1 µg/L = 1 mg/m^3). The average for the entire range of data is 84.12 µg/L. Table 5 was provided in the main report, in which values of TP were used as input into the BATHTUB model to generate the TSI-TP Score, a numerical measure of trophic status.

Table 5 ***Summary table of BATHTUB Model TSI-TP scores from TP values***

Location and Study Year	TP (mg/m^3)	TSI-TP Score	Trophic Status
Aza 1931	21.7	46.4	Mesotrophic
Aza 1957	23.1	48.4	Mesotrophic
Aza 1995	16.8	41.2	Mesotrophic
R11 1931	29.0	49.9	Mesotrophic
R11 1957	30.5	51.8	Eutrophic
R11 1995	23.6	44.9	Mesotrophic

The Aza location was upstream of both Livingstone and Victoria Falls settlements. The R11 location is located just downstream of Victoria Falls and close to the BTS. The TP average value from BTS of 28.95 µg/L is bounded by the minimum and maximum TP values obtained from ZRA 1998 validating the TP calculation method mentioned in the main report. Additionally, BATHTUB was rerun using this TP value of 28.95 µg/L which confirmed the determination of mesotrophic reservoir status.

Nitrogen is not considered in BATHTUB even though ammonia values were provided in the BTS dataset. As stated in the main report, phosphorus was found to be the limiting nutrient in the Zambezi River. Unless nitrogen values are decreased significantly, the nitrogen concentration will have no effect on the trophic status until it becomes the limiting nutrient. This possibility is not an issue with the new dataset as ammonia values are consistently greater than TP, confirming that phosphorus is still the limiting nutrient.

CONCLUSION

The inflow temperatures calculated by MetGen and calibrated to the 2003 – 2004 data closely match those measured at BTS. Use of the new data would not have changed the estimated degree of reservoir stratification nor the downstream rate of recovery of temperatures released to the Zambezi.

The initial modeling used dissolved oxygen values for the Zambezi River inflow based on the calculated temperatures and the assumption of oxygen saturation at the calculated temperatures; these values did not match the peaks and troughs that were measured at BTS. DO values at the powerhouse outflow closely follow the shape of inflow DO values; since the BTS values show larger seasonal amplitude, these are evident in the outflow DO concentrations. Results

comparisons similar to those made for temperature show more pronounced in-reservoir DO differences between the simulations using the calculated DO values and the measured DO values. However, the changed values (up to 1.5 mg/L difference) would have limited impact on the calculated rate of recovery of DO downstream of the dam.

The average value of TP determined from BTS in the new dataset is bounded by the minimum and maximum TP values from R11 station used in the main report. Use of the Big Tree TP value would not change the estimated trophic status of the reservoir.

Annex J

Environmental Flow Report

BATOKA GORGE HYDRO-ELECTRIC SCHEME

ENVIRONMENTAL FLOW ASSESSMENT

VOLUME 1 (of 2): UPDATED MAIN REPORT (FINAL)

For

ERM Southern Africa

February 2019

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LIST OF ACRONYMS

Acronym	Description
AddPM	Additional Scenarios, Post Meeting
BGHES	Batoka Gorge Hydro-Electric Scheme
DO	Dissolved Oxygen
DRIFT	Downstream Response to Imposed Flow Transformations
DSS	Decision Support System
EF	Environmental Flow(s)
ERM	Environmental Resources Management Southern Africa (Pty) Ltd.
ESIA	Environmental and Social Impact Assessment
FSL	Full Supply Level
GAI	Geomorphological Assessment Index
HPP	Hydropower Project
IUCN	International Union for Conservation of Nature
km	Kilometer(s)
m	Meter(s)
mamsl	Meters Above Mean Sea Level
masl	Meters Above Sea Level
Mm	Megameters
MW	Megawatt
PES	Present Ecological State
SAIAB	South African Institute for Aquatic Biodiversity
SASS5	South African Scoring System Version 5
Sc	Scenario
SP	Studio Pietrangeli
VEGRAI	Vegetation Response Assessment Index
ZISS	Zambian Scoring System
ZRA	Zambezi River Authority

1 INTRODUCTION

1.1 BACKGROUND

The Inception Report for the ESIA (ERM et al. 2014) provides a comprehensive summary of the historical background to the Batoka Gorge Hydro-Electric Scheme (BGHES).

Zambezi River Authority (ZRA) has commissioned Environmental Resources Management (ERM), in association with Kaizen Consulting (Zambia) and Black Crystal Consulting (Zimbabwe) to produce an updated Environmental and Social Impact Assessment (ESIA) to inform the Governments of Zambia and Zimbabwe, the ZRA, national power utilities, interested and affected parties and other stakeholders about potential environmental and social impacts associated with development of the BGHES. These will include evaluation of potential impacts at the dam site and surrounding areas, the reservoir inundation area, any upstream and or downstream impacts, as well as those from associated infrastructure, such as transmission lines, and operations infrastructure.

As part of the ESIA, Southern Waters was commissioned by ERM to undertake an Environmental Flows (EF) assessment for the downstream riverine ecosystem between the BGHES and Kariba Dam.

This report (Volume 1 of 2) summarises the outcome of the EF assessment. Additional details are available in the specialist reports (Volume 2) and in the DRIFT (Downstream Response to Imposed Flow Transformations) DSS (Decision Support System) populated for this project (see Section 1.4). The main body of the report was completed as part of the ESIA in December 2014. The outcome of a subsequent process to refine and agree on operating rules for the proposed BGHES is presented in Appendix A.

1.2 THE PROPOSED BATOKA GORGE HYDRO-ELECTRIC SCHEME

The proposed BGHES is located on the middle Zambezi River (Figure 1.1) at 18º1'S ; 26º 34' E, in the central portion of the Zambezi River Basin, c. 47 km downstream of Victoria Falls. It will be positioned in a steep-sided gorge, with the inundated area of the reservoir contained within the gorge, stopping just short of the falls themselves. The development will extend across the international boundary between Zambia and Zimbabwe, with a power house and tailrace on each bank. The proposed high-arch gravity dam wall will be 177 m high (SP 2014). The full supply level (FSL) of the reservoir is tentatively set at 757 masl. After impoundment to the FSL, the reservoir surface area will cover approximately 23 km^2. The most recent principal data for the scheme are provided in Table 1.1.

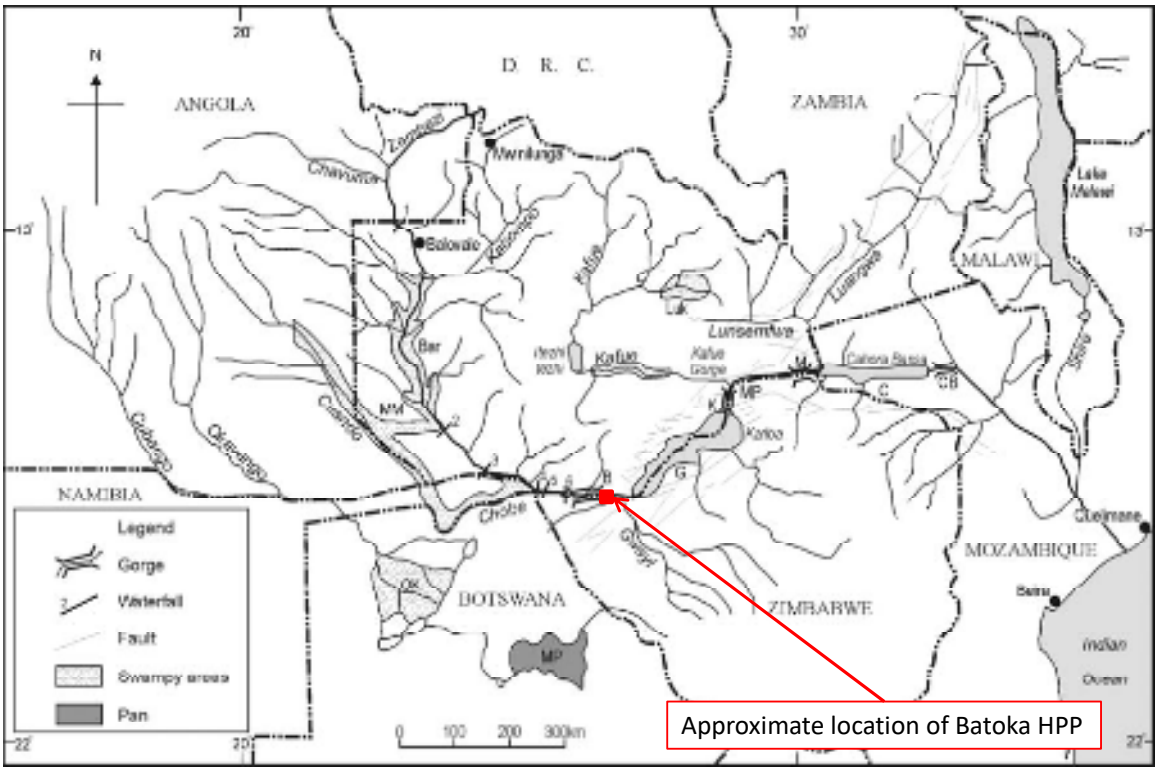


Figure 1.1 **Zambezi River basin (Source: Moore *et al.* 2007).**

Table 1.1 **Principal data for the recommended design proposed for the BGHES on the Zambezi River (SP 2014)**

Reservoir	Catchment area	508 000 km²
	Full supply level	757 masl
	Minimum operation level	746 masl
	Total storage	1392 Mm³
	Surface area at FSL	23 km²
	Volume at FSL	1392 Mm³
Spillway	Located at about two kilometres from the dam site, at the end of a canal about 2.5 km long, which will link the reservoir with a gorge parallel to the Zambezi river on the south side.	
Dam	Type	Roller Compacted Concrete Gravity Arch
	Height	177 m
	Crest length	720 m
	Crest elevation	762 mamsl
Power Station	Type	Two outdoor and above-ground power stations, located at the dam toe, one on north and one on south bank.
	Installed capacity	2400 MW
	Turbines	12 Francis turbines each with 200 MW of installed capacity

The design of the BGHES is still being finalized. The summary characteristics provided in Table 1.1 are the latest proposals for design (SP 2014), and we developed after the EF assessment was well underway. They include an adjustment to the spillway design that may affect the downstream river, *viz*: *the spillway will be located at about two kilometres from the dam site, at the end of a canal about 2.5 km long, which will link the reservoir with a gorge parallel to the Zambezi River on the south side*. This new spillway design was not evaluated as part of this EF study. However, it will be evaluated the overall assessment should it remain a preferred engineering option.

1.3 THE ENVIRONMENTAL FLOW ASSESSMENT

1.3.1 Objectives

The objectives of the EF assessment were:

- To evaluate location, design criteria and proposed operating procedures for the BGHES to assess any impacts associated with potential changes to the natural flow regimes of the Zambezi River from upstream of the BGHES to Lake Kariba.
- To evaluate how the condition of the river could change under different operational scenarios for the proposed BGHES, and define the environmental boundary conditions downstream of the BGHES, and recommend required water release during reservoir filling and operation of the BGHES.

1.3.2 Scope of Work

Southern Waters' Scope of Work was to:

- Delineate the river within the study area and select representative sites for the EF assessment.
- Provide input to the selection of scenarios for the EF assessment.
- Collect/collate primary and secondary data for the configuration of the Downstream Response to Imposed Flow Transformations (DRIFT) EFs assessment model.
- Incorporate the hydrological data provided by ERM into the DRIFT model and select ecologically-relevant flow indicators.
- Model and incorporate the ecohydraulic relationships based on survey data from EF Sites 1 and 2 into the DRIFT model.
- Select discipline indicators for the DRIFT model.
- Set up, populate and calibrate the DRIFT Decision Support System.
- Simulate scenarios.
- Present results in a report.

The Scope of Work was restricted to an assessment of the riverine biophysical aspects within the direct influence of the BGHES, and did not include an assessment of the consequent social and economic impacts of the project.

All of the local and international EF team members visited the Zambezi River upstream and downstream of the proposed BGHES between the 1st and 5th of September 2014. Thereafter (27th -31st October 2014), the population and calibration of the DRIFT Decision Support System was completed in a workshop situation in Cape Town.

1.3.3 The EF assessment process

DRIFT is a holistic EF assessment approach (Brown *et al.* 2013) that, in this project, was applied at the level of the direct influence of the proposed BGHES. This is essentially the Zambezi River from the location of the proposed BGHES dam wall to Kariba Dam. The objective was to describe the present condition of the river ecosystem and then, through scenarios, to predict how this could change with different design and operation of the BGHES.

Changes in the hydrological regime drive the assessment process. Each scenario would change flow conditions along the river in a different way, with possible different repercussions for the river system. Once these hydrological changes have been simulated, then the DRIFT software provides predictions of the consequent changes in the biotic and abiotic aspects of the river.

1.3.4 Team

The EF team members are listed in Table 1.2.

Table 1.2 EF team members

Name	Organisation	Position on team
Mr Tim Smith	ERM	ERM Task Leader
Dr Cate Brown	Southern Waters	EF Task Leader
Dr Alison Joubert	Southern Waters	DRIFT DSS
Dr Ed Buchak	ERM	Hydrology/Scenarios
Dr George Krallis	ERM	Water Quality
Dr Andrew Birkhead	Streamflow Solutions	Ecohydraulic modeling
Dr Denis Tweddle	SAIAB	Fish ecology
Mr Mark Rountree	Fluvius Consultants	Geomorphology
Dr Justine Ewart-Smith	Freshwater Consulting Group	Macroinvertebrates
Dr Karl Reinecke	Southern Waters	Riparian vegetation

1.4 THIS REPORT

This report is Volume 1 of two volumes:
Volume 1: Environmental Flow Assessment: Main Report (*this report*)
Volume 2: Specialists' Report (*due February 2015*).

Volume 1 provides the results for a suite of scenarios that reflect potential operation of BGHES, and were selected in discussion with the ERM and the Client. Each scenario comprises of a different permutation of design and operation options for BGHES. The report is intended to provide information on the ecological response to each of these for consideration during discussion and eventual setting for the EF releases for the proposed BGHES and informing the ESIA.

The layout of this report is as follows:

Section 0: Background to the river, study objectives and Scope of Work.
Section 2: Summary of Zambezi River to provide the geographic context of the proposed BGHES.
Section 3: The location and Present Ecological Status of the EF sites.
Section 4: DRIFT biophysical indicators.
Section 5: Scenarios assessed and the hydrological data on which the assessment was based.
Section 6: Rules for defining the four ecological seasons in the Zambezi River and other considerations that apply to the scenarios, such as sediment, connectivity, the concept of minimum degradation and uncertainty.
Section 7: The predicted changes in individual biophysical indicators and overall ecosystem integrity for the reach of the Zambezi River represented by each EF site.
Section 8: Summary of the results for all sites and all scenarios.
Section 10: Conclusions.
Section 12: References.

Appendix A: Additional analyses for the refinement of operating rules
Appendix B: An overview of DRIFT

2 *THE ZAMBEZI RIVER*

The Zambezi River (Figure 2.1) is the fourth largest floodplain river in Africa. It rises in north-west Zambia close to the border between Zambia, Angola and Democratic Republic of the Congo, and flows to the Indian Ocean in Mozambique some 2 700 km downstream. The river enters the sea through a mosaic of alluvial grassland and swamp forest (the Marromeu Complex) some 100 km inland from the coast, and a mangrove–deltaic system with a sea frontage of about 290 km (Tinley and Sousa Dias 1973). Its basin covers about 1,390,000 km^2 and drains the land of eight countries: Angola; Namibia; Zambia; Botswana; Zimbabwe; Malawi; Tanzania, and; Mozambique (Figure 2.1).

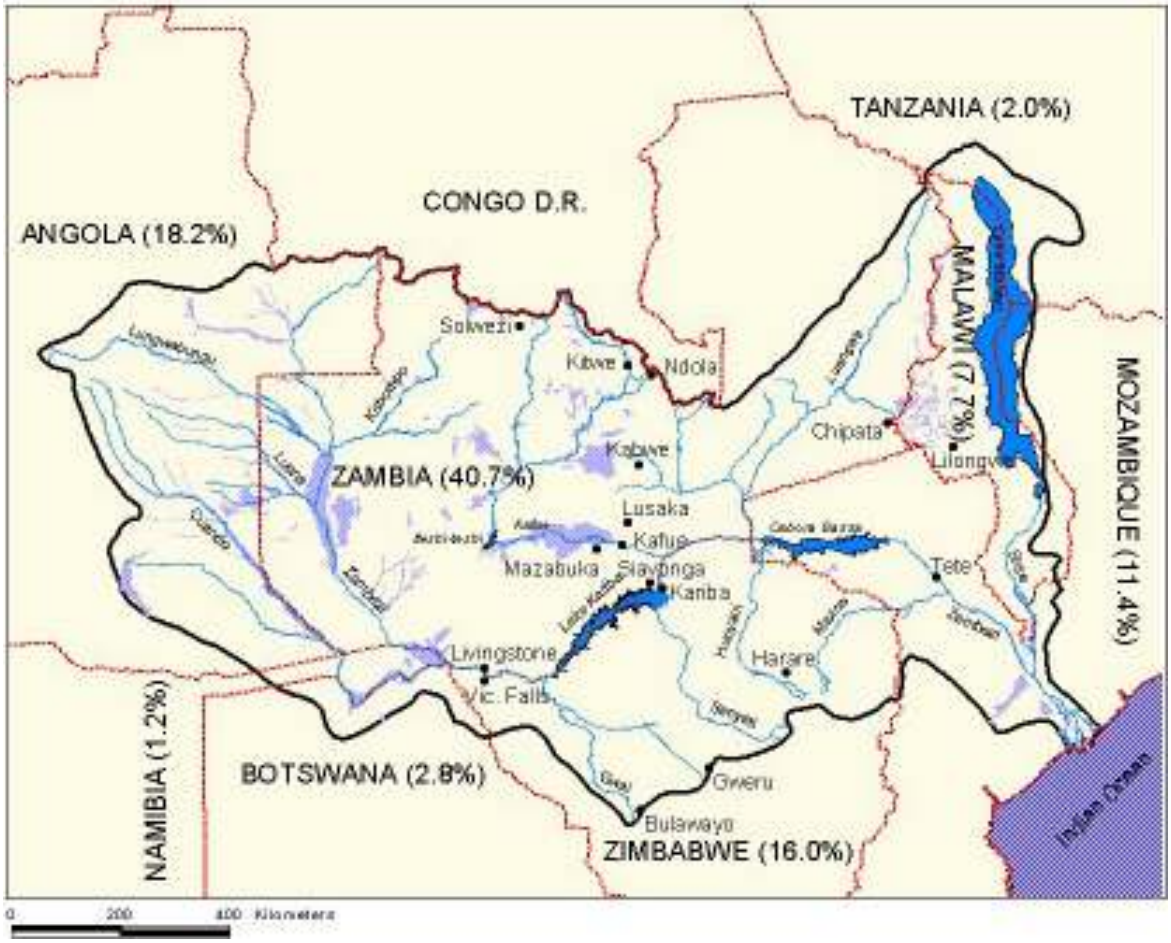


Figure 2.1 The Zambezi River Basin (Zambezi River Authority)

The River carries more than 75% of the mean annual runoff of the region's interior, and drains more than 40% of the landmass. Almost 33% of the total population of the riparian countries lives in the basin (ZRA 2008). Demand for water is increasing with population and economic growth. The Zambezi is not only an area of astounding natural beauty and biodiversity, but also a source of water, food, electricity, transport, communication and recreation for millions of people (ZRA 2008).

There are several major tributaries along the course of the Zambezi River, which contribute towards an average annual runoff of 107.6 km^3 (Table 2.1).

Table 2.1 Estimated mean annual runoff for Zambezi sub-basins (after Beilfuss et al. 2001).

Sub-Basin	Catchment Area (km2)	Mean Annual Discharge ± 95% C.I. (m^3/s)	Mean Annual Runoff ± 95% C.I. (km^3)
Upper Zambezi	507,200	1046 ± 815	32.9 ± 25.7
Gwembe Valley	156,600	222 ± 196	7.2 ± 6.2
Total to Kariba Gorge	**663,800**	**1268 ± 997**	**40.1 ± 31.4**
		Volume of Kariba Reservoir	*180 km^3*
Kafue River	154,200	285 ± 279	9.0 ± 8.8
Luangwa River and others	232,000	888 ± 818	28.0 ± 25.8
Total to Cahora Bassa Gorge	**1,050,000**	**2442 ± 1917**	**77.1 ± 60.4**
		Volume of Cahora Bassa	*52 km^3*
Plateau Tributaries	177,500	412 ± 365	13.0 ± 11.5
Shire Basin	154,000	539 ± 422	17.0 ± 13.3
Zangue Basin	8,500	16 ± 14	0.5 ± 0.4
Total to Zambezi Delta	**1,390,000**	**3424 ± 2675**	**107.6 ± 84.4**

An extensive review of the ecological setting of the Zambezi River can be found in Davies (1986).

2.1 DELINEATION OF THE ZAMBEZI RIVER

The physical structure of a river ecosystem is determined by geomorphological processes which shape the channel. These processes determine the material from which the channel is formed, the shape of the channel and the stability of its bed and banks. The channel geomorphology in turn determines the substrate conditions for the riverine fauna and flora and the hydraulic conditions for any given flow. Structural changes to the river channel may be caused by changes in the riparian area, sediment inputs from catchment erosion or reservoir induced changes in the flow regime, all of which can cause long-term irreversible effects for biota (Kochel 1988; O'Keeffe 2000). Geomorphology thus provides an appropriate basis to classify the physical habitat of riparian and aquatic ecosystems.

The aim of geomorphological classification is to subdivide the river's longitudinal profile into morphologically uniform units, so that sites may be selected within these uniform units to facilitate predictions of expected changes. Channel slope is well correlated with many physical habitat descriptors including channel planform, bed material and assemblages of morphological units (Rowntree et al. 2000). Changes in slope down the longitudinal profile

are usually correlated with morphological changes and these provide the basis for the zone delineation. These breaks are usually due to changes in lithology, but can also be as a result of tectonic activity or the upstream migration of 'knick' points (Dollar 1998). Rowntree et al. (2000) presented a hierarchical classification system for South African rivers based partly on slope characteristics. This scale-based framework links various components of the river system, ranging from the catchment to the instream habitat (Table 2.2). The classification system describes six hierarchical levels:

- the catchment,
- the segment,
- the zone,
- the reach,
- the morphological unit and
- the hydraulic biotope.

Table 2.2 Definition of geomorphological classification levels (after Rowntree et al. 2000)

Hierarchical unit	Description	Scale
Catchment	The catchment is the land surface which contributes water and sediment to any given stream network.	Can be the whole river system, from source to mouth, or a lower order catchment above a specified point of interest.
Segment	A segment is a length of channel along which there is no significant change in the flow discharge or sediment load.	Segment boundaries will tend to be co-incident with major tributary junctions.
Longitudinal zone	A zone is a sector of the river long profile which has a distinct valley form and valley slope.	Sectors of the river long profile.
Reach	The reach is a length of channel characterised by a particular channel pattern and morphology that results from a uniform set of local constraints on channel form.	100s of meters.
Morphological Unit	The morphological units are the basic structures recognised by fluvial geomorphologists as comprising the channel morphology and may be either erosional or depositional features.	Morphological units occur at a scale of an order similar to that of the channel width.
Hydraulic biotope	Hydraulic biotopes are spatially distinct instream flow environments with characteristic hydraulic attributes.	Hydraulic biotopes occur at a spatial scale of the order of 1 m^2 to 100 m^2 and are discharge dependent.

This classification system was used to describe the macro- and regional scale characteristics of the study area in the middle Zambezi River segment. Reach, morphological unit and hydraulic biotope classifications may be applied to the two EF Sites, based largely on field assessment backed up by reference to available satellite imagery such as Google Earth.

The geomorphological segments and zones were used to guide the spatial framework for the study, the location of the two EF Sites, the site visits for detailed study and the determination of habitat integrity at the EF Sites. Information derived from the field study at the EF Sites may be scaled up to the zone to obtain a broad overview of likely condition and impacts for the entire study area.

2.1.1 Geomorphological zones of the Upper Zambezi River and the study area

The longitudinal zonation of southern African rivers reflects regional geology, tectonic events and long term fluvial action, which together have affected the shape of their long profiles. The classic concave long profile may be disrupted by a number of features including outcrops of more resistant rock and rejuvenation due to tectonic uplift or a fall in sea-level, river capture or the presence of a highly resistant lithology.

The Zambezi River flows over a distance of 3000 km from its source in the Kalene Hills in Zambia at 1585 m above sea level down to the delta at the Indian Ocean in Mozambique (ZRA 1998). The Upper Zambezi River segment drains south-eastern Angola and northern Zambia into the Barotse Floodplain, an extensive floodplain over a distance of 500 km that ends at Ngonye Falls (Figure 2.2). Downstream of this, the river gradient begins to steepen culminating in the dramatic Victoria Falls. The study area, situated in the Middle Zambezi River segment, is from Victoria Falls to the full supply level of Lake Kariba (Figure 2.3). Below the falls, the gradient steepens and the river flows over cascades and rapids through Batoka Gorge. After the gorge, the valley widens and the river consists of wide/deep pools that flow around vegetated islands before the impoundment of Lake Kariba backs the water up.

The study area, downstream of Victoria Falls, was divided into three geomorphological zones based on slope, valley width and confinement, the presence and diversity of morphological units, and tributary inflows as these bring in both flow events and sediment loads to the gorge area (Figure 2.4). These are the Upper Gorge, the Lower Gorge and the Rejuvenated Cascades zones. A description of the river through these three zones is provided in Table 2.3.

The BGHES (Figure 2.5) and EF Site 1 (Figure 2.6) are situated in the Upper Gorge zone, which is characterised by a confined channel (maximum width 180 m) with a moderate to steep gradient and limited development of lateral alluvial features. The reaches of this zone comprise combinations of bedrock falls, cascades and pool-rapid morphological units. There are few sandy alluvial deposits since there are few tributary inputs. Due to this there are

few/no marginal graminoids present. The riparian area is narrow and patchy and comprises riparian trees along the channel situated at elevations above the median flood stage. This zone is approximately 100 km long.

The river channel through the Lower Gorge (Figure 2.7) is similar to that of the Upper Gorge in being a confined channel with a moderate to steep gradient and with limited lateral alluvial features. It differs in being wider (maximum width 250 m) and with an increase in the frequency of alluvial sandy deposits due to the presence of a number of tributary junctions. The reaches of this zone comprise combinations of bedrock falls, cascades and pool-rapid morphological units.

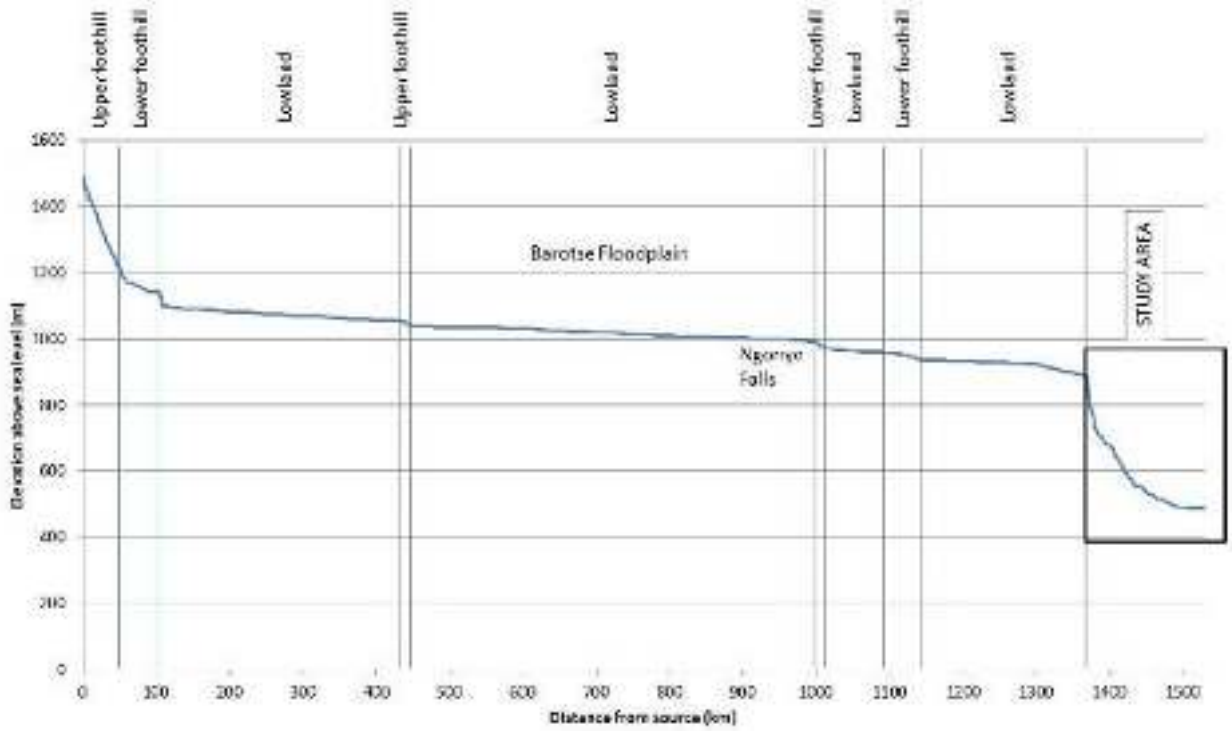


Figure 2.2 **Longitudinal profile of the Upper Zambezi River with geomorphological zones (Rowntree et al. 2000) from its source to Victoria Falls, the upper limit of the study area.**

Figure 2.3 **Overview of the study area and location of the EF Sites in relation to Victoria Falls, BGHES, the end of the gorge and Lake Kariba.**

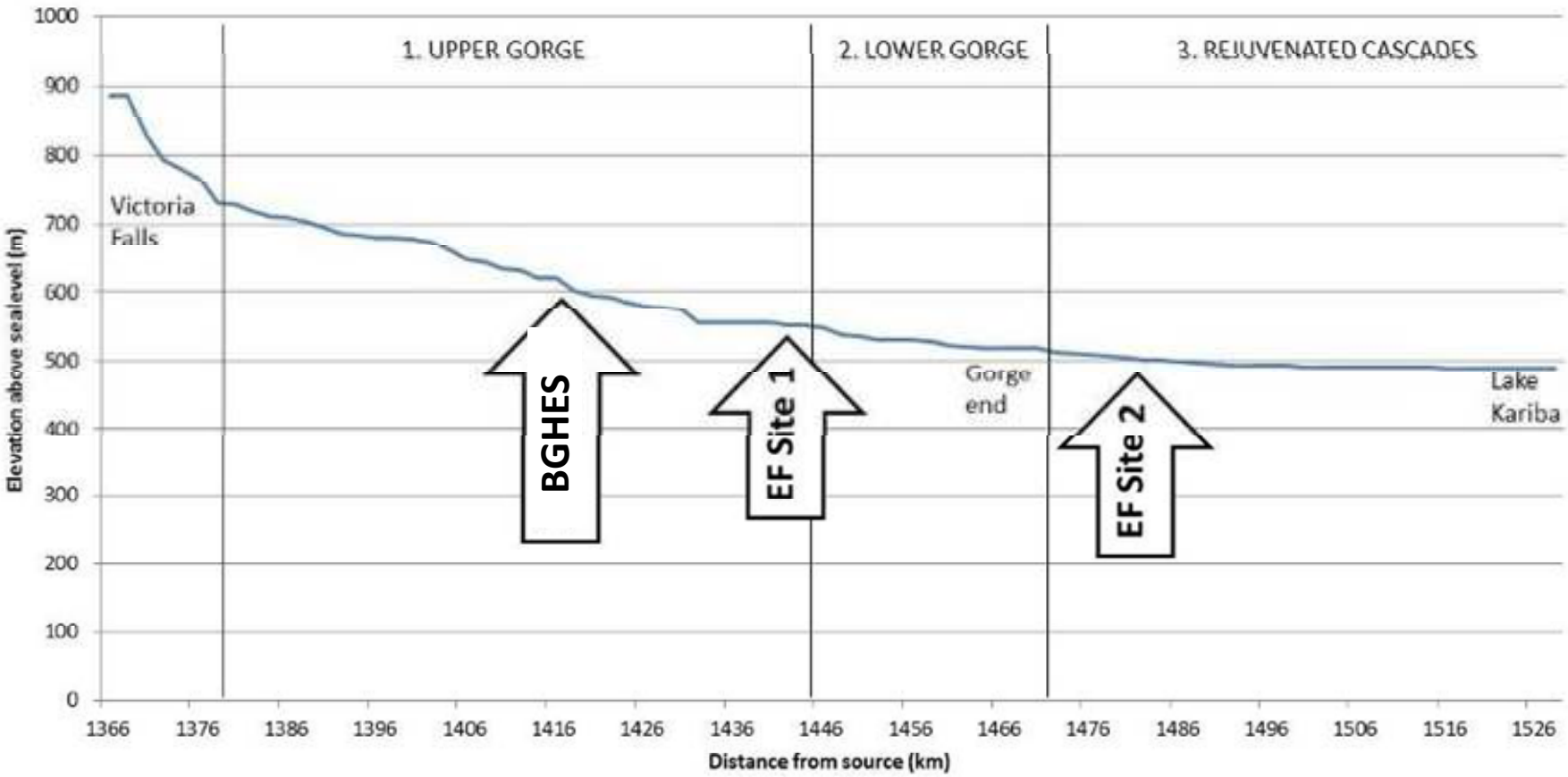


Figure 2.4 **Longitudinal profile of the study area with geomorphological zones (Rowntree et al. 2000) in relation to the location of Victoria Falls, the BGHES, EF Sites 1 and 2 and Lake Kariba.**

Table 2.3 **Descriptions of zones in the study area (Rowntree et al. 2000), river slopes and approximate width/length**

No	Zone name and description	Slope	Maximum channel width (m)	Zone length (km)
1	*Upper Gorge - no tributary inputs: BGHES and EF Site 1* Moderate to steep gradient, confined channel (gorge) with limited lateral development of alluvial features. Morphological units include bedrock fall, cascades and pool-rapid. There are few sandy alluvial deposits but no riparian plants establish there. A narrow riparian area consists of trees in patches along the channel but no reeds at the channel edge.	0.0021	180	100
2	*Lower Gorge - some tributary inputs* Moderate gradient with a wider yet still confined channel (gorge) with limited lateral development of alluvial features. Morphological units include bedrock fall, cascades and pool-rapid. Alluvial sand deposits provide some habitat for riparian trees and there are likely to be some marginal graminoids present[1]. The riparian area is narrow.	0.0016	250	24
3	*Rejuvenated cascades - widened river valley: EF Site 2* Moderate gradient, still within a confined channel, but wider and less steeply sloping banks. Limited lateral development of alluvial features. Morphological units include cascades, pool-rapid, gravel bars, sand bars and vegetated islands. The riparian area remains narrow and consists of a fringing zone of marginal graminoids (reeds) and a narrow band of riparian trees along the channel.	0.0010	550	24

Alluvial sandy deposits provide some habitat for riparian trees and it is likely that there are a greater abundance of marginal graminoids here. The overall extent of the riparian area remains narrow and patchy with the majority of species being found at elevations higher than the median flood stage. This zone is shorter and occurs over a distance of 24 km ending where the gorge ends and the valley widens.

EF Site 2 is located in the Rejuvenated Cascades zone (Figure 2.8) in a widened river valley. The river flows within a confined channel over a moderate gradient but with wider and less sloping banks. This zone, like the two upstream, is also characterised by limited

[1] The extent to which marginal graminoids were present in this zone could not be determined accurately due to the poor image quality available of Google Earth.

development of alluvial features and combinations of cascades and pool-rapids morphological units. It differs with the presence of gravel bars, sand bars and vegetated islands that provide a greater variety of riparian habitats for reeds, shrubs and trees. Marginal graminoids comprise a far greater proportion of the riparian area when compared to the gorge upstream.

Figure 2.5 Zone 1: Upper Gorge at BGHES.

Figure 2.6 Zone 1: Upper Gorge with EF Site 1.

Figure 2.7 Zone 2: Lower Gorge with tributary inputs.

Figure 2.8 Zone 3: EF Site 2.

3 THE EF SITES

3.1 INFLUENCE OF THE BGHES ON FLOWS IN THE ZAMBEZI RIVER

The design and location of the BGHES means that its potential impacts on the flow and sediment regime in the downstream Zambezi River will limited to the river reach between the BGHES and Lake Kariba, where after any changes in the daily or monthly distribution of flows will be absorbed by the Kariba impoundment. Flow in the river downstream of Kariba Dam will be influenced by the operating rules of Kariba rather than those of the proposed BGHES. It is however possible that operation of Kariba Dam will change as a result of the construction of BGHES (see comment in Section 10).

3.2 LOCATION OF EF SITES

The BGHES EF assessment concentrated on two sites on the Zambezi River between the proposed BGHES and Kariba Dam (Table 3.1; Figure 3.1; Figure 3.2; Figure 3.3). The sites were selected considering:

- geomorphologically different river reaches (See Section 2.1);
- biological variations along the length of the river;
- different types and levels of impacts likely to be incurred as a result of the BGHES location and operation;
- access and safety.

Table 3.1 EF sites for the BGHES EF assessment.

Site No.	Site	Description	Coordinates[2]
1	EF Site 1	Represents the Zambezi River in Batoka Gorge from downstream of the tailrace of the proposed BGHES to the end of the gorge	17°56'17.45"S 26°18'34.37"E
2	EF Site 2	Represents the Zambezi River from the end of Batoka Gorge to Lake Kariba.	18° 3'21.62"S 26°38'33.05"E

The flow regimes at the EF sites will be affected by BGHES in three main ways (see also Section 5).

- EF Site 1 (Figure 3.2) represents the Zambezi River within Batoka Gorge. It will be affected by releases from the BGHES tailrace. It will also be affected by the barrier

[2] Coordinate System WGS 84.

Figure 3.1 The Zambezi River between Victoria Falls and Lake Kariba, showing the approximate position of the BGHES, and EF Sites 1 and 2.

effect of the BGHES dam wall, which will have consequences as mentioned above and will also alter the thermal, sediment and physicochemical regimes along the river downstream of the dam.

- EF Site 2 (Figure 3.3) represents the Zambezi River between Batoka Gorge and Lake Kariba. It will be affected by releases from the BGHES tailrace and by the barrier effect of BGHES dam wall and will be used to predict any anticipated recovery of the river ecosystem with distance downstream of the BGHES.

Figure 3.2 EF Site 1 in the Batoka Gorge at the site of the BGHES dam wall

Figure 3.3 EF Site 2, c. 46 km downstream of BGHES and 3 km upstream of the full supply level of Kariba Dam.

The data collected for EF Site 1 were in fact collected at the location of the proposed BGHES dam wall. However, the EF Site represents the Batoka Gorge from downstream of BGHES to the end of the gorge and, as such, is shown some distance downstream of the tailrace in (Figure 3.2).

In addition, although not evident in Figure 3.1, on occasion, the backup of water from Kariba Dam extends to the Hwange Fishing and Boating Club, which is located c. 3 km downstream of EF Site 2.

Additional detail on the discipline-specific aspects of the EF sites is given in Volume 2.

3.3 PRESENT DAY ECOLOGICAL CONDITION OF THE EF SITES

Definitions of the Present Ecological State (PES) categories are given in Table 3.2.

Table 3.2 Definitions of the Present Ecological State (PES) categories (after Kleynhans 1996)

Ecological category	Description of the habitat
A	Unmodified. Still in a natural condition.
B	Near natural. A small change in natural habitats and biota has taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota has occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically modified. The system has been critically modified with an almost complete loss of natural habitat and biota. In the worst instances, basic ecosystem functions have been destroyed and the changes are irreversible.

The Present Ecological Status of the sites is provided in Table 3.3, with discipline specific details available in Volume 2 of this report. In summary, the Present Ecological State of the Zambezi River within the study area is Category B (slightly modified from natural condition).

Table 3.3 Present Ecological Status for the BGHES EF sites

Discipline	EF Site 1	EF Site 2
Hydrology	A/B	B
Geomorphology	A	A
Vegetation	A/B	B
Aquatic macroinvertebrates	A/B	A/B
Fish	A/B	B
Crocodiles	B	B/C
TOTAL	A/B	B

3.3.1 Hydrology

There are currently no artificial obstructions such as dams or weirs on the Zambezi River above the gorge and no major water abstraction. The Victoria Falls hydroelectric turbines operate as run-of-the-river with no storage; therefore water flows either over the falls or through the turbines with no effect on river level downstream. The flow regime is therefore close to pristine at EF Site 1.

At EF Site 2, there is some abstraction for water to Hwange and surrounding areas, but there are no available river data to assess the extent of the impact of this abstraction. Presumably its biggest effect is on the dry season flows, particularly in dry years, in the reach represented by EF Site 2. For this reason the present status of the hydrology at EF Site 2 was set at a B-category.

3.3.2 Geomorphology

The present ecological condition of the geomorphology at each EF site was assessed using the South African Department of Water Affairs' Geomorphological Assessment Index (GAI) Level 4 EcoStatus assessment tool (Rowntree and du Preez In press).

EF Site 1: The geomorphology at EF Site 1 is a Category A. This very high score is due to the fact that there are no large dams and thus relatively minor changes to flow upstream of Victoria Falls (i.e. upstream of the site), any changes in sediment loads are also similarly relatively small and, moreover, are attenuated in the large wetlands and slow flowing depositional areas of the upper Zambezi. Furthermore, the gorge in which EF Site 1 is located is insensitive to small-scale changes in sediment and flow due to its resistant, bedrock dominated morphology.

EF Site 2: The geomorphology at EF Site 2 is a Category A. This high score is due to the fact that there are relatively minor changes to flow upstream of the site through the gorge or above Victoria Falls; any changes in sediment loads are similarly relatively small and are attenuated in the large wetlands and slow

flowing depositional areas of the upper Zambezi. The reach where EF Site 2 is located is only moderately sensitive to changes in sediment and flow due to the widespread resistant bedrock outcrops alongside and within the channel. There is a small degree of degradation to the geomorphology at EF Site 2, but this is from on-site (non-flow related) bank disturbances associated with land use activities. The small pockets of riparian agriculture on the Zambian side and recreational/residential encroachment into the upper riparian areas on the Zimbabwean side would have very slightly reduced the integrity of the riparian vegetation and bank stability.

3.3.3 Vegetation

The Vegetation Response Assessment Index (VEGRAI) (Kleynhans *et al.* 2007) was used to assess the condition of the riparian vegetation at each EF Site[3]. The method compares the present day condition to that which would be expected under natural (reference) conditions, and considers how past impacts may have influenced the ecological condition over time. The reference condition was taken from ZRA (1998).

EF Site 1: There were no obvious disturbances to the ecological condition of the riparian area at EF Site 1, which scored an Ecological Category A/B. At this EF Site the riparian area was narrow and patchily distributed along the edge of the gorge. The marginal zone normally comprises a mixture of graminoids (such as reeds and sedges) and small trees (such as figs or willows) but here the marginal zone was sparse. There were some marginal graminoids present on lateral bars (of alluvial sand) downstream of this EF Site but overall these constitute a small proportion of the gorges riparian flora. The non-marginal zone was narrow and comprised a mixture of trees, shrubs and their saplings, indicative of healthy relationship between the natural flow regime and the life histories of the plants.

EF Site 2: There were few disturbances to the ecological condition of the riparian area at EF Site 2, which an Ecological Category of B. In contrast to EF Site 1, both the marginal and non-marginal zones of the riparian area were well established. The marginal zone comprised a mixture of marginal graminoids (such as reeds and sedges) and small trees (such as figs or willows). The population of trees and shrubs of the non-marginal zone comprised a mixture of adults and saplings, indicative of a healthy relationship between the natural flow regime and the life histories of these plants. The only visible impacts were related to use of woody plants for firewood or construction material; grazing of saplings or reeds in the marginal area; and the presence of one alien species (*Sesbania sesban)*.

[3] Please note: this method does not take plants of the aquatic zone into account.

3.3.4 Aquatic macroinvertebrates

Aquatic macroinvertebrates were collected at EF Sites 1 and 2, and identified to family level according to the Zambian Scoring System (ZISS) biomonitoring method (Lowe 2012). The ZISS method was developed for aquatic macroinvertebrates expected in streams and rivers in Zambia. The ZISS is similar to the South African Scoring System version 5 (SASS5) (Dickens and Graham 2002), but the sensitivity scores have been adjusted and taxa added to account for the regional differences.

At both EF Site 1 and EF Site 2, many sensitive taxa were recorded. The diversity and the average sensitivity score per taxon were high, although slightly lower than expected under undisturbed conditions. No single taxon was dominant. Therefore, the PES was rated as Category A/B (very slightly impaired).

3.3.5 Fish

The fish fauna in the Middle Zambezi River between Victoria Falls and Lake Kariba is naturally depauperate (Jackson 1961; Minshull 2010; Marshall 2011) because of the character of the river. The river flows through the steep-sided rocky Batoka Gorge, and below that it is a 'sandbank' river with marked seasonal flow and a resulting paucity of weed cover. Sampling in the Middle Zambezi River before and during the construction of Kariba Dam yielded only 22 species (Jackson 1961), in marked contrast to the 80+ species found in the 'reservoir' type Upper Zambezi River above Victoria Falls (Tweddle 2014). The very limited sampling in the current field survey yielded 19 species, one of which, a species of *Cyphomyrus*, is a new record for the Middle Zambezi and is currently under taxonomic/genetic investigation.

EF Site 1: Minshull (2010) recorded 29 fish species in Batoka Gorge, including small numbers of juveniles of Upper Zambezi species. Of the 29 recorded species, only 12 can be regarded as common 'permanent residents'. Some Upper Zambezi species have become established in the more complex habitats of Lake Kariba, but in general such species can only be regarded as temporary inhabitants in the gorge.

The health of the fish population in Batoka Gorge has to be assessed in terms of the naturally hostile environment in the gorge. Anthropogenic effects are very low. Fishing is restricted to hook and line for predatory fish, tigerfish (*Hydrocynus vittatus*) and vundu (*Heterobranchus longifilis*). Access points are limited and thus fishing mortality is small. Some nutrient enrichment and presence of raised *E. coli* levels are reported from the gorge below the towns of Victoria Falls and Livingstone but at low levels, and thus the fish populations in the gorge can be regarded as near pristine, Category A-B.

EF Site 2: Anthropogenic impacts are much more evident at EF Site 2. Villages border the river and the banks are heavily grazed, either by hippos, cows, or both. Numerous, but small, sand beaches occur wherever there is human habitation,

with such sites cleared for water collection and/or washing. Water quality, however, appears to remain healthy.

Fishing activity is evident everywhere, particularly on the Zambian bank. Numerous makoros (dugout canoes) were seen and many monofilament gillnets were observed in makoros, on the river banks and in the water. These monofilament nets are a recent addition to the fishery, and have resulted in serious adverse effects on fish biomass in the Upper Zambezi above Victoria Falls. They are also much more damaging to other fauna than older multifilament nets because (a) they are cheap, easily damaged, not easily repairable, and are thus discarded after use, and (b) they are made of a material that does not lie limply on the ground but instead forms springy bunches of material in which animals of all varieties are trapped and die.

Anthropogenic impacts are not on a scale that impacts on fish diversity, but probably sufficient to lead to changed species abundance ratios. Large cichlids, mainly tilapiines in this area, in particular are most reduced by targeted fishing, while *Labeo altivelis* abundance may be negatively affected by heavy exploitation during breeding migrations (Skelton et al. 1991). Thus, the fish populations in the reach represented by EF Site 2 can be regarded as Category B (slightly modified from natural condition).

3.3.6 Crocodiles

The crocodile populations in the middle Zambezi River were near extinction in the 1950s, but concerned protection resulted in a considerable recovery (IUCN 1989). Nonetheless, it is likely that wild populations at EF Site 1 and 2 are depressed relative to natural levels as a result of conflict between humans and crocodiles and (at EF Site 2) direct pressure from egg collections to stock the nearby crocodile farm[4]. Thus, the condition of the crocodile populations in the reach represented by EF Site 1 was assigned a Category B and that at EF Site 2, a Category B/C.

[4] Under its current operation (September 2014), the farm does not return juveniles to river to compensate for egg removal.

4 INDICATORS USED TO DESCRIBE THE RIVER ECOSYSTEM

In the DRIFT process, the hydrological simulations form the foundation upon which the biophysical and social predictions of change are built. The EF team chose a range of hydrological indicators, and biophysical indicators that they believe will best illustrate the river's response to the flow and other changes likely to result from the BGHES (Table 4.1).

Table 4.1 Discipline indicators used in the DSS

Discipline	Indicators	EF site
Examples of hydrology indicators	Mean annual runoff	1 and 2
	Dry season onset	1 and 2
	Dry season minimum 5-day discharge	1 and 2
	Dry season duration	1 and 2
	Dry season average daily volume	1 and 2
	Dry season within day range in discharge	1 and 2
	Dry season maximum instantaneous discharge	1 and 2
	Dry season minimum instantaneous discharge	1 and 2
	Wet season onset	1 and 2
	Wet season maximum 5-day discharge	1 and 2
	Wet season duration	1 and 2
	Wet season flood volume	1 and 2
	Wet season within day range in discharge	1 and 2
	Wet season maximum instantaneous discharge	1 and 2
	Wet season minimum instantaneous discharge	1 and 2
	Transition 1 within day range in discharge	1 and 2
	Transition 1 maximum instantaneous discharge	1 and 2
	Transition 1 minimum instantaneous discharge	1 and 2
	Transition 2 average daily volume	1 and 2
	Transition 2 within day range in discharge	1 and 2
	Transition 2 maximum instantaneous discharge	1 and 2
	Transition 2 minimum instantaneous discharge	1 and 2
	Transition 2 recession shape (slope of decrease in flow)	1 and 2
Hydraulics	Width/wetted perimeter	1 and 2
	Depth	1 and 2
	Mean velocity (across the cross-section)	1 and 2

Discipline	Indicators	EF site
Suspended sediments	Dry: min Coarse suspended sediment	1 and 2
	Dry: mean Coarse suspended sediment	1 and 2
	Dry: max Coarse suspended sediment	1 and 2
	Dry: min Fine suspended sediment	1 and 2
	Dry: mean Fine suspended sediment	1 and 2
	Dry: max Fine suspended sediment	1 and 2
	Wet: min Coarse suspended sediment	1 and 2
	Wet: mean Coarse suspended sediment	1 and 2
	Wet: max Coarse suspended sediment	1 and 2
	Wet: min Fine suspended sediment	1 and 2
	Wet: mean Fine suspended sediment	1 and 2
	Wet: max Fine suspended sediment	1 and 2
Geomorphology	Low mid-channel rock exposures	1 and 2
	Lengths of cut marginal banks	2
	Backwater bed sediment (fine to coarse)	1 and 2
	Area of backwaters and secondary channels	2
	Vegetated mid-channel bars	1 and 2
	Channel bed sediment (fine to coarse)	1 and 2
	Depth of pools	1 and 2
	Sand bars	1 and 2
Water quality (see below)	*Nutrient concentration*	*1 and 2*
	Temperature	*1 and 2*
Vegetation	Single-celled diatoms	1 and 2
	Filamentous green algae	1 and 2
	Bryophyta	1 and 2
	Marginal Graminoids	1 and 2
	Marginal Shrubs	1 and 2
	Lower Trees	1 and 2
	Upper Trees	1 and 2
	Organic detritus	1 and 2
Macroinvertebrates	Species richness	1 and 2
	Ephemeroptera	1 and 2
	Bivalves	2
	Oligoneuridae	1 and 2
	Chironomidae	1 and 2
	Shrimps	2
	Ceratopogonidae	1 and 2
	Simulidae	1 and 2

Discipline	Indicators	EF site
Fish	Tigerfish, *Hydrocynus vittatus*	1 and 2
	Cornish jack, *Mormyrops anguilloides*	1 and 2
	Redeye labeo, *Labeo cylindricus*	1 and 2
	Alestids, i.e. *Brycinus imberi, B. lateralis and Micralestes acutidens*	1 and 2
	Cichlids	1 and 2
	Chessa and Nkupe, *Distichodus* spp	2
	Labeo altivelis	2
	Barbus spp.	2
	Vundu, *Heterobranchus longifilis*	1 and 2
	Squeaker, *Synodontis zambezensis*	1 and 2
Crocodiles	Nile Crocodile, *Crocodylus niloticus*	1 and 2

Please note: Water quality was not included in the DRIFT assessment, which concentrates on the effects of potential flow and sediment changes, and barrier effects, as a result of the BGHES. The water quality variables listed in Table 4.1 were switched off for the scenarios assessments. However, the additional effects on the downstream environment as a result of expected changes in water quality, were assessed qualitatively base on the outcome the water quality modelling undertaken by ERM (Section 9).

5 SCENARIOS EVALUATED

The EFs assessment included consideration of twelve flow scenarios. The hydrological modeling underlying the generation of flow scenarios is explained in ERM (2014).

Operation of the BGHES will result in releases down the Zambezi River from the reservoir at the dam via the tailrace[5]. Thus, the EF sites are each affected in different ways by the BGHES:

U/s BGHES: Situated upstream of the full supply level of the reservoir. BGHES releases will not have any effect on flows at this site. Biotic communities between the full supply level of the BGHES and Victoria Falls may be affected by the barrier effect of the dam itself, which could halt or reduce the upstream movement of aquatic animals. However, this EF study focuses on the river downstream of the BGHES and so these effects were not considered further in the EF study.

EF Site 1 (Batoka Gorge): Situated downstream of the tailrace. This site will be affected by releases down the tailrace and by releases/spills down the river from the reservoir.

EF Site 2 (Upstream Kariba): As for EF Site 1 but probably less affected as impact of the dam should decrease with distance downstream

The scenarios differ from one another in terms of the pattern of releases (peaking versus non-peaking) and the minimum dry season releases from the reservoir. Additionally:

- one scenario incorporates a hypothetical sediment flushing operating rule.

5.1 SCENARIO EVALUATED

The scenarios evaluated for the BGHES were:

Scenario 1 (Sc1): "Base" case of straight-through, run-of-river design with no defined flow conditions (minimum or otherwise) other than to match outflows to inflows at all times throughout the day. Sc1 has no sediment flushing.

Sc1Fl: Sediment flushing in the wet season (see Section 6.4.1).

Scenario 2 (Sc2): Outflows peak over a three-hour period every morning and evening with reservoir storage being balanced over a 24-hour period to achieve this. Outflows are managed so that there is no net change in storage over this period. Scenario 2 was run with four variations in the minimum release during the dry season.

a: Minimum release = 94 m^3s^{-1}.

b: Minimum release = 180 m^3s^{-1}.

c: Minimum release = 216 m^3s^{-1}.

d: Minimum release = 255 m^3s^{-1}.

[5] The outlet back into the river after power generation.

Scenario 3 (Sc3): Outflows peak over a three-hour period every morning and evening during ***weekdays*** with reservoir storage being balanced over the weekly period to achieve this. Weekends revert to straight-through, run-of-river, as in Scenario 1. Scenario 3 was run with four variations in the minimum release during the dry season.

a: Minimum release = 94 m^3s^{-1}.

b: Minimum release = 180 m^3s^{-1}.

c: Minimum release = 216 m^3s^{-1}.

d: Minimum release = 255 m^3s^{-1}.

5.2 NOTES ON THE COMPUTATION OF THE SCENARIOS (FROM ERM)

5.2.1 Assumptions

The assumptions used for modelling by ERM can be summarized as follows:

- Began with full pool on 1 October 1924 (elevation = 752 [m ASL], spillway elevation).
- Volume in = volume out ***over each day.***
- Peak flow 6-9 AM and 6-9 PM is the maximum turbine flow of 2550 m^3s^{-1}, whenever there is sufficient volume to achieve this rate.

5.2.2 Computations

The computations conducted by ERM can be summarized as follows:

- Minimum flow is met regardless of inflow, and drawn from storage if necessary.
- Additional available volume first used to fill a less-than-full pool.
- Additional available volume then used to increase flow beyond the requested minimum value.

In all cases for all time, reduction in storage was able to maintain the requested minimum flow.

5.3 EXAMPLES OF SCENARIO FLOW REGIMES

Figure 5.1 shows the baseline (no dam) flow regime at EF Site 1 for the first seven years of the period (1924-1931). The flows for Scenario 1 are identical to those of the baseline because, under Scenario 1, BGHES is operated as a true run-of-river project, i.e., instantaneous inflow = instantaneous outflow.

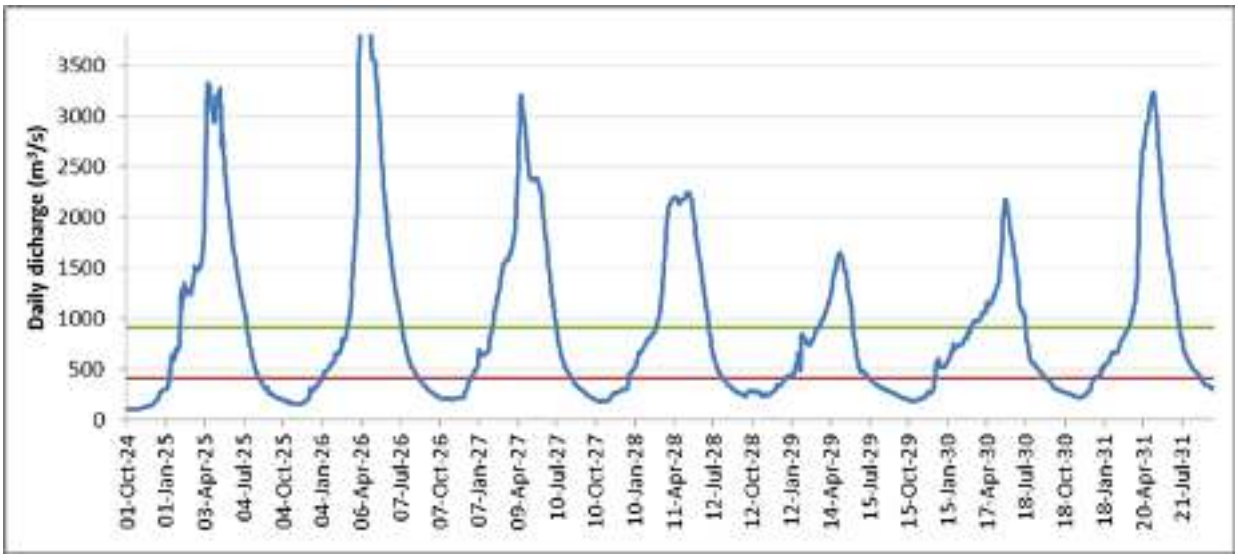


Figure 5.1 **Baseline flows at EF Site 1 with no dam in place, with the average T1/Wet season threshold (green line) and average Dry/T1 threshold (orange). Flows for Scenario 1 are identical to these flows.**

Figure 5.2 shows the flow regime at EF Site 1 for Scenario 2, with minimum releases of A = 94 m^3s^{-1}; B = 180 m^3s^{-1}; C = 216 m^3s^{-1}; D = 255 m^3s^{-1}. The four images show the pattern of flows for increasing time periods: a few days, to 14 years.

Figure 5.3 shows the flow regime at EF Site 1 for Scenario 3, with minimum releases of A = 94 m^3s^{-1}; B = 180 m^3s^{-1}; C = 216 m^3s^{-1}; D = 255 m^3s^{-1}. The four images show the pattern of flows for increasing time periods: a few days, to 14 years.

Please note the scenarios have an increased minimum release moving from dry season to wet season, i.e., through transition 1, and a gradually reducing minimum release from wet season to dry, i.e., transition 2. This is a more environmentally friendly option than fixing the minimum releases, which would allow peaking for longer. In reality what could happen is that, as the flow increases into the wet season, the dam will be operated to peak longer until it there is sufficient water to operate at full capacity for 24 hrs. This possibility was not modelled.

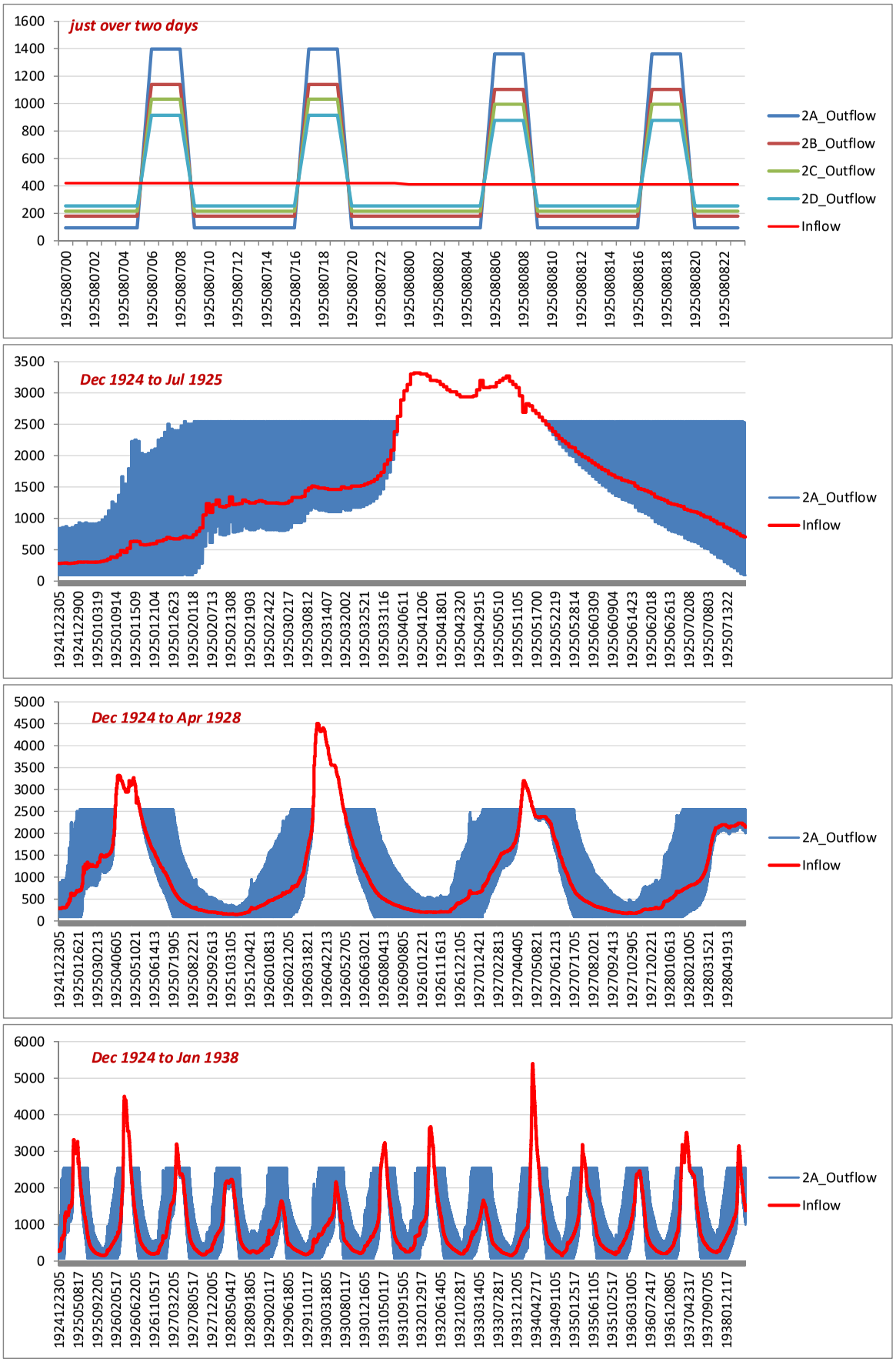


Figure 5.2 **Examples of the pattern of flow for Scenario 2 at EF Site 1 (units on Y axis are in cumecs)**

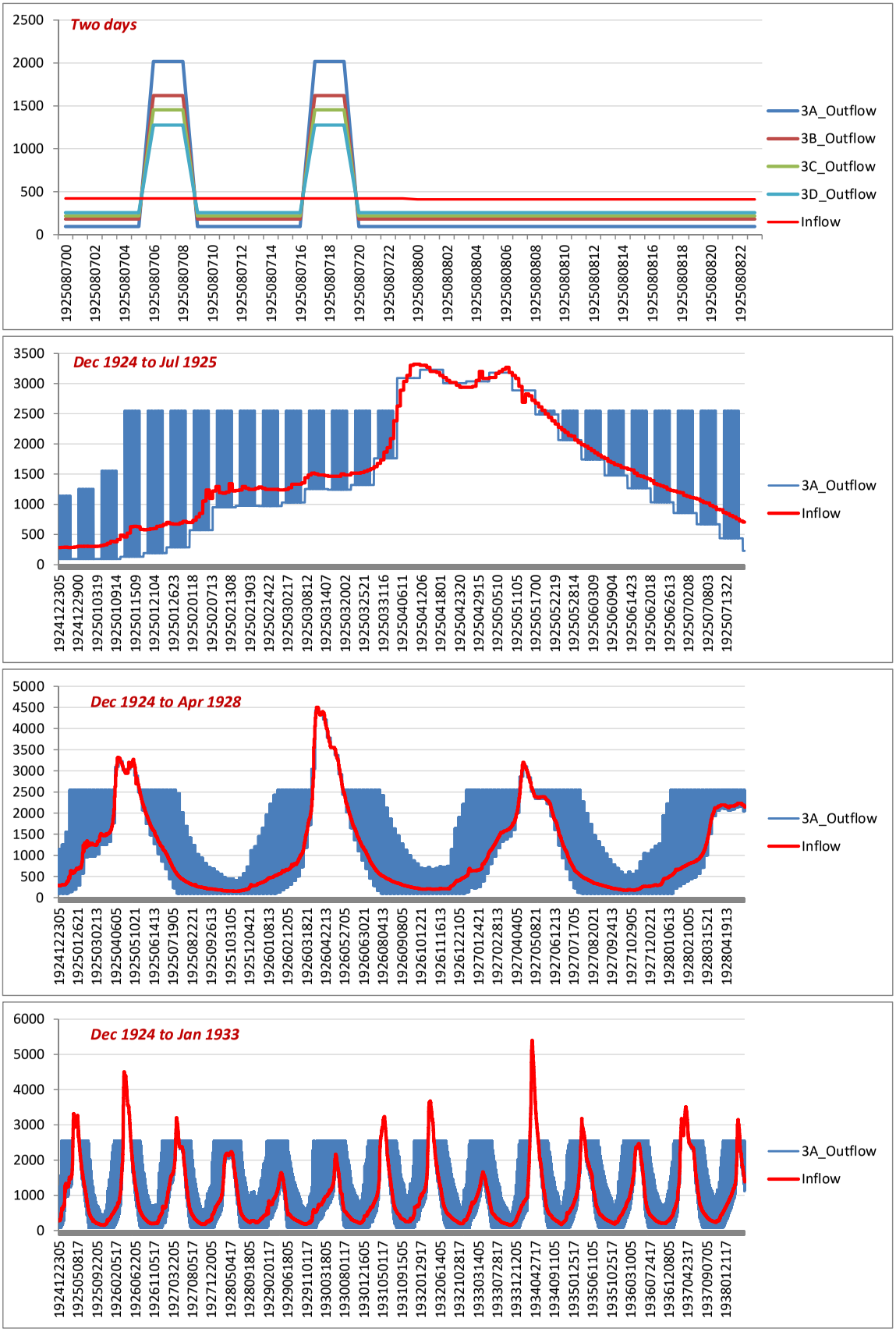


Figure 5.3 **Examples of the patterns of flow for Scenario 3 at EF Site 1. (units on Y axis are in cumecs)**

6 USE OF DATA FOR THE SCENARIOS

6.1 ANALYSIS OF THE FLOW REGIME

The hydrological record for the Zambezi River suggests that this is a flood pulse system. The seasons for the EF assessment were:

- Dry season
- Transitional season 1.
- Wet season.
- Transitional season 2.

The rules for defining the seasons for the Zambezi River are provided in Table 6.1. The start and end dates of each season are defined for every year of the hydrological time-series. Examples of seasonal divisions for two years are shown in Figure 6.1.

Table 6.1 Rules for defining the four ecological seasons in the Zambezi River.

Transition	Rule for transition from season to season
Dry Season to Transition 1 threshold	Up-crossing over 4.35 x minimum 5-day dry-season discharge
Transition 1 to Wet season threshold	Up-crossing over 0.8 x mean annual discharge
End of Wet Season	Down-crossing below 1 x mean annual discharge
Transition 2 to Dry season	Average recession rate over 14 days >-0.7 m3 s-1 d-1

6.2 DRIFT SCORING

With contemporary understanding of how river ecosystems function, it has become easier to predict WHAT will change and the DIRECTION of change. It is less easy to predict by HOW MUCH ecosystem components will change and HOW LONG it will take. Recognising this, the indicators are chosen as the WHAT, and the response curves show in which DIRECTION they are expected to change. Predictions of by HOW MUCH each indicator might change are less certain and so are captured using severity ratings; these are broad ranges of change from baseline, which is the 2014 condition (Table 3.6).

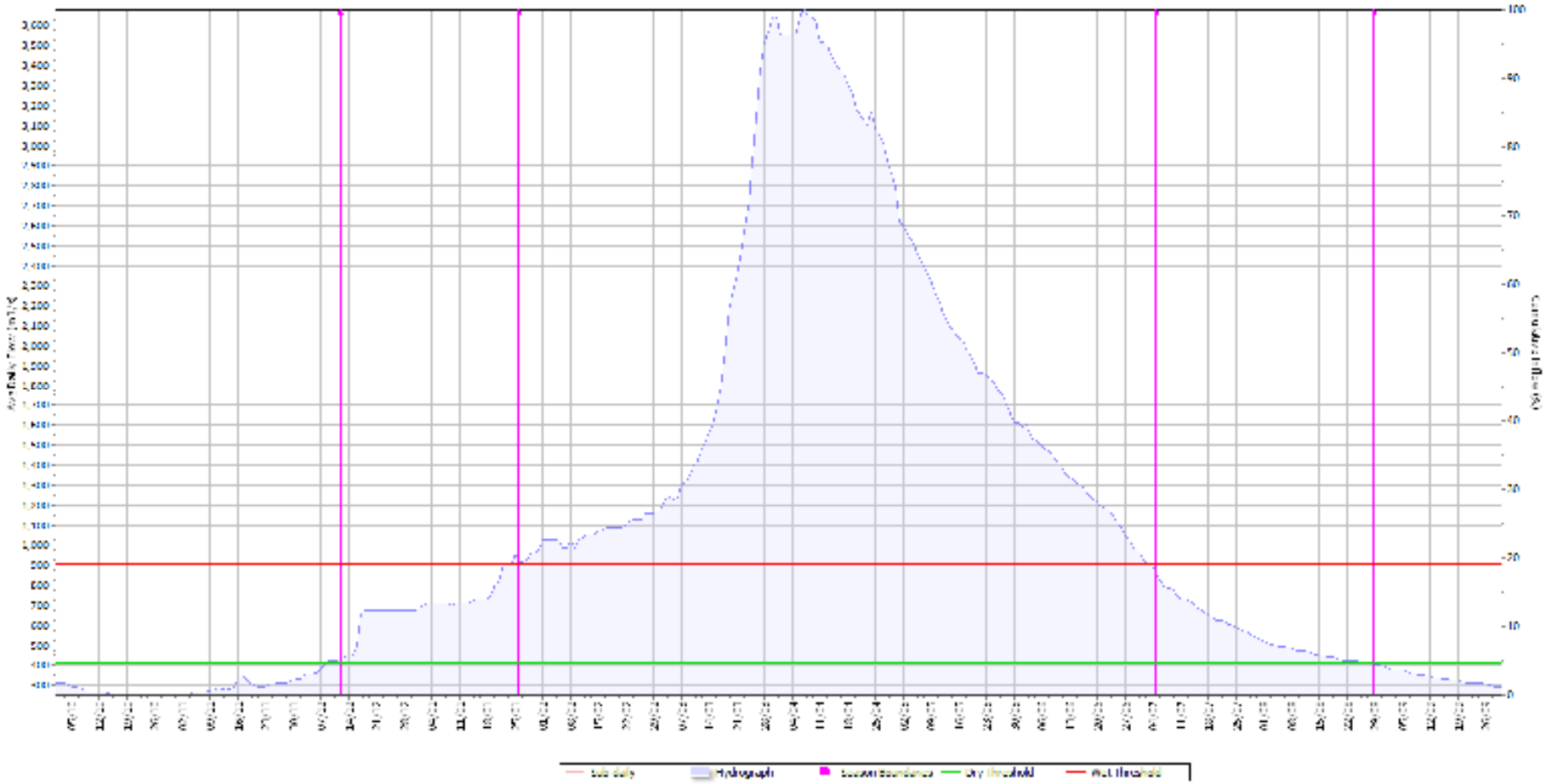


Figure 6.1 **Printscreen from the DRIFT-DSS showing examples of seasonal divisions.**

Table 3.6 **DRIFT severity ratings and their associated abundances and losses (King and Brown 2010)**

Severity rating[1]	Severity of change	% abundance change
5	Critically severe	501% gain to ∞ up to pest proportions
4	Severe	251-500% gain
3	Moderate	68-250% gain
2	Low	26-67% gain
1	Negligible	1-25% gain
0	None	no change (represents Baseline)
-1	Negligible	80-100% retained
-2	Low	60-79% retained
-3	Moderate	40-59% retained
-4	Severe	20-39% retained
-5	Critically severe	0-19% retained includes local extinction

The incoming flow regime for any chosen scenario/site accesses the response curves and produces a prediction of change for each indicator and for the ecosystem as a whole. Although these are given by the DSS as precise numbers, they are best interpreted through a search for broad trends of change. In Table 3.7, for instance, one would expect: all but indicator 2 to decrease in abundance from the 2014 condition; indicators 1, 6, 7 and 8 to show more change than the others; and Scenarios 1 and 2 to have the most impact on the river while Scenario 3 has the least impact.

Table 3.7 **Example of depicting trends: the mean percentage changes, relative to 2014, of eight ecosystem indicators under four hypothetical development scenarios.**

Indicator	Baseline	Hypothetical scenario 1	Hypothetical scenario 2	Hypothetical scenario 3	Hypothetical scenario 4
	Percentage change				
1	0	-50	-50	-33	-33
2	0	19.0	19.0	6.1	14.2
3	0	-21.2	-20.0	-2.3	-6.4
4	0	-15.1	-15.0	1.0	0
5	0	-2.3	-3.3	0	-1.6
6	0	-49.7	-48.2	-7.2	-17.8
7	0	-79.5	-78.2	-13.6	-35.9
8	0	-65.5	-62.8	-9.4	-28.4

Change: 0-20% %-40% > %

HOW LONG BEFORE CHANGE STARTS is addressed through the DRIFT time-series, which depict baseline conditions and future change over the span of years used in the hydrological simulations (in the case of the Zambezi River, the 52 years from 1960 to 2012).

[1] A negative score is a loss in abundance relative to Baseline, a positive is a gain. Zero severity is the Baseline situation.

These prediction of onset of change are based on past climate conditions, and so may differ in reality, depending on future climatic conditions.

6.2.1 Description of percentage of 2014 conditions for changes in bed conditions

The bed sediment conditions linked to the DRIFT severity ratings for the Zambezi River within the study area are provided in Table 6.2.

Table 6.2 Bed sediment condition descriptions linked as percentage of 2014 conditions for the Zambezi River within the study area

% of PD condition	Description of the active channel bed condition
0	Surface is dominated by sand and silts, almost all cobbles are embedded
25	50% more embeddedness than the PD condition, extensive fine deposits
50	25% more embeddedness than the PD condition
75	10% more embeddedness than the PD condition
100	Conditions of the river bed as observed in September, 2014
150	Doubling of the cobble bars with more, larger interstitial spaces, fewer fines.
200	The channel bed is dominated by boulders, cobbles and bedrock (no fines, very few, very small gravel deposits).
250	The active channel has a bedrock/large boulder bed.

6.3 DISCIPLINE-SPECIFIC RESPONSE CURVES

Response curves were compiled that described the relationships between the driving (flow) and responding (biophysical) indicators. In some cases, indicators responded indirectly to flow changes through an intermediary influence. Fish, for instance, might be responding directly to pool depth or nutrient levels, which in turn might be driven by flow changes. These intermediaries reflect that flow may not be the only driver used in a response curve. The full system of links between driver and responding indicators is a complex web of response curves within the DRIFT DSS.

Each response curve describes the expected impact of a single type of flow or other driving change on the abundance of a single responding biophysical indicator, on a response scale of 0 (no response) to 5 (critically high response). A change in flow could thus be followed through various linked indicators to a change in river condition. The ratings of change were also converted to percentages for use in some meetings and reports. In total, about 240 response curves were created per site for the project and housed in the DRIFT DSS.

In the DSS, for each site and scenario, each year's value for a driving indicator is linked with each response curve that employs that driver and the corresponding value of the responding indicator is recorded. An indicator such as Dry Season Onset, for instance, would have 90 values from a 90-year simulated flow regime of the calendar week in which the onset

occurred. Through a response curve, this would produce 90 annual values for the predicted abundance of, for instance, the indicator 'Tigerfish, *Hydrocynus vittatus*'.

The scores from all the response curves for any one indicator were combined in various ways, so that measures of change could be expressed as time-series per indicator, per discipline, or as overall ecosystem integrity. For the latter, results were provided on a scale of A to E, where A represented a pristine ecosystem and E a critically modified one with few, if any, intact ecosystem functions and thus of little value to people (King and Brown 2010).

The DRIFT DSS and process are described in more detail in Appendix A. The links for each indicator and the resultant response curves are provided in Volume 2 of this report (Specialist Reports). For each curve detailed reasoning and relevant scientific references are also provided.

6.4 CONSIDERATION OF BARRIER EFFECTS AS A RESULT OF BGHES DAM WALL

At 180 m, the BGHES dam wall will present an unsurpassable barrier to in-channel movement of abiotic and biotic components of the river ecosystem. Apart from water, the most significant other abiotic component is sediment of different sizes (boulders, cobbles, gravel, sand, mud and silt). However, the impact of these barriers on the functioning of the Zambezi ecosystem is considerably reduced by the siting of the BGHES directly downstream of Victoria Falls.

6.4.1 Trapping and flushing of suspended sediments

The Upper Zambezi River has a low sediment load in comparison with many other large rivers, largely because of the low gradient and extensive wetlands in the upper catchment.

Estimates of the reduced sediment load (relative to baseline of 100%; Table 6.3) were developed based on the design and operation of, and catchment area affected by, the BGHES, together with consideration of the siting of the BGHES, the sediment inflows from tributaries and the availability of sediment which could be reworked and entrained from the bed and banks.

The basic assumptions were:

- Sand and larger calibre sediments will settle out in the reservoir
- Clays, silts and organics will stay in suspension.
- Sediment flushing from the reservoir if it is applied will occur in the wet season[6].

Trapping of (and therefore possible reductions in bedload) was not considered. Bedload is low as a result of Victoria Falls.

[6] Wet-season flushing is the most ecologically friendly option. Flushing in the dry season would have considerably greater ecological impacts, and was not considered here.

Table 6.3 Estimates of changes in suspended sediment delivery to the EF sites

	Fine suspended sediments (silts and clays)				Coarse suspended sediments (sands and larger)			
	Median		Maximum		Median		Maximum	
Flow season:	Flood	Dry	Flood	Dry	Flood	Dry	Flood	Dry
EF 1: Baseline	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***
EF 1: Dam, no flushing	30	20	40	20	15	10	15	10
EF 1: Dam with flushing	40	30	120	30	15	10	15	10
EWR 2: Baseline	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***
EF 2: Dam, no flushing	40	20	40	20	20	15	20	15
EF 2: Dam with flushing	50	30	100	30	20	15	20	15

6.4.2 Barrier to fish movement

At the scale of the Zambezi River, the influence of the BGHES dam wall and reservoir on the upstream and downstream movement of fish is expected to be negligible. This is because the dam wall will be situated on c. 50km downstream of Victoria Falls, which represents a significant natural barrier. There is some evidence that juveniles from upstream are flushed downstream of the falls, possibly through the turbines. Some of these have established in Lake Kariba, but there is little evidence that they can survive to adulthood in the river (see Volume 2). These incidental downstream migrations were not considered further in the EF assessment.

6.5 CONSIDERATION OF IMPACTS IN OTHER PARTS OF THE BASIN

The scenarios EXCLUDE consideration of possible cumulative impacts on riverine habitats and biota resulting from developments in other parts of the Zambezi Basin or degradation of the surrounding landscape. However, fishing pressure was considered because fishing pressure creates an obvious and likely confounding factor when evaluating the effects of reduced lowflows on the system: pressure (fishing success) on fish stocks increases when flows in the river are low because fish are confined to a smaller area.

6.6 INCORPORATION OF HYDRAULIC DATA

Survey data of cross-sections at the BGHES EF sites 1 and 2 (Table 3.1) were used to model the hydraulics of the sites and the fish hydraulic habitat available over a range of flows (specialist report on hydraulics). The hydraulic modelling enabled hydraulic indicators (Table 4.1) to be inserted into the DSS and used to estimate flow and sediment-driven changes in habitat. The data used to calculate the hydraulic indicators are presented in the Hydraulics Report (Volume 2).

6.7 *INDIVIDUAL INDICATOR SCORES DENOTING MINIMUM DEGRADATION*

The 'minimum degradation' designation refers to a scenario(s) that is expected to result in a small change in river condition. It is defined as follows:

If the overall CHANGE in the Integrity Score of a scenario at a site is a drop of less than 0.5 from baseline (2014) conditions, then the flow change represented by the scenario is deemed to have had a minimal negative impact on the existing ecosystem condition at that site, that is, there will be minimal additional degradation.

The drop of 0.5 in the Integrity score can keep the river in the same condition category or drop it a lower one, in both cases still representing minimum degradation:

- if the condition of an ecosystem is in the upper or middle part of a category, a drop of 0.5 in the Integrity Score could be insufficient to result in a drop to a lower ecological category (for instance, an upper B category condition could drop to a lower B condition).
- if an ecosystem is already in the lower part of a category, a drop of 0.5 in the Integrity Score from Baseline could result in a drop to the next lower category (for instance, a lower B category condition could drop to an upper C condition).

According to this definition 'minimum degradation' does not equate with 'no impact', as some impact has been allowed for.

7 *RESULTS FOR THE SCENARIOS*

For each scenario, the predicted changes in the study river a represented by the EF Sites are evaluated per site as:

1. estimated mean percentage change from baseline[7] in the abundance, area or concentration of key indicators;
2. time-series of abundance, area or concentration of key indicators under the flow regime resulting from each scenario
3. Overall Ecosystem Integrity.

For comparison purposes, the predicted change in Overall Ecosystem Integrity, relative to baseline, associated with each scenario at both EF sites is provided in Section 8.

7.1 BGHES EF SITE 1

EF Site 1 is located immediately downstream of the BGHES tailrace in Batoka Gorge. As such it is directly affected by EF releases made at the dam. It is also affected by the barrier that BGHES dam wall poses to sediments and fish, and by any limnological changes that may take place in the BGHES reservoir, such as an increase in phyto- and zooplankton, a decrease in oxygen or a change in water temperature.

7.1.1 Characteristics of the flow regime of each scenario at BGHES EF Site 1

The main characteristics of the flow regimes at BGHES EF Site 1 associated with each of the scenarios are summarised in Table 7.1

7.1.2 Mean percentage changes

The mean percentage changes (relative to baseline) for the indicators for the scenarios at BGHES EF Site 1 are given in Table 7.2.

In Table 7.2, baseline, by definition, equals 100%.

[7] Baseline ecological conditions are taken as those measured in 2014.

Table 7.1 Characteristics of the flow regime of each scenario at BGHES EF Site 1. Median values are given for the flow indicators

Indicators	Units	Scenarios										
		Baseline	Sc1	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d
Mean annual runoff	m^3/s	1101.72	1101.72	1101.72	1098.27	1098.27	1098.27	1098.27	1098.53	1098.39	1098.33	1098.27
Dry season Min 5d Q	m^3s^{-1}	220.59	220.59	220.59	220.59	220.59	220.66	255.00	202.65	216.21	221.97	255.00
Dry season onset	weeks	35.00	35.00	35.00	35.00	35.00	35.00	35.00	33.00	33.50	34.00	34.00
Dry season duration	weeks	110.50	110.50	110.50	110.50	110.50	110.50	110.50	115.00	117.50	117.00	117.00
Dry season ave daily vol	m^3	25.730	25.730	25.73	25.73	25.73	25.73	26.08	26.46	26.21	26.14	26.55
Wet season Max 5d Q	m^3s^{-1}	3309.19	3309.19	3309.19	3294.47	3294.47	3294.47	3294.47	3256.58	3256.58	3256.58	3256.58
Wet season onset	weeks	7.00	7.00	7.00	7.00	8.00	8.00	8.00	6.00	6.00	6.00	7.00
Wet season duration	weeks	147.00	147.00	147.00	145.00	145.00	142.50	135.50	156.50	156.00	151.00	143.50
Wet season ave daily vol	m^3	169.63	169.63	169.63	167.53	169.61	172.28	176.91	164.94	164.94	165.95	170.25
Flood volume	MCM	26798.04	26798.04	26798.04	26501.99	26437.15	26161.32	25658.37	26834.26	26834.26	26704.62	26332.99
T1 ave daily vol	m^3	56.56	56.56	56.56	56.56	56.56	56.60	57.87	46.69	48.83	49.65	51.22
T2 ave daily vol	m^3	48.31	48.31	48.31	48.34	48.31	48.31	48.31	53.21	52.28	51.99	51.34
Dry within day range	m^3s^{-1}	0.00	0.00	0.00	745.98	401.98	257.98	101.98	906.54	419.40	217.80	4.94
Wet within day range	m^3s^{-1}	0.00	0.00	0.00	823.09	823.09	816.89	714.88	319.20	319.20	319.20	311.93
T1 within day range	m^3s^{-1}	0.00	0.00	0.00	2165.98	1894.25	1750.25	1644.18	1920.97	1663.89	1536.75	1446.60
T2 within day range	m^3s^{-1}	0.00	0.00	0.00	1733.71	1386.84	1242.84	1086.84	2192.34	1874.74	1639.48	1365.44
T2 max rate of change	m^3s^{-1}	0.00	0.00	0.00	2450.84	2362.48	2325.16	2278.07	2429.94	2335.29	2287.45	2252.50
T2 max instantaneous Q	m^3s^{-1}	844.62	844.62	844.62	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00
T2 min instantaneous Q	m^3s^{-1}	402.25	402.25	402.25	94.00	180.00	216.00	255.00	94.00	180.00	216.00	255.00
Wet season max rate of change	m^3s^{-1}	7.20	7.20	7.20	2248.00	2248.00	2248.00	2248.00	2152.11	2152.04	2144.75	2082.91
Wet season max instantaneous Q	m^3s^{-1}	3321.25	3321.25	3321.25	3321.26	3321.26	3321.26	3321.26	3256.58	3256.58	3256.58	3256.58
Wet season min instantaneous Q	m^3s^{-1}	864.00	864.00	864.00	282.39	281.02	281.02	281.02	393.28	393.69	396.75	401.77
T1 max rate of change	m^3s^{-1}	2.01	2.01	2.01	2443.44	2363.12	2332.31	2295.00	2419.83	2338.96	2325.73	2295.00
T1 max instantaneous Q	m^3s^{-1}	924.41	924.41	924.41	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00
T1 min instantaneous Q	m^3s^{-1}	429.47	429.47	429.47	94.00	180.00	216.00	255.00	94.00	180.00	216.00	255.00
Dry season max rate of change	m^3s^{-1}	1.28	1.28	1.28	1322.90	978.90	834.90	678.90	2010.34	1453.02	1199.64	958.32
Dry season max instantaneous Q	m^3s^{-1}	424.72	424.72	424.72	1416.90	1158.90	1050.90	933.90	2104.34	1633.02	1415.64	1213.32
Dry season min instantaneous Q	m^3s^{-1}	218.39	218.39	218.39	94.00	180.00	216.00	255.00	94.00	180.00	216.00	255.00

Table 7.2 BGHES EF Site 1: The mean percentage changes in abundance (relative to baseline) for the indicators for the scenarios.

Disciplines	Indicators	Scenario									
		Sc1	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d
Geomorphology	Low mid-channel rock exposures	0.3	0.3	-69.6	-57.6	-52.0	-47.6	-73.2	-58.5	-52.2	-46.4
	Backwater bed sediment (fine to coarse)	101.7	101.7	114.1	112.6	111.7	111.0	115.0	113.1	112.3	111.6
	Area of backwaters and secondary channels	0.3	1.1	-37.2	-30.1	-26.8	-23.1	-37.5	-29.4	-25.1	-20.6
	Channel bed sediment (fine to coarse)	101.3	101.3	113.9	112.4	111.5	110.7	114.7	112.8	112.0	111.3
	Depth of pools	-2.6	-0.5	5.9	3.7	2.8	2.0	6.9	4.2	3.1	2.1
	Sand bars	-65.4	-47.5	-79.9	-77.4	-76.4	-75.2	-80.7	-78.7	-77.3	-75.7
Vegetation	Single-celled diatoms	17.6	15.4	-25.5	-15.3	-10.1	-4.9	-29.2	-17.0	-10.9	-4.2
	Filamentous green algae	19.1	17.4	-41.3	-29.8	-23.6	-17.3	-44.0	-31.4	-24.2	-16.0
	Bryophyta	25.2	19.0	91.7	76.8	70.9	69.3	99.2	81.9	74.0	70.3
	Marginal Graminoids	-18.8	-14.2	-6.0	-5.6	-4.9	-4.4	-7.5	-6.7	-6.0	-5.4
	Marginal Shrubs	-9.0	-9.0	26.0	26.7	26.9	21.8	26.0	26.8	27.6	28.6
	Lower Trees	-5.9	-5.9	8.3	6.4	5.6	4.6	13.3	10.0	8.6	7.3
	Upper Trees	0.4	0.4	0.4	0.4	0.4	0.3	1.0	1.0	1.0	0.8
	Organic detritus	-11.8	-11.8	-42.9	-40.3	-38.2	-36.0	-44.9	-40.3	-37.3	-34.5
Macro-invertebrates	Species richness	-31.6	-29.5	-45.9	-45.0	-44.9	-44.2	-45.7	-44.6	-44.3	-43.6
	Ephemeroptera	-0.9	-0.9	-61.0	-50.9	-45.5	-39.7	-66.9	-54.2	-47.0	-39.5
	Oligoneuridae	-3.0	-3.0	-64.7	-49.1	-41.4	-35.5	-72.8	-54.3	-45.2	-37.3
	Chironomidae	-1.6	-1.6	-54.9	-43.4	-39.8	-36.6	-60.6	-48.1	-43.0	-38.2
	Ceratopogonidae	-24.6	-24.6	-30.9	-29.6	-30.1	-29.3	-37.2	-35.1	-34.6	-33.2
	Simulidae	0.1	0.1	-69.0	-52.2	-44.6	-38.2	-74.8	-55.1	-45.9	-37.5
	Gastropods	2.4	2.5	2.0	2.0	1.9	1.7	1.2	1.8	1.9	1.7
Fish	Redeye labeo, *Labeo cylindricus*	0.5	0.5	-37.8	-37.3	-36.7	-36.3	-36.8	-35.7	-35.2	-34.3
	Cichlids	-7.0	-6.8	-47.6	-45.1	-42.2	-33.1	-48.0	-45.8	-40.7	-29.1
	Synodontis zambezensis	-1.3	-1.3	-23.5	-17.3	-9.8	-1.8	-26.4	-19.6	-10.3	-0.5
	Alestids	-2.9	-2.9	-18.5	-12.9	-8.0	-4.8	-23.0	-13.2	-7.3	-3.1
	Cornish jack, *Mormyrops anguilloides*	-9.6	-9.2	-49.5	-48.8	-48.0	-46.1	-49.4	-48.6	-47.7	-43.3
	Vundu, *Heterobranchus longifilis*	-2.0	-1.8	-10.1	-8.1	-5.5	-1.6	-10.6	-6.8	-4.0	0.2
	Tigerfish, *Hydrocynus vittatus*	-1.9	-1.8	-43.0	-37.7	-32.9	-27.2	-43.6	-36.7	-30.6	-22.8
Crocodiles	Nile Crocodile, *Crocodylus niloticus*	0.0	0.0	-34.3	-29.5	-27.5	-25.8	-42.5	-34.4	-31.1	-28.9

7.1.3 Time-series

The time-series for the scenarios for the biophysical indicators (Figure 7.1 to Figure 7.4) show the annual changes in abundance behind the mean values given in Table 7.4. The period simulated is 1924-2014. These show the year-on-year changes in each indicator in response to the prevailing conditions. These conditions, derived using the historical flow records (1924-2014), show the predicted response for each indicator, under the condition specified in each scenario, should the same flow conditions be replicated into the future. In the plots, some scenario lines are hidden underneath others. Where the visible scenarios are quite different, the location of the hidden scenario(s) is given in the text.

7.1.3.1 Geomorphology

The overall predictions (Figure 7.1), relative to the baseline scenario, are that in-channel habitats would change slightly under Scenario 1 and 1F (the effects of the flushing scenario are negligible).

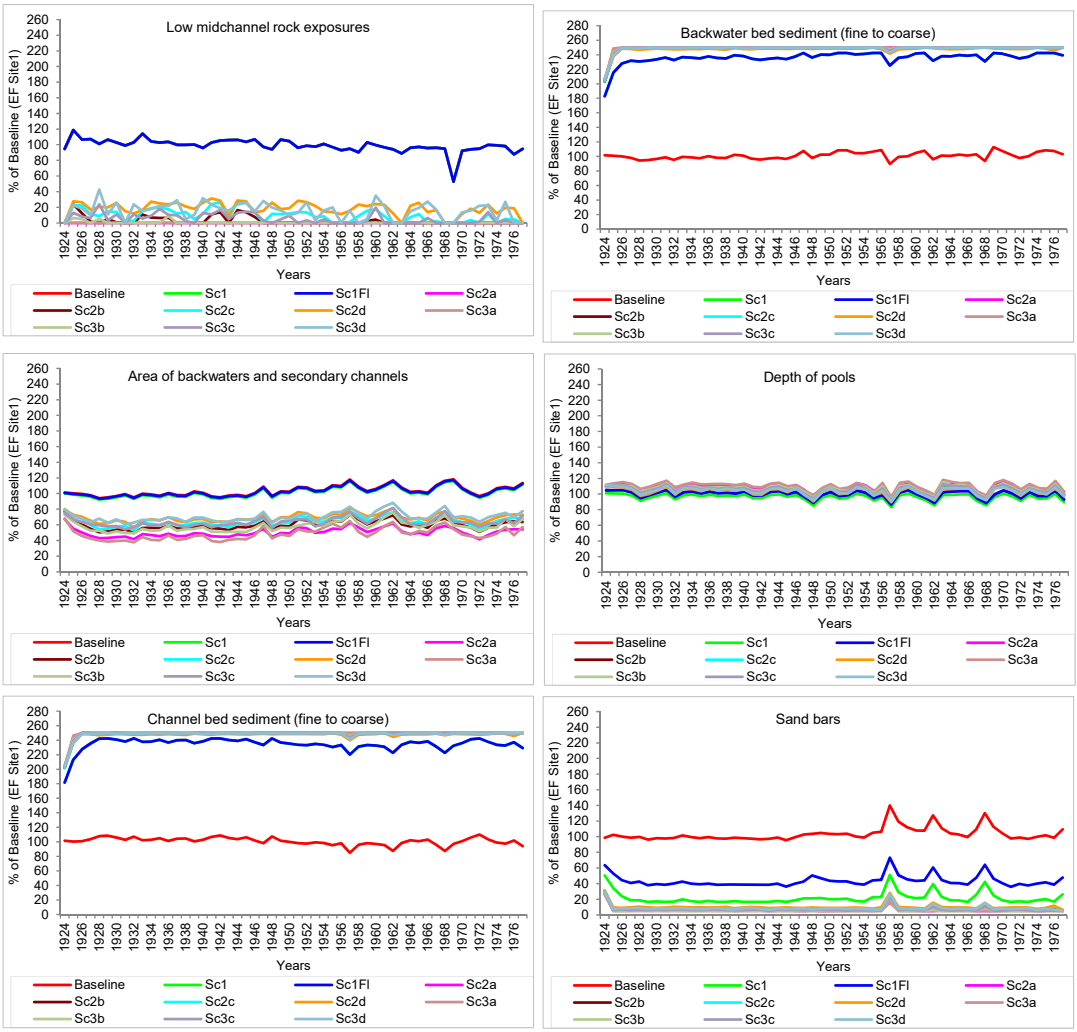


Figure 7.1 Time-series of predicted changes in geomorphological indicators at EF Site 1. Scenario lines not visible are hidden by those showing.

Under run-of-river operation, a general coarsening of the bed sediments is expected, with the most significant change expected being a reduction in sand bars. These are fairly uncommon but important habitats in the gorge, and are expected to be negatively affected by the capture, by the BGHES, of sediments travelling down the river. This is expected to be somewhat offset, but not completely mitigated, by sediment flushing from the dam in the wet season.

If peak power releases are implemented at the BGHES, they would increase sediment movement through the reach represented by EF Site 1, and the bed sediments will coarsen and the sand bars will be removed. A reduction in backwater areas is also predicted. As mentioned above, the sandbars and backwater areas, although uncommon in Batoka Gorge represent valuable habitat for several species in that reach. There is a chance that peaking releases will result in increased bank slumping, but given the steep and rocky nature of the Zambezi River in Batoka Gorge, this is likely to be limited.

7.1.3.2 Vegetation

The time series of the effect of the BGHES scenarios on vegetation at EF Site 1 are shown in Figure 7.2.

Peaking releases are expected to be far more damaging. Peaking at 2 500 m^3s^{-1} will inundate the entire marginal zone. Continuous inundation of the marginal zone is expected to flush any settled organic particulate matter, algae and diatoms leaving little available as a food source for biota. On the other hand, the moss Bryopyta is expected to increase under peaking, mainly because there will be less abrasion by sediments (as these will be trapped in the upstream impoundment) and because peaking flows are sufficiently large to inundate the rocks used by moss but are insufficient to effect scouring. Continual wetting will favour growth of the rock moss. Similarly the marginal vegetation (shrubs and graminoids) is expected to increase slightly as peaking flows will inundate the marginal zone, stimulating growth but are not sufficiently large to cause stem snap to wash plants away. Riparian trees are unlikely to be affected by flows from the BGHES.

Figure 7.2 **Time-series of predicted changes in vegetation indicators at EF Site 1. Scenario lines not visible are hidden by those showing.**

7.1.3.3 Macroinvertebrates

The overall predictions for macroinvertebrates relative to the baseline scenario (Figure 7.3)

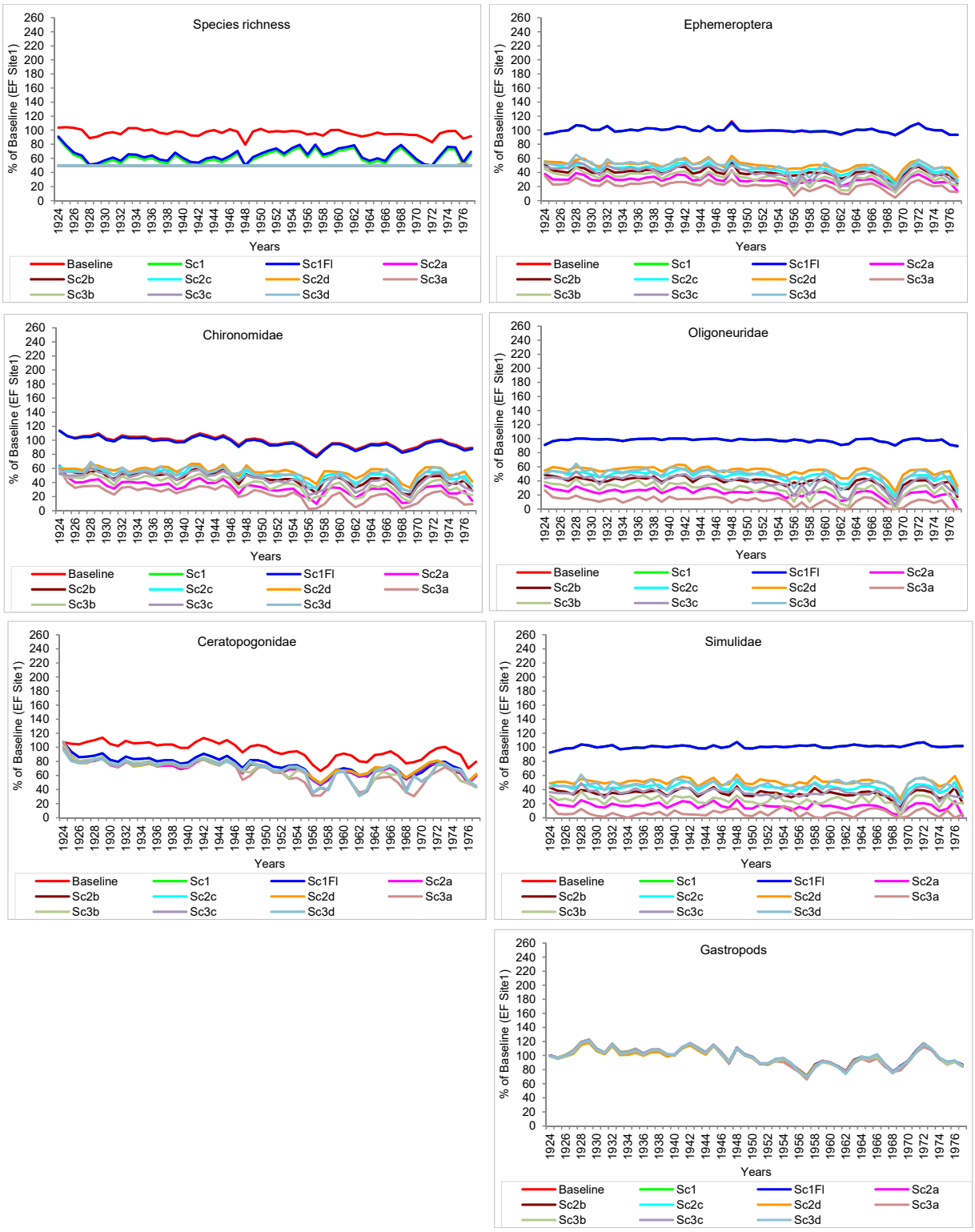


Figure 7.3 **Time-series of predicted changes in invertebrate indicators at EF Site 1. Scenario lines not visible are hidden by those showing, i.e., baseline and Sc1 are under Sc1Fl for several indicators.**

showed minimal change under Scenario 1 and 1F (the effects of the flushing scenario are negligible). Simuliids could also increase in abundance with the expected decline in fine sediments and armouring of the river bed (Berry et al 2003), plus some plankton from the

reservoir. There are some slight reductions in sediment-loving species such as Ceratopogonidae, whereas the expected decline in suspended sediments will favour other invertebrates as there will be reduced abrasion. However, under peaking releases, all of these effects will be offset by a disturbance from a fluctuating flow regime and a reduction in the amount and quality of available habitat and food (Figure 7.3).

7.1.3.4 Fish

The effect of the BGHES (Figure 7.4) on fish abundance in the gorge is related to:

- peaking flows that considerably disrupt spawning behavior, survival of eggs and survival of juveniles;
- reduction in algae and macroinvertebrates, which are a food source for some of the fish.

Peaking flows, particularly at the time of the beginning of the rains and during the naturally rising flood waters will have a deleterious effect the spawning of several species as eggs laid in the river margins will be alternately dried out and inundated and potentially washed away. Peaking flows may also will reduce (or render unsafe) the availability of juvenile habitat such as in rocky areas where the juveniles hide beneath and between the rocks. In addition, the peaking may have a serious impact on breeding success of cichlids as the male cichlids establish breeding territories known as nests (Tweddle et al. 1997) in the shallows where they court females, and fluctuating water levels will interfere with this courting behaviour. For some species, the effect on the overall abundance of fish in the gorge may be mitigated to some extent by migration into the area from downstream. This is particularly the case for tigerfish, which have been shown to range more widely in the Zambezi system than other fish species (Okland et al. 2005).

7.1.3.5 Crocodiles

In the DRIFT DSS, Crocodiles at EF Site 1 are only linked to the fluctuating flows with peaking releases. Thus, the predicted responses with Scenarios 2 and 3 are as a result of daily fluctuating flows disrupting nests (Dry Season) and washing out the young (Transition Season 1; Figure 7.11; Swanepoel et al. 2000).

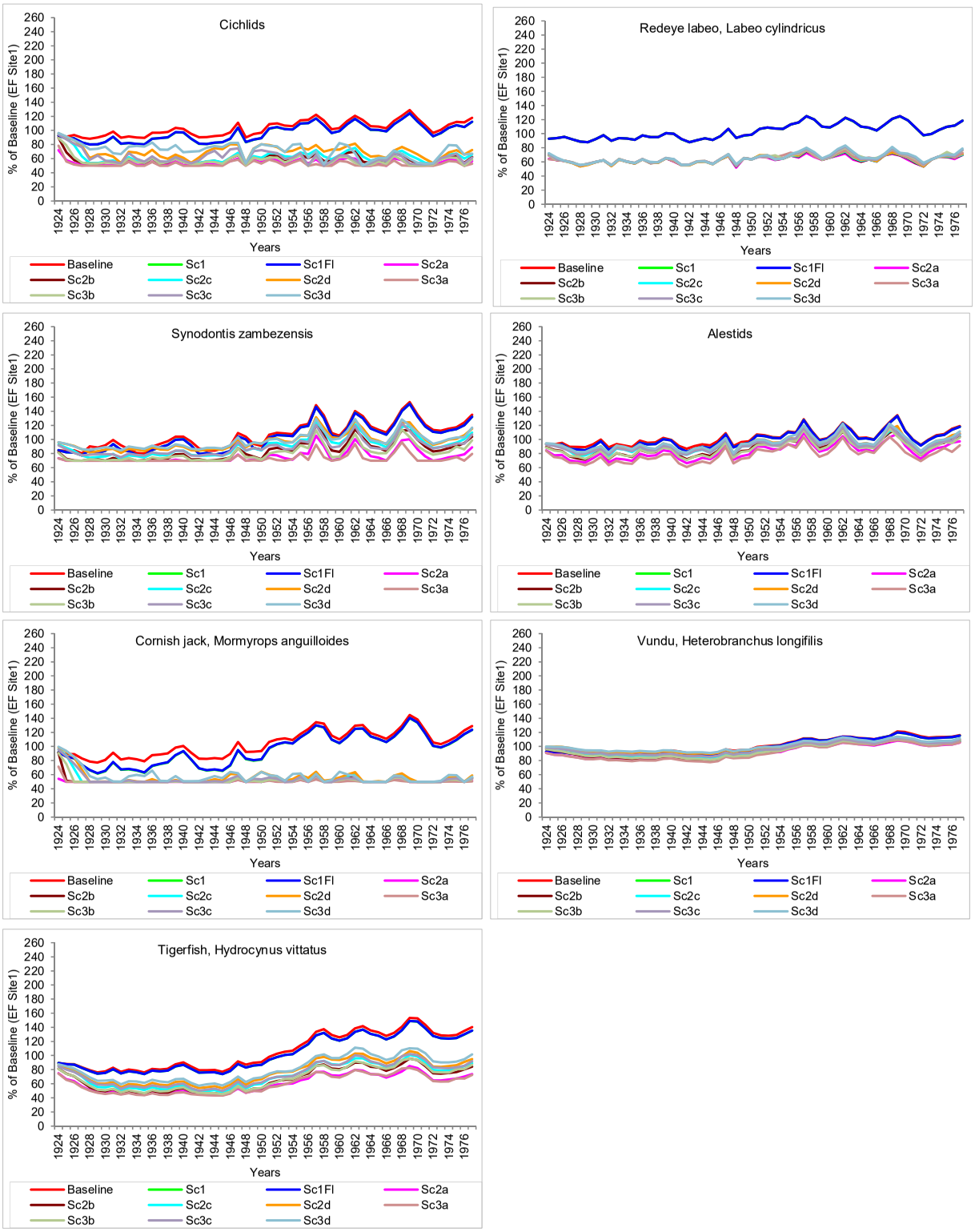


Figure 7.4 **Time-series of predicted changes in fish indicators at EF Site 1. Scenario lines not visible are hidden by those showing.**

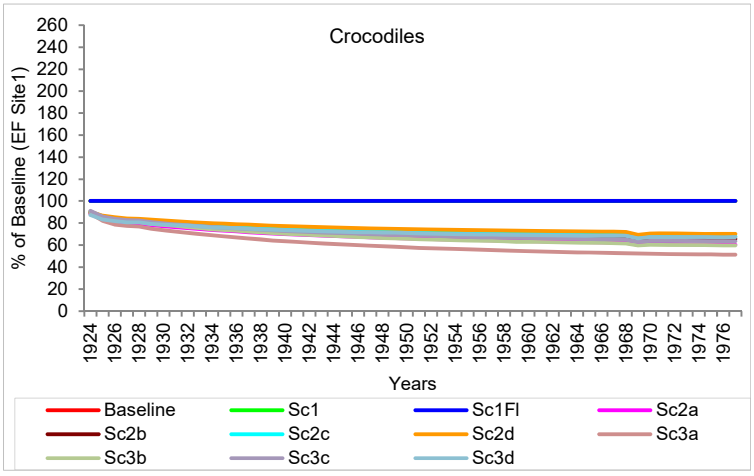


Figure 7.5 **Time-series of predicted changes in crocodiles at EF Site 1. Scenario lines not visible are hidden by those showing.**

7.1.4 Overall Ecosystem Integrity

The Overall Integrity for each the scenarios at BGHES EF Site 1 are illustrated in Figure 7.6. Comments are provided in Section 8.

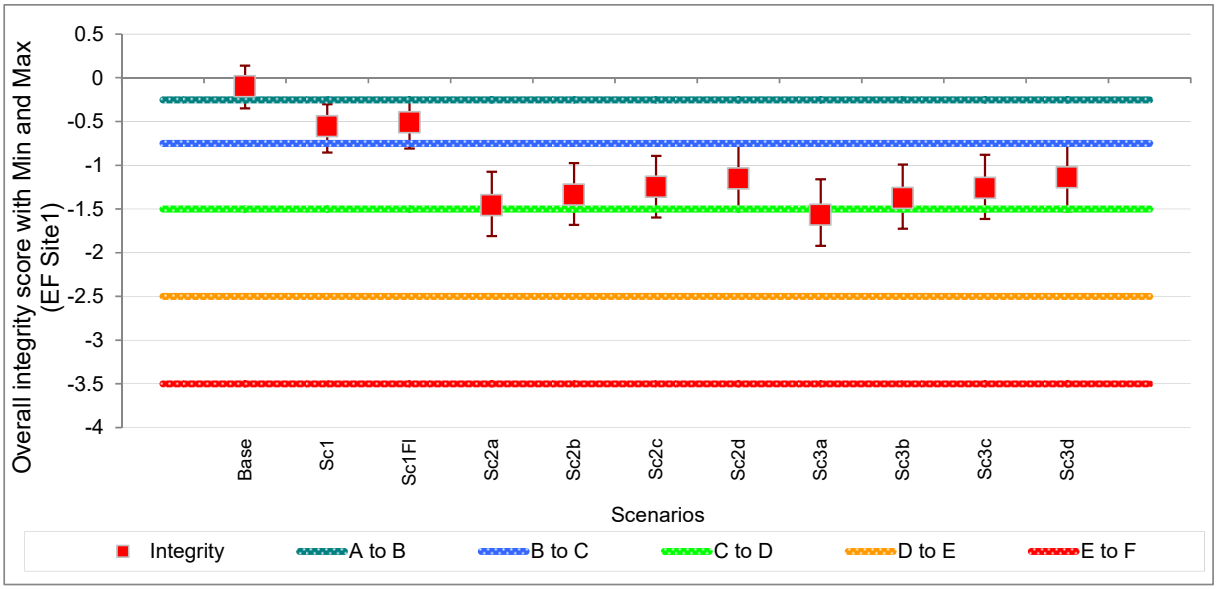


Figure 7.6 **Overall ecosystem integrity scores for the scenarios at BGHES EF Site 1 (Batoka Gorge).**

7.2 *BGHES SITE 2*

EF Site 2 is downstream of the BGHES tailrace and so receives the flow returning to the river after passage through the power house. As modelled, the flow at EF Site 2 is essentially the same as at EF Site 1.

As with the other sites, EF Site 2 is also affected by the barrier that the BGHES dam wall poses to sediments and fish, and by any limnological changes that may take place in the BGHES reservoir, such as an increase in zooplankton or a decrease in oxygen.

7.2.1 Characteristics of the flow regime of each scenario at BGHES EF Site 2

The main characteristics of the flow regimes at BGHES EF Site 2 associated with each of the scenarios are summarised in Table 7.3.

7.2.2 Mean percentage changes

The mean percentage changes (relative to baseline) for the indicators for the scenarios at BGHES EF Site 2 are given in Table 7.4.

In Table 7.4, baseline, by definition, equals 100%.

7.2.3 Time-series

The time-series for the scenarios for the biophysical indicators (Figure 7.7 to Figure 7.11) show the annual changes in abundance encapsulated in the mean values given in Table 7.4.

The period simulated is 1924-2014. The plots show the year-on-year changes in each indicator in response to the prevailing conditions. These conditions, derived using the historical flow records, show the predicted response for each indicator, under the condition specified in each scenario, should the same climatic conditions be replicated into the future. In the plots, some scenario lines are hidden underneath others. Where the visible scenarios are quite different, the location of the hidden scenario(s) is given in the text.

Table 7.3 Characteristics of the flow regime of each scenario at BGHES EF Site 2. Median values are given for the flow indicators.

Indicator	Units	Scenarios										
		Base	Sc1	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d
Mean annual runoff	MCM	1101.72	1101.72	1101.72	1098.27	1098.27	1098.27	1098.27	1098.53	1098.39	1098.33	1098.27
Dry season Min 5d Q	m^3s^{-1}	220.59	220.59	220.59	220.59	220.59	220.66	255.00	202.65	216.21	221.97	255.00
Dry season onset	weeks	35	35	35.00	35.00	35.00	35.00	35.00	33.00	33.50	34.00	34.00
Dry season duration	weeks	111	111	110.50	110.50	110.50	110.50	110.50	115.00	117.50	117.00	117.00
Dry season ave daily vol	m^3	25.730	25.730	25.73	25.73	25.73	25.73	26.08	26.46	26.21	26.14	26.55
Wet season Max 5d Q	m^3s^{-1}	3309.19	3309.19	3309.19	3294.47	3294.47	3294.47	3294.47	3256.58	3256.58	3256.58	3256.58
Wet season onset	weeks	7.00	7.00	7.00	7.00	8.00	8.00	8.00	6.00	6.00	6.00	7.00
Wet season duration	weeks	147.00	147.00	147.00	145.00	145.00	142.50	135.50	156.50	156.00	151.00	143.50
Wet season ave daily vol	m^3	169.63	169.63	169.63	167.53	169.61	172.28	176.91	164.94	164.94	165.95	170.25
Flood volume	MCM	26798.04	26798.04	26798.04	26501.99	26437.15	26161.32	25658.37	26834.26	26834.26	26704.62	26332.99
T1 ave daily vol	m^3	56.56	56.56	56.56	56.56	56.56	56.60	57.87	46.69	48.83	49.65	51.22
T2 ave daily vol	m^3	48.31	48.31	48.31	48.34	48.31	48.31	48.31	53.21	52.28	51.99	51.34
Dry within day range	m^3s^{-1}	0.00	0.00	0.00	745.98	401.98	257.98	101.98	906.54	419.40	217.80	4.94
Wet within day range	m^3s^{-1}	0.00	0.00	0.00	823.09	823.09	816.89	714.88	319.20	319.20	319.20	311.93
T1 within day range	m^3s^{-1}	0.00	0.00	0.00	2165.98	1894.25	1750.25	1644.18	1920.97	1663.89	1536.75	1446.60
T2 within day range	m^3s^{-1}	0.00	0.00	0.00	1733.71	1386.84	1242.84	1086.84	2192.34	1874.74	1639.48	1365.44
T2 max rate of change	m^3s^{-1}	0.00	0.00	0.00	2450.84	2362.48	2325.16	2278.07	2429.94	2335.29	2287.45	2252.50
T2 max instantaneous Q	m^3s^{-1}	844.62	844.62	844.62	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00
T2 min instantaneous Q	m^3s^{-1}	402.25	402.25	402.25	94.00	180.00	216.00	255.00	94.00	180.00	216.00	255.00
Wet season max rate of change	m^3s^{-1}	7.20	7.20	7.20	2248.00	2248.00	2248.00	2248.00	2152.11	2152.04	2144.75	2082.91
Wet season max instantaneous Q	m^3s^{-1}	3321.25	3321.25	3321.25	3321.26	3321.26	3321.26	3321.26	3256.58	3256.58	3256.58	3256.58
Wet season min instantaneous Q	m^3s^{-1}	864.00	864.00	864.00	282.39	281.02	281.02	281.02	393.28	393.69	396.75	401.77
T1 max rate of change	m^3s^{-1}	2.01	2.01	2.01	2443.44	2363.12	2332.31	2295.00	2419.83	2338.96	2325.73	2295.00
T1 max instantaneous Q	m^3s^{-1}	924.41	924.41	924.41	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00	2550.00
T1 min instantaneous Q	m^3s^{-1}	429.47	429.47	429.47	94.00	180.00	216.00	255.00	94.00	180.00	216.00	255.00
Dry season max rate of change	m^3s^{-1}	1.28	1.28	1.28	1322.90	978.90	834.90	678.90	2010.34	1453.02	1199.64	958.32
Dry season max instantaneous Q	m^3s^{-1}	424.72	424.72	424.72	1416.90	1158.90	1050.90	933.90	2104.34	1633.02	1415.64	1213.32
Dry season min instantaneous Q	m^3s^{-1}	218.39	218.39	218.39	94.00	180.00	216.00	255.00	94.00	180.00	216.00	255.00

Table 7.4 BGHES Site 2: The mean percentage changes (relative to 2014) for the indicators under the scenarios.

Discipline	Indicator	Scenarios									
		Sc1	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d
Geomorphology	Low mid-channel rock exposures	1.0	1.0	-70.4	-57.8	-50.6	-43.9	-69.9	-54.6	-47.5	-39.5
	Lengths of cut marginal banks	26.0	14.1	93.3	78.0	71.8	66.6	97.8	80.7	73.1	65.9
	Backwater bed sediment (fine to coarse)	105.1	105.1	116.8	116.9	116.2	114.1	115.9	116.3	115.2	113.2
	Area of backwaters and secondary channels	2.5	2.8	-44.5	-35.1	-31.0	-27.3	-45.5	-34.9	-30.0	-25.3
	Vegetated mid-channel bars	-40.8	-31.7	-72.5	-70.5	-69.7	-69.0	-72.9	-70.3	-69.3	-68.4
	Channel bed sediment (fine to coarse)	80.6	80.6	86.7	83.8	82.7	81.9	90.3	85.5	83.7	82.8
	Depth of pools	6.9	5.1	16.3	14.1	13.1	12.3	17.4	14.5	13.4	12.3
	Sand bars	-20.4	-15.2	-45.7	-40.5	-38.2	-36.1	-46.7	-39.9	-37.1	-34.6
Vegetation	Single-celled diatoms	14.4	12.3	-28.4	-18.4	-13.3	-8.2	-31.7	-19.9	-13.9	-7.3
	Filamentous green algae	-12.2	-10.8	-38.1	-28.2	-23.7	-20.3	-42.3	-30.3	-24.8	-20.4
	Marginal Graminoids	-11.5	-10.1	-27.3	-17.0	-12.4	-9.4	-30.2	-18.6	-13.1	-8.2
	Marginal Shrubs	-4.5	-4.5	24.4	22.0	21.0	19.8	30.5	26.4	24.5	23.0
	Lower Trees	0.3	0.3	0.3	0.3	0.3	0.2	0.7	0.7	0.7	0.6
	Upper Trees	-9.6	-9.6	-43.0	-40.5	-38.3	-36.1	-45.1	-40.4	-37.3	-34.3
	Organic detritus	-12.2	-10.8	-38.1	-28.2	-23.7	-20.3	-42.3	-30.3	-24.8	-20.4
Macro-invertebrates	Species richness	-17.4	-10.1	-41.7	-34.8	-30.7	-27.1	-44.1	-38.5	-33.4	-28.4
	Ephemeroptera	-2.3	-2.1	-42.7	-31.6	-26.3	-22.2	-47.5	-33.7	-27.3	-21.9
	Bivalves	-18.9	-14.8	-43.8	-36.1	-31.3	-26.6	-46.2	-35.3	-30.0	-25.0
	Oligoneuridae	-2.3	-2.3	-57.8	-43.5	-37.3	-32.1	-65.0	-47.5	-39.9	-32.9
	Chironomidae	-2.6	-2.6	-49.2	-39.7	-36.3	-32.4	-52.0	-41.5	-36.9	-31.7
	Shrimps	-5.5	-4.9	-16.2	-11.4	-9.2	-7.2	-18.2	-11.9	-9.3	-6.9
	Ceratopogonidae	-24.1	-24.1	-30.8	-30.0	-29.4	-28.4	-33.2	-31.7	-30.5	-29.3
	Simulidae	-0.8	-0.7	-3.0	-1.5	-0.2	0.9	-3.3	-1.0	0.4	1.5
	Gastropods	1.4	1.4	0.7	1.0	0.9	0.8	-0.5	0.2	0.4	0.5

Discipline	Indicator	Scenarios									
		Sc1	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d
Fish	Labeo altivelis	13.6	8.8	-40.7	-56.2	-57.2	-59.6	58.5	-25.0	-38.4	-42.1
	Redeye labeo, Labeo cylindricus	1.3	1.3	-33.5	-32.5	-31.5	-30.6	-32.1	-30.7	-29.7	-28.2
	Cichlids	-6.1	-5.2	-18.3	-25.1	-25.5	-26.0	57.0	-12.6	-20.3	-21.5
	Chessa and Nkupe, *Distichodus* spp	-4.2	-5.0	-10.6	-15.7	-14.0	-14.6	-1.7	-9.5	-9.8	-9.7
	Synodontis zambezensis	-1.4	-1.1	-3.0	-3.4	2.3	6.7	-1.3	2.5	7.9	13.4
	Alestids	-2.5	-2.3	-14.0	-14.0	-13.6	-13.4	-13.8	-13.6	-13.3	-13.0
	Barbus spp	-7.2	-6.0	-52.5	-51.4	-50.0	-46.7	-52.4	-51.0	-48.6	-43.1
	Cornish jack, *Mormyrops anguilloides*	-11.3	-11.2	-37.2	-33.7	-25.8	-14.0	-21.1	-23.6	-15.6	-2.2
	Vundu, *Heterobranchus longifilis*	2.1	1.3	24.6	13.3	15.0	16.9	78.3	40.0	29.3	29.5
	Tigerfish, *Hydrocynus vittatus*	-7.8	-8.3	-34.1	-44.5	-44.6	-45.5	46.0	5.5	-9.1	-11.7
Crocodiles	Nile Crocodile, *Crocodylus niloticus*	0.0	0.0	-34.3	-29.5	-27.5	-25.8	-42.5	-34.4	-31.1	-28.9

7.2.3.1 *Geomorphology*

There is very little effect expected at EF Site 2 as a result of flow changes if the BGHES is operated as a genuine run-of-river plant. However, there is a possibility of a slight coarsening of the river bed and backwater habitats as a result of reduced sediment supply (Figure 7.7).

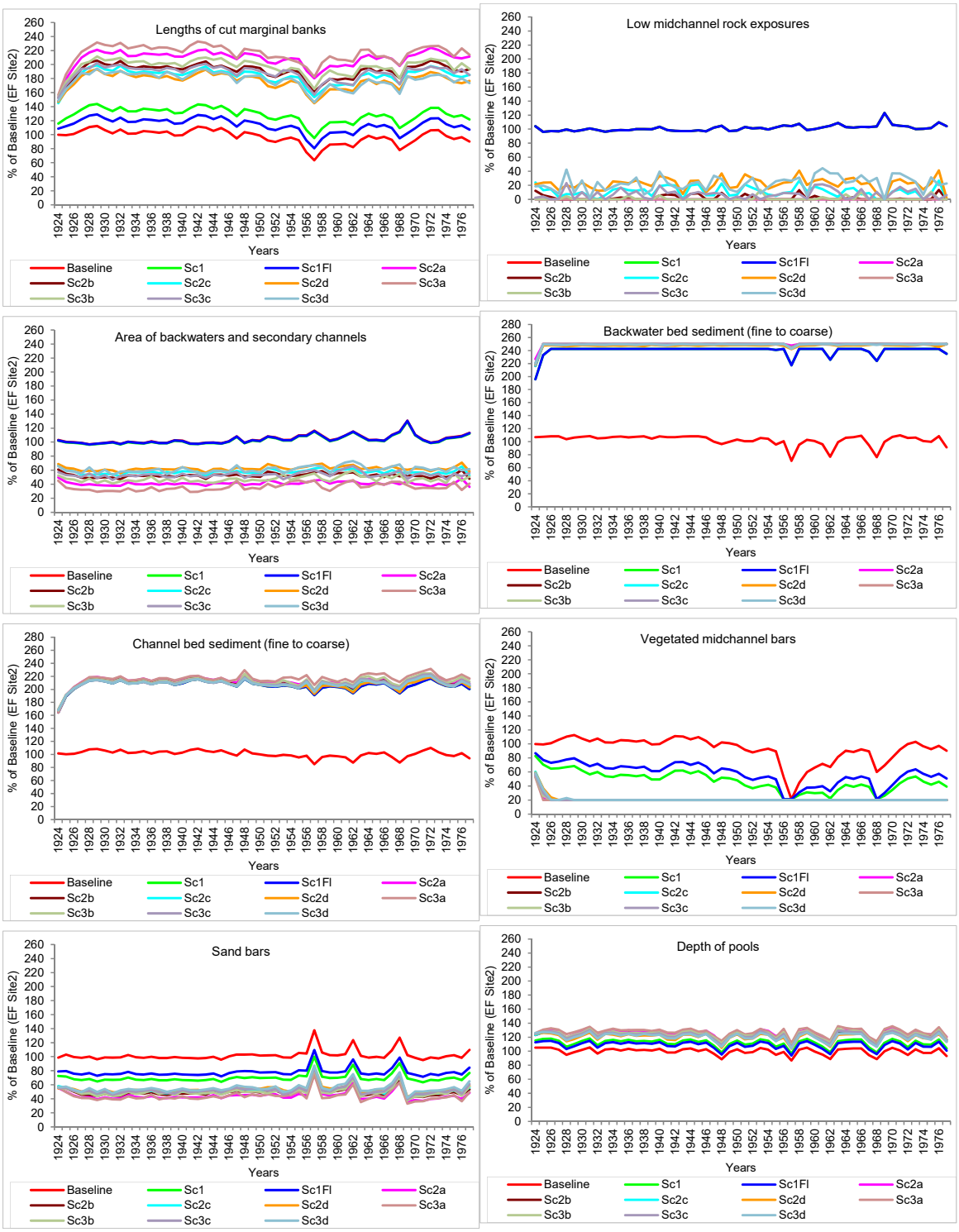


Figure 7.7 Time-series of predicted changes in geomorphological indicators at EF Site 2. Scenario lines not visible are hidden by those showing.

This is expected to be equal to or possibly even greater than at EF Site 1 despite the fact that EF Site 2 is situated quite some distance downstream of BGHES. The reason for this is that, unlike EF Site 1, which is bedrock dominated, EF Site 2 is characterized by much finer bed sediments and habitats that are vulnerable to flushing (particularly in the backwater areas).

EF Site 2 has a wider, flatten lateral profile and thus a different response to peaking from EF Site 1. There are also more sand bands and vegetated islands, which will be vulnerable to the rapid flow changes associated with peaking, which will be exacerbated by the reduction in sediment supply, albeit small. The changes in geomorphology at EF Site 2 (Figure 7.7) are driven by:

- the characteristics of the reach represented by EF Site 2;
- slightly reduced bedload supply;
- slightly reduced suspended sediment supply for much of the year as a result of trapping of sediments in the reservoir; and;
- peaking power releases for several hours a day.

7.2.3.2 Vegetation

The main effect of the BGHES on vegetation under Sc1 and Sc1Fl is related to the expected reduction in sediments (Figure 7.8).

For the marginal graminoids and shrubs, the peaking will provide additional water in the dry and transitional seasons. This is expected to have a slight positive effect, which will slightly offset the effects of reduced sediments. As a result these indicators increase in abundance under the peaking scenarios. Conversely, peaking is expected to flush any settled organic particulate matter, algae and diatoms leaving little available as a food source for biota.

The lower riparian trees are also expected to benefit slightly from peaking flows, as the shape of the channel at EF Site 1 means that they are slightly wetted by the peak flows. The upper zone trees are expected to be unaffected by BGHES.

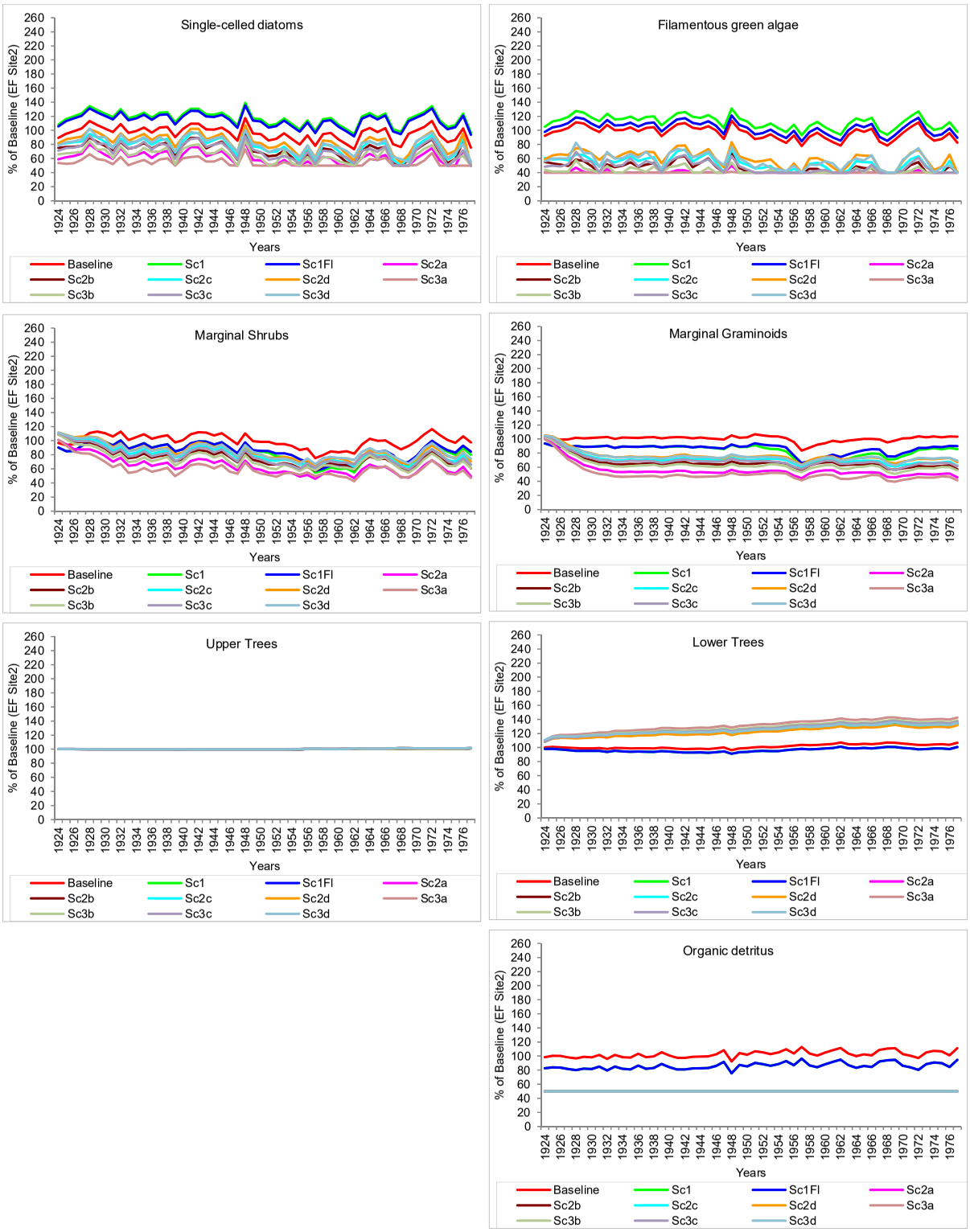


Figure 7.8 **Time-series of predicted changes in vegetation indicators at EF Site 2. Scenario lines not visible are hidden by those showing.**

7.2.3.3 Macroinvertebrates

Aquatic invertebrates would remain at approximately baseline abundances under S1 and S1Fl.

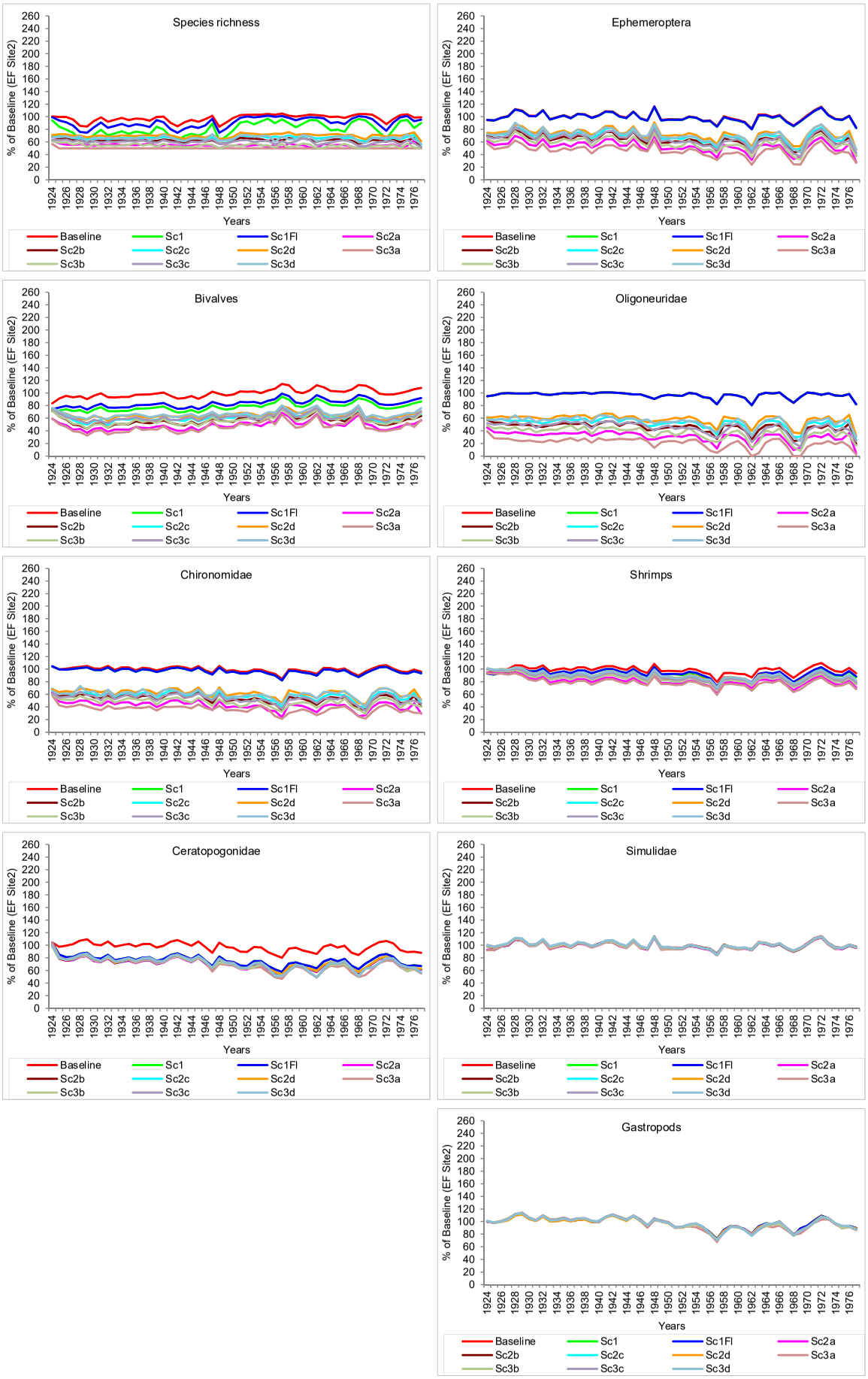


Figure 7.9 **Time-series of predicted changes in invertebrate indicators at EF Site 2. Scenario lines not visible are hidden by those showing.**

7.2.3.4 *Fish*

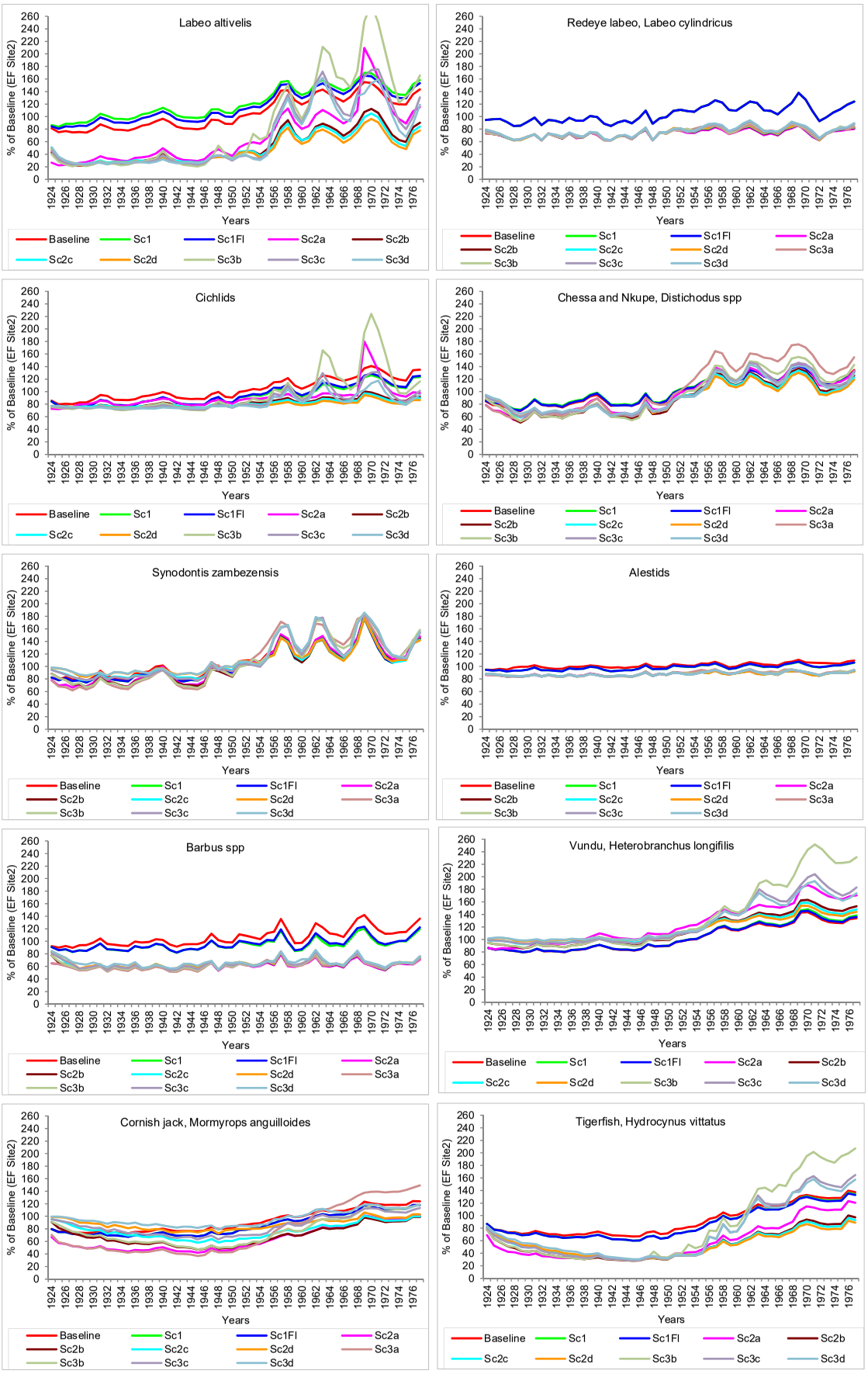


Figure 7.10 **Time-series of predicted changes in fish indicators at EF Site 2. Scenario lines not visible are hidden by those showing.**

The outcomes for fish at EF Site 2 (Figure 7.10) are similar to those reported for EF Site 1. The effect of the BGHES on fish abundance is related to:

- peaking flows that considerably disrupt spawning behavior, survival of eggs and survival of juveniles;
- reduction in algae and macroinvertebrates, which are a food source for some of the fish.

By virtue of their life histories and behaviour, these effects are greatest on the cichlids, mormyrids and tiger fish. It is worth reiterating that one of the mormyrids, a species of *Cyphomyrus*, was collected for the first time in the Middle Zambezi in this study and is currently under taxonomic/genetic investigation.

7.2.3.5 Crocodiles

In the DRIFT DSS, Crocodiles at EF Site 2 are only linked to the fluctuating flows with peaking releases. Thus, the predicted responses with Scenarios 2 and 3 are as a result of daily fluctuating flows disrupting nests (Dry Season) and washing out the young (Transition Season 1; Figure 7.11; Swanepoel et al. 2000).

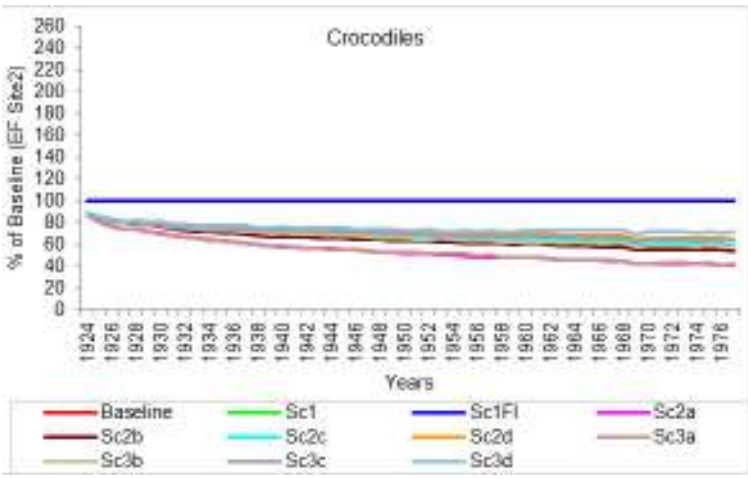


Figure 7.11 Time-series of predicted changes in crocodiles at EF Site 2. Scenario lines not visible are hidden by those showing.

7.2.4 Overall Ecosystem Integrity

The Overall Integrity for each the scenarios at BGHES EF Site 2 is illustrated in Figure 7.12. Comments are provided in Section 8.

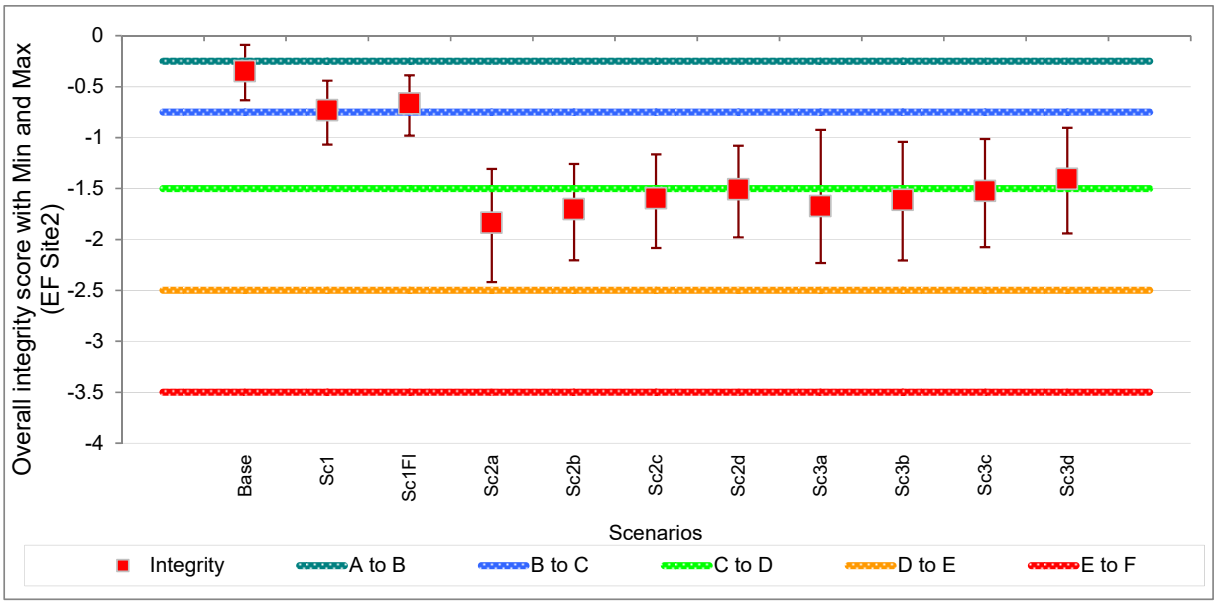


Figure 7.12 **Overall ecosystem integrity scores for the scenarios at EF Site 2 (upstream Lake Kariba).**

8 OVERALL INTEGRITY FOR ALL SITES AND ALL SCENARIOS

The overall integrity scores for all sites and all scenarios are presented in Figure 8.1, which gives an indication of the distribution of impacts on the Zambezi River in the study area.

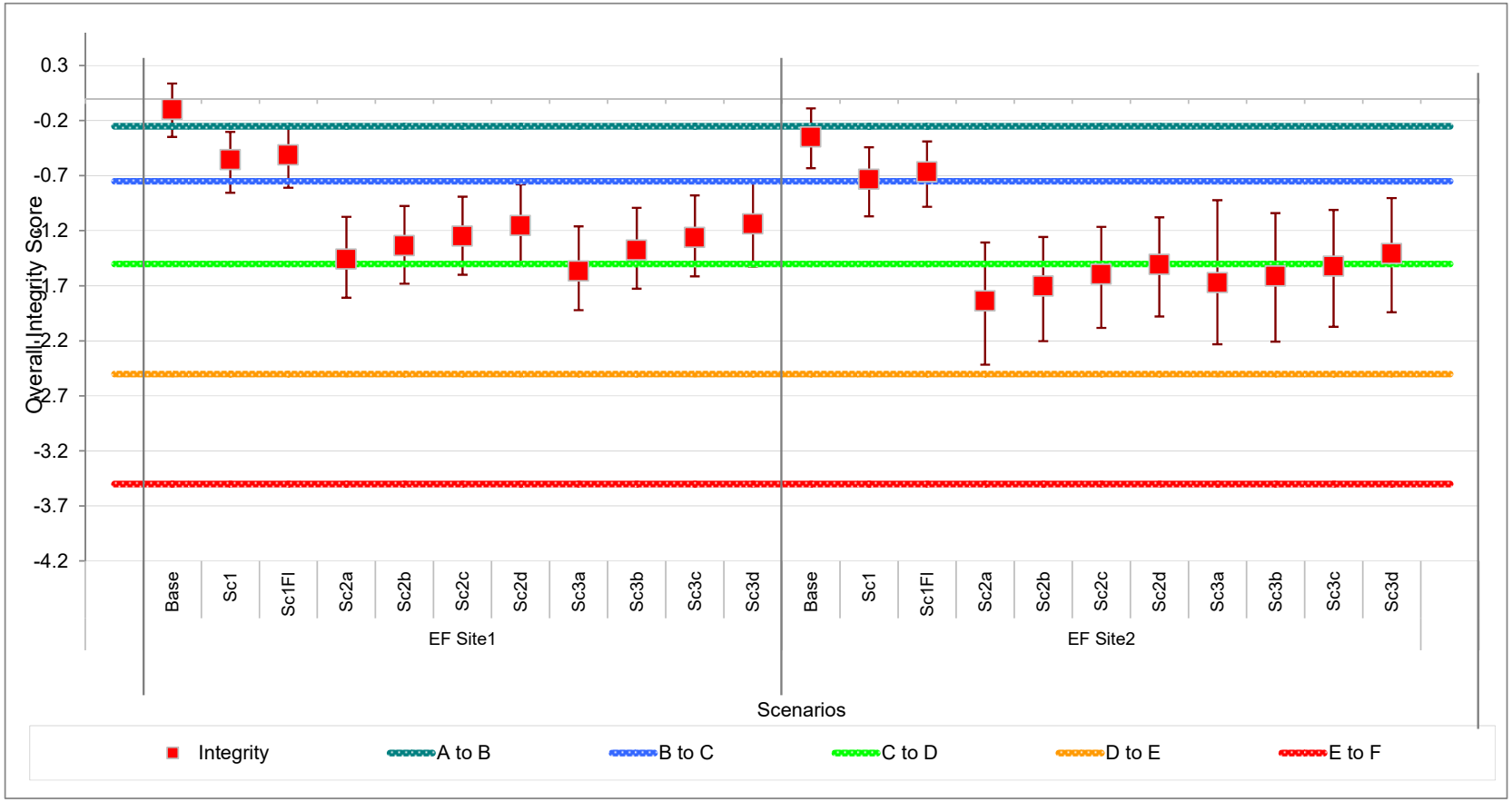


Figure 8.1 Overall integrity scores for all sites and all scenarios

The Overall Integrity plots show clearly that, if operated at a genuine run-of-river plant, the BGHES is expected to have only minor impacts on the downstream riverine ecosystem. The few impacts predicted are a result of a slight decline in suspended sediments as a result of BGHES dam wall. These impacts are expected to be slightly greater at EF Site 2 than at EF Site 1, despite its greater distance from the BGHES. This is because the character of the site, with its sandy banks and vegetated islands means that it is more vulnerable to erosion than EF Site 1.

The overall results for the scenarios can be summarized as follows:

8.1 EF SITE 1

Scenario 1: No change from an A/B Category. Essentially the change should be unnoticeable.
Scenario 1 (Flushing): No change from an A/B. Very similar to Scenario 1, some effects slightly reduced by periodic flushing of sediments.
Scenario 2a: Decline in condition from an A/B to a D Category.
Scenario 2b: Decline in condition from an A/B to a C/D Category.
Scenario 2c: Decline in condition from an A/B to a C/D Category.
Scenario 2d: Decline in condition from an A/B to a C Category.
Scenario 3a: Decline in condition from an A/B to a D Category.
Scenario 3b: Decline in condition from an A/B to a C/D Category.
Scenario 3c: Decline in condition from an A/B to a C/D Category.
Scenario 3d: Decline in condition from an A/B to a C Category.

Thus Scenarios 1 and 1Fl meet the criteria for minimum degradation (see Section 6.7). For the Scenario 2 and 3, the increased minimum flow releases A through D, are expected to have a marked impact on the overall condition, with the higher releases resulting in fewer impacts.

8.2 EF SITE 2

Very similar in pattern but slightly more severe than changes expected at EF Site 1,
Scenario 1: Very slight decline in condition from a B to B/C Category.
Scenario 1 (Flushing): Same as Sc1.
Scenario 2a: Decline in condition from a B to a D Category.
Scenario 2b: Decline in condition from a B to a D Category.
Scenario 2c: Decline in condition from a B to a D Category.
Scenario 2d: Decline in condition from a B to a D Category.
Scenario 3a: Decline in condition from a B to a D Category.
Scenario 3b: Decline in condition from a B to a D Category.
Scenario 3c: Decline in condition from a B to a D Category.
Scenario 3d: Decline in condition from a B to a C/D Category.

As is the case for EF Site 1, Scenarios 1 and 1Fl meet the criteria for minimum degradation (see Section 6.7). For the Scenario 2 and 3, the increased minimum flow releases A through D, are expected to have a marked impact on the overall condition, with the higher releases resulting in fewer impacts.

9 COMMENTS ON COMPOUNDING IMPACTS AT EF SITE 1 AND 2 RELATED TO WATER QUALITY CHANGES AS A RESULT OF THE BGHES

Water quality was not included in the DRIFT assessment, which concentrated on the effects of potential flow and sediment changes, and barrier effects, as a result of the BGHES. However, this section provides a qualitatively assessment of the additional effects on the downstream environment as a result of expected changes in water quality, based on the outcome the water quality modelling undertaken by ERM.

9.1 SUMMARY OF WATER QUALITY MODELLING RESULTS

Three different annual inflow hydrographs were selected from the Victoria Falls historical flow record to use for the water quality analysis as follows:

- 1931 was chosen to represent a median flow year
- 1957 was chosen to represent an extreme high flow year.

The downstream analysis focussed on temperature and dissolved oxygen conditions in the reservoir and downstream for the different powerhouse intake configurations presented in SP (2014). Since the results for 1931 and those for 1957 did not differ markedly, only the median flow year (1931) is referred to here.

The simulated time-series of temperature and dissolved oxygen at the reservoir outlet under median annual inflow conditions are presented in Figure 9.1 and Figure 9.2, respectively[8].

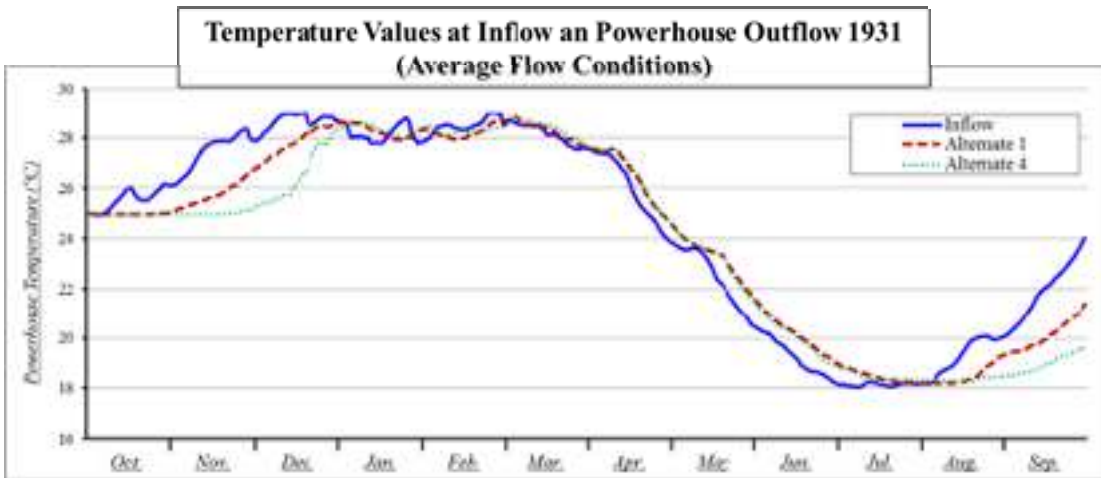


Figure 9.1 Temperature of the water at the inflow and powerhouse outflows under median hydrological conditions (ERM 2014)

[8] ERM warn that the influent water temperature and dissolved oxygen data are derived from available meteorological data for the region and so the results should be interpreted in comparative terms only.

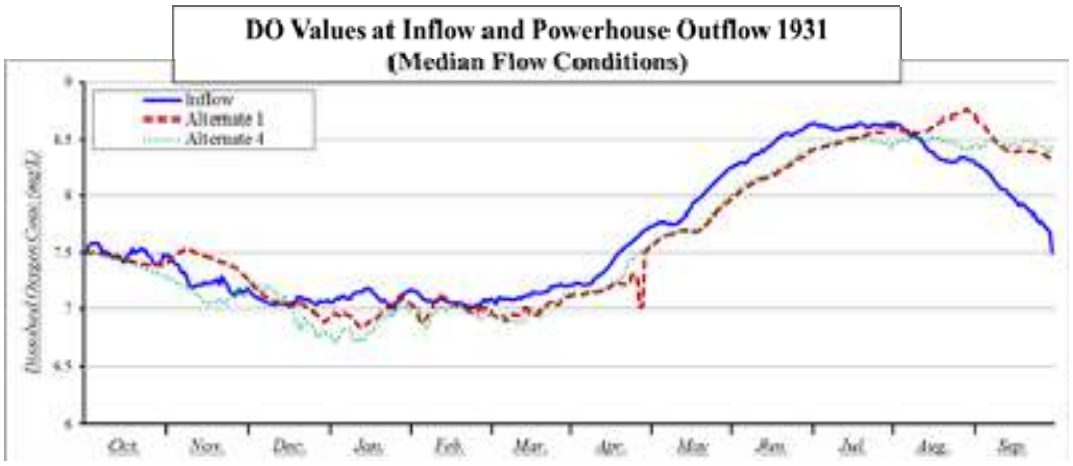


Figure 9.2 **Dissolved oxygen values at the inflow and powerhouse outflows under median hydrological conditions (ERM 2014)**

9.1.1 Temperature

In broad terms, the results show that the reservoir becomes stratified under low inflow conditions, and as a result the outflow from the lower intake (Alternative 4) is a few degrees cooler for a period of a few months at the beginning of the hydrological year. However, under average and high flow conditions (December onwards) the reservoir becomes vertically mixed as larger inflows are passed through the powerhouse. The vertically mixed condition causes outflow temperatures to be similar to natural river conditions. These effects do not significantly change for the different operational scenarios considered, i.e., with different peaking and minimum outflow requirements.

9.1.2 Dissolved oxygen

A similar effect is evident for dissolved oxygen. There is a small lag between natural and reservoir conditions because of stratification in the reservoir as inflows begin to rise. However, there is negligible difference between the two intake configurations for these impacts.

9.1.3 Downstream attenuation of effects

Preliminary calculations based upon estimated surface heat exchange conditions and re-aeration coefficients suggests that there will be only limited recovery of temperature and dissolved oxygen between the dam and EF Site 2 owing to the surface area constraints introduced by the gorge and the fast flow of the river.

9.2 COMPOUNDING IMPACTS AT EF SITE 1 AND 2 RELATED TO WATER QUALITY CHANGES

9.2.1 Geomorphology

Changes in temperature and dissolved oxygen of the levels described by the modelling will not affect any of the geomorphological indicators.

9.2.2 Vegetation

None of the vegetation indicators are linked to dissolved oxygen. One, filamentous green algae, is linked to temperature. However, the changes suggested by the modelling will be insufficient to markedly affect algal growth, as their response is mostly driven by flow.

9.2.3 Macroinvertebrates

Over the low flow period, which is the time when many of the insects are reliant on the river system to complete the aquatic phases of their life histories, a temperature difference of 3-5°C as indicated in September (Figure 9.1) would affect the number of generations within a season for multi-voltine species, the success of hatching, the timing of emergence and growth rate. This would mean that under lower temperatures, more generalist (less sensitive) taxa would flourish at the expense of sensitive species, which could impact on species richness, and a reduction in the number of ephemeroptera.

9.2.4 Fish

The lower temperature at the end of the simulated year is of concern. Cichlid spawning is temperature controlled, starting as the river starts to warm up in September. A delay in temperature rise could thus delay the start of spawning. The tigerfish spawning trigger is the onset of rains, but gonad maturation in preparation is probably temperature linked as they mature in October. A few months delay until mixing occurs in December could have a definite adverse impact on spawning.

It is unlikely that there would be any impact on fish as a result of changes in dissolved oxygen as the modelled fluctuations are well within the normal range for the river.

10 IMPACTS DOWNSTREAM OF THE KARIBA HPP

This EF study has necessarily focused on the section of the Zambezi River between the proposed BGHES and Lake Kariba, but that there will be consequences further downstream if Kariba HPP is operated differently as a result of the presence of the BGHES. If this is the case, these knock-on effects, and their impacts on the Zambezi River downstream of Kariba Dam, have not, and should be assessed.

However, it is the assumption that the operating conditions for Kariba will remain relatively unchanged following the operation of the BGHES. As described in Chapter 2 of the ESIA document (ERM, 2019), and as elaborated in SP (2018), the proposed Batoka HPP, with its inflows, relatively small impoundment and hence relatively short residence time of inflows (~26 days), will allow only a daily or weekly (under specific conditions) regulation of the inflows. On the contrary, the reservoir of the Kariba HPP is large enough to guarantee the annual regulation of the inflows.

In terms of potential effects within Lake Kariba itself, given the relative storage volumes of the two reservoirs (approximately 185 km^3 for Kariba, and less than 2 km^3 for Batoka), and the capacity of Batoka to regulate primarily daily flows only, it is extremely unlikely that the Project would have any noticeable regulating effect on storage volumes or water levels in Lake Kariba (assuming that operating conditions for Kariba remain relatively unchanged). Therefore, there is unlikely to be any impact on direct water abstractions from the main body of the lake, on lake fisheries, and any noticeable impacts downstream of Kariba as a result of the operation of the Batoka HPP.

The design and location of the Batoka HPP means that its potential impacts on the flow and sediment regime in the downstream Zambezi River will be limited to the river reach between the HPP and Lake Kariba, where after any changes in the daily or monthly distribution of flows will be absorbed by the Kariba impoundment. Flow in the river downstream of Kariba Dam will be influenced by the operating rules of Kariba rather than those of the proposed Batoka HPP.

During dam filling, the reduction in flood volume due to the filling of the new dam will reduce the scale of the annual fluctuation of Kariba levels, and thus negatively impact on fish abundance and catch rates. Annual floods bring fresh sediments and associated nutrients to the western arm of Lake Kariba. After the short-term increase in sediment during and shortly after the construction phase, annual sediment and nutrient input to the western arm of Lake Kariba will be reduced as a result of the Batoka HPP. In the long-term, therefore, there may be a negative but slight impact on productivity in the western arm of Lake Kariba, unless flood releases from the dam can be designed to transport sediment from the reservoir bed.

In mitigation, it is recommended that during the filling phase, released flows should closely follow the natural flood cycle, with greater flow release at the beginning of the local rains, which act as spawning cues for many of the important fish species.

11 CONCLUSIONS

The expected downstream impacts of the proposed BGHES are expected to be low provided it is operated as a purely run-of-river plant, i.e., *c.* instantaneous inflow = *c.* instantaneous outflow. If operated in this manner, the impacts of the BGHES on the downstream river are expected to be largely limited to those related to a reduction in sediment supply. EF Site 2 is expected to be slightly more vulnerable to impacts from the BGHES than is EF Site 1, this is mainly because it is a broader and flatter section of river, and will be more affected by the expected reduction in sediment. However, under run-of-river operation (as defined above), the presence of the BGHES is expected to have only a minor impact (minimum degradation) on the integrity of the downstream Zambezi River.

However, any peaking operations are expected to have a significant negative impact on the integrity of the downstream river ecosystem. Given the slope of the river through Batoka Gorge, it is highly unlikely that these flows will be attenuated to any meaningful extent before they reach Lake Kariba.

<u>Thus, the recommendation of this EF study is avoid peaking power releases at the BGHES</u>. Failing this, peaking releases can be slightly mitigated through maximising the dry season minimum flow condition and thereby reducing the peaking differential.

Finally, this EF study has necessarily focused on the section of the Zambezi River between the proposed BGHES and Lake Kariba, but that there will be consequences further downstream if Kariba HPP is operated differently as a result of the presence of the BGHES. If this is the case, these knock-on effects, and their impacts on the Zambezi River downstream of Kariba Dam, have not been, and should be, assessed.

However, it is the assumption that the operating conditions for Kariba will remain relatively unchanged. Based on this assumption, the overall impact of the Batoka Gorge dam on the Lake Kariba fish and fisheries will be limited, with the possible exception of lower annual flood lake level rise, but this will likely be restricted largely to the western arm of the lake near the Zambezi inflow. Given the relative storage volumes of the two reservoirs (approximately 185 km^3 for Kariba, and less than 2 km^3 for Batoka), impacts downstream of the Kariba Dam wall on the Zambezi River, are expected to be insignificant

Please note, as stated in Section 0: The main body of the report was completed as part of the ESIA in December 2014. The outcome of a subsequent process to refine and agree on operating rules for the proposed BGHES is presented in Appendix A. The final agreed

operating rules associated with this subsequent process to satisfy downstream EFlows requirements were:

AddPM04 DRY Season (**Sep-Jan**): Baseline flows; no sediment flushing.
WET Season (**Feb-Aug**): QMin with one 6-hour peak a day.

12 REFERENCES

Batoka Joint Venture Consultants (BJVC). 1993. Batoka Gorge Hydro Electirc Scheme Feasibility Study. Engineering and Economics. Final Report. September 1993.

Beilfuss, R., Bento, C. and dos Santos, D. 2001.Patterns of vegetation change in the Zambezi delta. Mozambique. Working paper 3. Programme for the sustainable management of Cahora Bassa Dam and the lower Zambezi valley.

Berry, W., Hill, B., Melzian, B. and Rubinstein, N. 2003. The Biological Effects of Suspended and Bedded Sediments (SABS) in Aquatic Systems: a Review, Internal report prepared by the U.S. Environmental Protection Agency, Offi ce of Research and Development.

Brown, C.A., Joubert, A.R., Beuster, J. Greyling, A. and King, J.M. 2013. DRIFT: DSS software development for Integrated Flow Assessments. Final Report to the South African Water Research Commission. February 2013.

Davies, B.R. 1986: The Zambezi River System. – In: Davies, B. R. and Walker, K. F., (eds): The Ecology of River Systems. Monogr. Biol. **60:** 225–267. – Dr. W. Junk, Dordrecht.

Dickens, C.W.S., Graham, P.M. 2002. The South African Scoring System (SASS) Version 5 rapid bioassessment for rivers. African Journal of Aquatic Science 27:1-10.

Dollar, E.S.J. 1998. Palaeofluvial geomorphology in southern Africa: a review. Progress in Physical Geography 22: 325-349.

Environmental Resource Management (ERM) Southern Africa, Black Crystal Consulting and Kaizen Consulting International. 2014. Environmental and Social Impact Assessment of the proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River. Final Inception Report for Zambezi River Authority. August 2014. 312 pp.

IUCN. 1989. Crocodiles: Their ecology, management and conservation. A special publication of the Crocodile Specialist Group of the Species Survival Commission of the International Union for the Conservation of Nature and Natural Resources. IUCN, Switzerland. ISBN 2880329876. 308 pp.

Jackson, P.B.N. 1961. Kariba Studies, Ichthyology, The fish of the Middle Zambezi. Trustees of the National Museums of Southern Rhodesia, Manchester University Press, 1-36.

King, J.M. and Brown, C.A. 2010. Integrated flow assessments: concepts and method development in Africa and South-east Asia. Freshwater Biology 55(1), 127-146.

Kleynhans, C.J. 1996. A qualitative procedure for the assessment of the habitat integrity status of the Luvuvhu River. Journal of Aquatic Ecosystem Health 5: 41 - 54.

Kleynhans, C.J., Mackenzie, J., Louw, D.A. 2007. Module F: Riparian vegetation response assessment index in River EcoClassification: Manual for EcoStatus determination (version 2). WRC report No. 329/08. Joint Water Research Commission and Department of Water Affairs and Forestry publication, Pretoria, South Africa.

Kochel, R.C. 1988. Geomorphic Impact of Large Floods: review and new perspectives on magnitude and frequency. In Baker, V.R., Kochel, R.C. and Patton, P.C. (Eds.). Flood Geomorphology. Wiley-Interscience, New York, 169-87.

Lowe, S. 2012. Photographic guide to the aquatic macroinvertebrates of Zambia. Prepared for the SAFRASS project. 15pp.

Marshall, B. 2011. The fishes of Zimbabwe and their biology. South African Institute for Aquatic Biodiversity & Musée Royal de l'Afrique Centrale, *Smithiana Monograph* 3, 290 pp.

Minshull, J.L. 2010. What is the significance of Upper Zambezi fish in the Batoka Gorge below Victoria Falls? African Journal of Aquatic Science, 35(1): 103-106.

Moore, A.E., Cotterill, F.P.D., Main, M.P.L. and Williams, H.B. 2007. The Zambezi River. In Gupta (ed). Large Rivers: Geomorphology and Management. John Wiley and Sons.

O'Keeffe, J.H. 2000. Possible definitions for different levels of flow-related stress for instream riverine fauna. In: Jooste, S., MacKay, H.M., Scherman, P.A., Muller, W.J. (Eds.). Feasibility of using a risk-based approach to set integrated environmental objectives for the protection of water resources, Water Research Commission, Report No. 914/1/00. 144pp.

Okland, F., Thorstad, E.B., Hay, C.J. and Chanda, B. 2005. Patterns of movement and habitat use by tiger fish (*Hydrocynus vittatus*) in the Upper Zambezi River (Namibia). Ecology of Freshwater Fish 14: 79-86.

Rowntree, K. and du Preez, L. (in press). MODULE B: Geomorphology Driver Assessment Index (GAI), in River Ecoclassification: Manual For Ecostatus Determination (Version 2). Water Research Commission Report, Pretoria, South Africa.

Rowntree K.M., Wadeson, R.A., O'Keefe, J.O. 2000. The development of a geomorphological classification system for the longitudinal zonation of South African Rivers. South African Geographical Journal 82(3): 163-172.

Skelton, P.H., Tweddle, D. and Jackson, P.B.N. 1991. Cyprinids of Africa. In Cyprinid Fishes: Systematics, biology and exploitation, edited by Winfield, I.J. & Nelson, J.S. Chapman and Hall, London, Fish and Fisheries Series, 3:211-239.

Studio Pietrangeli Consulting Engineers (SP). 2014. Batoka Groge Hydro-electric Scheme. Phase II layout. Options Assessment Report. Report for Zambezi River Authority. No: 200GENRASP001A. July 2014. 188 pp.

Swanepoel. D.G.J., Ferguson, N.S. and Perrin, M.R. 2000. Nesting ecology of Nile crocodiles (Crocdylus niloticus) in the Olifants River, Kruger National Park. Koedoe 43: 35-46. Pretoria. ISSN: 0075-6458.

Tinley, K.L. and Sousa Dias, A.H.D. 1973: Wildlife reconnaissance of the Mid Zambezi Valley in Moçambique before the formation of the Cabora Bassa Dam. Vet. Moçamb. Lourenço Marques 6: 103–131.

Tweddle, D. 2014. Barotse/Upper Zambezi river and floodplain fishes. NNF/EU Community Conservation Fisheries in KAZA Project, Windhoek, Namibia & South African Institute for Aquatic Biodiversity, Grahamstown, South Africa. Information Poster.

Tweddle, D., Eccles, D.H., Frith, C.B., Fryer, G., Jackson, P.B.N., Lewis, D.S.C. and Lowe-McConnell, R.H. (1997). Cichlid spawning structures - bowers or nests? Env. Biol. Fish. 51:107-109.

Zambezi River Authority (ZRA). 1998. Zambezi River Authority. Batoka gorge hydro electric scheme feasibility report. Volume 4a of 7. Further environmental impact assessment studies. Civil Consult (Pty) Ltd and Soils Incorporated (Pty) Ltd, Harare, Zimbabwe.

Zambezi River Authority (ZRA). 2008. Transboundary issues on sustainable hydropower development in the Zambezi River Basin in the eyes of the Zambezi River Authority. A ZRA Presentation at the Ministry of Energy and Water Development, Zambia . Hydropower Sustainability Assessment Forum Meeting: September 2008, Kafue Gorge Regional Training Centre. http://www.hydrosustainability.org. Accessed 23.10.2014.

Appendix A. ADDITIONAL ANALYSES FOR REFINEMENT OPERATING RULES

A.1. INTRODUCTION

The EF assessment undertaken for the original ESIA, which was based on the scenarios outlined in Section 5, was extended to include additional scenario designed to assist with the refinement of the operating rules for the proposed BGHES. The purpose of the additional assessments was to find a balance between minimising environmental impacts in the downstream river and maximising power output from the BGHES, specifically through the generation of power in periods of peak demand.

The process adopted for these additional assessments was:

1. December 2018 – emails and conference calls between ZRA, ERM, Southern Waters and the design engineers (Studio Pietrangeli) to agree on a work plan and exchange of information.
2. December 2018 – Studio Pietrangeli developed a series of possible wet- and dry-season operating regimes for the BGHES, distinguished from one another through different levels of releases in off-peak periods (Appendix Table 1).
3. January 2019 – Southern Waters combined the wet- and dry-season operating regimes provided by Studio Pietrangeli in various permutations (referred to Operating Rule SET A) and analysed the likely impact of these on the downstream river ecosystem using the DRIFT EF model developed for the BGHES EF assessment (Appendix B).
4. 22-23 January 2019 – Representatives of ZRA, ERM, Studio Pietrangeli and Southern Waters convened for a 2-day workshop at ERM offices in Rivonia, South Africa. At the workshop:
    a. Studio Pietrangeli explained the implications for power production of different operating regimes.
    b. Southern Waters provided feedback on the outcome of impact of the additional on the downstream river ecosystem additional scenarios relative to the impact predicted for the original (ESIA) scenarios.
    c. Workshop participants agreed an further three scenarios (referred to Operating Rule SET B), designed to highlight particular issues related to hydropower production and impacts on the downstream river ecosystem, which were constructed, analysed and presented on the second day of the workshop.
    d. On the basis of the results for all of the scenarios, workshop participants agreed on a set of environmental and engineering criteria (Appendix Table 2) for selecting a scenario that would become the operating rules for the BGHES.
5. 30 January 2019 - In an effort to arrive at a scenario that met both the environmental and the engineering criteria, Studio Pietrangeli designed three additional power-generation scenarios for evaluation, and Southern Waters designed one additional flow scenario

(referred to Operating Rule SET C). NB. Some of these scenarios included two peaks per day, i.e., similar to the ESIA pattern of peaking but with lower peak discharges. The downstream impacts of these four scenarios were also evaluated using DRIFT.

Appendix Table 1 Monthly percentiles used in design of the additional scenarios

	Dry	Wet	Wet	Wet	Wet	Wet	Wet/ Dry[9]	Wet/ Dry[10]	Dry	Dry	Dry	Dry
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Q_avg (m^3/s)	660	1130	2112	2958	2545	1585	814	484	345	264	265	404
Q_min (m^3/s)	319	443	602	784	871	447	281	220	161	116	118	199
Q_05 (m^3/s)	441	628	861	1122	1089	637	394	294	218	169	162	261
Q_10 (m^3/s)	467	666	893	1230	1328	899	468	333	247	179	182	276
Q_20 (m^3/s)	503	747	1048	1529	1700	1158	569.2	369.8	265	204	207	308

Appendix Table 2 Agreed environmental and engineering criteria for deciding on a scenario

Type	Criteria
Environmental criteria	No more than a 1.5 class drop in Overall Ecosystem Condition in the downstream river, i.e., from A/B to no less than a mid-C category. This represents a drop in ecological category from "near natural" to "moderately modified" (Table 3.2), which is still considered a healthy functioning ecosystem.
	No more than a 25% reduction in abundance for 90% of the fish species.
Engineering criteria[11]	Minimum constraints on power generation in the wet season (when flows are lower than Q20).
	Peak discharges cannot exceed 75% of design peak flows, with Kariba to compensate for this gap.
	No constraints in the wet seasons, unless it is a low flow year in which case ramping up to reduced peak with Kariba compensating.
	Dry seasons Q20 with some minor modifications.

The predicted impacts on the downstream river ecosystem (EF Site 2) for the sets of scenarios tested as part of this process are presented in Sections A.2.1 to A.2.3. Depictions of the flow regimes associated with each scenario are presented in Appendix B. Note there is considerable, and intentional, overlap between the scenarios in each of the sets. This is to facilitate comparison between the various scenarios.

[9] Whether July was treated as dry or wet month depended on the scenario
[10] Whether August was treated as dry or wet month depended on the scenario.
[11] The engineering criteria informed the construction of operating SET C criteria – but see SET C descriptions in Section A.2.3.

A.2. RESULTS OF SCENARIO ASSESSMENTS USING DRIFT

A.2.1. OPERATING RULE SET A

The scenarios presented for Operating Rule Set A comprise the full suite of scenarios from the ESIA, plus eight additional scenarios derived from the wet and dry season data sent by SP, as follows[12] (monthly values corresponding to Qmin, Q10, etc. are given in Appendix Table 1):

QMin — Whole year: Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Qmin; no sediment flushing.

QMinB — DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Qmin; no sediment flushing. WET Season (Feb-Jun): Baseline, i.e., no peaking.

Q05 — Whole year: Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q5%; no sediment flushing.

Q05B — DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q5%; no sediment flushing. WET Season: Baseline, i.e., no peaking.

Q10 — Whole year: Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q10%; no sediment flushing.

Q10B — DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q10%; no sediment flushing. WET Season: Baseline, i.e., no peaking.

Q20 — DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q20%; no sediment flushing. WET Season: Baseline, i.e., no peaking.

Q30 — DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q30%; no sediment flushing. WET Season: Baseline, i.e., no peaking.

Int — Whole year: Daily 6-hour peak at maximum of 1371 m^3s^{-1}; median off-peak release of 297 m^3s^{-1}; no sediment flushing.

Each flow regime comprised hourly data for 90 years. The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set A at EF Site 1 and 2 are given in Appendix Table 3 and Appendix Table 4, respectively. Depictions of the flow regimes associated with each scenario are presented in Appendix B.

The estimated mean percentage change in abundance/area/concentration of ecosystem indicators at EF Site and 2 under the SET A scenarios are given in Appendix Table 5 and Appendix Table 6, respectively. EF Site 2 has slightly more diverse habitats, and hence a larger array of species indicators. The tables are colour-coded to facilitate identification of major impacts. The colours *do not* denote whether the predicted change is a move towards or away from the natural condition of the river ecosystem.

The Overall Integrity for each the SET A scenarios at EF Site 1 and 2 are illustrated in Appendix Figure 1 and Appendix Figure 2, respectively.

[12] Note: Off-peak releases were equal to inflow when inflow was less than the relevant percentile discharge.

The result clearly illustrate that the operating regimes provided by SP for testing result in fewer downstream impacts in the river reaches represented by both EF sites than those originally tested in the ESIA. At the more sensitive of the two sites, EF Site 2, the differences between the two sets of operating rules result in an improvement in Overall Integrity of between half and one ecological category, depending on which scenarios are compared with one another. While predicted impacts on bed sediment size and sand banks are only slightly lower under the SP scenarios, the predicted impacts on vegetation, invertebrates, fish, and crocodiles are considerably lower. This is mostly attributable the fact that the additional operating scenario mostly comprise only a single daily peak[13] and significantly lower peak discharges, relative to the ESIA scenarios.

[13] There are exceptions to this in operating Rule SET C.

Appendix Table 3 **The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set A at EF Site 1. Units are given in Table 7.1.**

EF1	Base	Sc1noFl	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q30	Int1
Mean annual runoff (Mm^3)	35738	35738	35738	35534	35534	35534	35534	35533	35533	35533	35533	35738	35738	35738	35738	35738	35738	35738	35738	35725
Dry season onset	35.0	35.0	35.0	35.0	35.0	35.0	35.0	33.0	33.5	34.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Dry season duration	110.5	110.5	110.5	110.5	110.5	110.5	110.5	115.0	117.5	117.0	117.0	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5
Dry season Min 5d Q	220.6	220.6	220.6	220.6	220.6	220.7	255.0	202.6	216.2	222.0	255.0	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6
Wet season onset	7.0	7.0	7.0	7.0	8.0	8.0	8.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Wet season duration	147.0	147.0	147.0	145.0	145.0	142.5	135.5	156.5	156.0	151.0	143.5	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
Wet season Max 5d Q	3309	3309	3309	3294	3294	3294	3294	3257	3257	3257	3257	3309	3309	3309	3309	3309	3309	3309	3309.1	3309.1
Flood volume	26798	26798	26798	26502	26437	26161	25658	26834	26834	26705	26333	26798	26798	26798	26798	26798	26798	26798	26798	26798
Dry season ave daily vol	25.7	25.7	25.7	25.7	25.7	25.7	26.1	26.5	26.2	26.1	26.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
T1 ave daily vol	56.6	56.6	56.6	56.6	56.6	56.6	57.9	46.7	48.8	49.6	51.2	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
Wet season ave daily vol	169.6	169.6	169.6	167.5	169.6	172.3	176.9	164.9	164.9	165.9	170.3	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6
T2 ave daily vol	48.3	48.3	48.3	48.3	48.3	48.3	48.3	53.2	52.3	52.0	51.3	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.3	48.4
Dry within day range	0.0	0.0	0.0	746.0	402.0	258.0	102.0	906.5	419.4	217.8	4.9	563.3	563.3	337.4	337.4	256.3	256.3	162.6	81.7	404.6
T1 within day range	0.0	0.0	0.0	2166.0	1894.2	1750.2	1644.2	1921.0	1663.9	1536.8	1446.6	1089.9	980.1	750.9	610.3	662.3	518.6	372.5	216.6	645.8
Wet within day range	0.0	0.0	0.0	823.1	823.1	816.9	714.9	319.2	319.2	319.2	311.9	79.8	33.1	75.8	33.1	66.8	33.1	33.1	33.1	33.1
T2 within day range	0.0	0.0	0.0	1733.7	1386.8	1242.8	1086.8	2192.3	1874.7	1639.5	1365.4	1151.3	1151.3	814.3	814.3	618.6	618.6	395.0	219.0	819.7
Dry season Min 5d Depth	7.7	7.7	7.7	7.7	7.7	7.6	7.5	7.8	7.8	7.6	7.5	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Dry season Min 5d Velocity	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Dry season Min 5d WetPerim	223.7	223.7	223.7	223.7	223.7	223.7	229.9	217.2	222.8	223.9	229.9	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7
Wet season Max 5d Depth	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
Wet season Max 5d Velocity	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Wet season Max 5d WetPerim	289.2	289.2	289.2	289.1	289.1	289.1	289.1	288.8	288.8	288.8	288.8	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2
Wet season Min 5d Depth	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.2	8.2	8.2	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Wet season Min 5d Velocity	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Wet season Min 5d WetPerim	262.4	262.4	262.4	262.4	262.4	262.4	262.5	259.1	259.1	259.3	260.6	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4
Wet: ave Fine suspended sediment (%)	100.0	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Wet: max Fine suspended sediment(%)	100.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Wet: ave Coarse suspended sediment(%)	100.0	29.9	41.8	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9
Wet: max Coarse suspended sediment(%)	100.0	40.0	120.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

Appendix Table 4 **The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set A at EF Site 2. (If not provided, units are given in Table 7.1.**

EF2	Base	Sc1noFl	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q30	Int1
Mean annual runoff (Mm^3)	35738	35738	35738	35534	35534	35534	35534	35533	35533	35533	35533	35738	35738	35738	35738	35738	35738	35738	35738	35725
Dry season onset	35.0	35.0	35.0	35.0	35.0	35.0	35.0	33.0	33.5	34.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Dry season duration	110.5	110.5	110.5	110.5	110.5	110.5	110.5	115.0	117.5	117.0	117.0	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5
Dry season Min 5d Q	220.6	220.6	220.6	220.6	220.6	220.7	255.0	202.6	216.2	222.0	255.0	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6
Wet season onset	7.0	7.0	7.0	7.0	8.0	8.0	8.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Wet season duration	147.0	147.0	147.0	145.0	145.0	142.5	135.5	156.5	156.0	151.0	143.5	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
Wet season Max 5d Q	3309.2	3309.2	3309.2	3294.5	3294.5	3294.5	3294.5	3256.6	3256.6	3256.6	3256.6	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1
Flood volume	26798	26798	26798	26502	26437	26161	25658	26834	26834	26705	26333	26798	26798	26798	26798	26798	26798	26798	26798	26798
Dry season ave daily vol	25.7	25.7	25.7	25.7	25.7	25.7	26.1	26.5	26.2	26.1	26.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
T1 ave daily vol	56.6	56.6	56.6	56.6	56.6	56.6	57.9	46.7	48.8	49.6	51.2	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
Wet season ave daily vol	169.6	169.6	169.6	167.5	169.6	172.3	176.9	164.9	164.9	165.9	170.3	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6
T2 ave daily vol	48.3	48.3	48.3	48.3	48.3	48.3	48.3	53.2	52.3	52.0	51.3	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.3	48.4
Dry within day range	0.0	0.0	0.0	746.0	402.0	258.0	102.0	906.5	419.4	217.8	4.9	563.3	563.3	337.4	337.4	256.3	256.3	162.6	81.7	404.6
T1 within day range	0.0	0.0	0.0	2166.0	1894.2	1750.2	1644.2	1921.0	1663.9	1536.8	1446.6	1089.9	980.1	750.9	610.3	662.3	518.6	372.5	216.6	645.8
Wet within day range	0.0	0.0	0.0	823.1	823.1	816.9	714.9	319.2	319.2	319.2	311.9	79.8	33.1	75.8	33.1	66.8	33.1	33.1	33.1	33.1
T2 within day range	0.0	0.0	0.0	1733.7	1386.8	1242.8	1086.8	2192.3	1874.7	1639.5	1365.4	1151.3	1151.3	814.3	814.3	618.6	618.6	395.0	219.0	819.7
Dry season Min 5d Depth	4.5	4.5	4.5	4.5	4.5	4.5	4.6	4.4	4.4	4.5	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Dry season Min 5d Velocity	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Dry season Min 5d WetPerim	120.4	120.4	120.4	120.4	120.4	120.4	121.7	120.3	120.4	120.5	121.7	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4
Wet season Max 5d Depth	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Wet season Max 5d Velocity	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Wet season Max 5d WetPerim	455.5	455.5	455.5	455.3	455.3	455.3	455.3	453.6	453.6	453.6	453.6	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5
Wet season Min 5d Depth	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.5	3.5	3.5	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Wet season Min 5d Velocity	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Wet season Min 5d WetPerim	259.4	259.4	259.4	259.2	259.3	259.5	260.2	215.3	215.4	218.0	236.2	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3
Wet: ave Fine suspended sediment(%)	100.0	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	14.8	19.8	19.8	19.8	19.8	19.8
Wet: max Fine suspended sediment(%)	100.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	15.0	20.0	20.0	20.0	20.0	20.0
Wet: ave Coarse suspended sediment(%)	100.0	39.3	50.7	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	29.9	39.3	39.3	39.3	39.3	39.3
Wet: max Coarse suspended sediment(%)	100.0	40.0	100.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

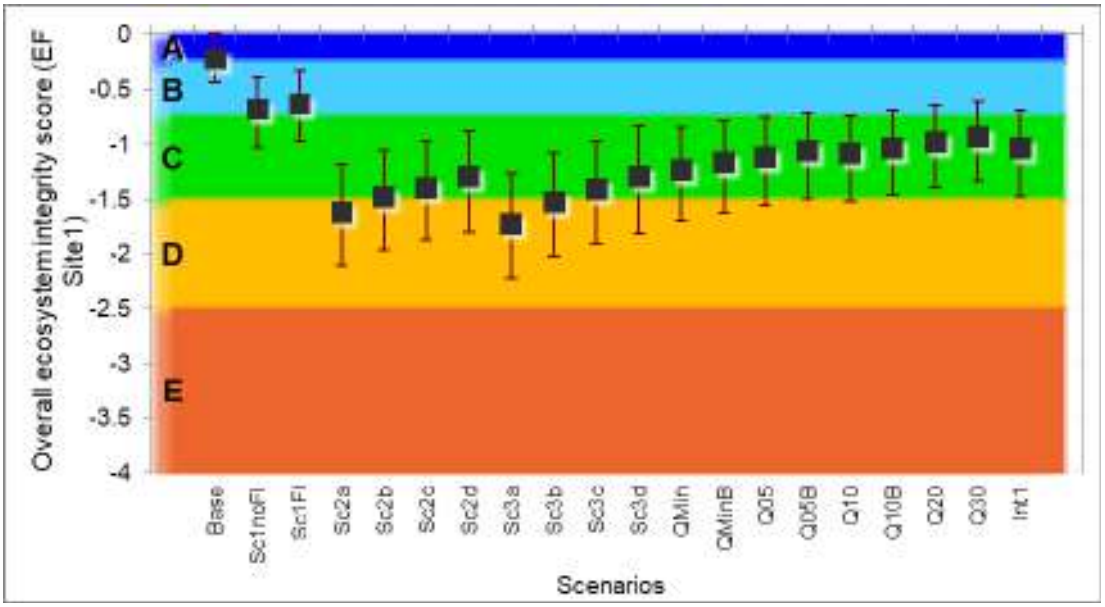
Appendix Table 5 **BGHES EF Site 1: The mean percentage changes in abundance (relative to baseline) for the indicators for the SET A scenarios. Blue and green are major changes that represent an INCREASE: green = 40-70%; blue = >70%. Orange and red are major changes that represent a DECREASE: orange = 40-70%; red = >70%. Baseline, by definition, equals 100%.**

	Base	Sc1noFl	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q30	Int1
Geomorphology																				
Low mid-channel rock exposures	0.3	0.5	0.0	-69.9	-57.9	-52.3	-48.0	-73.6	-58.8	-52.5	-46.7	-41.3	-34.9	-25.4	-22.4	-20.7	-18.6	-14.1	-10.7	-23.2
Backwater bed sediment (fine to coarse)	0.9	100.7	100.7	113.2	111.6	110.8	110.0	114.1	112.1	111.4	110.7	109.7	108.6	106.8	106.2	105.6	105.2	104.0	103.2	106.5
Area of backwaters and secondary channels	0.9	-1.3	-0.5	-38.8	-31.7	-28.4	-24.7	-39.9	-31.6	-27.1	-22.7	-24.1	-21.3	-17.5	-16.0	-15.1	-13.9	-11.4	-9.1	-16.5
Channel bed sediment size (fine to coarse)	1.5	99.0	99.0	112.3	110.7	109.8	109.0	112.9	111.0	110.2	109.4	108.8	108.2	106.6	106.0	105.5	105.0	103.9	102.7	106.2
Depth of pools	-1.1	-2.1	-1.0	5.6	3.5	2.7	2.0	6.6	4.0	2.9	2.0	1.9	1.3	0.3	0.0	-0.2	-0.4	-0.8	-1.2	0.0
Sand bars	0.9	-66.3	-49.0	-80.8	-78.3	-77.3	-76.2	-81.6	-79.6	-78.3	-76.6	-76.1	-75.4	-73.9	-73.4	-72.9	-72.5	-71.5	-70.5	-73.6
Riparian vegetation																				
Single-celled diatoms	0.3	17.0	14.8	-26.1	-15.9	-10.7	-5.4	-29.8	-17.6	-11.5	-4.8	-6.3	-3.0	2.2	3.8	5.0	6.1	8.7	10.7	3.7
Filamentous green algae	-0.1	18.5	16.9	-41.8	-30.4	-24.2	-18.0	-44.2	-31.8	-24.7	-16.5	-16.1	-11.1	-3.3	-1.0	0.8	2.4	6.2	9.2	-1.1
Bryophyta	-2.0	15.7	12.5	82.2	67.2	61.3	59.2	88.5	71.5	63.8	59.7	51.1	46.2	38.3	36.1	33.9	32.3	28.3	25.1	36.1
Marginal Graminoids	-1.8	-18.0	-13.5	-7.9	-7.6	-6.9	-6.5	-9.2	-8.4	-7.7	-7.3	-8.0	-8.5	-8.5	-9.3	-8.9	-9.6	-10.1	-10.7	-9.4
Marginal Shrubs	-1.6	-10.4	-10.4	13.4	14.1	14.9	14.5	13.3	13.9	14.7	15.6	12.9	12.3	10.7	9.6	9.6	8.6	6.8	5.0	10.2
Lower Trees	-1.5	-5.6	-5.6	1.2	0.2	-0.3	-0.9	4.0	2.4	1.6	0.7	-3.3	-3.6	-4.0	-4.3	-4.1	-4.5	-4.7	-4.8	-5.0
Upper Trees	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.3	0.3	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Organic detritus	-0.4	-11.4	-11.4	-42.5	-39.9	-37.8	-35.5	-44.5	-39.8	-36.9	-34.1	-36.1	-33.5	-28.9	-27.1	-25.8	-24.5	-21.5	-19.1	-27.3
Macroinvertebrates																				
Species richness	-1.9	-25.8	-23.8	-43.4	-42.6	-42.5	-41.8	-43.2	-42.1	-41.9	-41.0	-42.7	-41.1	-41.0	-39.8	-40.0	-39.0	-37.6	-36.0	-40.6
Ephemeroptera	-1.3	0.0	0.0	-60.1	-50.0	-44.6	-39.1	-66.0	-53.3	-46.1	-38.8	-41.5	-36.8	-32.4	-29.6	-28.7	-26.3	-22.1	-18.4	-30.5
Oligoneuridae	-1.9	0.1	0.0	-61.3	-45.8	-39.0	-33.3	-68.9	-50.8	-42.7	-35.0	-32.8	-28.4	-20.5	-18.5	-16.5	-15.1	-11.5	-8.7	-18.6
Chironomidae	0.9	-3.0	-2.9	-55.4	-43.8	-40.2	-37.1	-61.1	-48.6	-43.5	-38.7	-30.6	-26.7	-19.8	-18.0	-16.1	-14.9	-11.4	-8.8	-18.2
Ceratopogonidae	-0.9	-24.5	-24.2	-29.5	-28.2	-28.7	-27.9	-36.1	-33.9	-33.4	-32.1	-26.8	-26.4	-25.1	-24.9	-24.4	-24.2	-23.5	-22.8	-25.1
Simulidae	0.4	0.0	0.0	-69.1	-52.4	-44.8	-38.5	-74.8	-55.1	-45.9	-37.6	-37.2	-32.1	-23.6	-21.3	-19.1	-17.5	-13.3	-10.0	-21.4
Gastropods	1.6	-0.3	0.0	-0.4	-0.4	-0.5	-0.7	-1.3	-0.7	-0.6	-0.8	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Fish																				
Redeye labeo, Labeo cylindricus	-0.5	-0.1	0.0	-37.5	-37.1	-36.6	-36.2	-36.8	-35.7	-35.2	-34.4	-35.6	-28.5	-31.9	-24.8	-29.9	-23.2	-21.0	-19.5	-26.9
Cichlids	-1.4	-5.4	-5.2	-46.2	-43.2	-40.0	-30.2	-46.6	-44.0	-38.5	-26.3	-41.5	-41.0	-38.3	-37.8	-35.9	-35.3	-29.9	-24.5	-38.0
Synodontis zambezensis	-2.0	-2.2	-2.2	-21.7	-15.9	-10.2	-2.9	-24.6	-18.2	-11.1	-1.8	-11.4	-10.6	-8.5	-8.0	-7.6	-7.2	-6.1	-5.2	-7.7
Alestids	-1.7	-1.4	-1.4	-15.5	-9.9	-5.3	-2.0	-19.7	-10.0	-4.3	0.0	-7.8	-7.0	-5.6	-5.2	-4.8	-4.5	-3.8	-3.2	-5.3
Cornish jack, Mormyrops anguilloides	-1.7	-6.5	-6.1	-47.6	-46.8	-46.0	-43.8	-47.5	-46.6	-45.6	-40.2	-46.7	-46.7	-46.3	-46.3	-46.0	-45.9	-44.7	-43.1	-46.3
Vundu, Heterobranchus longifilis	-1.5	-0.7	-0.6	-8.6	-6.5	-4.1	-0.3	-9.1	-5.3	-2.7	1.6	-6.6	-5.7	-5.9	-5.1	-5.6	-4.9	-4.5	-4.2	-5.3
Tigerfish, Hydrocynus vittatus	-1.9	-1.5	-1.5	-39.6	-33.8	-28.7	-23.2	-40.1	-32.2	-26.2	-18.9	-27.2	-22.3	-22.2	-18.2	-20.3	-16.6	-14.6	-12.9	-19.0
Crocodiles																				
Crocodiles	0.0	0.0	0.0	-34.3	-29.5	-27.5	-25.8	-42.5	-34.4	-31.1	-28.9	-12.8	-11.2	-8.9	-7.2	-7.9	-6.2	-5.0	-4.1	-4.3

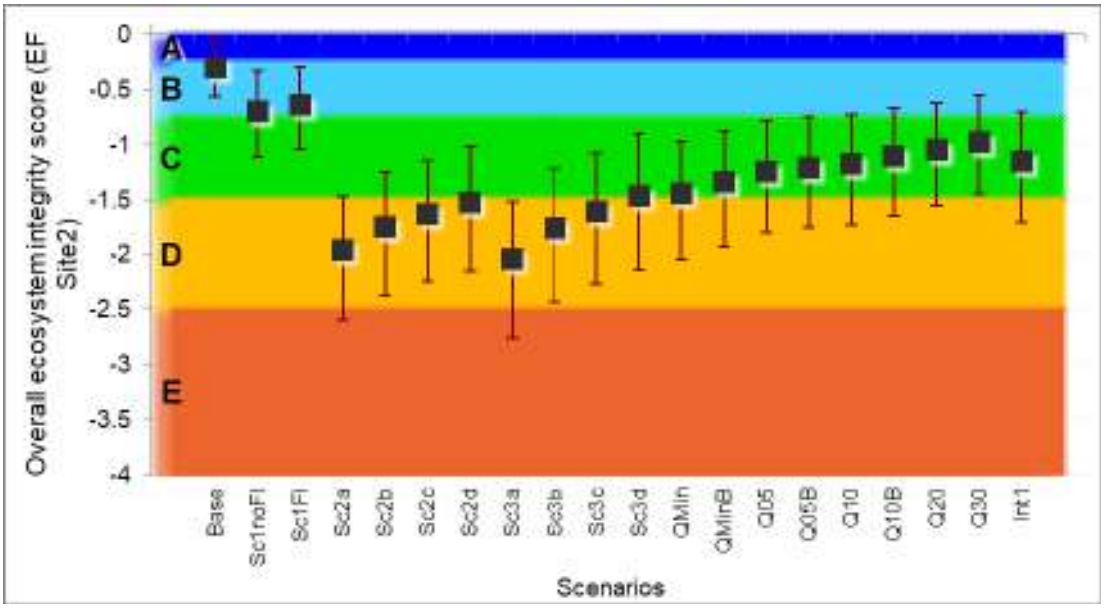
Appendix Table 6 **BGHES EF Site 2: The mean percentage changes in abundance (relative to baseline) for the indicators for the SET A scenarios. Blue and green are major changes that represent an INCREASE: green = 40-70%; blue = >70%. Orange and red are major changes that represent a DECREASE: orange = 40-70%; red = >70%. Baseline, by definition, equals 100%.**

	Base	Sc1noFl	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q30	Int1
Geomorphology																				
Low midchannel rock exposures	1.0	0.0	0.0	-71.4	-58.8	-51.5	-44.9	-70.8	-55.6	-48.5	-40.5	-42.3	-35.9	-26.2	-23.2	-21.5	-19.4	-14.9	-11.4	-23.7
Lengths of cut marginal banks	-1.3	23.3	13.3	90.6	75.3	69.0	63.9	94.8	77.6	70.1	62.9	59.2	54.2	46.1	51.3	41.7	40.2	36.1	32.9	43.9
Backwater bed sediment size (fine to coarse)	1.8	103.4	103.4	115.0	115.1	114.4	112.4	114.2	114.5	113.5	111.5	112.4	111.9	111.1	111.1	110.2	110.1	108.9	107.6	111.1
Area of backwaters and secondary channels	1.9	-0.6	-0.2	-47.2	-37.8	-33.7	-29.9	-48.5	-37.8	-32.9	-28.0	-28.0	-24.3	-19.6	-17.9	-16.7	-15.3	-12.4	-10.0	-18.1
Vegetated midchannel bars	-1.9	-40.1	-30.7	-71.0	-69.0	-68.2	-67.6	-71.4	-68.9	-67.9	-67.1	-66.0	-62.8	-58.6	-58.3	-55.4	-53.9	-50.9	-48.3	-58.3
Channel bed sediment (fine to coarse)	1.5	78.2	78.2	84.3	81.3	80.2	79.4	87.3	82.7	81.0	80.1	82.5	82.5	80.7	101.2	80.2	80.2	79.6	79.2	81.1
Depth of pools	-1.1	6.4	5.3	15.3	13.1	12.2	11.4	16.3	13.5	12.4	11.4	11.2	10.6	9.4	9.4	8.9	8.6	8.1	7.7	9.2
Sand bars	0.3	-21.0	-15.9	-46.3	-41.1	-38.9	-36.7	-47.4	-40.5	-37.8	-35.3	-35.8	-33.2	-30.9	-33.3	-29.5	-28.4	-26.9	-25.8	-30.0
Riparian vegetation																				
Single-celled diatoms	-0.3	14.4	12.4	-28.4	-18.4	-13.3	-8.1	-31.6	-19.8	-13.9	-7.3	-8.8	-5.5	-0.3	3.8	2.5	3.5	6.1	8.1	1.2
Filamentous green algae	-1.2	15.9	14.4	-42.7	-32.6	-26.6	-21.2	-44.8	-33.8	-27.2	-20.0	-18.7	-13.7	-5.9	-1.0	-1.8	-0.2	3.6	6.6	-3.8
Marginal Graminoids	-0.7	-11.8	-10.7	-37.1	-27.3	-22.9	-19.9	-40.9	-29.0	-23.6	-19.7	-18.0	-14.4	-9.5	-12.1	-7.5	-7.5	-6.3	-5.5	-9.2
Marginal Shrubs	-1.5	-12.2	-10.9	-27.3	-17.1	-12.7	-10.4	-30.0	-18.3	-12.8	-8.4	-8.7	-5.2	-1.8	-4.5	-0.5	-0.7	-0.6	-1.0	-1.5
Lower Trees	-1.1	-4.8	-4.8	9.9	8.7	8.1	7.3	13.2	11.1	10.1	9.2	0.8	0.4	-0.2	-1.5	-0.6	-1.0	-1.5	-2.1	-2.5
Upper Trees	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Organic detritus	1.2	-10.8	-10.8	-44.3	-41.7	-39.6	-37.3	-46.3	-41.6	-38.5	-35.5	-37.4	-33.9	-28.7	-27.4	-25.5	-24.2	-21.0	-18.5	-27.1
Macroinvertebrates																				
Species richness	-1.9	-18.8	-16.7	-38.0	-29.7	-26.3	-23.2	-41.2	-33.3	-28.9	-24.8	-23.0	-22.1	-19.2	-21.9	-18.3	-18.6	-18.1	-17.7	-18.3
Ephemeroptera	-1.7	-1.2	-1.2	-41.6	-30.6	-25.3	-21.6	-46.3	-32.5	-26.1	-21.1	-22.5	-19.5	-13.9	-13.1	-11.2	-10.4	-7.9	-6.0	-12.9
Bivalves	-1.7	-16.5	-12.4	-41.6	-33.9	-29.5	-24.7	-43.8	-33.1	-28.2	-23.0	-29.4	-27.1	-24.8	-27.4	-23.7	-22.7	-21.4	-20.5	-24.0
Oligoneuridae	-1.9	0.0	0.0	-55.5	-41.2	-35.1	-30.0	-62.9	-45.4	-37.7	-30.8	-30.4	-26.6	-19.2	-17.5	-15.5	-14.3	-10.8	-8.1	-17.8
Chironomidae	1.3	-3.7	-3.6	-48.3	-39.3	-36.4	-33.0	-50.9	-41.3	-37.3	-32.5	-28.6	-25.5	-20.2	-18.8	-17.3	-16.3	-13.5	-11.1	-18.9
Shrimps	-0.9	-4.8	-4.3	-15.2	-10.5	-8.3	-6.5	-17.0	-10.8	-8.2	-6.0	-7.2	-5.8	-3.8	-4.8	-3.0	-3.0	-2.5	-2.2	-3.7
Ceratopogonidae	0.7	-25.2	-24.9	-28.8	-28.8	-28.9	-28.5	-31.0	-30.9	-30.4	-29.9	-28.0	-28.0	-27.5	-27.4	-27.2	-27.1	-26.8	-26.4	-27.5
Simulidae	0.1	-0.9	-0.8	-70.1	-53.3	-45.6	-39.3	-75.4	-55.7	-46.5	-38.1	-36.8	-31.5	-23.0	-20.9	-18.4	-16.8	-12.7	-9.6	-20.6
Gastropods	0.5	-0.3	0.0	-0.6	-0.3	-0.4	-0.5	-1.9	-1.3	-1.0	-0.9	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6

	Base	Sc1noFl	Sc1Fl	Sc2a	Sc2b	Sc2c	Sc2d	Sc3a	Sc3b	Sc3c	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q30	Int1
Fish																				
Labeo altivelis	-0.6	17.0	14.8	-76.7	-74.5	-72.9	-71.0	-73.8	-68.7	-66.6	-62.7	-70.0	-58.0	-58.3	-40.0	-51.3	-36.7	-29.2	-23.6	-46.8
Redeye labeo, Labeo cylindricus	1.1	0.0	0.0	-34.6	-33.6	-32.7	-31.7	-33.3	-31.9	-30.9	-29.4	-31.4	-25.2	-27.8	-22.1	-26.1	-20.7	-19.0	-17.7	-23.7
Cichlids	-0.1	-8.3	-7.6	-29.7	-29.4	-29.0	-28.6	-29.8	-29.4	-28.9	-27.9	-28.7	-28.2	-27.9	-27.9	-27.7	-27.4	-27.1	-26.4	-27.7
Chessa and Nkupe, Distichodus spp	-1.7	-1.3	-1.3	-25.0	-19.0	-15.3	-12.2	-24.8	-16.9	-13.0	-9.2	-15.8	-14.2	-13.1	-12.0	-12.1	-10.8	-9.7	-8.8	-12.2
Synodontis zambezensis	0.8	-3.0	-2.7	-24.9	-16.2	-8.5	-1.2	-28.7	-14.1	-4.9	3.8	-12.7	-11.0	-8.3	-8.1	-7.1	-6.7	-5.5	-4.7	-7.7
Alestids	-1.3	-2.0	-1.9	-14.5	-13.7	-13.2	-12.8	-14.9	-13.8	-13.1	-12.6	-13.4	-12.3	-12.6	-11.6	-12.2	-10.9	-10.3	-9.7	-11.8
Barbus spp	0.0	-9.3	-8.3	-53.8	-52.4	-51.1	-47.9	-53.9	-52.2	-50.0	-44.9	-51.3	-48.9	-48.3	-46.1	-45.9	-42.3	-37.4	-33.0	-47.1
Cornish jack, Mormyrops anguilloides	**-2.4**	-12.9	-11.9	-80.1	-69.1	-59.3	-43.2	-83.3	-66.6	-51.9	-32.9	-69.3	-67.8	-62.2	-62.4	-58.8	-58.4	-53.2	-48.1	-63.5
Vundu, Heterobranchus longifilis	-0.7	0.7	0.5	-0.5	1.3	5.1	10.5	0.1	4.7	8.5	14.2	-0.3	0.2	0.0	0.4	0.1	0.3	0.3	0.3	0.3
Tigerfish, Hydrocynus vittatus	0.7	-5.5	-5.2	-65.9	-61.7	-59.0	-55.6	-38.9	-38.2	-38.6	-34.3	-51.5	-43.8	-40.9	-35.7	-37.8	-33.0	-30.1	-27.2	-36.1
Crocodiles																				
Crocodiles	0.0	0.0	0.0	-34.3	-29.5	-27.5	-25.8	-42.5	-34.4	-31.1	-28.9	-12.8	-11.2	-8.9	-7.2	-7.9	-6.2	-5.0	-4.1	-4.3



Appendix Figure 1 **Overall ecosystem integrity scores for the scenarios at EF Site 1 under the SET A scenarios.**



Appendix Figure 2 **Overall ecosystem integrity scores for the scenarios at EF Site 2 under the SET A scenarios.**

A.2.2. OPERATING RULE SET B

Discussion of the SET A results at the two-day workshop (See Section A.1) led to the formulation of three additional scenarios, with slightly different combinations of wet and dry operating rules in an attempt to reduce impact power-production, while limiting downstream impacts. These were tested and presented on the second day of the workshop (SET B; Section A3).

The scenarios presented for Operating Rule Set B comprise one of the ESIA scenarios (Sc3d), which was retained for the purposes of comparison, the eight additional scenarios derived from the wet and dry season data sent by SP (see Section A.2.1), plus three scenarios that were designed at the 2-day workshop. The three scenarios were:

Q20Q10 DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q20; no sediment flushing. WET Season: Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q10; no sediment flushing.

Q20QMin DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q20; no sediment flushing. WET Season: Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at QMin; no sediment flushing.

Q20Q10Q10: DRY Season (Jul-Jan): Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at Q20; except for July and August, which were set at Q10; no sediment flushing. WET Season: Daily 6-hour peak at maximum of 1645 m^3s^{-1}, with off-peak releases set at QMin; no sediment flushing

The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set B at EF Site 1 and 2 are given in Appendix Table 7 and Appendix Table 8, respectively. Depictions of the flow regimes (over three hydrological years) associated with each scenario are presented in Appendix B. The estimated mean percentage change in abundance/area/concentration of ecosystem indicators at EF Site and 2 under the SET B scenarios are given in Appendix Table 9 and Appendix Table 10, respectively. EF Site 2 has slightly more diverse habitats, and hence a larger array of species indicators. The tables are colour-coded to facilitate identification of major impacts. The colours *do not* denote whether the predicted change is a move towards or away from the natural condition of the river ecosystem.

The Overall Integrity for each the SET B scenarios at EF Site 1 and 2 are illustrated in Appendix Figure 3 and Appendix Figure 4, respectively.

The results of the workshop scenarios were not markedly different from those for SET A, but they did provide some insight into the relative effect of small adjustments, and the direction needed to arrive at a fair trade-off between power production and downstream impacts. The agreed maximum drop in ecosystem condition (Appendix Table 2) is marked on Appendix Figure 3 and Appendix Figure 4, which shows that at EF Site 2, Q10B, Q20, Q20Q10 and Q30 meet the ecosystem condition criterion set at the workshop. However, none of these four scenarios meet the criterion that at least 90% of fish species are not impacted by more than 25%.

Appendix Table 7 **The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set B at EF Site 1. Where not provided, units are given in Table 7.1.**

EF1	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	Q30	Int1
Mean annual runoff (Mm^3)	35738	35533	35738	35738	35738	35738	35738	35738	35738	35738	35738	35738	35738	35725
Dry season onset	35.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Dry season duration	110.5	117.0	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5
Dry season Min 5d Q	220.6	255.0	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6
Wet season onset	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Wet season duration	147.0	143.5	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
Wet season Max 5d Q	3309	3257	3309	3309	3309	3309	3309	3309	3309	3309	3309	3309.1	3309.1	3309.1
Flood volume	26798	26333	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798.0	26798	26798
Dry season ave daily vol	25.7	26.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
T1 ave daily vol	56.6	51.2	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
Wet season ave daily vol	169.6	170.3	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6
T2 ave daily vol	48.3	51.3	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.3	48.4
Dry within day range	0.0	4.9	563.3	563.3	337.4	337.4	256.3	256.3	162.6	162.6	162.6	178.6	81.7	404.6
T1 within day range	0.0	1446.6	1089.9	980.1	750.9	610.3	662.3	518.6	372.5	539.7	760.4	539.7	216.6	645.8
Wet within day range	0.0	311.9	79.8	33.1	75.8	33.1	66.8	33.1	33.1	66.8	79.8	66.8	33.1	33.1
T2 within day range	0.0	1365.4	1151.3	1151.3	814.3	814.3	618.6	618.6	395.0	395.0	395.0	610.7	219.0	819.7
Dry season Min 5d Depth	7.7	7.5	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Dry season Min 5d Velocity	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Dry season Min 5d WetPerim	223.7	229.9	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7
Wet season Max 5d Depth	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
Wet season Max 5d Velocity	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Wet season Max 5d WetPerim	289.2	288.8	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2
Wet season Min 5d Depth	8.4	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Wet season Min 5d Velocity	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Wet season Min 5d WetPerim	262.4	260.6	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4
Wet: ave Fine suspended sediment (%)	100.0	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Wet: max Fine suspended sediment (%)	100.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Wet: ave Coarse suspended sediment (%)	100.0	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9
Wet: max Coarse suspended sediment (%)	100.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

Appendix Table 8 The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set B at EF Site 2. Where not provided, units are given in Table 7.1.

EF2	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	Q30	Int1
Mean annual runoff (Mm^3)	35738	35533	35738	35738	35738	35738	35738	35738	35738	1101.7	1101.7	1101.7	35738	35725
Dry season onset	35.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Dry season duration	110.5	117.0	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5
Dry season Min 5d Q	220.6	255.0	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6
Wet season onset	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Wet season duration	147.0	143.5	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
Wet season Max 5d Q	3309.2	3256.6	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1
Flood volume	26798	26333	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798
Dry season ave daily vol	25.7	26.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
T1 ave daily vol	56.6	51.2	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
Wet season ave daily vol	169.6	170.3	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6
T2 ave daily vol	48.3	51.3	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.3	48.4
Dry within day range	0.0	4.9	563.3	563.3	337.4	337.4	256.3	256.3	162.6	162.6	162.6	178.6	81.7	404.6
T1 within day range	0.0	1446.6	1089.9	980.1	750.9	610.3	662.3	518.6	372.5	539.7	760.4	539.7	216.6	645.8
Wet within day range	0.0	311.9	79.8	33.1	75.8	33.1	66.8	33.1	33.1	66.8	79.8	66.8	33.1	33.1
T2 within day range	0.0	1365.4	1151.3	1151.3	814.3	814.3	618.6	618.6	395.0	395.0	395.0	610.7	219.0	819.7
Dry season Min 5d Depth	4.5	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Dry season Min 5d Velocity	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Dry season Min 5d WetPerim	120.4	121.7	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4
Wet season Max 5d Depth	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Wet season Max 5d Velocity	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Wet season Max 5d WetPerim	455.5	453.6	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5
Wet season Min 5d Depth	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Wet season Min 5d Velocity	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Wet season Min 5d WetPerim	259.4	236.2	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3
Wet: ave Fine suspended sediment (%)	100.0	19.8	19.8	19.8	19.8	14.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8
Wet: max Fine suspended sediment (%)	100.0	20.0	20.0	20.0	20.0	15.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Wet: ave Coarse suspended sediment (%)	100.0	39.3	39.3	39.3	39.3	29.9	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3
Wet: max Coarse suspended sediment (%)	100.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

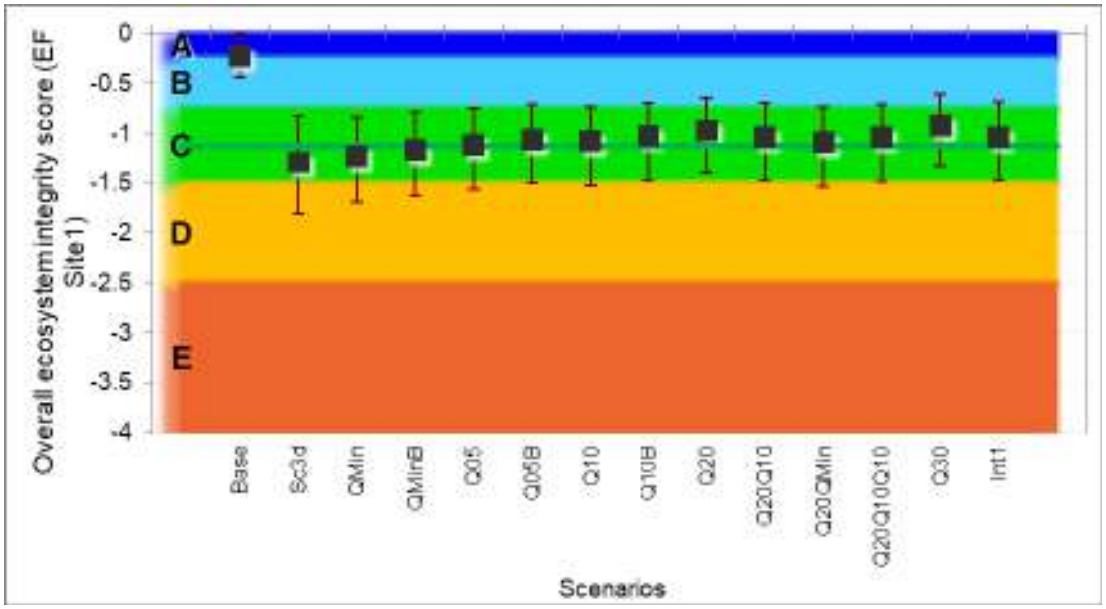
Appendix Table 9 **BGHES EF Site 1: The mean percentage changes in abundance (relative to baseline) for the indicators for the SET B scenarios. Blue and green are major changes that represent an INCREASE: green = 40-70%; blue = >70%. Orange and red are major changes that represent a DECREASE: orange = 40-70%; red = >70%. Baseline, by definition, equals 100%.**

	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	Q30	Int1
Geomorphology														
Low midchannel rock exposures	0.3	-46.7	-41.3	-34.9	-25.4	-22.4	-20.7	-18.6	-14.1	-15.9	-20.4	-17.0	-10.7	-23.2
Backwater bed sediment (fine to coarse)	0.9	110.7	109.7	108.6	106.8	106.2	105.6	105.2	104.0	104.5	105.7	105.1	103.2	106.5
Area of backwaters and secondary channels	0.9	-22.7	-24.1	-21.3	-17.5	-16.0	-15.1	-13.9	-11.4	-12.4	-14.4	-13.2	-9.1	-16.5
Channel bed sediment size (fine to coarse)	1.5	109.4	108.8	108.2	106.6	106.0	105.5	105.0	103.9	104.3	104.9	104.8	102.7	106.2
Depth of pools	-1.1	2.0	1.9	1.3	0.3	0.0	-0.2	-0.4	-0.8	-0.7	-0.3	-0.6	-1.2	0.0
Sand bars	0.9	-76.6	-76.1	-75.4	-73.9	-73.4	-72.9	-72.5	-71.5	-71.9	-72.5	-72.4	-70.5	-73.6
Riparian vegetation														
Single-celled diatoms	0.3	-4.8	-6.3	-3.0	2.2	3.8	5.0	6.1	8.7	7.7	5.5	6.8	10.7	3.7
Filamentous green algae	-0.1	-16.5	-16.1	-11.1	-3.3	-1.0	0.8	2.4	6.2	4.9	1.5	3.5	9.2	-1.1
Bryophyta	-2.0	59.7	51.1	46.2	38.3	36.1	33.9	32.3	28.3	29.6	32.8	31.4	25.1	36.1
Marginal Graminoids	-1.8	-7.3	-8.0	-8.5	-8.5	-9.3	-8.9	-9.6	-10.1	-9.1	-8.0	-8.9	-10.7	-9.4
Marginal Shrubs	-1.6	15.6	12.9	12.3	10.7	9.6	9.6	8.6	6.8	8.2	9.4	8.4	5.0	10.2
Lower Trees	-1.5	0.7	-3.3	-3.6	-4.0	-4.3	-4.1	-4.5	-4.7	-4.2	-4.0	-4.2	-4.8	-5.0
Upper Trees	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Organic detritus	-0.4	-34.1	-36.1	-33.5	-28.9	-27.1	-25.8	-24.5	-21.5	-22.6	-25.0	-23.7	-19.1	-27.3
Macroinvertebrates														
Species richness	-1.9	-41.0	-42.7	-41.1	-41.0	-39.8	-40.0	-39.0	-37.6	-38.8	-39.3	-39.0	-36.0	-40.6
Ephemeroptera	-1.3	-38.8	-41.5	-36.8	-32.4	-29.6	-28.7	-26.3	-22.1	-24.7	-28.0	-26.0	-18.4	-30.5
Oligoneuridae	-1.9	-35.0	-32.8	-28.4	-20.5	-18.5	-16.5	-15.1	-11.5	-12.6	-15.4	-14.0	-8.7	-18.6
Chironomidae	0.9	-38.7	-30.6	-26.7	-19.8	-18.0	-16.1	-14.9	-11.4	-12.5	-15.2	-13.9	-8.8	-18.2
Ceratopogonidae	-0.9	-32.1	-26.8	-26.4	-25.1	-24.9	-24.4	-24.2	-23.5	-23.6	-23.9	-23.9	-22.8	-25.1
Simulidae	0.4	-37.6	-37.2	-32.1	-23.6	-21.3	-19.1	-17.5	-13.3	-14.6	-18.0	-16.4	-10.0	-21.4
Gastropods	1.6	-0.8	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Fish														
Redeye labeo, Labeo cylindricus	-0.5	-34.4	-35.6	-28.5	-31.9	-24.8	-29.9	-23.2	-21.0	-28.8	-33.9	-28.8	-19.5	-26.9
Cichlids	-1.4	-26.3	-41.5	-41.0	-38.3	-37.8	-35.9	-35.3	-29.9	-30.6	-31.7	-31.6	-24.5	-38.0
Synodontis zambezensis	-2.0	-1.8	-11.4	-10.6	-8.5	-8.0	-7.6	-7.2	-6.1	-6.5	-7.0	-6.8	-5.2	-7.7
Alestids	-1.7	0.0	-7.8	-7.0	-5.6	-5.2	-4.8	-4.5	-3.8	-4.1	-4.7	-4.4	-3.2	-5.3
Cornish jack, Mormyrops anguilloides	-1.7	-40.2	-46.7	-46.7	-46.3	-46.3	-46.0	-45.9	-44.7	-44.9	-45.2	-45.1	-43.1	-46.3
Vundu, Heterobranchus longifilis	-1.5	1.6	-6.6	-5.7	-5.9	-5.1	-5.6	-4.9	-4.5	-5.3	-5.9	-5.3	-4.2	-5.3
Tigerfish, Hydrocynus vittatus	-1.9	-18.9	-27.2	-22.3	-22.2	-18.2	-20.3	-16.6	-14.6	-18.5	-21.9	-18.8	-12.9	-19.0
Crocodiles														
Crocodiles	0.0	-28.9	-12.8	-11.2	-8.9	-7.2	-7.9	-6.2	-5.0	-7.2	-8.9	-7.2	-4.1	-4.3

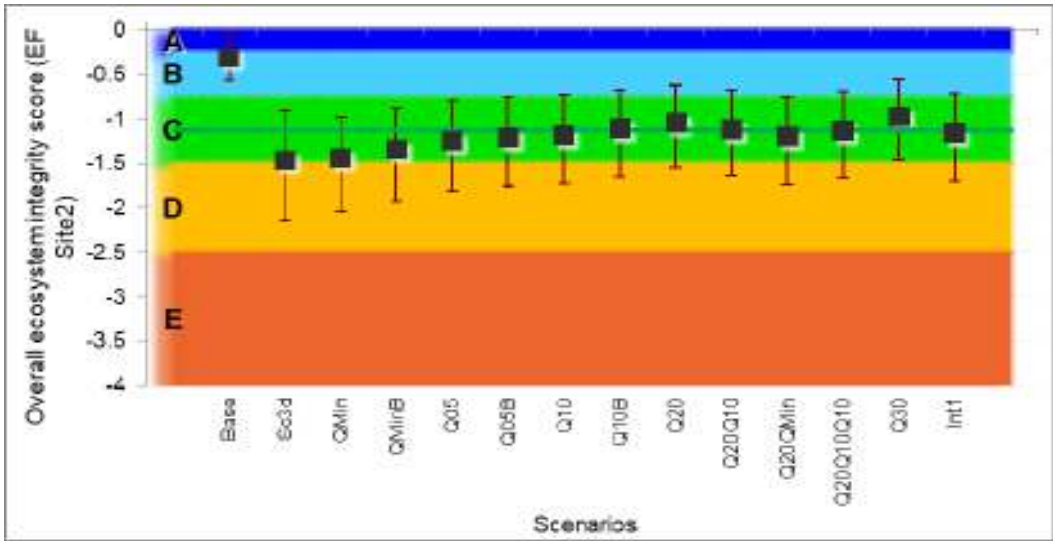
Appendix Table 10 **BGHES EF Site 2: The mean percentage changes in abundance (relative to baseline) for the indicators for the SET B scenarios. Blue and green are major changes that represent an INCREASE: green = 40-70%; blue = >70%. Orange and red are major changes that represent a DECREASE: orange = 40-70%; red = >70%. Baseline, by definition, equals 100%.**

	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	Q30	Int1
Geomorphology														
Low midchannel rock exposures	1.0	-40.5	-42.3	-35.9	-26.2	-23.2	-21.5	-19.4	-14.9	-16.7	-21.1	-17.8	-11.4	-23.7
Lengths of cut marginal banks	-1.3	62.9	59.2	54.2	46.1	51.3	41.7	40.2	36.1	37.4	40.8	39.2	32.9	43.9
Backwater bed sediment size (fine to coarse)	1.8	111.5	112.4	111.9	111.1	111.1	110.2	110.1	108.9	109.0	109.3	109.5	107.6	111.1
Area of backwaters and secondary channels	1.9	-28.0	-28.0	-24.3	-19.6	-17.9	-16.7	-15.3	-12.4	-13.8	-16.3	-14.8	-10.0	-18.1
Vegetated midchannel bars	-1.9	-67.1	-66.0	-62.8	-58.6	-58.3	-55.4	-53.9	-50.9	-52.2	-55.8	-53.8	-48.3	-58.3
Channel bed sediment (fine to coarse)	1.5	80.1	82.5	82.5	80.7	101.2	80.2	80.2	79.6	79.6	79.6	79.7	79.2	81.1
Depth of pools	-1.1	11.4	11.2	10.6	9.4	9.4	8.9	8.6	8.1	8.3	8.7	8.5	7.7	9.2
Sand bars	0.3	-35.3	-35.8	-33.2	-30.9	-33.3	-29.5	-28.4	-26.9	-28.1	-29.9	-28.2	-25.8	-30.0
Riparian vegetation														
Single-celled diatoms	-0.3	-7.3	-8.8	-5.5	-0.3	3.8	2.5	3.5	6.1	5.2	2.9	4.2	8.1	1.2
Filamentous green algae	-1.2	-20.0	-18.7	-13.7	-5.9	-1.0	-1.8	-0.2	3.6	2.3	-1.1	0.9	6.6	-3.8
Bryophyta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marginal Graminoids	-0.7	-19.7	-18.0	-14.4	-9.5	-12.1	-7.5	-7.5	-6.3	-5.7	-6.3	-6.3	-5.5	-9.2
Marginal Shrubs	-1.5	-8.4	-8.7	-5.2	-1.8	-4.5	-0.5	-0.7	-0.6	0.1	-0.4	-0.4	-1.0	-1.5
Lower Trees	-1.1	9.2	0.8	0.4	-0.2	-1.5	-0.6	-1.0	-1.5	-0.8	0.0	-0.7	-2.1	-2.5
Upper Trees	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Organic detritus	1.2	-35.5	-37.4	-33.9	-28.7	-27.4	-25.5	-24.2	-21.0	-22.2	-25.1	-23.3	-18.5	-27.1
Macroinvertebrates														
Species richness	-1.9	-24.8	-23.0	-22.1	-19.2	-21.9	-18.3	-18.6	-18.1	-17.7	-16.8	-17.9	-17.7	-18.3
Ephemeroptera	-1.7	-21.1	-22.5	-19.5	-13.9	-13.1	-11.2	-10.4	-7.9	-8.5	-10.3	-9.5	-6.0	-12.9
Bivalves	-1.7	-23.0	-29.4	-27.1	-24.8	-27.4	-23.7	-22.7	-21.4	-22.4	-23.9	-22.4	-20.5	-24.0
Oligoneuridae	-1.9	-30.8	-30.4	-26.6	-19.2	-17.5	-15.5	-14.3	-10.8	-11.8	-14.4	-13.1	-8.1	-17.8
Chironomidae	1.3	-32.5	-28.6	-25.5	-20.2	-18.8	-17.3	-16.3	-13.5	-14.3	-16.4	-15.4	-11.1	-18.9
Shrimps	-0.9	-6.0	-7.2	-5.8	-3.8	-4.8	-3.0	-3.0	-2.5	-2.3	-2.5	-2.5	-2.2	-3.7
Ceratopogonidae	0.7	-29.9	-28.0	-28.0	-27.5	-27.4	-27.2	-27.1	-26.8	-26.8	-26.9	-26.9	-26.4	-27.5
Simulidae	0.1	-38.1	-36.8	-31.5	-23.0	-20.9	-18.4	-16.8	-12.7	-14.0	-17.4	-15.7	-9.6	-20.6
Gastropods	0.5	-0.9	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6

	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	Q30	Int1
Fish														
Labeo altivelis	-0.6	-62.7	-70.0	-58.0	-58.3	-40.0	-51.3	-36.7	-29.2	-45.3	-58.9	-46.5	-23.6	-46.8
Redeye labeo, Labeo cylindricus	1.1	-29.4	-31.4	-25.2	-27.8	-22.1	-26.1	-20.7	-19.0	-25.2	-29.4	-25.2	-17.7	-23.7
Cichlids	-0.1	-27.9	-28.7	-28.2	-27.9	-27.9	-27.7	-27.4	-27.1	-27.5	-27.7	-27.6	-26.4	-27.7
Chessa and Nkupe, Distichodus spp	-1.7	-9.2	-15.8	-14.2	-13.1	-12.0	-12.1	-10.8	-9.7	-11.1	-12.3	-11.5	-8.8	-12.2
Synodontis zambezensis	0.8	3.8	-12.7	-11.0	-8.3	-8.1	-7.1	-6.7	-5.5	-5.8	-6.6	-6.2	-4.7	-7.7
Alestids	-1.3	-12.6	-13.4	-12.3	-12.6	-11.6	-12.2	-10.9	-10.3	-11.9	-12.7	-11.9	-9.7	-11.8
Barbus spp	0.0	-44.9	-51.3	-48.9	-48.3	-46.1	-45.9	-42.3	-37.4	-42.2	-46.0	-42.9	-33.0	-47.1
Cornish jack, Mormyrops anguilloides	-2.4	-32.9	-69.3	-67.8	-62.2	-62.4	-58.8	-58.4	-53.2	-53.6	-54.5	-54.5	-48.1	-63.5
Vundu, Heterobranchus longifilis	-0.7	14.2	-0.3	0.2	0.0	0.4	0.1	0.3	0.3	0.2	-0.3	0.2	0.3	0.3
Tigerfish, Hydrocynus vittatus	0.7	-34.3	-51.5	-43.8	-40.9	-35.7	-37.8	-33.0	-30.1	-34.7	-41.7	-35.0	-27.2	-36.1
Crocodiles														
Crocodiles	0.0	-28.9	-12.8	-11.2	-8.9	-7.2	-7.9	-6.2	-5.0	-7.2	-8.9	-7.2	-4.1	-4.3



Appendix Figure 3 **Overall ecosystem integrity scores for the scenarios at EF Site 1 under the SET B scenarios. The line in category C shows the agreed maximum drop in ecosystem condition in the ecological criteria.**



Appendix Figure 4 **Overall ecosystem integrity scores for the scenarios at EF Site 2 under the SET B scenarios. The line in category C shows the agreed maximum drop in ecosystem condition in the ecological criteria.**

A.2.3. OPERATING RULE SET C

The scenarios presented for Operating Rule Set C comprise one of the ESIA scenarios (Sc3d), which was retained for the purposes of comparison, the nine Set A scenarios, 3 Set B scenarios and an additional four scenarios that were designed and evaluated after the workshop. Three of these: AddPM01-ADDPM03 were contributed by SP (see Memo in Appendix Table 11), and AddPM04 was contributed by Southern Waters, as follows:

AddPM01[14] DRY Season (**Sep-Jan**): Two 3 hour peaks a day, at maximum of 1.5 x the off-peak flows when Q is between Q10 and Q30; run of river when Q<Q10; peaking ramped up to the maximum; off-peak minimum set at Q10%; no sediment flushing.

WET Season (**Feb-Aug**): Two 3 hour peaks a day, at maximum of 1.75 x the off-peak flows when Q is < Q10; peaking ramped up to the maximum; off-peak releases set at Q10%; no sediment flushing.

AddPM02 DRY Season (**Sep-Jan**): Two 3 hour peaks a day with no constraints when Q > Q30; run of river when Q<Q30; peaking ramped up to the maximum; no sediment flushing.

WET Season(**Feb-Aug**): As for AddPM01.

AddPM03 DRY Season (**Sep-Jan**): Two 3 hour peaks a day, at maximum of 1.5 x the off-peak flows when Q is between Q10 and Q30; run of river when Q<Q10; peaking ramped up to the maximum; off-peak minimum set at Q20%; no sediment flushing.

WET Season(**Feb-Aug**): As for AddPM01.

AddPM04 DRY Season (**Sep-Jan**): Baseline flows; no sediment flushing.

WET Season(**Feb-Aug**): QMin with one 6-hour peak a day.

Appendix Table 11 SP Memo from SP for AddPM01-ADDPM03

SCENARIO PM01
WET SEASON (February-August) If Q_{in} >= Q_10% no constraint for the plant and peaking time of 6 h If Q_{in} < Q_10% following criteria are applied: Q_{off_peak} for 18 h a day $Q_{rump\ up/down} = 1.375*Q_{off\_peak}$ for 4 h a day[15] $Q_{peak} = 1.75*Q_{off\_peak}$ for 2 h a day TWO peaking timeframes are considered within the day, between 6-9 am and 6-9 pm, as follows: 6-7 am/pm RAMP UP; 7-8 am/pm PEAK; 8-9 am/pm RAMP DOWN spilled , if any, is always released **DRY SEASON (September-January)** If Q_{in} >= Q_30% no constraint for the plant and peaking time of 6 h If Q_{in} <= Q_10% the plant is run of the river If Q_10%< Q_{in} < Q_30% following criteria are applied: Q_{off_peak} for 18 h a day (with Q_{off_peak} MIN = Q_10%) $Q_{rump\ up/down} = 1.25*Q_{off\_peak}$ for 4 h a day $Q_{peak} = 1.5*Q_{off\_peak}$ for 2 h a day TWO peaking timeframes are considered within the day, between 6-9 am and 6-9 pm, as follows: 6-7 am/pm RAMP UP; 7-8 am/pm PEAK; 8-9 am/pm RAMP DOWN

[14] AddPM for: Additional Scenarios, Post Meeting.

[15] Hourly flows received did not show ramping.

SCENARIO 02 190123
WET SEASON (February-August) same as scenario AddPM01 **DRY SEASON (September-January)** If Q_{in} >= Q_30% no constraint for the plant and peaking time of 6 h If Q_{in} <= Q_30% the plant is run of the river
SCENARIO 03 190123
WET SEASON (February-August) same as scenario 01 190123 **DRY SEASON (September-January)** If Q_{in} >= Q_30% no constraint for the plant and peaking time of 6 h If Q_{in} <= Q_20% the plant is run of the river If Q_20%< Q_{in} < Q_30% following criteria are applied: Q_{off_peak} for 18 h a day (with Q_{off_peak} MIN = Q_20%) $Q_{rump\ up/down} = 1.25*Q_{off\_peak}$ for 4 h a day $Q_{peak} = 1.5*Q_{off\_peak}$ for 2 h a day TWO peaking timeframes are cosidered within the day: between 6-9 am and 6-9 pm, as follows: 6-7 am/pm RAMP UP; 7-8 am/pm PEAK; 8-9 am/pm RAMP DOWN

The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule Set C at EF Site 1 and 2 are given in Appendix Table 12 and Appendix Table 13, respectively. Depictions of the flow regimes associated with each scenario are presented in Appendix B. The estimated mean percentage change in abundance/area/concentration of ecosystem indicators at EF Site and 2 under the SET C scenarios are given in Appendix Table 9 and Appendix Table 10, respectively. Please note that the colour code used in these tables differs from that of the previous tables in this Appendix. In Appendix Table 14 and Appendix Table 15, only predicted changes greater than 25% in FISH species are highlighted, as these are of interest for the environmental criterion in Appendix Table 2.

The Overall Integrity for each of the SET C scenarios at EF Site 1 and 2 are illustrated in Appendix Figure 3 and Appendix Figure 4, respectively.

The results indicate that with respect to the environmental criteria in Appendix Table 2:

- All of the AddPM scenarios (AddPM01, AddPM02, AddPM03 and AddPM04) meet the criterion of no more than a 1.5 class drop in Overall Ecosystem Condition in the downstream river, i.e., from A/B to no less than a mid-C category, at both EF sites.
- Only AddPM04 meets the criterion that at least 90% of fish species should be impacted by <25%, at both EF sites.

We did not assess AddPM04 WET with two 3-hour peak a day, but our expectation is that it would also meet the criterion that at least 90% of fish species should be impacted by <25%, at both EF sites.

Appendix Table 12 **The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule SET C at EF Site 1. Where not provided, units are given in Table 7.1.**

	Baseline	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	AddPM01	AddPM02	AddPM03	AddPM04	Q30	Int1
Mean annual runoff (Mm^3)	35738	35533	35738	35738	35738	35738	35738	35738	35738	35738	35738	35738	35737	35738	35738	35738	35738	35725
Dry season onset	35.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Dry season duration	110.5	117.0	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5
Dry season Min 5d Q	220.6	255.0	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.7	220.6	220.7	220.6	220.6	220.6
Wet season onset	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Wet season duration	147.0	143.5	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
Wet season Max 5d Q	3309	3257	3309	3309	3309	3309	3309	3309	3309	3309	3309	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1
Flood volume	26798	26333	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798
Dry season ave daily vol	25.7	26.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.8	25.7	25.7
T1 ave daily vol	56.6	51.2	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
Wet season ave daily vol	169.6	170.3	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6
T2 ave daily vol	48.3	51.3	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.3	48.3	48.3	48.3	48.3	48.4
Dry within day range	0.0	4.9	563.3	563.3	337.4	337.4	256.3	256.3	162.6	162.6	162.6	178.6	122.5	119.8	124.2	3.5	81.7	404.6
T1 within day range	0.0	1446.6	1089.9	980.1	750.9	610.3	662.3	518.6	372.5	539.7	760.4	539.7	423.6	423.6	423.6	15.0	216.6	645.8
Wet within day range	0.0	311.9	79.8	33.1	75.8	33.1	66.8	33.1	33.1	66.8	79.8	66.8	78.6	78.6	78.6	56.6	33.1	33.1
T2 within day range	0.0	1365.4	1151.3	1151.3	814.3	814.3	618.6	618.6	395.0	395.0	395.0	610.7	413.0	413.0	413.0	6.0	219.0	819.7
Dry season Min 5d Depth	7.7	7.5	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Dry season Min 5d Velocity	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Dry season Min 5d WetPerim	223.7	229.9	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7	223.7
Wet season Max 5d Depth	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
Wet season Max 5d Velocity	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Wet season Max 5d WetPerim	289.2	288.8	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2	289.2
Wet season Min 5d Depth	8.4	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Wet season Min 5d Velocity	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Wet season Min 5d WetPerim	262.4	260.6	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4	262.4
Wet: ave Fine suspended sediment (%)	100.0	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
Wet: max Fine suspended sediment (%)	100.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Wet: ave Coarse suspended sediment (%)	100.0	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9
Wet: max Coarse suspended sediment (%)	100.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

Appendix Table 13 **The suite of flow, hydraulic and sediment indicators calculated from the hourly data for Operating Rule SET C at EF Site 2. Where not provided, units are given in Table 7.1.**

EF2	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	AddPM01	AddPM02	AddPM03	AddPM03	Q30	Int1
Mean annual runoff (Mm^3)	35738	35533	35738	35738	35738	35738	35738	35738	35738	35738	35738	35738	35737	35738	35738	35738	35738	35725
Dry season onset	35.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Dry season duration	110.5	117.0	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5	110.5
Dry season Min 5d Q	220.6	255.0	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.6	220.7	220.6	220.7	220.6	220.6	220.6
Wet season onset	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Wet season duration	147.0	143.5	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0	147.0
Wet season Max 5d Q	3309.2	3256.6	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1	3309.1
Flood volume	26798	26333	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798	26798
Dry season ave daily vol	25.7	26.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.8	25.7	25.7
T1 ave daily vol	56.6	51.2	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
Wet season ave daily vol	169.6	170.3	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6	169.6
T2 ave daily vol	48.3	51.3	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.3	48.3	48.3	48.3	48.3	48.4
Dry within day range	0.0	4.9	563.3	563.3	337.4	337.4	256.3	256.3	162.6	162.6	162.6	178.6	122.5	119.8	124.2	3.5	81.7	404.6
T1 within day range	0.0	1446.6	1089.9	980.1	750.9	610.3	662.3	518.6	372.5	539.7	760.4	539.7	423.6	423.6	423.6	15.0	216.6	645.8
Wet within day range	0.0	311.9	79.8	33.1	75.8	33.1	66.8	33.1	33.1	66.8	79.8	66.8	78.6	78.6	78.6	56.6	33.1	33.1
T2 within day range	0.0	1365.4	1151.3	1151.3	814.3	814.3	618.6	618.6	395.0	395.0	395.0	610.7	413.0	413.0	413.0	6.0	219.0	819.7
Dry season Min 5d Depth	4.5	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Dry season Min 5d Velocity	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Dry season Min 5d WetPerim	120.4	121.7	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4	120.4
Wet season Max 5d Depth	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Wet season Max 5d Velocity	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Wet season Max 5d WetPerim	455.5	453.6	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5	455.5
Wet season Min 5d Depth	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Wet season Min 5d Velocity	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Wet season Min 5d WetPerim	259.4	236.2	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3	259.3
Wet: ave Fine suspended sediment (%)	100.0	19.8	19.8	19.8	19.8	14.8	19.8	19.8	19.8	19.8	19.8	19.8	14.8	14.8	14.8	14.8	19.8	19.8
Wet: max Fine suspended sediment (%)	100.0	20.0	20.0	20.0	20.0	15.0	20.0	20.0	20.0	20.0	20.0	20.0	15.0	15.0	15.0	15.0	20.0	20.0
Wet: ave Coarse suspended sediment (%)	100.0	39.3	39.3	39.3	39.3	29.9	39.3	39.3	39.3	39.3	39.3	39.3	29.9	29.9	29.9	29.9	39.3	39.3
Wet: max Coarse suspended sediment (%)	100.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

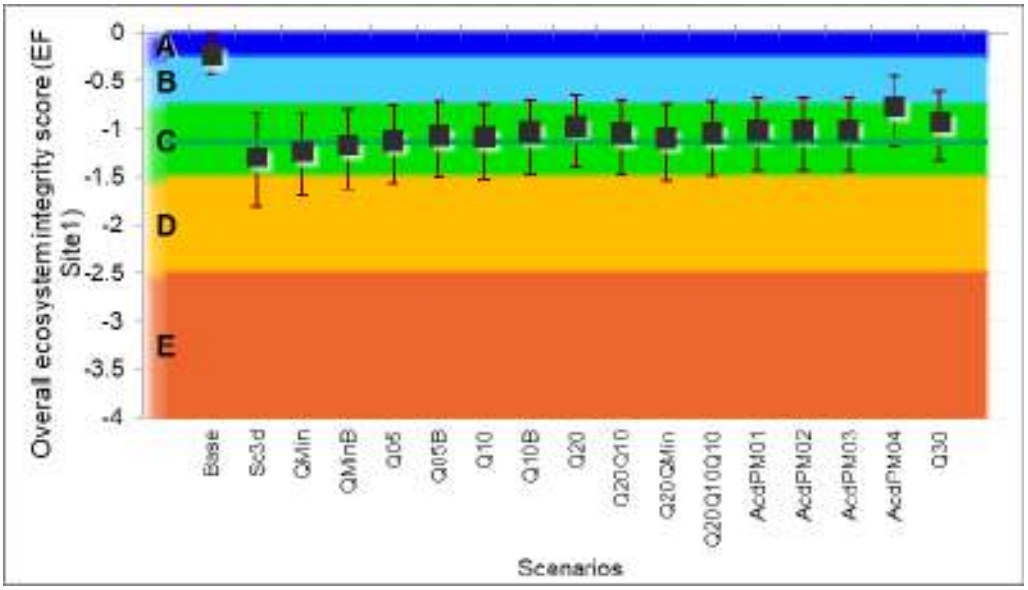
Appendix Table 14 **BGHES EF Site 1: The mean percentage changes in abundance (relative to baseline) for the indicators for the SET C scenarios. Predicted changes in FISH species greater than 25% are highlighted. Baseline, by definition, equals 100%.**

	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	AddPM01	AddPM02	AddPM03	AddPM04	Q30	Int1
Geomorphology																		
Low midchannel rock exposures	0.3	**-46.7**	**-41.3**	**-34.9**	**-25.4**	-22.4	-20.7	-18.6	-14.1	-15.9	-20.4	-17.0	-13.7	-13.7	-13.7	-2.7	-10.7	-23.2
Backwater bed sediment (fine to coarse)	0.9	**110.7**	**109.7**	**108.6**	**106.8**	**106.2**	**105.6**	**105.2**	**104.0**	**104.5**	**105.7**	**105.1**	**104.4**	**104.4**	**104.4**	**101.8**	**103.2**	**106.5**
Area of backwaters and secondary channels	0.9	-22.7	-24.1	-21.3	-17.5	-16.0	-15.1	-13.9	-11.4	-12.4	-14.4	-13.2	-11.9	-11.4	-11.9	-2.8	-9.1	-16.5
Channel bed sediment size (fine to coarse)	1.5	**109.4**	**108.8**	**108.2**	**106.6**	**106.0**	**105.5**	**105.0**	**103.9**	**104.3**	**104.9**	**104.8**	**103.8**	**103.8**	**103.8**	**99.5**	**102.7**	**106.2**
Depth of pools	-1.1	2.0	1.9	1.3	0.3	0.0	-0.2	-0.4	-0.8	-0.7	-0.3	-0.6	-0.9	-0.9	-0.9	-1.9	-1.2	0.0
Sand bars	0.9	**-76.6**	**-76.1**	**-75.4**	**-73.9**	**-73.4**	**-72.9**	**-72.5**	**-71.5**	**-71.9**	**-72.5**	**-72.4**	**-72.2**	**-72.1**	**-72.2**	**-67.1**	**-70.5**	**-73.6**
Riparian vegetation																		
Single-celled diatoms	0.3	-4.8	-6.3	-3.0	2.2	3.8	5.0	6.1	8.7	7.7	5.5	6.8	8.6	8.6	8.6	15.4	10.7	3.7
Filamentous green algae	-0.1	-16.5	-16.1	-11.1	-3.3	-1.0	0.8	2.4	6.2	4.9	1.5	3.5	6.2	6.2	6.2	16.2	9.2	-1.1
Bryophyta	-2.0	**59.7**	**51.1**	**46.2**	**38.3**	**36.1**	**33.9**	**32.3**	**28.3**	**29.6**	**32.8**	**31.4**	**28.7**	**28.6**	**28.7**	17.9	**25.1**	**36.1**
Marginal Graminoids	-1.8	-7.3	-8.0	-8.5	-8.5	-9.3	-8.9	-9.6	-10.1	-9.1	-8.0	-8.9	-8.0	-8.0	-8.0	-12.3	-10.7	-9.4
Marginal Shrubs	-1.6	15.6	12.9	12.3	10.7	9.6	9.6	8.6	6.8	8.2	9.4	8.4	8.7	8.7	8.7	-2.0	5.0	10.2
Lower Trees	-1.5	0.7	-3.3	-3.6	-4.0	-4.3	-4.1	-4.5	-4.7	-4.2	-4.0	-4.2	-4.4	-4.4	-4.4	-4.5	-4.8	-5.0
Upper Trees	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Organic detritus	-0.4	**-34.1**	**-36.1**	**-33.5**	**-28.9**	**-27.1**	**-25.8**	-24.5	-21.5	-22.6	**-25.0**	-23.7	-21.5	-21.4	-21.5	-13.1	-19.1	**-27.3**
Macroinvertebrates																		
Species richness	-1.9	**-41.0**	**-42.7**	**-41.1**	**-41.0**	**-39.8**	**-40.0**	**-39.0**	**-37.6**	**-38.8**	**-39.3**	**-39.0**	**-39.3**	**-38.7**	**-39.2**	**-28.0**	**-36.0**	**-40.6**
Ephemeroptera	-1.3	**-38.8**	**-41.5**	**-36.8**	**-32.4**	**-29.6**	**-28.7**	**-26.3**	-22.1	-24.7	**-28.0**	**-26.0**	**-25.8**	**-25.0**	**-25.7**	-4.9	-18.4	**-30.5**
Oligoneuridae	-1.9	**-35.0**	**-32.8**	**-28.4**	-20.5	-18.5	-16.5	-15.1	-11.5	-12.6	-15.4	-14.0	-11.2	-11.2	-11.3	-1.8	-8.7	-18.6
Chironomidae	0.9	**-38.7**	**-30.6**	**-26.7**	-19.8	-18.0	-16.1	-14.9	-11.4	-12.5	-15.2	-13.9	-11.5	-11.5	-11.5	-4.7	-8.8	-18.2
Ceratopogonidae	-0.9	**-32.1**	**-26.8**	**-26.4**	**-25.1**	-24.9	-24.4	-24.2	-23.5	-23.6	-23.9	-23.9	-23.5	-23.4	-23.5	-24.3	-22.8	**-25.1**
Simulidae	0.4	**-37.6**	**-37.2**	**-32.1**	-23.6	-21.3	-19.1	-17.5	-13.3	-14.6	-18.0	-16.4	-13.4	-13.4	-13.4	-2.4	-10.0	-21.4
Gastropods	1.6	-0.8	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.3	-0.4	-0.4
Fish																		
Redeye labeo, Labeo cylindricus	-0.5	**-34.4**	**-35.6**	**-28.5**	**-31.9**	-24.8	**-29.9**	-23.2	-21.0	**-28.8**	**-33.9**	**-28.8**	**-32.6**	**-32.4**	**-32.6**	-10.9	-19.5	**-26.9**
Cichlids	-1.4	**-26.3**	**-41.5**	**-41.0**	**-38.3**	**-37.8**	**-35.9**	**-35.3**	**-29.9**	**-30.6**	**-31.7**	**-31.6**	**-29.6**	**-27.2**	**-29.3**	-7.2	-24.5	**-38.0**
Synodontis zambezensis	-2.0	-1.8	-11.4	-10.6	-8.5	-8.0	-7.6	-7.2	-6.1	-6.5	-7.0	-6.8	-6.1	-6.0	-6.1	-2.8	-5.2	-7.7
Alestids	-1.7	0.0	-7.8	-7.0	-5.6	-5.2	-4.8	-4.5	-3.8	-4.1	-4.7	-4.4	-4.0	-3.9	-4.0	-1.9	-3.2	-5.3
Cornish jack, Mormyrops anguilloides	-1.7	**-40.2**	**-46.7**	**-46.7**	**-46.3**	**-46.3**	**-46.0**	**-45.9**	**-44.7**	**-44.9**	**-45.2**	**-45.1**	**-44.7**	**-44.1**	**-44.6**	-10.2	**-43.1**	**-46.3**
Vundu, Heterobranchus longifilis	-1.5	1.6	-6.6	-5.7	-5.9	-5.1	-5.6	-4.9	-4.5	-5.3	-5.9	-5.3	-5.6	-5.6	-5.6	-2.0	-4.2	-5.3
Tigerfish, Hydrocynus vittatus	-1.9	-18.9	**-27.2**	-22.3	-22.2	-18.2	-20.3	-16.6	-14.6	-18.5	-21.9	-18.8	-19.9	-19.7	-19.9	-6.8	-12.9	-19.0
Crocodiles																		
Crocodiles	0.0	**-28.9**	-12.8	-11.2	-8.9	-7.2	-7.9	-6.2	-5.0	-7.2	-8.9	-7.2	-6.2	-6.2	-6.3	-5.4	-4.1	-4.3

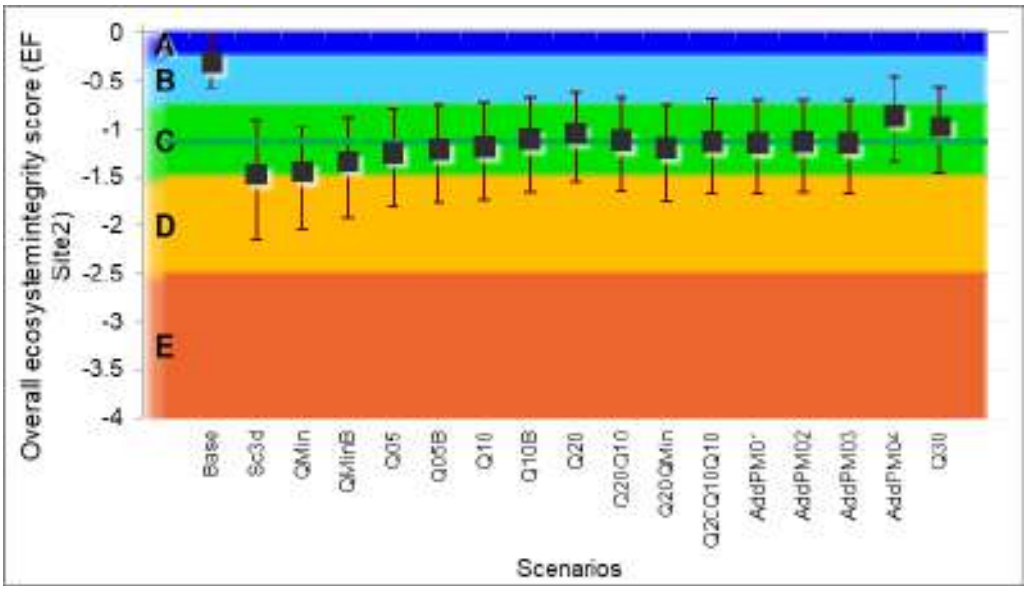
Appendix Table 15 BGHES EF Site 2: The mean percentage changes in abundance (relative to baseline) for the indicators for the SET C scenarios. Predicted changes in FISH species greater than 25% are highlighted. Baseline, by definition, equals 100%.

	Base	Sc3d	QMin	QMinB	Q05	Q05B	Q10	Q10B	Q20	Q20Q10	Q20QMin	Q20Q10Q10	AddPM01	AddPM02	AddPM03	AddPM04	Q30	Int1
Geomorphology																		
Low midchannel rock exposures	1.0	**-40.5**	**-42.3**	**-35.9**	**-26.2**	-23.2	-21.5	-19.4	-14.9	-16.7	-21.1	-17.8	-14.4	-14.4	-14.4	-3.2	-11.4	-23.7
Lengths of cut marginal banks	-1.3	**62.9**	**59.2**	**54.2**	**46.1**	**51.3**	**41.7**	**40.2**	**36.1**	**37.4**	**40.8**	**39.2**	**43.8**	**43.8**	**43.8**	**33.1**	**32.9**	**43.9**
Backwater bed sediment (fine to coarse)	1.8	**111.5**	**112.4**	**111.9**	**111.1**	**111.1**	**110.2**	**110.1**	**108.9**	**109.0**	**109.3**	**109.5**	**109.2**	**108.6**	**109.2**	**104.1**	**107.6**	**111.1**
Area of backwaters and secondary channels	1.9	**-28.0**	**-28.0**	-24.3	-19.6	-17.9	-16.7	-15.3	-12.4	-13.8	-16.3	-14.8	-13.6	-13.4	-13.6	-2.9	-10.0	-18.1
Vegetated midchannel bars	-1.9	**-67.1**	**-66.0**	**-62.8**	**-58.6**	**-58.3**	**-55.4**	**-53.9**	**-50.9**	**-52.2**	**-55.8**	**-53.8**	**-54.3**	**-54.3**	**-54.3**	**-45.6**	**-48.3**	**-58.3**
Channel bed sediment size (fine to coarse)	1.5	**80.1**	**82.5**	**82.5**	**80.7**	**101.2**	**80.2**	**80.2**	**79.6**	**79.6**	**79.6**	**79.7**	**100.0**	**100.0**	**100.0**	**99.0**	**79.2**	**81.1**
Depth of pools	-1.1	11.4	11.2	10.6	9.4	9.4	8.9	8.6	8.1	8.3	8.7	8.5	8.3	8.3	8.3	7.0	7.7	9.2
Sand bars	0.3	**-35.3**	**-35.8**	**-33.2**	**-30.9**	**-33.3**	**-29.5**	**-28.4**	**-26.9**	**-28.1**	**-29.9**	**-28.2**	**-31.4**	**-31.2**	**-31.4**	**-26.5**	**-25.8**	**-30.0**
Riparian vegetation																		
Single-celled diatoms	-0.3	-7.3	-8.8	-5.5	-0.3	3.8	2.5	3.5	6.1	5.2	2.9	4.2	8.7	8.7	8.7	15.4	8.1	1.2
Filamentous green algae	-1.2	-20.0	-18.7	-13.7	-5.9	-1.0	-1.8	-0.2	3.6	2.3	-1.1	0.9	6.2	6.2	6.2	16.2	6.6	-3.8
Marginal Graminoids	-0.7	-19.7	-18.0	-14.4	-9.5	-12.1	-7.5	-7.5	-6.3	-5.7	-6.3	-6.3	-6.3	-6.3	-6.3	-5.6	-5.5	-9.2
Marginal Shrubs	-1.5	-8.4	-8.7	-5.2	-1.8	-4.5	-0.5	-0.7	-0.6	0.1	-0.4	-0.4	-1.2	-1.2	-1.2	-5.8	-1.0	-1.5
Lower Trees	-1.1	9.2	0.8	0.4	-0.2	-1.5	-0.6	-1.0	-1.5	-0.8	0.0	-0.7	-1.6	-1.6	-1.6	-3.3	-2.1	-2.5
Upper Trees	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Organic detritus	1.2	**-35.5**	**-37.4**	**-33.9**	**-28.7**	**-27.4**	**-25.5**	-24.2	-21.0	-22.2	**-25.1**	-23.3	-21.7	-21.7	-21.7	-13.5	-18.5	**-27.1**
Macroinvertebrates																		
Species richness	-1.9	-24.8	-23.0	-22.1	-19.2	-21.9	-18.3	-18.6	-18.1	-17.7	-16.8	-17.9	-19.8	-19.8	-19.8	-20.2	-17.7	-18.3
Ephemeroptera	-1.7	-21.1	-22.5	-19.5	-13.9	-13.1	-11.2	-10.4	-7.9	-8.5	-10.3	-9.5	-7.8	-7.8	-7.8	-1.8	-6.0	-12.9
Bivalves	-1.7	-23.0	**-29.4**	**-27.1**	-24.8	**-27.4**	-23.7	-22.7	-21.4	-22.4	-23.9	-22.4	**-25.4**	**-25.2**	**-25.4**	-20.9	-20.5	-24.0
Oligoneuridae	-1.9	**-30.8**	**-30.4**	**-26.6**	-19.2	-17.5	-15.5	-14.3	-10.8	-11.8	-14.4	-13.1	-10.7	-10.6	-10.7	-1.7	-8.1	-17.8
Chironomidae	1.3	**-32.5**	**-28.6**	**-25.5**	-20.2	-18.8	-17.3	-16.3	-13.5	-14.3	-16.4	-15.4	-13.6	-13.4	-13.6	-5.3	-11.1	-18.9
Shrimps	-0.9	-6.0	-7.2	-5.8	-3.8	-4.8	-3.0	-3.0	-2.5	-2.3	-2.5	-2.5	-2.5	-2.5	-2.5	-2.2	-2.2	-3.7
Ceratopogonidae	0.7	**-29.9**	**-28.0**	**-28.0**	**-27.5**	**-27.4**	**-27.2**	**-27.1**	**-26.8**	**-26.8**	**-26.9**	**-26.9**	**-26.8**	**-26.7**	**-26.8**	**-25.3**	**-26.4**	**-27.5**
Simulidae	0.1	**-38.1**	**-36.8**	**-31.5**	-23.0	-20.9	-18.4	-16.8	-12.7	-14.0	-17.4	-15.7	-12.6	-12.6	-12.6	-2.8	-9.6	-20.6
Gastropods	0.5	-0.9	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.7	-0.7	-0.7	-0.3	-0.6	-0.6

Fish																		
Labeo altivelis	-0.6	**-62.7**	**-70.0**	**-58.0**	**-58.3**	**-40.0**	**-51.3**	**-36.7**	**-29.2**	**-45.3**	**-58.9**	**-46.5**	**-47.6**	**-47.3**	**-47.7**	-1.5	-23.6	**-46.8**
Redeye labeo, Labeo cylindricus	1.1	**-29.4**	**-31.4**	**-25.2**	**-27.8**	-22.1	**-26.1**	-20.7	-19.0	**-25.2**	**-29.4**	**-25.2**	**-28.1**	**-27.9**	**-28.1**	-8.8	-17.7	-23.7
Cichlids	-0.1	**-27.9**	**-28.7**	**-28.2**	**-27.9**	**-27.9**	**-27.7**	**-27.4**	**-27.1**	**-27.5**	**-27.7**	**-27.6**	**-27.7**	**-27.6**	**-27.7**	-13.7	**-26.4**	**-27.7**
Chessa and Nkupe, Distichodus spp	-1.7	-9.2	-15.8	-14.2	-13.1	-12.0	-12.1	-10.8	-9.7	-11.1	-12.3	-11.5	-11.5	-11.5	-11.5	-2.6	-8.8	-12.2
Synodontis zambezensis	0.8	3.8	-12.7	-11.0	-8.3	-8.1	-7.1	-6.7	-5.5	-5.8	-6.6	-6.2	-5.6	-5.5	-5.6	-3.0	-4.7	-7.7
Alestids	-1.3	-12.6	-13.4	-12.3	-12.6	-11.6	-12.2	-10.9	-10.3	-11.9	-12.7	-11.9	-12.6	-12.6	-12.6	-6.2	-9.7	-11.8
Barbus spp	0.0	**-44.9**	**-51.3**	**-48.9**	**-48.3**	**-46.1**	**-45.9**	**-42.3**	**-37.4**	**-42.2**	**-46.0**	**-42.9**	**-45.4**	**-43.6**	**-45.2**	-14.9	**-33.0**	**-47.1**
Cornish jack, Mormyrops anguilloides	-2.4	**-32.9**	**-69.3**	**-67.8**	**-62.2**	**-62.4**	**-58.8**	**-58.4**	**-53.2**	**-53.6**	**-54.5**	**-54.5**	**-53.4**	**-51.1**	**-53.0**	-18.5	**-48.1**	**-63.5**
Vundu, Heterobranchus longifilis	-0.7	14.2	-0.3	0.2	0.0	0.4	0.1	0.3	0.3	0.2	-0.3	0.2	0.0	0.0	0.0	0.5	0.3	0.3
Tigerfish, Hydrocynus vittatus	0.7	**-34.3**	**-51.5**	**-43.8**	**-40.9**	**-35.7**	**-37.8**	**-33.0**	**-30.1**	**-34.7**	**-41.9**	**-35.0**	**-36.6**	**-36.5**	**-36.6**	-15.3	**-27.2**	**-36.1**
Crocodiles																		
Crocodiles	0.0	**-28.9**	-12.8	-11.2	-8.9	-7.2	-7.9	-6.2	-5.0	-7.2	-8.9	-7.2	-6.2	-6.2	-6.3	-5.4	-4.1	-4.3



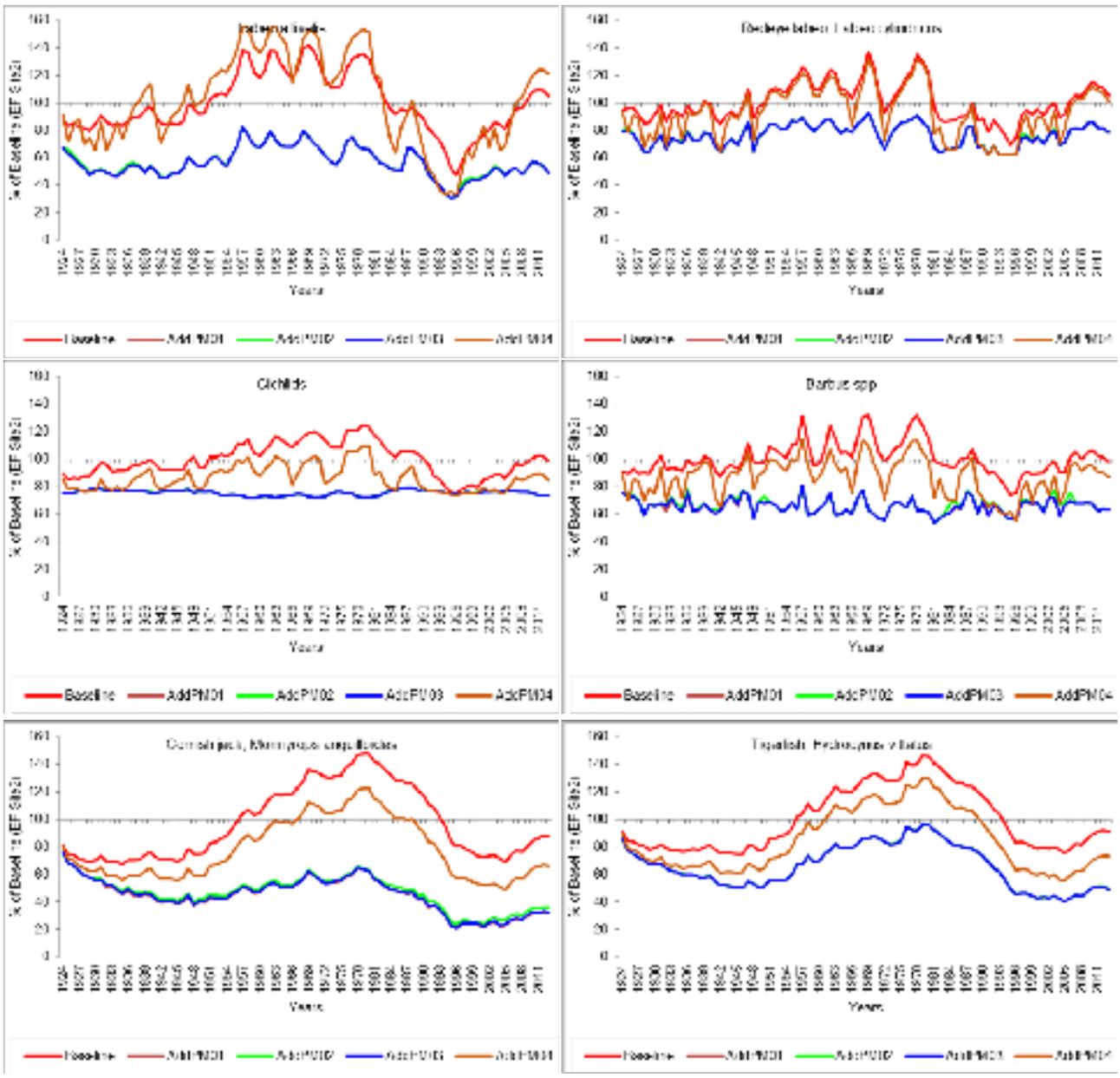
Appendix Figure 5 **Overall ecosystem integrity scores for the scenarios at EF Site 1 under the SET C scenarios. The line in category C shows the agreed maximum drop in ecosystem condition in the ecological criteria.**



Appendix Figure 6 **Overall ecosystem integrity scores for the scenarios at EF Site 2 under the SET C scenarios. The line in category C shows the agreed maximum drop in ecosystem condition in the ecological criteria.**

Finally, as mentioned, the projected impacts associated with the scenarios in Appendix Table 14 and Appendix Table 15 are based on median changes in abundance/concentration/area of the indicators over a 90-year flow sequence. However, these abundances are expected to vary year-on-year, based on climatic and other conditions, e.g., wet years versus dry years. The modelled time-series of fish abundances under the SET C scenarios, should similar climatic and development conditions prevail over the next 90 years, are illustrated in Appendix Figure 7. It

is important to take these expected annual variations into consideration in the design and implementation of the monitoring and evaluation of the downstream impact of BGHES, as exclusive use of the median values could result in misinterpretation of the monitoring results.



Appendix Figure 7 **Modelled time-series of abundances for a selection of fish indicators at EF Site 2 under the AddPM scenarios.**

A.3. DECISION ON OPERATING RULES TO MEET EFLOWS FOR THE DOWNSTREAM RIVER

The final agreed operating rules to satisfy downstream EFlows requirements were:

AddPM04 DRY Season (**Sep-Jan**): Baseline flows; no sediment flushing.
WET Season (**Feb-Aug**): QMin with one 6-hour peak a day.

A.4. EFLOWS FOR THE DEWATERED REACHES BETWEEN THE WEIR AND THE TAILRACE

EFlows releases to cater for the 600 m of river between the weir and the tailrace were not explicitly considered in the ESIA or the subsequent assessments. However, there was general agreement that the EFlows operating rules would focus on the Zambezi River downstream of the tailrace, and that forgoing peaking in the dry months would result in a significantly greater reduction of the impacts of the HPP on the river than would forcing high EFlows releases at the weir.

Thus, for the 600-m dewatered section, the following provisions have been agreed to:

- Minimum release of 10% of the mean annual dry season discharge in the hydrological record used for the EFlows assessment. This equates to a daily volume of 2.57 m^3.
- Provision to ensure that there are permanent pools covering at least 50% of the previously wetted area in the 600 m section to provide habitat during the dry months, and to reduce the impression of dewatering. There is a likelihood that this will require some construction to create artificial pools, but this will be decided once Batoka Weir is in place.

A.5. EFLOWS DURING HYDROPOWER MAINTENANCE OPERATIONS

Details of the maintenance schedules for the BGHES are not available at this stage. However, as a general rule, EFlows releases as agreed should be maintained during maintenance operations. In instances where short deviations are unavoidable, these should not exceed four hours and at no point shall there be a complete suspension of downstream releases.

A.6. RESERVOIR FILLING RULES

Reservoir filling rules were not explicitly considered in the ESIA or the subsequent assessments. However, the environmental criteria in Appendix Table 2 offer some guidance for setting these. Thus, the impacts on the downstream river ecosystem of the following reservoir filling rules were tested:

Q10NP – All seasons: if flows are above the monthly 10th percentile values (Appendix Table 1), the surplus is stored, the rest released; no peaking; no sediment flushing.

Q20NP – All seasons: if flows are above the monthly 20th percentile values (Appendix Table 1), the surplus is stored, the rest released; no peaking; no sediment flushing.

Q30NP – All seasons: if flows are above the monthly 30th percentile values (Appendix Table 1), the surplus is stored, the rest released; no peaking; no sediment flushing.

The estimated mean percentage change in abundance/area/concentration of ecosystem indicators at EF Site and 2 under the SET C scenarios are given in Appendix Table 16 and Appendix Table 17, respectively.

The Overall Integrity for each of the SET C scenarios at EF Site 1 and 2 are illustrated in Appendix Figure 3 and Appendix Figure 4, respectively.

The results indicate that with respect to the environmental criteria in Appendix Table 2, and at the more-sensitive EF Site 2:

- Q20NP and Q30NP meet the criterion of no more than a 1.5 class drop in Overall Ecosystem Condition in the downstream river, i.e., from A/B to no less than a mid-C category, at both EF sites.
- None of the scenarios meets the criterion that at least 90% of fish species should be impacted by <25%, at both EF sites.

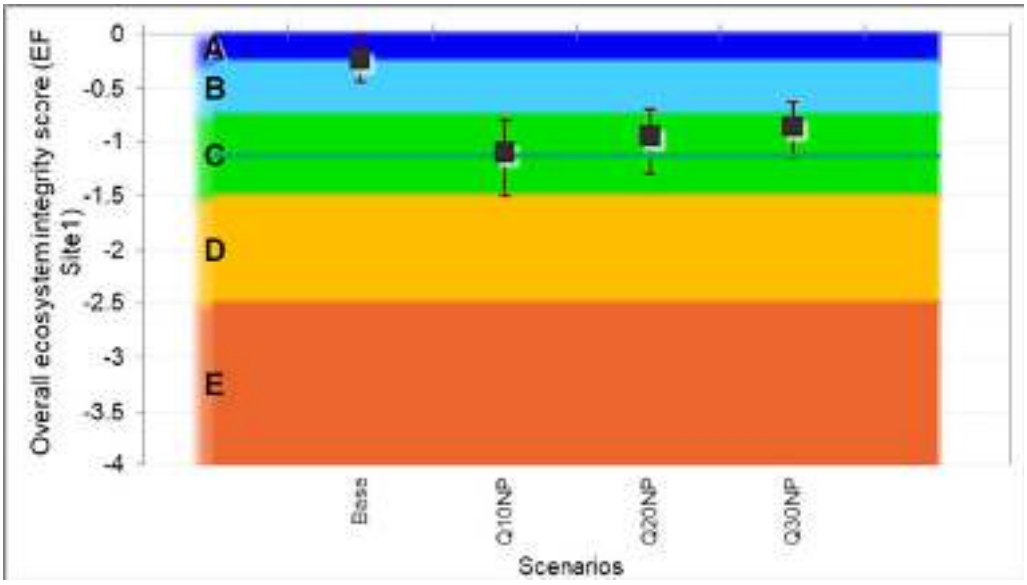
However, the scenarios evaluated assume that the filling rules will be applied <u>consistently for 90 years</u>. In our opinion, given the outcome of the scenarios assessed, i.e., that even if applied for 90 years, both Q20NP and Q30NP meet the first of the two ecological criteria, the releases during reservoir filling should be in line with Q20NP, provided this is not applied for longer than two years.

Appendix Table 16 **BGHES EF Site 1: The mean percentage changes in abundance (relative to baseline) for the indicators for the Reservoir Filling scenarios. Predicted changes in FISH species greater than 25% are highlighted. Baseline, by definition, equals 100%.**

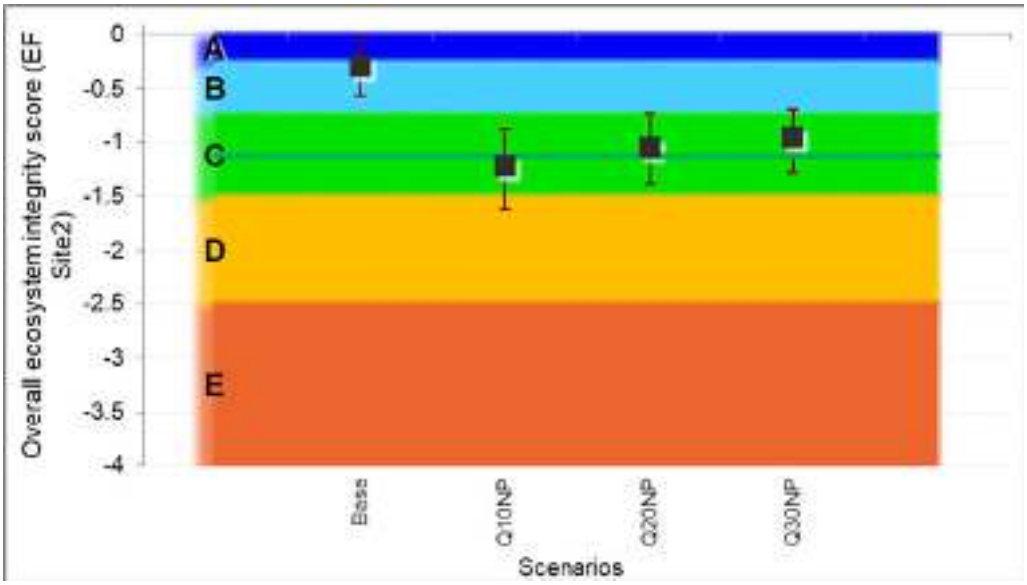
EF1	Base	Q10NP	Q20NP	Q30NP
Geomorphology				
Low midchannel rock exposures	0.3	1.6	1.7	-0.1
Backwater bed sediment (fine to coarse)	0.9	**95.6**	**96.9**	**98.6**
Area of backwaters and secondary channels	0.9	-6.9	-5.5	-4.8
Channel bed sediment (fine to coarse)	1.5	**103.7**	**103.5**	**103.0**
Depth of pools	-1.1	-4.5	-2.3	-1.8
Sand bars	0.9	**-67.0**	**-68.3**	**-68.3**
Riparian vegetation				
Single-celled diatoms	0.3	**30.3**	**25.5**	**25.2**
Filamentous green algae	-0.1	**29.0**	**26.5**	**25.7**
Bryophyta	-2.0	**38.6**	**32.1**	**28.6**
Marginal Graminoids	-1.8	-14.0	-14.7	-14.6
Marginal Shrubs	-1.6	3.5	3.2	3.8
Lower Trees	-1.5	-14.6	-11.4	-10.0
Upper Trees	0.1	-3.7	-1.7	-0.6
Organic detritus	-0.4	-19.2	-16.9	-14.0
Macroinvertebrates				
Species richness	-1.9	**-30.1**	**-27.9**	**-28.5**
Ephemeroptera	-1.3	3.2	4.0	2.7
Oligoneuridae	-1.9	1.2	1.4	1.3
Chironomidae	0.9	14.1	7.3	4.2
Ceratopogonidae	-0.9	-3.8	-12.1	-15.7
Simulidae	0.4	0.3	1.0	0.1
Gastropods	1.6	23.7	14.2	9.0
Fish				
Redeye labeo, Labeo cylindricus	-0.5	-14.6	-10.2	-7.8
Cichlids	-1.4	**-28.2**	-17.4	-14.7
Synodontis zambezensis	-2.0	**-25.9**	-23.5	-16.6
Alestids	-1.7	-22.9	-15.2	-11.5
Cornish jack, Mormyrops anguilloides	-1.7	**-46.1**	**-35.9**	**-29.6**
Vundu, Heterobranchus longifilis	-1.5	**-27.2**	-18.8	-14.5
Tigerfish, Hydrocynus vittatus	-1.9	**-42.8**	**-30.5**	-23.7
Crocodiles				
Crocodiles	0.0	0.0	0.0	0.0

Appendix Table 17 BGHES EF Site 2: The mean percentage changes in abundance (relative to baseline) for the indicators for the Reservoir Filling scenarios. Predicted changes in FISH species greater than 25% are highlighted. Baseline, by definition, equals 100%.

	Base	Q10NP	Q20NP	Q30NP
Geomorphology				
Low midchannel rock exposures	1.0	-0.9	-1.1	0.3
Lengths of cut marginal banks	-1.3	**42.9**	**39.8**	**37.9**
Backwater bed sediment (fine to coarse)	1.8	**103.9**	**103.8**	**104.1**
Area of backwaters and secondary channels	1.9	-5.2	-4.1	-3.0
Vegetated midchannel bars	-1.9	**-26.4**	**-28.4**	**-31.0**
Channel bed sediment (fine to coarse)	1.5	**103.7**	**103.5**	**103.0**
Depth of pools	-1.1	3.3	6.4	7.1
Sand bars	0.3	**-25.3**	**-26.7**	**-26.2**
Riparian vegetation				
Single-celled diatoms	-0.3	**28.4**	**25.6**	**25.3**
Filamentous green algae	-1.2	**30.1**	**27.6**	**26.8**
Marginal Graminoids	-0.7	-8.4	-8.2	-7.2
Marginal Shrubs	-1.5	2.6	2.9	3.5
Lower Trees	-1.1	-15.0	-11.8	-10.4
Upper Trees	0.1	-3.3	-1.5	-0.5
Organic detritus	1.2	-13.4	-11.9	-11.6
Macroinvertebrates				
Species richness	-1.9	**-37.4**	**-34.5**	**-33.1**
Ephemeroptera	-1.7	0.5	4.3	2.4
Bivalves	-1.7	**-29.1**	**-26.1**	-23.7
Oligoneuridae	-1.9	0.8	3.4	3.8
Chironomidae	1.3	3.5	-1.7	-3.9
Shrimps	-0.9	0.9	0.7	-0.5
Ceratopogonidae	0.7	-8.4	-16.2	-18.8
Simulidae	0.1	3.4	3.4	1.5
Gastropods	0.5	17.9	9.7	6.8
Fish				
Labeo altivelis	-0.6	-20.0	-7.9	-3.2
Redeye labeo, Labeo cylindricus	1.1	-20.0	-14.6	-11.7
Cichlids	-0.1	**-26.4**	-21.0	-17.5
Chessa and Nkupe, Distichodus spp	-1.7	**-49.9**	**-35.2**	**-28.9**
Synodontis zambezensis	0.8	**-39.8**	**-28.4**	-22.5
Alestids	-1.3	-9.4	-6.3	-4.7
Barbus spp	0.0	-21.2	-15.9	-12.1
Cornish jack, Mormyrops anguilloides	-2.4	**-82.8**	**-58.2**	**-47.6**
Vundu, Heterobranchus longifilis	-0.7	**-39.0**	**-25.5**	-19.5
Tigerfish, Hydrocynus vittatus	0.7	**-71.0**	**-64.6**	**-56.5**
Crocodiles				
Crocodiles	0.0	0.0	0.0	0.0



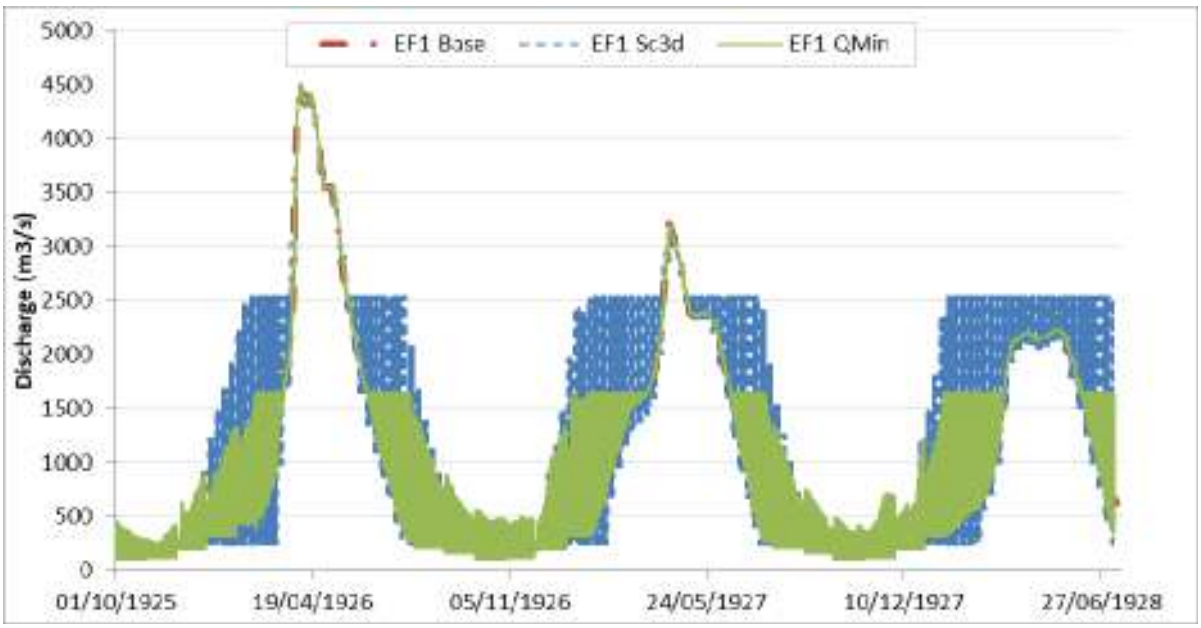
Appendix Figure 8 **Overall ecosystem integrity scores for the scenarios at EF Site 1 under the Reservoir Filling scenarios. The line in category C shows the agreed maximum drop in ecosystem condition in the ecological criteria.**

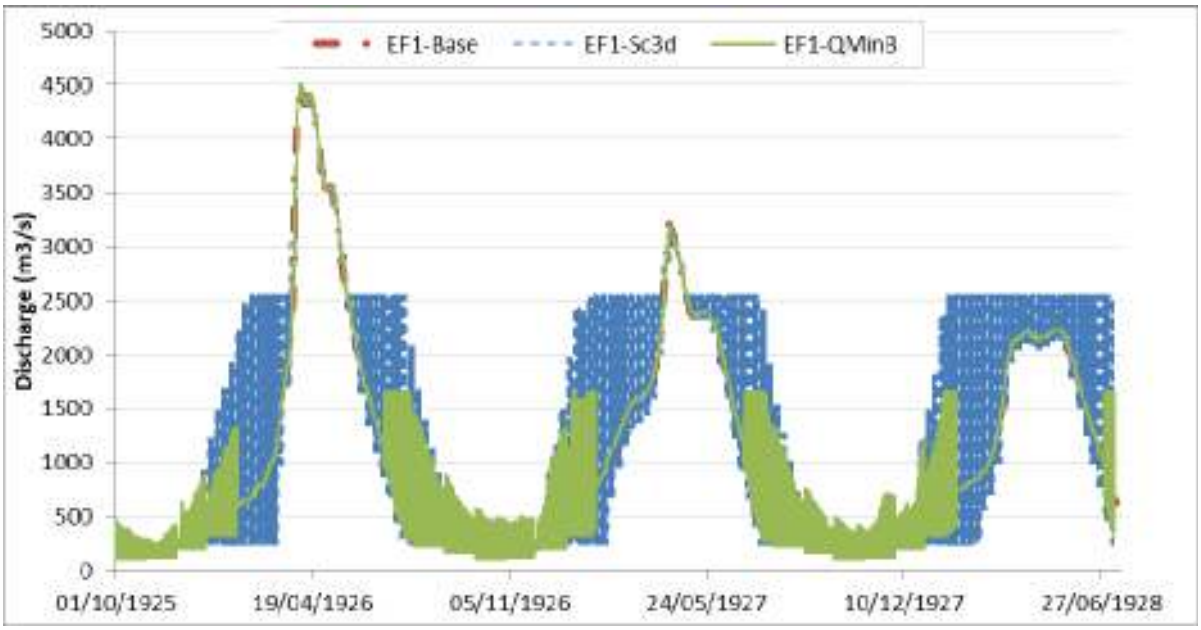


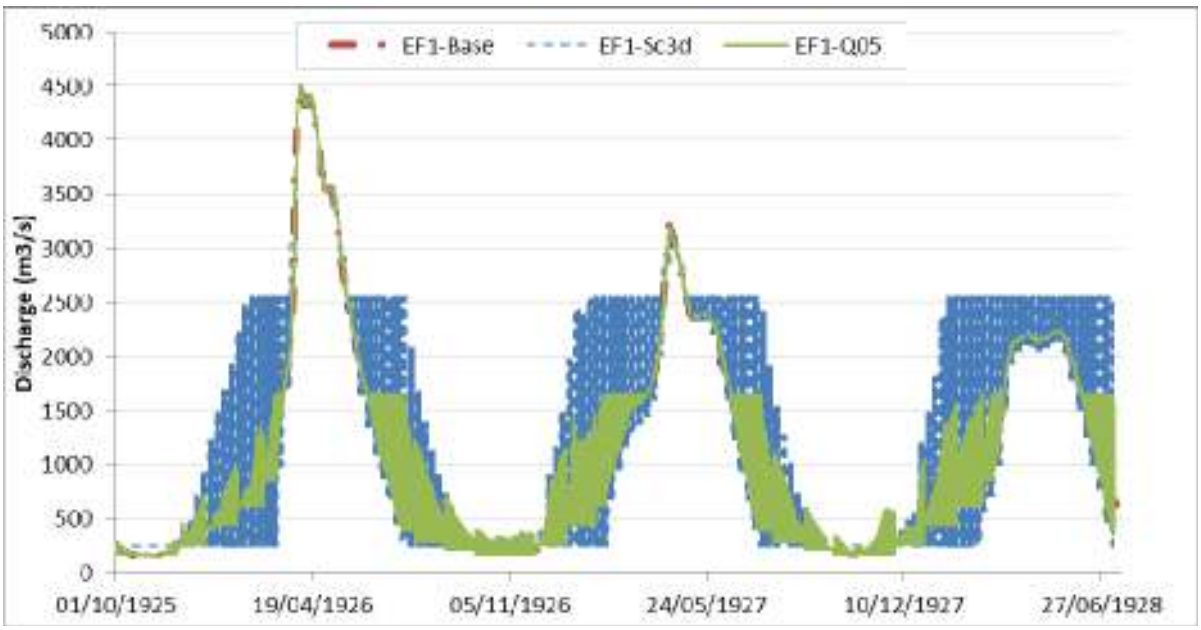
Appendix Figure 9 **Overall ecosystem integrity scores for the scenarios at EF Site 2 under the Reservoir Filling scenarios. The line in category C shows the agreed maximum drop in ecosystem condition in the ecological criteria.**

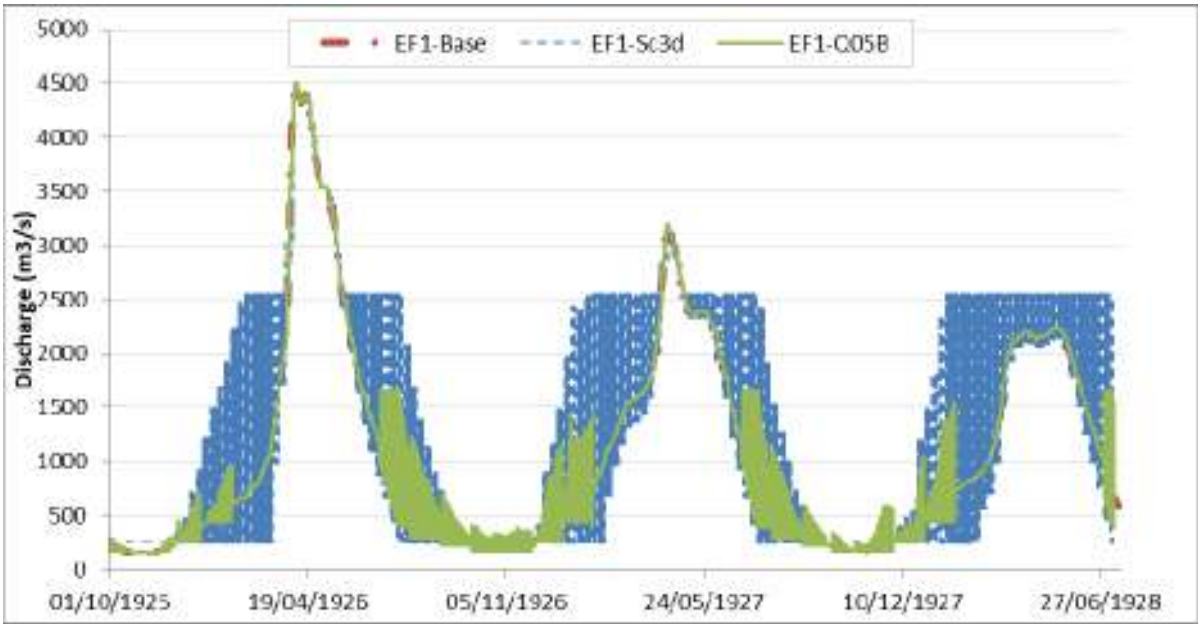
Appendix B. DEPICTIONS OF THE FLOW REGIMES ASSOCIATED WITH EACH OPERATIONAL SCENARIO

Each of the additional operating scenarios are shown with the Baseline (EF1-Base) and one of the ESIA scenarios (EF-Sc3d) as reference.






EF1-Base
EF1-Sc3d
EF1-Q05
Discharge (m3/s)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928


EF1-Base
EF1-Sc3d
EF1-Q05B
Discharge (m3/s)
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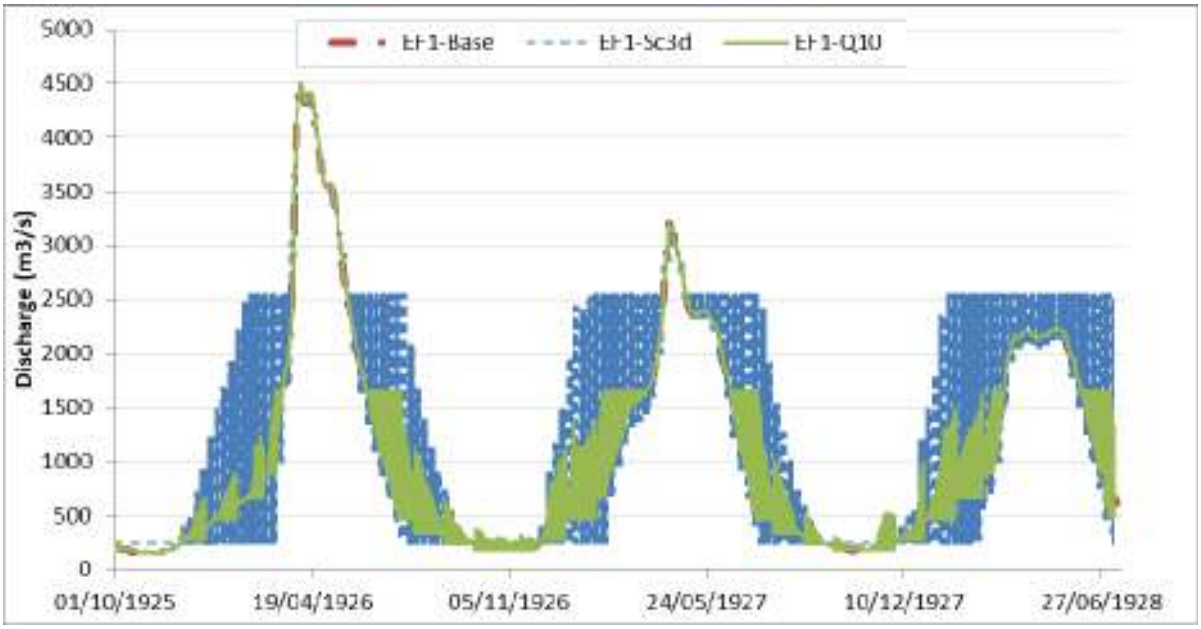
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928


EF1-Base
EF1-Sc3d
EF1-Q10
Discharge (m3/s)
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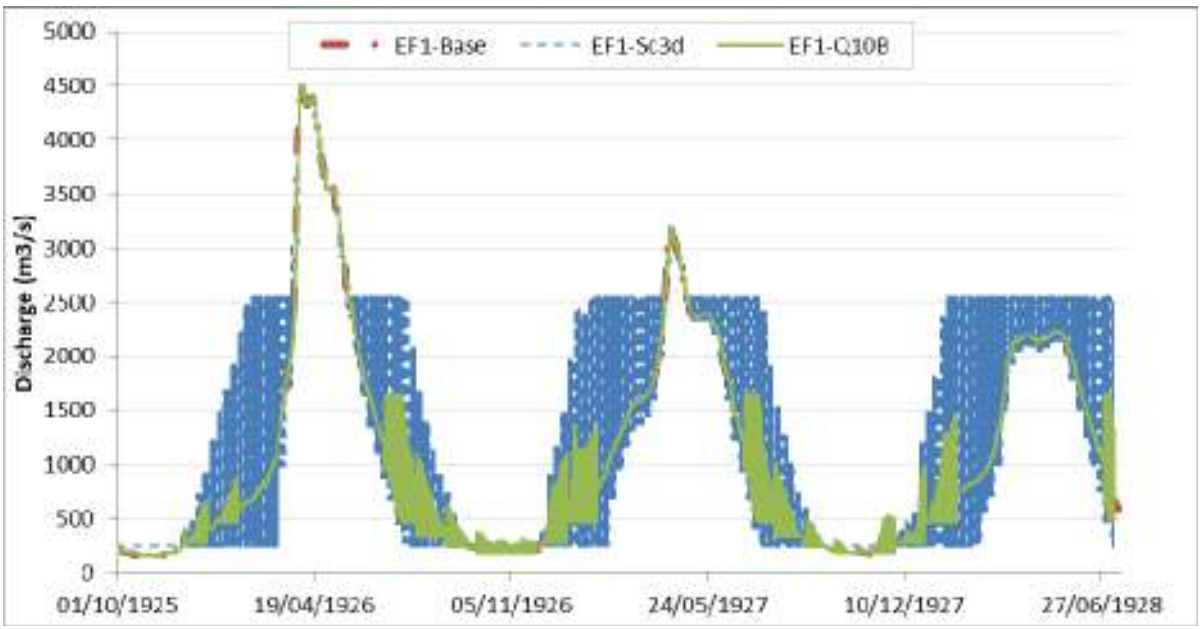
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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EF1-Sc3d
EF1-Q10B
Discharge (m3/s)
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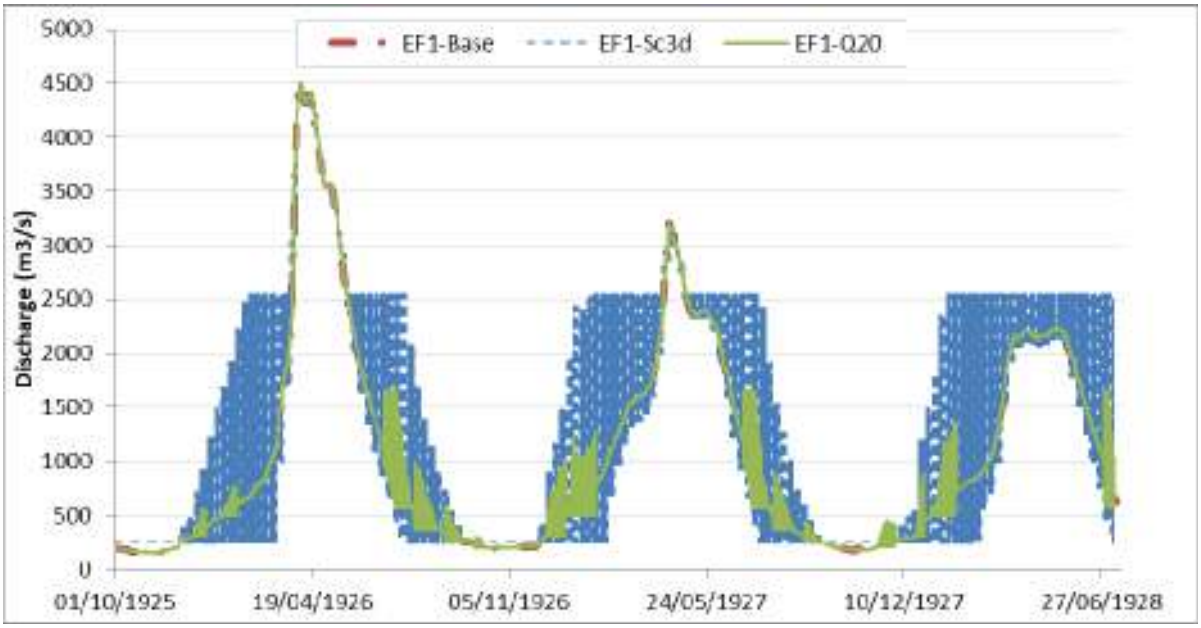
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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EF1-Sc3d
EF1-Q20
Discharge (m3/s)
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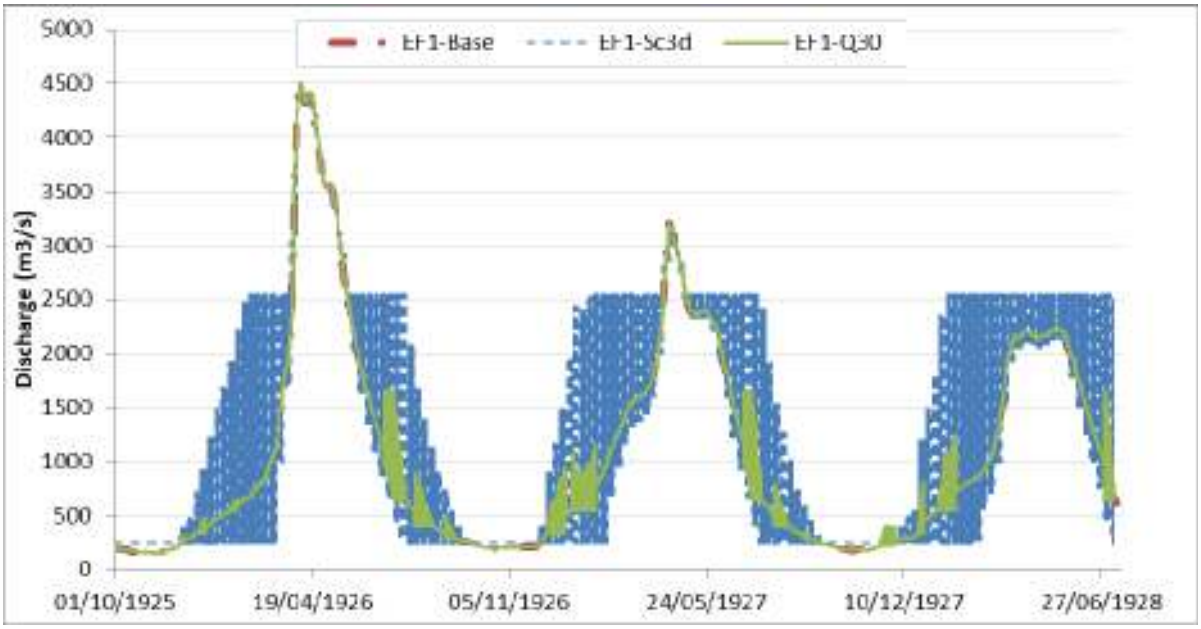
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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EF1-Sc3d
EF1-Q30
Discharge (m3/s)
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4500
4000
3500
3000
2500
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1500
1000
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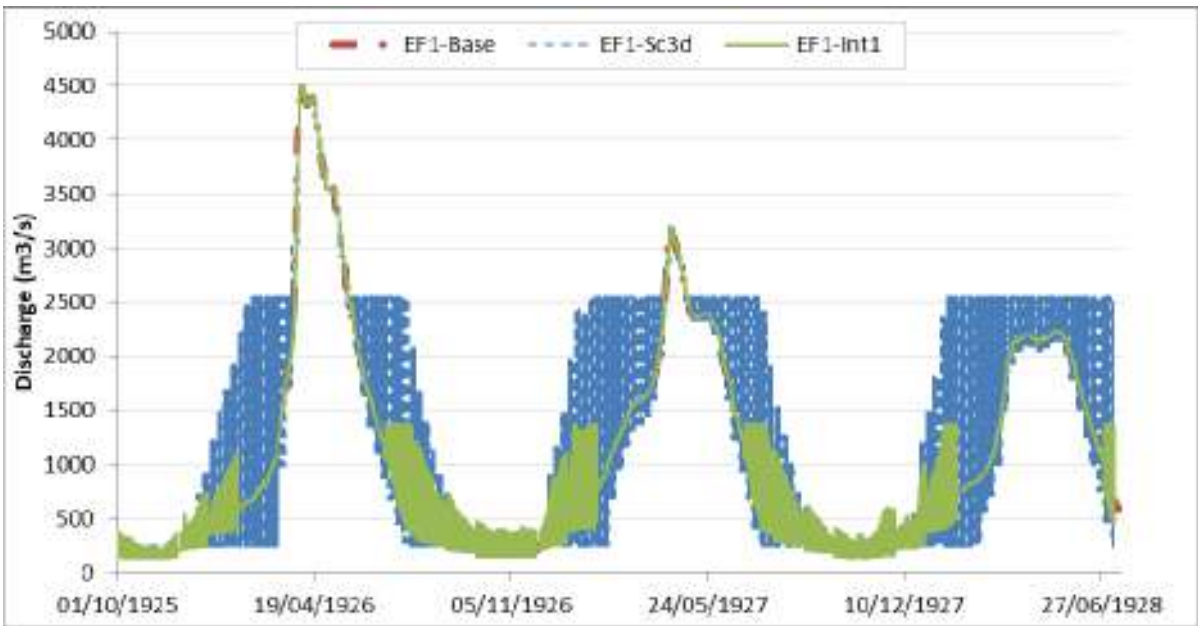
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928


EF1-Base
EF1-Sc3d
EF1-Int1
Discharge (m3/s)
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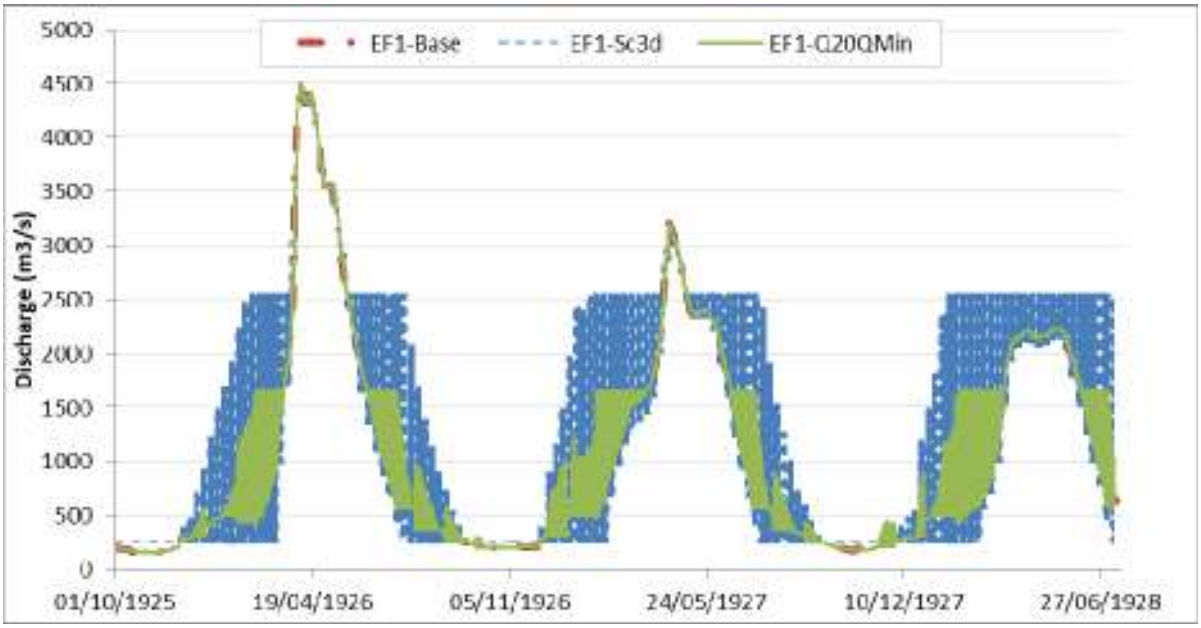
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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EF1-Sc3d
EF1-Q20QMin
Discharge (m3/s)
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4500
4000
3500
3000
2500
2000
1500
1000
500
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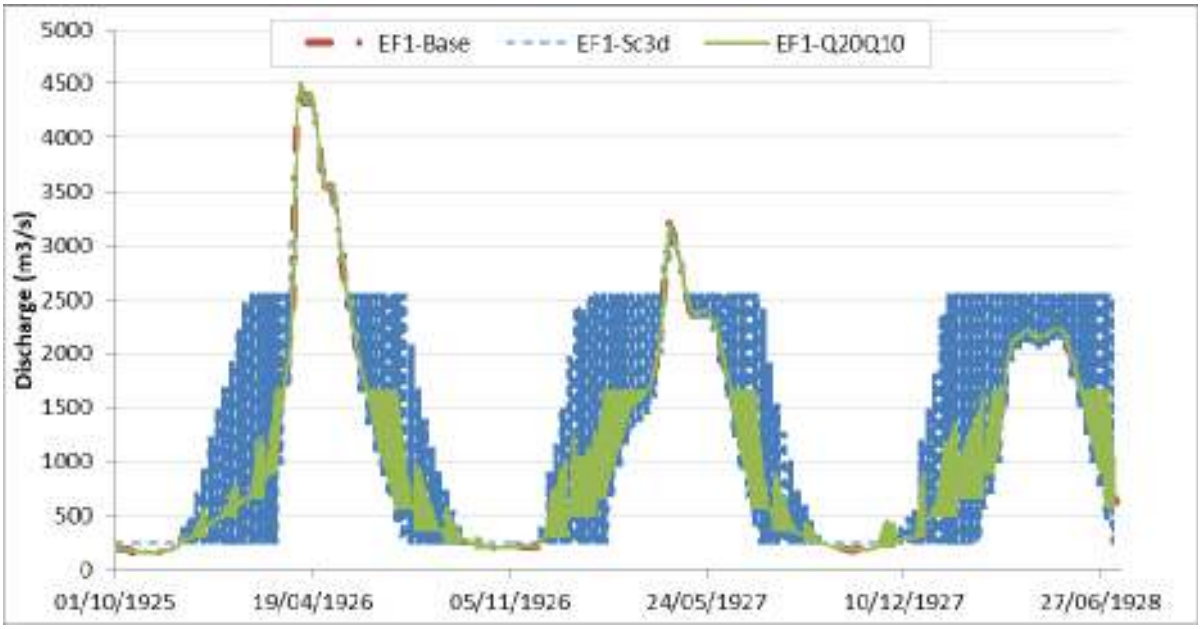
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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EF1-Sc3d
EF1-Q20Q10
Discharge (m3/s)
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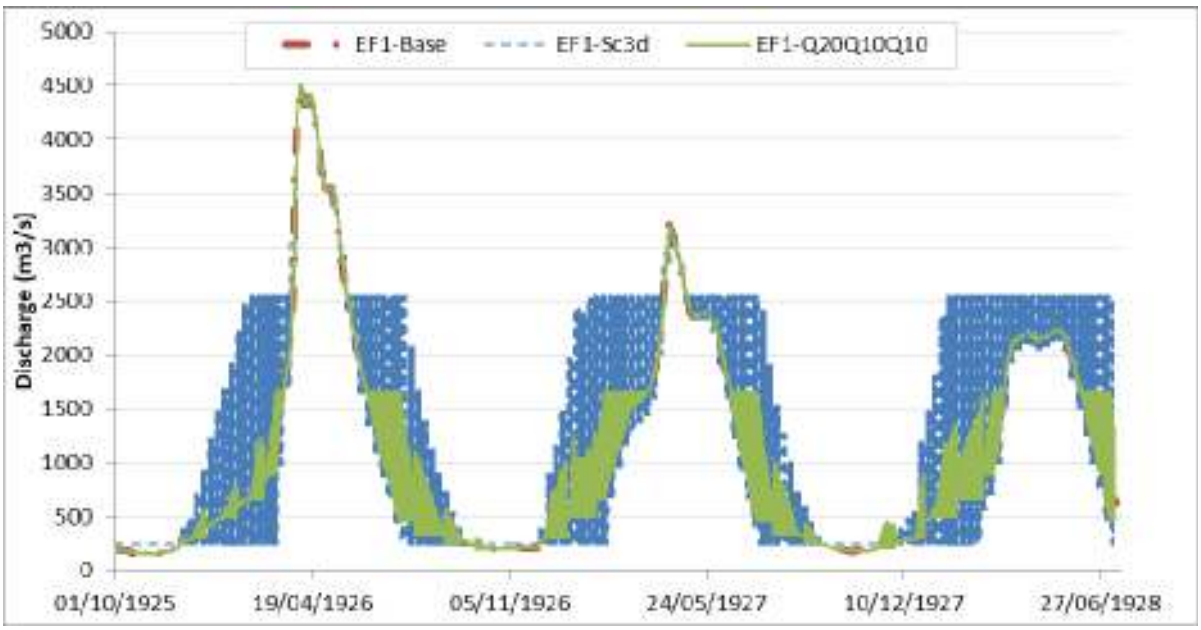
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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EF1-Sc3d
EF1-Q20Q10Q10
Discharge (m3/s)
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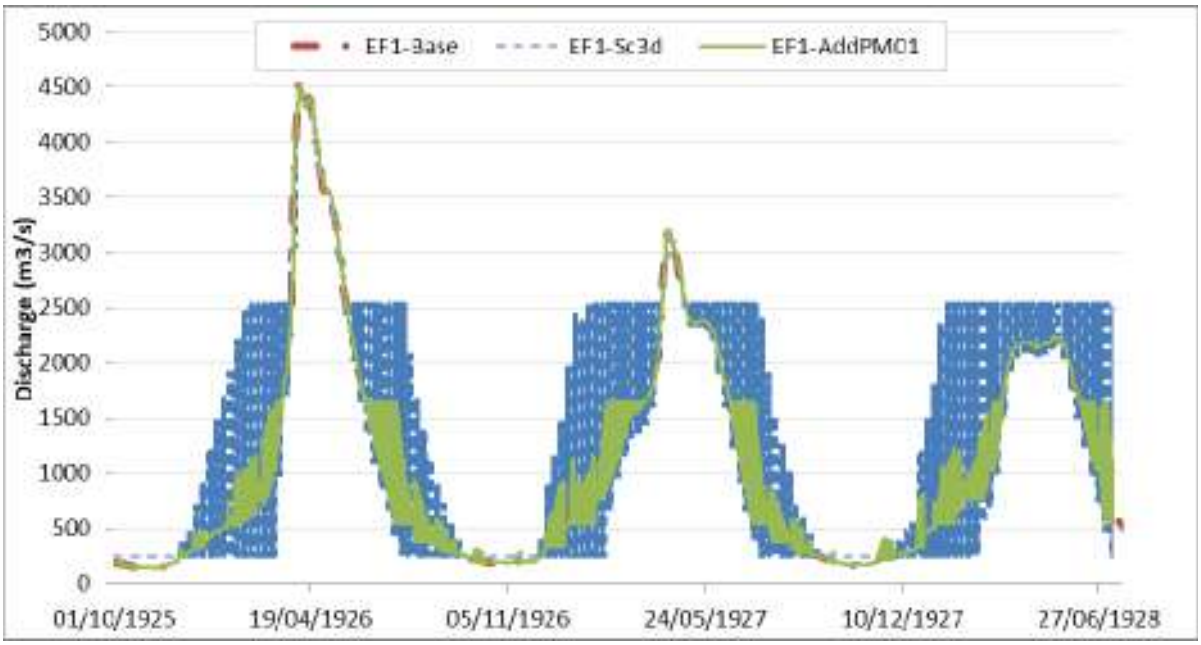
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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4000
3500
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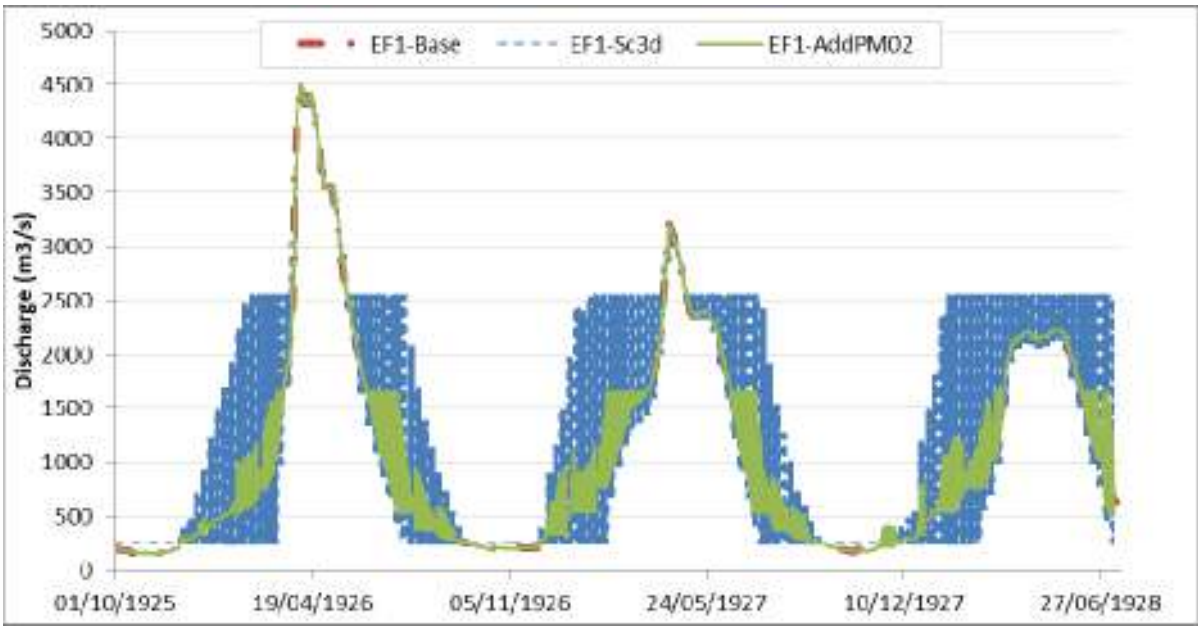
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928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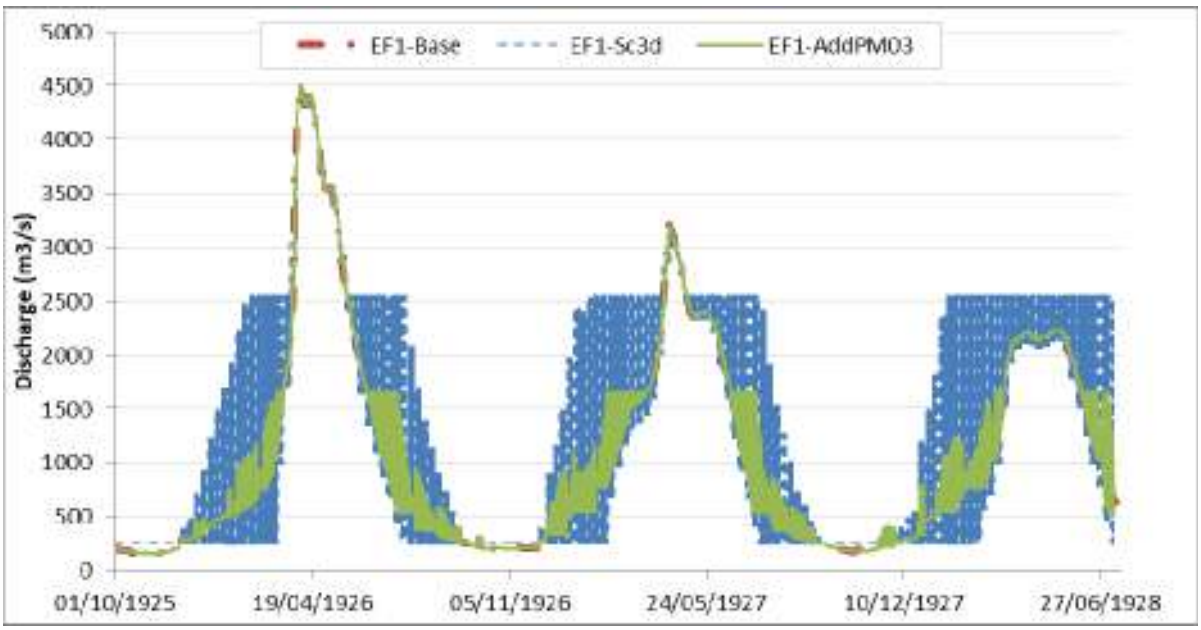
05/11/1926
24/05/1927
10/12/1927
27/06/1928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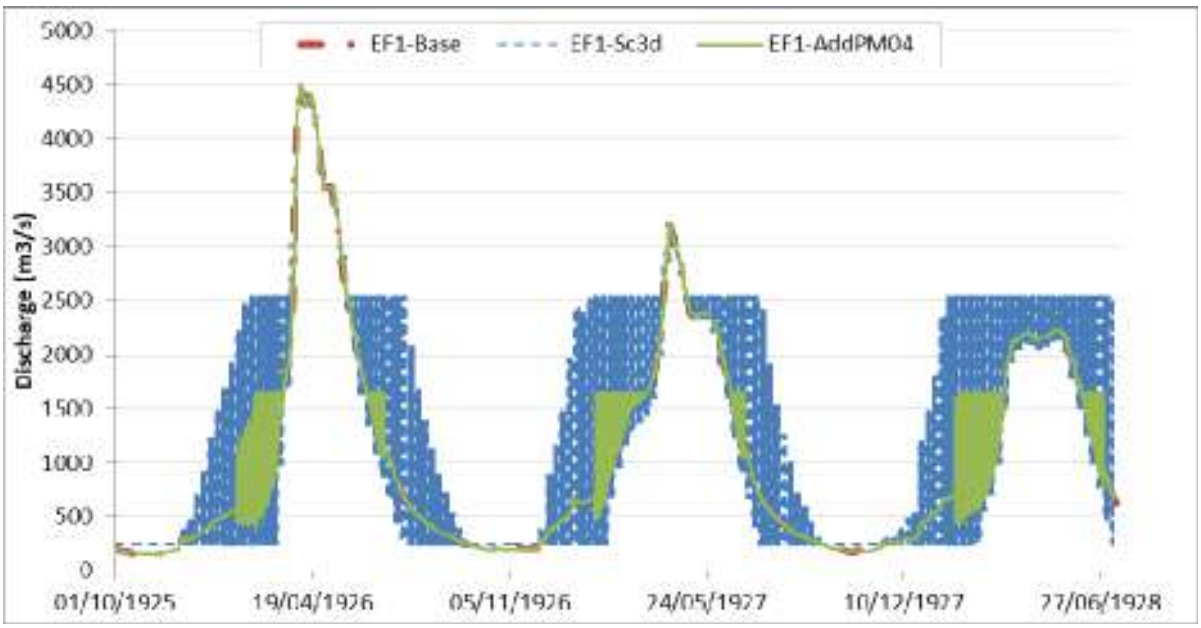
24/05/1927
10/12/1927
27/06/1928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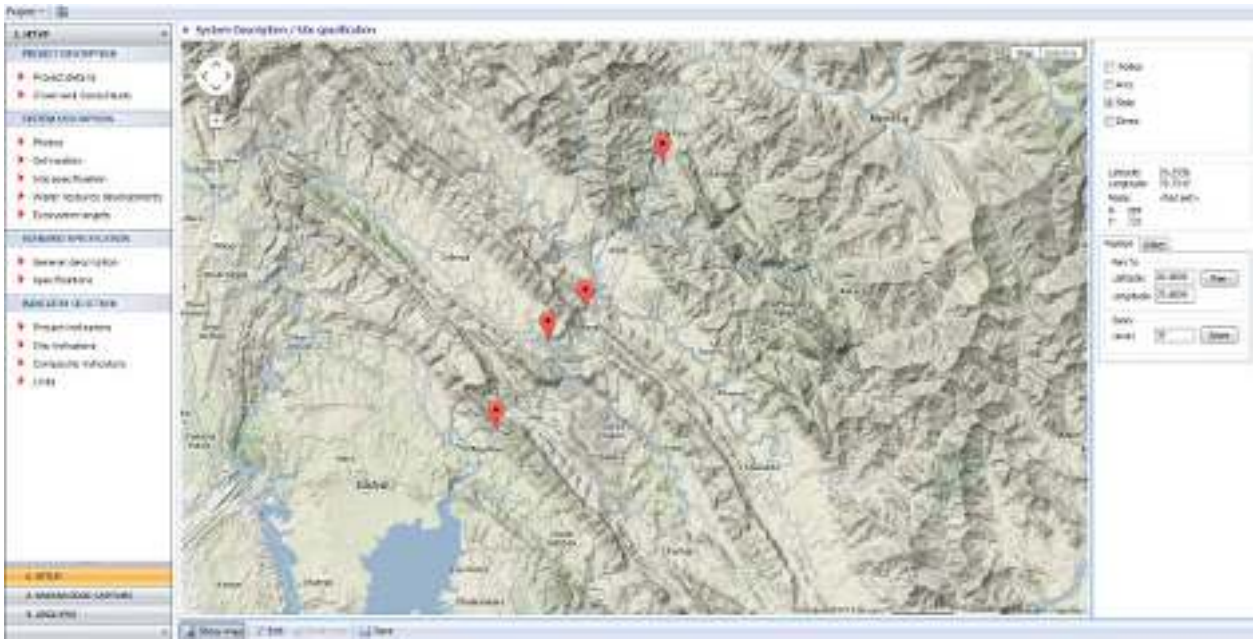
01/10/1925
19/04/1926
05/11/1926
24/05/1927
10/12/1927
27/06/1928

Appendix C. OVERVIEW OF DRIFT

C.1. DRIFT-DSS

The DRIFT-DSS is programmed using Delphi XE and uses a NexusDB v3 database. The software is designed for use in all computers running Windows XP and upwards.

The DSS makes use of Google Earth (standard version) and Google Kml files (Appendix Figure 10). No licence is required unless Google Earth images are used in any reports.

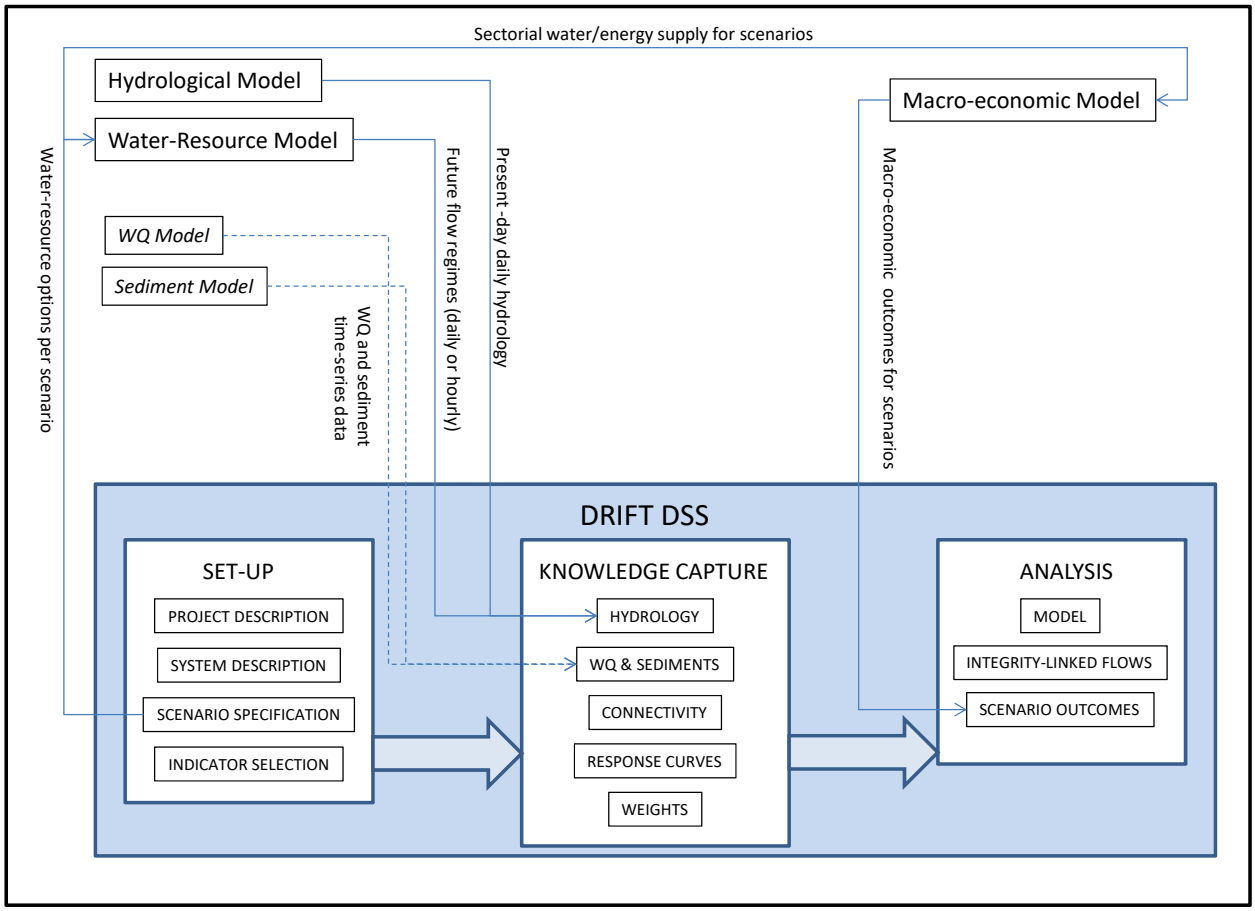


Appendix Figure 10 Screen shot of DRIFT map page showing the Zambezi River, and the EF sites.

The DRIFT DSS is divided into three sections, each dealing with a different stage in the EF determination process. These are (Brown *et al*. 2013; Appendix Figure 11):

6. Set-up
7. Knowledge Capture
8. Analysis.

The first two sections deal with the population of the DSS and the calibration of the relationships that will be used to predict the ecosystem response to changes in flows. The third section is used to generate results once the first two sections have been populated, and to produce the reports and graphics detailing the predictions for the scenarios under consideration.

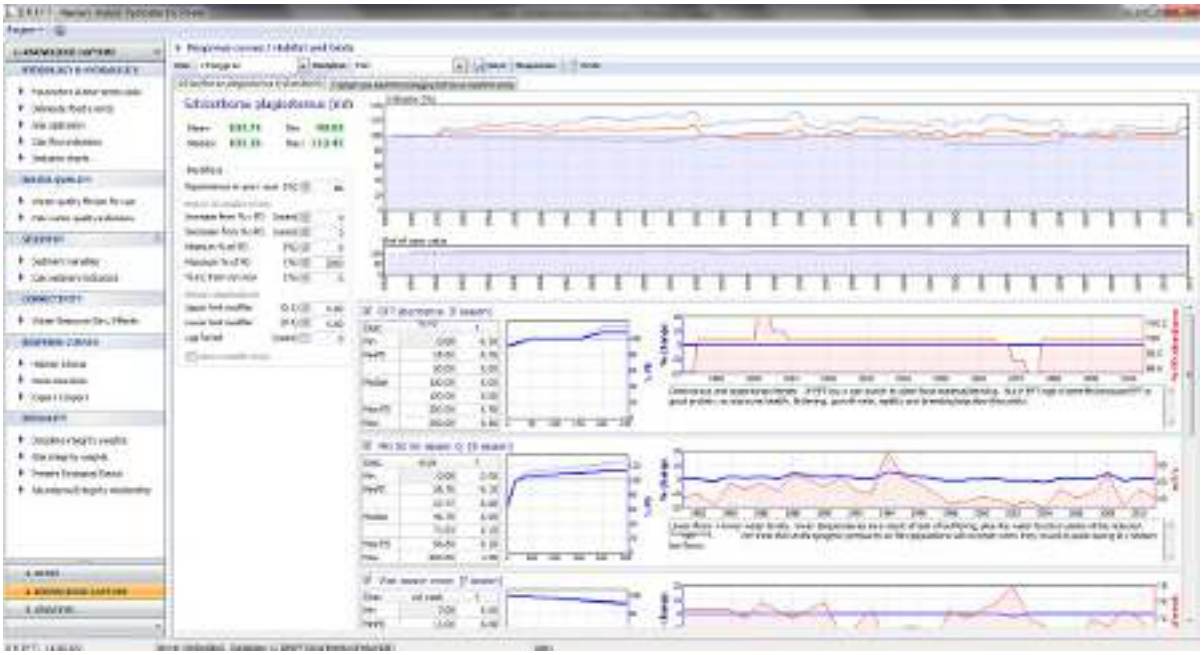


Appendix Figure 11 Arrangement of modules in the DRIFT-DSS and inputs required from external models.

All hydrological modelling is done outside of the DSS. The DSS is dependent on the outputs of two external models, namely:

- an Hydrological Model used to provide baseline basin hydrology; and
- a Water Resource Model used to predict the changes in the flow regime associated with the existing and proposed water-resource developments under the various scenarios.

The module groups in the DRIFT DSS and external models are shown in Appendix Figure 11, and an example of the DRIFT-DSS Response Curves entry datasheet for fish, showing BGHES data I shown in Appendix Figure 12. Additional detail on the DSS, including a User Manual, is available in Brown *et al.* (2013).



Appendix Figure 12 Example of the DRIFT-DSS Response Curves entry datasheet for fish, showing BGHES data.

C.2. SUMMARY OF DRIFT PROCESS

DRIFT (Downstream Response to Imposed Flow Transformations; King *et al.* 2003) was used to evaluate different water management scenarios for the Zambezi River upstream and downstream of BGHES for, *inter alia*, the following reasons:

1. It is a holistic interactive method, which provides the biophysical consequences for the downstream river for various scenarios of flow change. These scenarios can then be used to determine the impact of proposed operating rules for the dam, and possible mitigation thereof.
2. It is a published method (King *et al*. 2003), with a detailed User Manual (Brown *et al.,* 2008), and as such is has been peer reviewed.
3. It has been widely applied in the Southern African Development Community, such as Lesotho (King *et al*. 2003), Mozambique (Beilfuss and Brown, 2010; Southern Waters 2011), Namibia (Southern Waters 2010), Peru (Norconsult and Southern Waters 2011), South Africa (e.g. Brown *et al*., 2006), Tanzania (PBWO/IUCN 2008), Zimbabwe (Brown 2007) and Sudan (Southern Waters 2009). It was used as the basis of a basin-wide EF assessment in the Okavango River Basin (Angola, Namibia and Botswana; King and Brown 2009), and has been used in Pakistan on the Neelum-Jhellum River (Southern Waters and Hagler-Bailly Pakistan 2013).
4. It is based on Response Curves constructed from any relevant knowledge including expert opinion and local wisdom and as such is suitable for use in regions where there are few biophysical data available for the flow-related aspects of the rivers, as was the case for the Zambezi River

5. It aims to provide an objective and transparent assessment of the effects of changes in flow on the downstream environment based solely on structured consideration of the biophysical aspects thereof.

DRIFT is a data-management tool, allowing data and knowledge to be used to their best advantage in a structured way. Within DRIFT, each specialist, to derive the links between river flow and river condition, uses discipline-specific methods. The central rationale of DRIFT is that different aspects of the flow regime of a river elicit different responses from the riverine ecosystem. Thus, removal of part or all of a particular element of the flow regime will affect the riverine ecosystem differently than will removal of some other element.

In DRIFT, the long-term daily-flow time-series is partitioned into parts of the flow regime that are thought to play different roles in sculpting and maintaining the river ecosystem, such as the onset of important flow seasons, which may affect breeding cycles, or the magnitude of the annual flood, which may inundate a floodplain. This makes it easier for ecologists to predict how changes in the flow regime could affect the ecosystem. The 'parts' of the flow regime used in DRIFT are called flow indicators. In flow indicators used in this project are listed in Table 4.1.

The variability of the flow regime in timing and magnitude, both in its natural state and in any future scenario, was captured automatically through instructions within the hydrological module of the DSS that identify the flow indicators year-by-year. Thus, for the Zambezi River, the time-series are made up of annual time-series of each flow indicator for the 50 years of flow record. This means the specialists can consider a response to a condition for a particular time-step rather than thinking of an averaged response over several years. They can also use data from a particular year or season to calibrate time-series responses.

The study process was structured as follows:

1. The study focused on four EF sites on the Zambezi Rivers (Table 3.1).
2. The flow changes that were evaluated encompass a mixture of:
    i. Changes in magnitude.
    ii. Changes in duration.
    iii. Changes in timing (e.g., delayed onset of wet season or range of hourly discharge fluctuations).
3. Specialists provided opinion on the consequences of these changes in the form of Response Curves. The disciplines represented were:
    i. Water quality
    ii. Hydraulics
    iii. Geomorphology
    iv. Algae
    v. Riparian vegetation
    vi. Invertebrates
    vii. Fish
    viii. Socioeconomics.
4. The database was used to evaluate

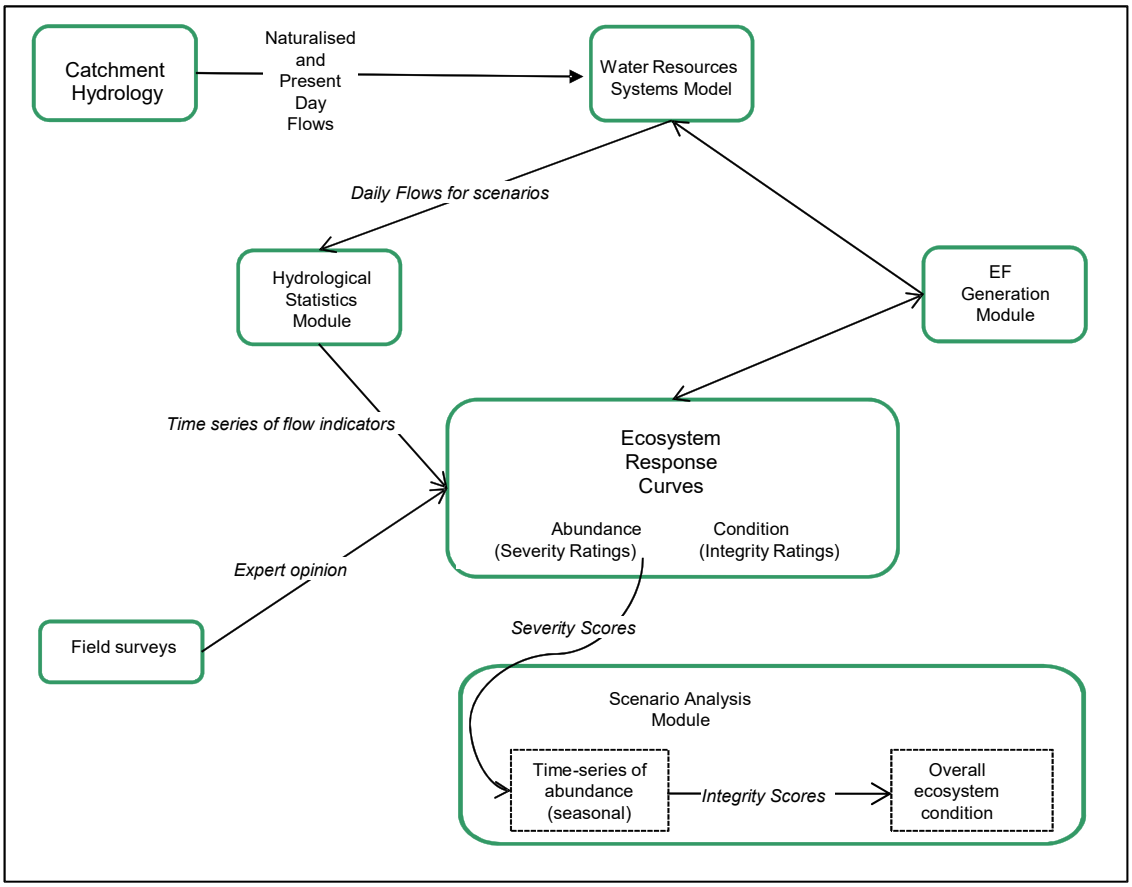
i. changes in individual aspects of the ecosystem (e.g. fish, vegetation), for each site and scenario;

ii. changes in the overall condition of the river, for each site and scenario.

5. The outputs of the DRIFT database are written up in Sections 7 and 0.

The basic sequence of activities in the DRIFT DSS can be summarised as follows (Appendix Figure 13):

1. Collect data for the study at the river.
2. Augment with expert knowledge for similar river systems and a global understanding of river functioning.
3. Construct relationships for the expected response of individual ecosystem indicators to changes in aspects of the flow regime (Response Curves).
4. Use Response Curves to predict time-series of abundance changes.
5. Adjust the severity ratings to integrity ratings by assigning a negative sign for a move away from the natural ecosystem condition and a positive for a move towards natural.
6. Model future changes in catchment hydrology.
7. Calculate annual flow indicator time-series.
8. Use Response curves to calculate severity scores and develop time-series of change in abundance for ecosystem indicators.
9. Calculate average severity score for each indicator for entire hydrological time-series.
10. Convert severity scores to Integrity Scores to predict overall ecological condition.



Appendix Figure 13 Flow chart of DRIFT process

C.3. RESPONSE CURVES[16]

Response Curves depict the relationship between a biophysical or socio-economic indicator and a driving variable (e.g., flow). In this EF assessment, Response Curves linked an indicator to any other indicator deemed to be driving change. The aim is not to ensure that every conceivable link is captured but rather to restrict the linkages to those that are most meaningful and can be used to predict the bulk of the likely responses to a change in the flow or sediment regimes of the river.

Response curves are constructed using severity ratings (Section C.4).

The full set of Response Curves for this study are presented in Volume 2: Specialists' Report.

The number of Response Curves constructed for an EF assessment depends on the level of detail at which a flow assessment is done. In this assessment, the specialists collectively completed c. 200 Response Curves for EFs Site 2. These were used to evaluate scenarios by taking the value of the flow indicator for any one scenario and reading off the resultant value for the biophysical indicators from their respective Response Curves. Once this had been done the database combined these values to predict the overall change in each biophysical indicator and in the overall ecosystem under each scenario.

C.3.1. CONSTRUCTION OF THE RESPONSE CURVES

The Response Curves used in this project were constructed as follows:

- Draft curves constructed at a workshop in Cape Town attended by all the EF team members.
- Draft curves were re-evaluated by Southern Waters once the scenarios has been run, and referred back to the specialists for adjustment where deemed necessary.
- Draft curves re-evaluated by relevant specialists using the scenarios as reference, and adjusted where deemed necessary.

Note: The final curves and explanations for their shape are contained in the DRIFT DSS, and addressed in Volume 2: Specialists' Report.

C.3.2. RESPONSE CURVES AND CUMULATIVE CHANGE

The time-series approach means that the Response Curves are used to predict the likely seasonal change in an ecosystem indicator in response to the flow/sediment conditions experienced in that, or possibly preceding, seasons. For instance, the kind of question typically asked to facilitate setting the dry season discharge Response Curve for Kashmir catfish are:

- "If the dry season discharge declines from baseline values, what will be the consequences for the abundance of Kashmir catfish?":

[16] The bulk of this section is taken from Joubert *et al.*, 2009.

- Do Kashmir catfish use the main river in the dry season?
- Do Kashmir catfish abundances change noticeably over the climatic range covered in the baseline, i.e., are they noticeably more abundant in wet years than in dry years, or vice versa?
- What kinds of habitat do adult Kashmir catfish use in the main river?
- Do Kashmir catfish breed in the dry season?
- Do they breed in the main river or in the tributaries?
- Where do Kashmir catfish lay their eggs?
- What sorts of habitat do fry, fingerlings and juvenile trout use in the main river?
- At what discharge(s) does the favoured habitat(s) disappear?
- What is the consequence of these habitats not being available for one season?
- If discharge reaches zero for one season, are there pools that the trout will be able to survive in?
- Can the Kashmir catfish survive for a dry season in pools?
- Is water temperature a concern, i.e., would winter temperature be an issue for Kashmir catfish if discharge dropped?
- What do Kashmir catfish adults/juveniles/fingerlings/fry eat?
- How will the food base be affected by changes in dry season lowflows?
- Etc.

Often, a species (such as Kashmir catfish will be expected to survive even an extremely-dry dry season, with possibly only minor changes (5-10%) in overall abundance if dry season flows drop to zero. If, however, the flows drop to this level in the dry season year after year, then the cumulative effect on trout populations is likely to be far greater. The time-series enable the DSS to capture this cumulative effect.

C.4. SCORING SYSTEM USED

Into the foreseeable future, predictions of river change will be based on limited knowledge. Most river scientists, particularly when using sparse data, are thus reluctant to quantify predictions: it is relatively easy to predict the nature and direction of ecosystem change, but more difficult to predict its timing and intensity. To calculate the implications of loss of resources to subsistence and other users in order to facilitate discussion and tradeoffs, it is nevertheless necessary to quantify these predictions as accurately as possible.

Two types of information are generated for each biophysical indicator, *viz*.:

- Severity ratings, which describe increase/decreases for an indicator in response to changes in the flow indicators, and;
- Integrity ratings, which indicate whether the predicted change is a move towards or away from natural, i.e., how the change influences overall ecosystem condition.

The severity ratings are used to construct the Response Curves. The Integrity ratings are used to describe overall ecosystem condition/health.

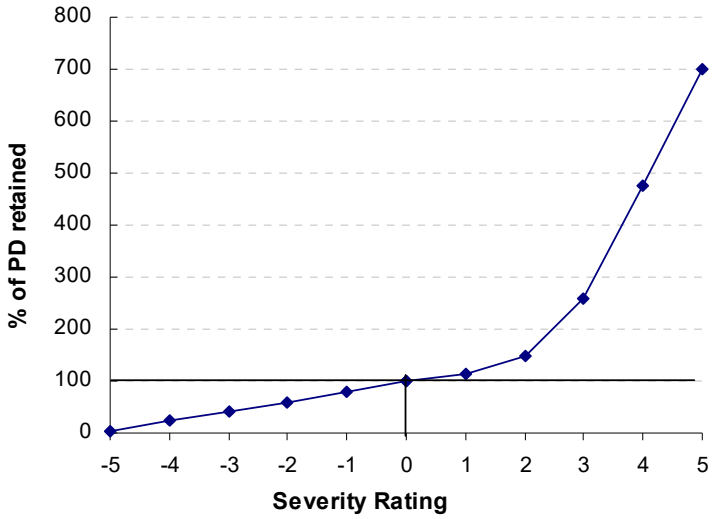
C.4.1. SEVERITY RATINGS

The severity ratings comprise 11-point scale of -5 (large reduction) to +5 (very large change; Brown *et al.*, 2008; Appendix Table 18), where the + or – denotes a increase or decrease in abundance or extent. These ratings are converted to percentages using the relationships provided in Appendix Table 18. The scale accommodates uncertainty, as each rating encompasses a range of percentages; however, greater uncertainty can also be expressed through providing a range of severity ratings (i.e. a range of ranges) for any one predicted change (after King *et al.*, 2003).

Appendix Table 18 DRIFT severity ratings and their associated abundances and losses – a negative score means a loss in abundance relative to baseline, a positive means a gain.

Severity rating	Severity	% abundance change
5	Critically severe	501% gain to ∞ up to pest proportions
4	Severe	251-500% gain
3	Moderate	68-250% gain
2	Low	26-67% gain
1	Negligible	1-25% gain
0	**None**	**no change**
-1	Negligible	80-100% retained
-2	Low	60-79% retained
-3	Moderate	40-59% retained
-4	Severe	20-39% retained
-5	Critically severe	0-19% retained includes local extinction

Note that the percentages applied to severity ratings associated with gains in abundance are strongly non-linear[17] and that negative and positive percentage changes are not symmetrical (Appendix Figure 14; King *et al.* 2003).



17 The non-linearity is necessary because the scores have to be able to show that a critically-severe loss equates to local extinction whilst a critically severe gain equates to proliferation to pest proportions.

Appendix Figure 14 **The relationship between severity ratings (and severity scores) and percentage abundance lost or retained as used in DRIFT and adopted for the DSS. (PD=present day AND = 100%).**

For each year of hydrological record, and for each ecosystem indicator, the severity rating corresponding to the value of a flow indicator is read off its Response Curve. The severity ratings for each flow indicator are then combined to produce a severity score, which provides an indication of how abundance, area or concentration of an indicator is expected to change under the given flow conditions in each year, relative to the changes that would have been expected under baseline conditions in the catchment.

C.4.2. INTEGRITY RATINGS

Integrity ratings use the absolute value of between 0 and 5 provided for the severity scores but include a negative or positive sign, depending on whether the change in abundance predicted by the severity score represents a shift to/away from naturalness, *viz.* (Brown and Joubert 2003):

- *toward natural* ecosystem condition is represented by a positive integrity rating; and
- *away from natural* ecosystem condition is represented by a negative integrity rating.

The integrity ratings are calculated using the average severity score for each ecosystem indicator over the entire hydrological time-series. The integrity ratings for each indicator are then combined to provide an Overall Integrity Score, which is used to place a flow scenario within a classification of overall river condition, using the South African eco-classification categories A to F (Appendix Table 19; Kleynhans 1996; Kleynhans 1999; Brown and Joubert 2003). The ecological condition of a river is defined as its ability to support and maintain a balanced, integrated composition of physico-chemical and habitat characteristics, as well as biotic components on a temporal and spatial scale that are comparable to the natural

Appendix Table 19 **Definitions of the Present Ecological State (PES) categories (after Kleynhans 1996).**

Ecological category	Description of the habitat
A	Unmodified. Still in a natural condition.
B	Slightly modified. A small change in natural habitats and biota has taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota has occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.

Ecological category	Description of the habitat
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically / Extremely modified. The system has been critically modified with an almost complete loss of natural habitat and biota. In the worst instances, basic ecosystem functions have been destroyed and the changes are irreversible.

characteristics of ecosystems of the region. For instance, if the present ecological status (PES) of a river is a B-category, a scenario that yields a negative Integrity Score would represent movement in the direction of a category C-F, whilst one with a positive score would indicate movement toward a category A, as follows:

If the Overall Integrity Score is positive, this denotes a move toward natural, i.e. restoration initiatives:

- ≤1 or ≥-1, the ecological condition will remain within the same category as present day/baseline;
- >1 and ≤2, the ecological condition will move one category closer to natural;
- >2 and ≤3, the ecological condition will move two categories closer to natural;
- Etc.

If the Overall Integrity Score is negative, this denotes a move away from natural:

- ≥-1, the ecological condition will remain within the same category as present day;
- <1 and ≥ 2, the ecological condition will move one category further away from natural;
- <2 and ≥ 3, the ecological condition will move two categories further away from natural;
- Etc.

Note : In South Africa, the D-category is considered to represent the lower limit of degradation allowable under sustainable development (e.g., Dollar et al. 2006; Dollar *et al*. 2010).

Overall Integrity Scores are calculated for the ecosystem as a whole, i.e., the combined effect of changes in the indicators. The results can be plotted as Overall Integrity Score (y-axis) vs. percentage or volume of MAR (x-axis) or, where there are relatively few points as in this project, simply as a plot of Overall Integrity Scores per site, which allows for easy comparison between sites. The categories actually represent points along a continuum, thus the 'divisions' between the categories are only guides as to the general position at which the ecological condition might be expected to shift from one category to the next. Furthermore, the rules for the integrity categories were developed on rivers outside of Kashmir, and have not been tested on Kashmir rivers. They provide an indication of the relative categories associated with each scenario and should not be misconstrued as an absolute prediction of future condition.

C.5. IDENTIFICATION OF ECOLOGICALLY-RELEVANT ELEMENTS OF THE FLOW REGIME

One of the main assumptions underlying the DRIFT EFs process is that it is possible to identify ecologically-relevant elements of the flow regime and isolate them within the historical hydrological record. Thus, one of the first steps in the DRIFT process is to identify the ecologically-important flow indicators, which are calculated per season for each year. The rules and thresholds for defining the seasons on the Zambezi River are given in Section 6.1, and the list of flow indicators calculated for BGHES are provided in Table 4.1.

C.6. MAJOR ASSUMPTIONS AND LIMITATIONS OF DRIFT

Predicting the effect of flow changes on rivers is difficult because the actual trajectory and magnitude of the change is additionally dependent on so many other variables, such as climate, sediment supply and human use of the system. Thus, several assumptions underlie the predictions. Should any of these assumptions prove to be invalid, the actual changes may not match the predicted changes. This does not necessarily make the predictions themselves incorrect or invalid, but simply means that the surrounding set of circumstances that support the predictions has changed.

The following important major assumptions apply:

- The baseline hydrology closely approximates the actual flow conditions in the river over the period of record.
- Different parts of the flow regime sustain the river ecosystem in different ways. Changing one part of the flow regime will change the river in a different way than will changing another part.
- It is possible to identify ecologically-relevant elements of the flow regime and isolate them within the historical hydrological record (see Section C.5)
- Measured flows (1924 - 2014) in the Zambezi River were used as the baseline flow for predicting change, and change was expressed as a percentage move towards or away from the 2014.
- Changes include flow and non-flow related changes.
- The expected operational scenario for the BGHES (Sc1) does not include any flow changes associated with BGHES, and only include predictions of ecosystem condition expected with a slight reduction in suspended sediment load.
- Predicted changes in ecological status are relative to the baseline ecological state (2014).
- Predictions are based on a 90-year horizon.

The main limitation is the paucity of data. This is a universal problem, as ecosystems are complex and we will probably never have complete certainty of their present and possible future characteristics. Instead it is essential to push ahead cautiously and aid decision-making, using best available information. The alternative is that water resource development decisions are made without consideration of the consequences for the supporting ecosystems, eventually probably making management of sustainability impossible. Data paucity is addressed in the DRIFT process by accessing every kind of knowledge available - general scientific understanding, international scientific literature, local wisdom and specific data from the river under consideration or from

similar ones – and capturing these in a structured process that is transparent, with the DSS inputs and outputs checked and approved at every step. The Response Curves used (and the reasoning used to construct them) are available for scrutiny within the DSS and they, as well as the DRIFT DSS, can be updated as new information becomes available.

A second aspect of the paucity of data is that it is neither known what the river was like in its pristine condition nor exactly how abundant each ecosystem aspect (sand bars, fish, etc.) was then or is now. To address this, all DRIFT predictions are made relative to the baseline situation (there will be a little more, or a lot less, than today, and so on), as explained further below.

These inherent uncertainties also mean that the trends and relative position of the scenarios are more reliable predictors of the impacts of the scenarios than are their absolute values. Also, DRIFT is designed to predict overall condition, and focusing on one indicator to the exclusion of others is not recommended.

C.7. REFERENCES

Beilfuss, R. and Brown, C. 2010. Assessing environmental flow requirements and trade-offs for the Lower Zambezi River and Delta, Mozambique. *International Journal of River Basin Management, Volume 8. Issue 2:* 127 – 138.

Brown, C.A. 2007. Mzingwane Environmental Flows Process: DRIFT Output. Unpublished Report to IUCN-ROSA. 30 pp.

Brown, C.A., Joubert, A.R., Pemberton, C.W., Greyling, A.J., and King, J.M. 2008. DRIFT USER MANUAL V2.0: Biophysical Module for predicting overall river condition in small to medium sized rivers with relatively predictable flow regimes (incorporating updates to the DRIFT database). Report to the Water Research Commission.

Brown, C.A. and Joubert, A. 2003. Using multicriteria analysis to develop environmental flow scenarios for rivers targeted for water resource development. *Water SA* 29(4): 365-374.

Brown, C.A., Joubert, A.R., Beuster, J. Greyling, A. and King, J.M. 2013. DRIFT: DSS software development for Integrated Flow Assessments. FINAL REPORT to the South African Water Research Commission. February 2013.

Brown, C.A. Pemberton, C., Birkhead, A., Bok, A., Boucher, C., Dollar, E., Harding, W., Kamish, W., King, J., Paxton, B. and Ractliffe, S. 2006. In Support of Water-resources planning – highlighting key management issues using DRIFT: A Case study. *Water SA* Vol. 32 No. 2. Pg 181-191.

Dollar, E.S.J, Brown, C.A., Turpie, J.K., Joubert, A.R., Nicolson, C.R. and Manyaka, S. 2006. The development of the Water Resource Classification System (WRCS). Volume 1. Overview and seven-step classification procedure. CSIR Report No., Department of Water Affairs and Forestry, Pretoria. 70pp.

Dollar, E.S.J, Nicolson, C.R., Brown, C.A., Turpie, J.K., Joubert, A.R, Turton, A.R., Grobler, D.F. and Manyaka, S.M. 2010. The development of the South African Water Resource Classification System (WRCS): a tool towards the sustainable, equitable and efficient use of water resources in a developing country. Water Policy.

Joubert, A.R., Brown, C.A. and King, J.M. 2009. Startup DSS software development for integrated flow management. Progress Report: Water Research Commission Project K8/848. 21 pp.

King, J.M., Brown, C.A. and Sabet, H. 2003. A scenario-based holistic approach to environmental flow assessments for regulated rivers. *Rivers Research and Application*s 19 (5-6). Pg 619-640.

King, J.M. and Brown, C.A. 2009. Environment protection and sustainable management of the Okavango River Basin: Preliminary Environmental Flows Assessment. Scenario Report: Ecological and social predictions. Project No. UNTS/RAF/010/GEF. Report No. 07/2009. Four Volumes.

Kleynhans, C.J. 1996. A qualitative procedure for the assessment of the habitat integrity status of the Luvuvhu River. Journal of Aquatic Ecosystem Health 5: 41 - 54.

Kleynhans, C.J. 1999. A procedure for the determination of the ecological reserve for the purposes of the national water balance model for South African Rivers. Institute for Water Quality Studies. Department of Water Affairs and Forestry, Pretoria, South Africa.

NESPAK - National Engineering Services Pakistan (Pvt.) Limited. 2011. Kishenganga/Neelum River hydrology and impact of Kishenganga hydroelectric plant on energy generation in Pakistan. Draft report prepared for the Government of Pakistan Ministry of Water And Power, Office of the Pakistan Commissioner for Indus Waters.

PBWO/IUCN 2008. Final Scenario Report: Report 4: Pangani River Basin Flow Assessment, Moshi, 23pp.

Southern Waters. December 2010. Environmental Flow Assessment. Volume 1: Main Report. ESIA for the Baynes Hydropower Project on the Cunene River on the border between Angola and Namibia. Unpublished project report for ERM, and NamPower.

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VOLUME 2 (of 2): SPECIALIST SUPPORTING REPORT

For

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Abbreviations and acronyms

ASPT	Average Score Per Taxon
RSF	Rippled Surface Flow
SBT	Smooth Boundary Turbulent
SIC	Stones-in-current
SOOC	Stones-out-of-current
VIC	Vegetation-in-current
VOOC	Vegetation-out-of-current
ZISS	Zambian Scoring System
ZISS	Zambian Scoring System

Glossary of terms

Habitat: biotic and abiotic environment of a species which is described by substratum type, hydraulic characteristics and refuge value.

Hydraulic biotope: Spatially distinct instream flow environments characterised by specific hydraulic attributes that provide the abiotic environment in which species assemblages or communities live.

1 INTRODUCTION

1.1 BACKGROUND

The Inception Report for the ESIA (ERM et al. 2014) provides a comprehensive summary of the historical background to the Batoka HPP.

Zambezi River Authority (ZRA) has commissioned Environmental Resources Management (ERM), in association with Kaizen Consulting (Zambia) and Black Crystal Consulting (Zimbabwe) to produce an updated Environmental and Social Impact Assessment (ESIA) to inform the Governments of Zambia and Zimbabwe, the ZRA, national power utilities, interested and affected parties and other stakeholders about potential environmental and social impacts associated with development of the Batoka Gorge HydroPower Project (HPP). These will include evaluation of potential impacts at the dam site and surrounding areas, the reservoir inundation area, any upstream and or downstream impacts, as well as those from associated infrastructure, such as transmission lines, and operations infrastructure.

As part of the ESIA, Southern Waters was commissioned by ERM to undertake an environmental flow assessment for the downstream riverine ecosystem between the Batoka HPP and Kariba Dam.

This report summarises the outcome of the Environmental Flow (EF) assessment. Additional detail is available in the specialist reports and in the DRIFT DSS populated for this project (see Section 1.5).

1.2 THE PROPOSED BATOKA HYDROPOWER PROJECT

The location of the proposed Batoka HPP is on the middle Zambezi River (Figure 1-1), located at 18°1′S ; 26° 34′ E, in the central portion of the Zambezi River Basin, c. 50 km downstream of Victoria Falls. It will be located in a steep-sided gorge, and the inundated area of the reservoir will be contained within the gorge, stopping just short of the falls themselves. The development will extend across the international boundary between Zambia and Zimbabwe, with a power house and tailrace on each bank. The proposed high arch gravity dam wall will be 180 m high (SP 2014). The full supply level (FSL) of the reservoir is tentatively set at 762 masl. After impoundment to the FSL, the reservoir surface area will cover approximately 23 km^2. The most recent principal data for the scheme are provided in Table 1-1.

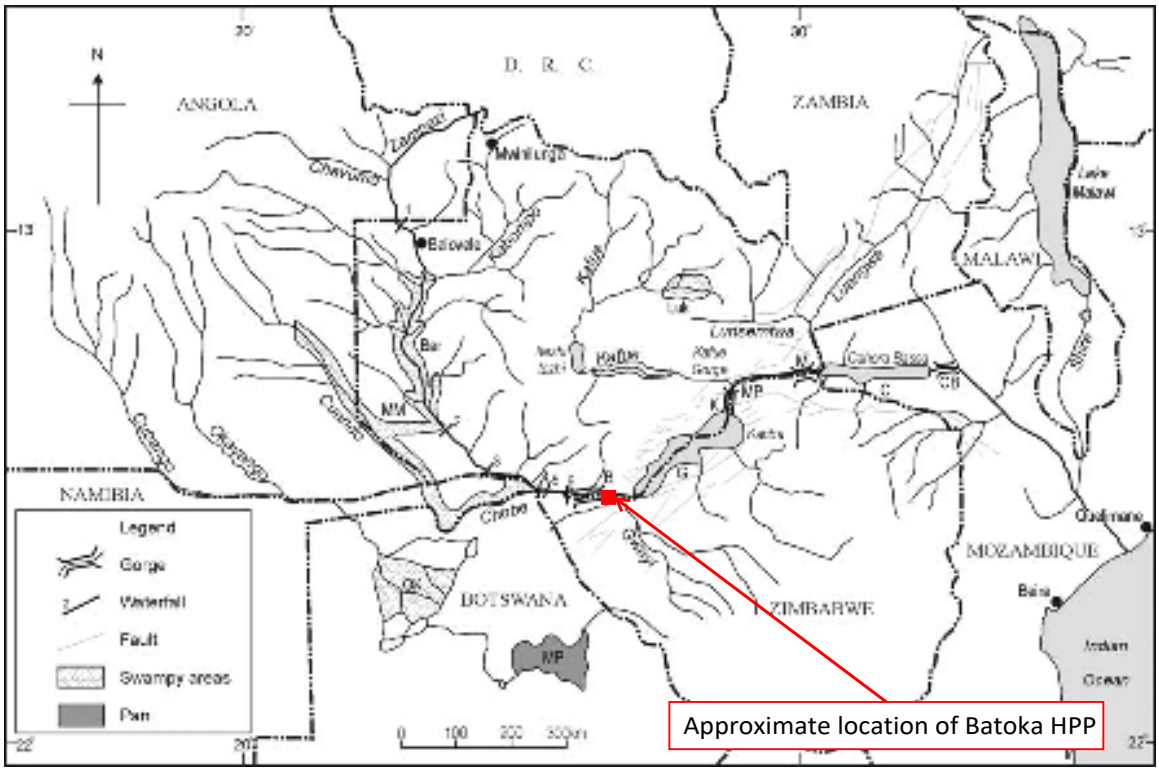


Figure 1.1 **Zambezi River basin (Source: Moore *et al.* 2007).**

Table 1.1 **Principal data for the recommended design proposed for Batoka HPP on the Zambezi River (SP 2014)**

Reservoir	Catchment area	508 000 km^2
	Full supply level	762 masl
	Minimum operation level	746 masl
	Total storage	1392 Mm^3
	Surface area at FSL	23 km^2
	Volume at FSL	1600 x 106 m^3
Spillway	Located at about two kilometres from the dam site, at the end of a canal about 2.5 km long, which will link the reservoir with a gorge parallel to the Zambezi river on the south side.	
Dam	Type	Roller Compacted Concrete Gravity Arch
	Height	180 m
	Crest level	720 m
	Crest length	766.5 m
Power Station	Type	Two above ground power stations, located at the dam toe, one on north and one on south bank.
	Installed capacity	3000 MW
	Turbines	4 Francis turbines each with 375 MW of installed capacity

The design of Batoka HPP is still being finalized. The summary characteristics provided in Table 1-1 are the latest proposals for design (SP 2014). They include an adjustment to the spillway design that may affect downstream, *viz*: *the spillway will be located at about two kilometres from the dam site, at the end of a canal about 2.5 km long, which will link the reservoir with a gorge parallel to the Zambezi River on the south side*. This new spillway design was not evaluated as part of this EF study. However, it will be evaluated the overall assessment should it remain a preferred engineering option.

1.3 THE ENVIRONMENTAL FLOW ASSESSMENT

1.3.1 Objectives

The objectives of the EF assessment were:

- to evaluate the present day condition (i.e. the present structure and functioning) of the Zambezi River from upstream of Batoka HPP to Lake Kariba;
- to evaluate how the condition of the river could change under different operational scenarios for the proposed Batoka HPP.

1.3.2 Scope of Work

Southern Waters' Scope of Work was to:

- Delineate the river within the study area and select representative sites for the EF assessment.
- Provide input to the selection of scenarios for the EF assessment.
- Collect/collate primary and secondary data for the configuration of the DRIFT EF assessment model.
- Incorporate the hydrological data provided by ERM into the DRIFT model and select ecologically-relevant flow indicators.
- Model and incorporate the ecohydraulic relationships based on survey data from EF Sites 1 and 2 into the DRIFT model.
- Select discipline indicators for the DRIFT model.
- Set up, populate and calibrate the DRIFT Decision Support System.
- Simulate scenarios.
- Present results in a report.

The Scope of Work was restricted to an assessment of the riverine biophysical aspects of the Batoka HPP, and did not include an assessment of the consequent social and economic impacts of the project.

All of the local and international EF team members visited the Zambezi River upstream and downstream of the proposed Batoka HPP between the 1st and 5th of September 2014. Thereafter (27th -31st October 2014), the population and calibration of the DRIFT Decision Support System was completed in a workshop situation in Cape Town.

The results of the assessment and the main summary report (this report) were sent to the specialists for review and correction where necessary on 7th November 2014. Their comments have been incorporated into this version of the report – submitted on 21st November 2014.

1.3.3 The EF assessment process

DRIFT (Downstream Response to Imposed Flow Transformations) is a holistic EF assessment approach (Brown *et al.* 2013) that, in this project, was applied at the level of the direct influence of the proposed Batoka HPP. This is essentially the Zambezi River from the location of the proposed Batoka HPP weir to Kariba Dam. The objective was to describe the present condition of the river ecosystem and then, through scenarios, to predict how this could change with different design and operation of the Batoka HPP.

Changes in the hydrological regime drive the assessment process. Each scenario would change flow conditions along the river in a different way, with possible different repercussions for the river system. Once these hydrological changes have been simulated, then the DRIFT software provides predictions of the consequent changes in the biotic and abiotic aspects of the river.

1.3.4 Team

The EF team members are listed in Table 1-2.

Table 1.2 EF team members

Name	Organisation	Position on team
Mr Tim Smith	ERM	ERM Task Leader
Dr Cate Brown	Southern Waters	EF Task Leader
Dr Alison Joubert	Southern Waters	DRIFT DSS
Dr Ed Buchak	ERM	Hydrology/Scenarios
Dr George Krallis	ERM	Water Quality
Dr Andrew Birkhead	Streamflow Solutions	Ecohydraulic modeling
Mr Denis Tweddle	SAIAB	Fish ecology
Mr Mark Rountree	Fluvius Consultants	Geomorphology
Dr Justine Ewart-Smith	Freshwater Consulting Group	Macroinvertebrates
Dr Karl Reinecke	Southern Waters	Riparian vegetation

1.4 LOCATION OF THE STUDY SITES

The Batoka HPP EF assessment concentrated on two sites on the Zambezi River between the proposed HPP and Kariba Dam (Table 1-3; Figure 1-2; Figure 1-3; Figure 1-4). The sites were selected considering:

- geomorphologically different river reaches (see Volume 1);
- biological variations along the length of the river;
- different types and levels of impacts likely to be incurred as a result of Batoka HPP location and operation;
- access and safety.

Table 1.3 EF sites for the Batoka EF assessment.

Site No.	Site	Description	Coordinates
1	EF Site 1	Represents the Zambezi River in Batoka Gorge from downstream of the tailrace of the proposed Batoka HPP to the end of the gorge	17°56'17.45"S 26°18'34.37"E
2	EF Site 2	Represents the Zambezi River from the end of Batoka Gorge to Lake Kariba.	18° 3'21.62"S 26°38'33.05"E

- EF Site 1 (Figure 1-3) represents the Zambezi River within Batoka Gorge. It will be affected by releases from the Batoka tailrace. It will also be affected by the barrier effect of Batoka weir, which will have consequences as mentioned above and will also alter the thermal, sediment and physicochemical regimes along the river downstream of the dam.
- EF Site 2 (Figure 1-4) represents the Zambezi River between Batoka Gorge and Lake Kariba. It will be affected by releases from the Batoka tailrace and by the barrier effect of Batoka weir and will be used to predict any anticipated recovery of the river ecosystem with distance downstream of the HPP.

The data collected for EF Site 1 were in fact collected at the location of the proposed Batoka Weir. However, the EF Site represents the Batoka Gorge from downstream of Batoka HPP to the end of the gorge and, as such, is shown some distance downstream of the tailrace in (Figure 1-3).

Figure 1.2 The Zambezi River between Victoria Falls and Lake Kariba, showing the approximate position of the Batoka HPP, and EF Sites 1 and 2.

Figure 1.3 **EF Site 1 in the Batoka Gorge at the site of the Batoka HPP weir**

Figure 1.4 **EF Site 2, c. 46 km downstream of Batoka HPP and 3 km upstream of the full supply level of Kariba Dam.**

In addition, although not evident in Figure 1-2, on occasion, the backup of water from Kariba Dam extends to the Hwange Fishing and Boating Club, which is located c. 3 km downstream of EF Site 2.

1.5 THIS REPORT

This report is Volume 2 of two volumes:
Volume 1: Environmental Flow Assessment: Main Report
Volume 2: Specialists' Report (*this report*).

The specialist reports presented in this report are as follows:
Section 2: Geomorphology – Mark Rountree.
Section 3: Riparian vegetation – Dr Karl Reinecke.
Section 4: Macroinvertebrates – Dr Justine Ewart-Smith.
Section 5: Fish – Denis Tweddle.

2 GEOMORPHOLOGY: SPECIALIST REPORT

2.1 OBJECTIVES OF THE GEOMORPHOLOGY STUDY

The main objective of the geomorphology study was to identify the relationship between geomorphological features and flow level changes, and to predict what impacts, if any, will occur with changes to the present day flow regime.

For the geomorphological component of the EF assessment, 17 days were allocated to undertaking a literature review of previous information (2 days), a site visit (6 days), data analysis of the site information collected in the field (2 days), attending a workshop to determine the prediction of impacts and generation of response curves (5 days) and report writing (2 days).

This report follows the ToR provided by Southern Waters *viz.*:

- Familiarise yourself to the extent possible with the study area, including:
    - The character of the Zambezi River in the study area.
    - Delineation of homogenous areas based on geology reach slope, and river type.
    - The character of the reaches encompassing the proposed sites.
- Prepare a coarse-level reach analysis for the study river, focussing on the study area.
- Provide detailed information for two EF sites.
- Attend the field visit with the rest of the team to:
    - Ensure that the hydraulic cross-section surveys record whatever information you require for your analyses.
    - Record at each site, where relevant, (i) the dominant and sub-dominant substrata, (ii) the degree of embeddedness of large particles, (iii) the nature and extent of instream or overhead cover (for fish).
- Take responsibility for the adequacy of the data collected and provided for the geomorphology component of the EFA.
- Select key aspects as indicators for the DRIFT assessment, in liaison with the other specialists, and provide/develop information on:
    - altered flow regime-sediment transport potential;
    - changes in habitat types with changes in the flow regime;
    - any other relevant data as your experience suggests;
    - any other available information relevant to flow assessments;
    - relevant scientific references.
- Select linked indicators that can be used to explain flow-related changes for each of your indicators.
- Attend the DRIFT Workshop(s), prepared to populate the DRIFT response curves for your selected indicators and linked indicators.

- Compile a geomorphological chapter for inclusion in the EFA Report, with particular reference to response curve motivation tables.
- Adhere to standard formatting, font and layout specifications provided by the Southern Waters for written submissions.

2.2 *LAYOUT OF THIS SECTION*

This Section comprises the summary report for geomorphology, and provides:

- Overview of the study area, with focus on delineation of homogenous areas;
- For the EF sites:
    - Ecostatus assessments for your discipline, with supporting evidence;
        - the DRIFT indicators chosen, and reasons therefor;
        - the relationships between the chosen indicators and flow or other, with referenced, supporting motivations.
    - Supporting references from the international literature.
    - Data and the details of any analyses performed.

2.3 *DESCRIPTION OF THE STUDY AREA WITH THE FOCUS ON GEOMORPHOLOGY*

2.3.1 Geomorphological zonation of rivers

The physical structure of a river ecosystem is determined by the geomorphological processes that shape the channel. These processes determine the material from which the channel is formed, the shape of the channel and the stability of its bed and banks. The channel geomorphology in turn determines the substrate conditions for the riverine fauna and flora and the hydraulic conditions for any given flow discharge. Structural changes to the river channel (damage to the riparian zone, sediment inputs from catchment erosion or reservoir induced changes in the flow regime) can cause long term irreversible effects for biota (O'Keeffe 2000; Kochel 1988). Geomorphology thus provides a relevant basis of classification for describing the physical habitat of riparian and aquatic ecosystems.

The aim of the longitudinal zone classification is to subdivide the longitudinal profile of the river into morphologically uniform units, with sites selected within key units to provide predictions of expected changes within the different unit types. Channel slope is well correlated with many physical habitat descriptors including channel planform, bed material and assemblage of morphological units (Rowntree and Wadeson 1999). Changes in slope down the longitudinal profile are usualy correlated with morphological changes and thus provide the basis for the delineation of zones. These breaks are usually due to changes in lithology, but can also be as a result of tectonic activity or the upstream migration of knick points (Dollar, 1998). Rowntree and Wadeson (1999) developed a hierarchical classification system for Southern African rivers based partly slope characteristics. This scale-based framework links various components of the river system, ranging from the catchment to the instream habitat (Table 1.1).

The classification system consists of six hierarchical levels:

- the catchment,
- the segment,
- the zone,
- the reach,
- the morphological unit and
- the hydraulic biotope.

Table 3.1 Definition of geomorphological classification levels (after Rowntree and Wadeson 1999)

Hierarchical unit	Description	Scale
Catchment	The catchment is the land surface which contributes water and sediment to any given stream network.	Can be applied to the whole river system from source to mouth, or to a lower order catchment above a specified point of interest.
Segment	A segment is a length of channel along which there is no significant change in the flow discharge or sediment load.	Segment boundaries will tend to be co-incident with major tributary junctions.
Longitudinal zone	A zone is a sector of the river long profile which has a distinct valley form and valley slope.	Sectors of the river long profile.
Reach	The reach is a length of channel characterised by a particular channel pattern and channel morphology, resulting from a uniform set of local constraints on channel form.	>00s of meters.
Morphological Unit	The morphological units are the basic structures recognised by fluvial geomorphologists as comprising the channel morphology and may be either erosional or depositional features.	Morphological units occur at a scale of an order similar to that of the channel width.
Hydraulic biotope	Hydraulic biotopes are spatially distinct instream flow environments with characteristic hydraulic attributes.	Hydraulic biotopes occur at a spatial scale of the order of 1 m^2 to 100 m^2 and are discharge dependent.

The longitudinal zonation of southern African rivers reflects regional geology, tectonic events and long term fluvial action, which together have affected the shape of their long profiles. The classic concave long profile may be disrupted by a number of features including outcrops of more resistant rock and rejuvenation due to tectonic uplift or a fall in sea-level, river capture or the presence of a highly resistant lithology. Segment and zone delineation has been used to describe the macro- and regional scale characteristics of the Zambezi River. Reach, morphological unit and hydraulic biotope classifications may be

applied to specific EF sites, based largely on field assessment backed up by reference to available satellite imagery such as Google Earth.

The geomorphological segments and zones are used to guide the spatial framework for the delineation of Resource Units (which would also include operation rules and zones of altered hydrology), the assessment of habitat integrity, and selection of field sites for detailed study. Information derived from the field sites can then be scaled up to the zone scale to obtain a broad overview of likely condition and impacts for the entire study area.

2.3.2 The Zambezi River

The Zambezi River is the fourth largest river basin in Africa with a catchment area of nearly 1 500 000 km^2 (Davies 1986) with several major tributaries contributing to the estimates 108 km^3 annual discharge (Table 3.2). It flows over a distance of almost 3 000 kilometres, dropping from 1585 masl at its source in the north- west of Zambia down to the Indian Ocean at its delta 200 kilometres north of the Mozambican port of Beira (Figure 1.1). Headwater tributaries drain portions of eastern and southeastern Angola and northern Zambia and flow in to the very low-gradient Barotse floodplain. Further downstream at Ngonye Falls, the river steepens as it collects more flow from large tributaries such as the Cuando-Chobe River that drains southern Angola and Namibia's Caprivi Strip. Three hundred kilometres further downstream, the river flows over a nearly 100 metre drop, forming the dramatic Victoria Falls (Moore *et al.* 2007) and entering the steep, 100km long Batoka Gorge. Downstream of this the river flow in to the Kariba Reservoir, and then further downstream in to Cahorra Bassa Dam before existing and flowing across a wide, flat coastal belt in Mozambique before entering the Indian Ocean at Chinde.

Table 3.2 Mean estimated annual runoff for Zambezi sub-basins (after Beilfuss and dos Santos 2001).

Sub-Basin	Catchment Area (km^2)	Mean Annual Discharge ± 95% C.I. (m^3/s)	Mean Annual Runoff ± 95% C.I. (km^3)
Upper Zambezi	507,200	1046 ± 815	32.9 ± 25.7
Gwembe Valley	156,600	222 ± 196	7.2 ± 6.2
Total to Kariba Gorge	***663,800***	***1268 ± 997***	***40 ± 31***
		Volume of Kariba Reservoir	*180 km^3*
Kafue River	154,200	285 ± 279	9.0 ± 8.8
Luangwa River and others	232,000	888 ± 818	28.0 ± 25.8
Total to Cahora Bassa Gorge	***1,050,000***	***2442 ± 1917***	***77 ± 60***
		Volume of Cahora Bassa	*52 km^3*
Plateau Tributaries	177,500	412 ± 365	13.0 ± 11.5
Shire Basin	154,000	539 ± 422	17.0 ± 13.3
Zangue Basin	8,500	16 ± 14	0.5 ± 0.4
Total to Zambezi Delta	**1,390,000**	**3424 ± 2675**	**108 ± 84**

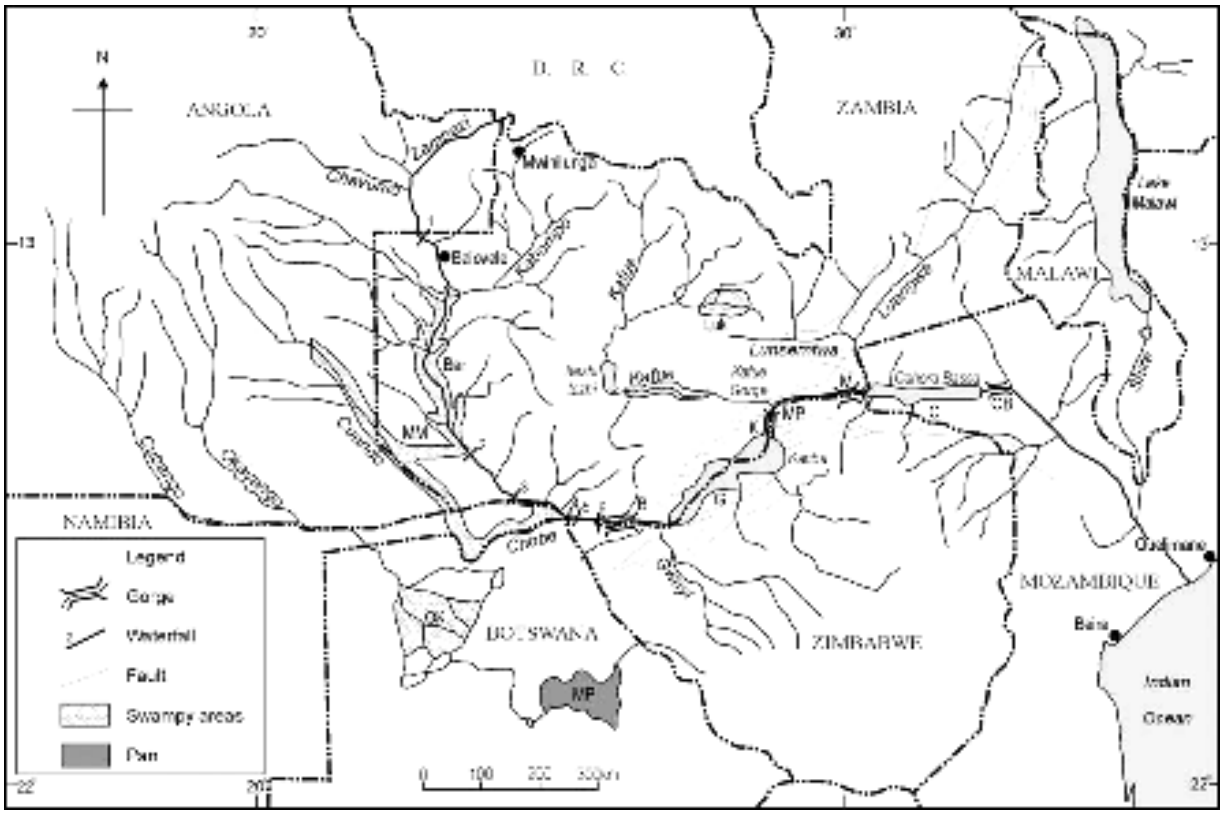


Figure 3.1 Zambezi River basin (Source: Moore et al. 2007).

At the largest scale, the Zambezi River has been divided in to three major segments, (Wellington 1955, Moore *et al.* 2007), namely:

- The Upper Zambezi, extending from the headwaters to Victoria Falls;
- The Middle Zambezi, extending from Victoria to the Mozambique coastal plain; and
- The Lower Zambezi, extending from the Cahora Bassa Gorge across the coastal plain of Mozambique (Figure 3.1).

The upper segment, above Victoria Falls, is characterised by generally low slopes and river channels with large floodplains and wetlands. The middle segment is characterised by extensive gorges, such as Batoka, Kariba and Cahora Bassa, with the confined floodplain of Mana Pools located between Kariba and Cahora Bassa (Figure 3.2). Downstream of Cahora Bassa the river flows in to the lower segment - a more than 400km long stretch of floodplains and delta across the Mozambiquan coastal belt.

In the middle segment of the Zambezi, from Victoria Falls to Cahora Bassa, the river is relatively steep and often confined to an incised, narrow channel. This segment has tremendous hydropower energy generation potential and the Kariba and Cahorra Bassa Dams are already located here. The focal study area is between Victoria Falls and Lake Kariba. This section of river has been subdivided in to three zones (Table 1.3) based on slope, valley width, the presence and diversity of morphological units, and tributary confluences.

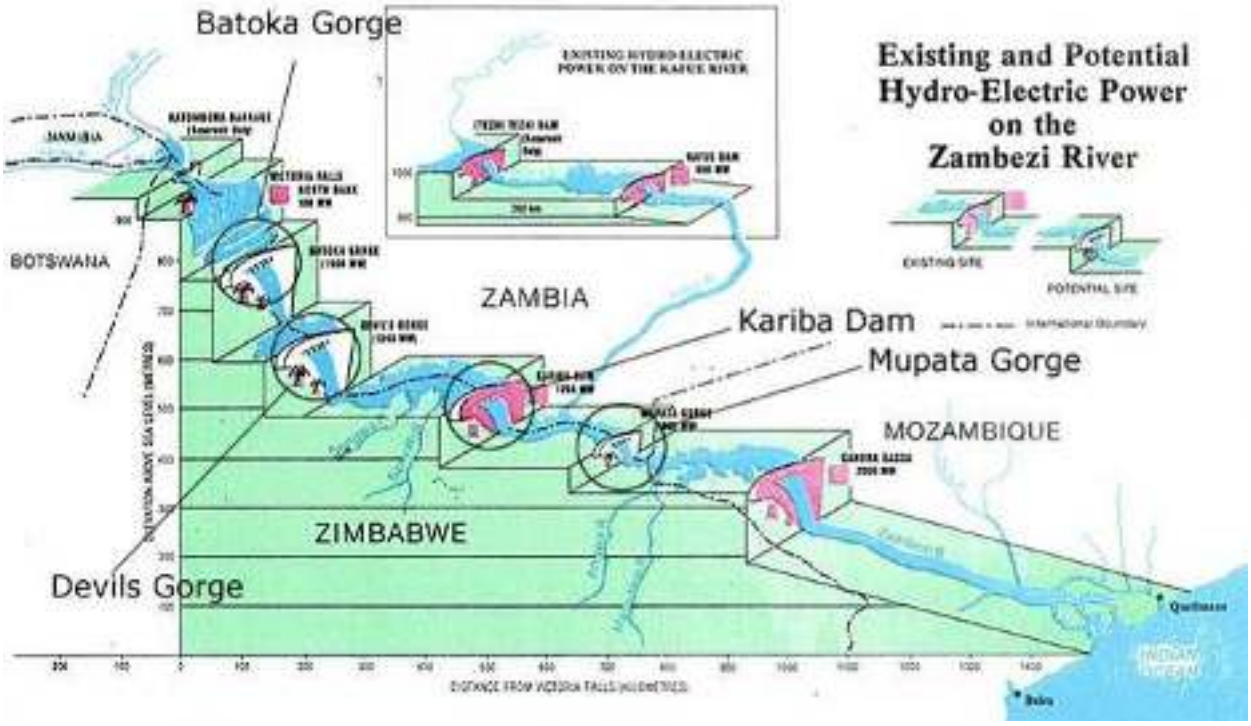


Figure 3.2 **Existing and proposed hydropower developments of the middle segment of the Zambezi River (source: Zambezi River Authority).**

Table 3.3 **Zones within the Middle Segment of the Zambezi River**

No	Zone name and description	EF site	Average slope	Length (km)
1	*Upper Gorge - no tributary inputs* Moderate to steep gradient, confined channel (gorge) with limited lateral development of alluvial features. Morphological units include bedrock fall, cascades and pool-rapid.	EF 1	0.0021	100
2	*Lower Gorge - some tributary inputs* Moderate to steep gradient, confined channel (gorge) with limited lateral development of alluvial features. Morphological units include bedrock fall, cascades and pool-rapid.	-	0.0016	24
3	*Rejuventated cascades: widened river valley* Moderate gradient, still within a confined channel, but wider and less steeply sloping banks. Limited lateral development of alluvial features. Morphological units would be cascades and pool-rapid, but also gravel bars, sand bars and vegetated islands.	EF2	0.0010	24

Zone 1 is the section of the Upper gorge, from Victoria Falls to approximately 100 km downstream. In this zone the river channel is steep and very narrow, with few

morphological or sedimentary deposits within the confined valley. EF Site 1 and the proposed Batoka Dam are located within this zone. Zone 2 is associated with a less steep slope and some tributary inputs. Tributaries contribute both flow events and sediment loads to the gorge area, and their role would be increasingly important for river ecology downstream of any proposed dams. The slightly wider valley floor, together with sediment inputs from tributaries, result in some small isolated sedimentary deposits which increase habitat diversity. Zone 3 is a length of rejuventated cascades associated with a further widened river valley and shallower slope. The more moderate gradient and wider, less steeply sloping banks result in some development of lateral alluvial features, and occasional cobble and gravel bars, some sandy bank sections and infrequent vegetated islands. EF Site 2 is located within Zone 3.

2.4 LITERATURE REVIEW

The ability of the river to move sediment is referred to as its sediment transport capacity and this is largely a function of river flow. Sediment supply is controlled by catchment and riverine erosion and deposition processes and it is the interaction between the supply of sediment and the ability of a river to transport that sediment which determines the form (morphology) of a river channel. Sediment supply and sediment transport capacity interact such that:

- where sediment supply is less than the sediment transport capacity, there is an excess of erosive energy, resulting in net erosion, causing the river channel to erode its bed/banks and incise, and;
- where sediment supply is greater than sediment transport capacity, there is an excess of sediment, resulting in net deposition and the development of an aggrading river/floodplain environment.

The ability of a river to move water and sediment downstream is a function of its longitudinal connectivity. Large dams disrupt the longitudinal connectivity of rivers, causing changes in the sediment supply and transport characteristics in the downstream river, but extensive floodplains or wetlands can have a similar, albeit less extreme, impact on reducing sediment supply to downstream reaches. In the Zambezi River, the floodplains and wetlands in the upper segment (above Victoria Falls) already act as natural sediment traps, such that flows downstream of the Victoria Falls are naturally relatively sediment poor. However, some sediment still passes through to downstream reaches whereas the large Kariba reservoir traps all sediment flowing within it, such that the releases from this dam, and similarly at Cahorra Bassa further downstream, are free of bedoad and have very reduced suspended sediment loads. This has morphological and ecological consequences downstream.

2.4.1 Effects of dams and hydropower operations on river morphology

As described above, dams act as sediment traps, causing a loss of sediment supply downstream (Ibanez et al. 1996; Vorosmarty et al. 2003; Wohl 2004; Anselmetti et al. 2007; Wang et al. 2007). Large dams also have important direct biological consequences such as the fragmentation of communities and reduced migration/dispersal (Anderson *et al*. 2006; Coutant and Whitney 2000; Jansson *et al*. 2000; Lundqvist *et al*. 2008) and increased retention of nutrients and organic matter in within the reservoirs resulting in eutrophication and nutrient loss downstream (Humborg *et al*. 2006).

Downstream of large dams, water releases are largely sediment free due to the deposition of bedload and suspended load within the reservoir. This results in the erosion of the beds, banks, bars and islands in the reaches downstream of dams. Changes downstream of dams typically include:

- decreased sediment loads (Grant et al. 2003);
- coarsening of the bed material and consequent changes to the instream physical habitat conditions;
- incision of the active channel/s;
- net erosion of the beds and banks of rivers due to clean water releases from dams; and,
- abandonment of secondary channels and associated loss of islands (islands frequently become joined to the main banks due to active channel incision).

These morphological impacts below large dams arise primarily due to the reduced sediment loads downstream of dams, but the changes in hydrology (specifically the magnitude, frequency and rate of change of floods downstream of dams) can play an equally or more significant role. Many of the typical morphological impacts have been described in the lower Zambezi River (Davies et al. 2010; Ronco et al. 2010; Beilfuss et al. 2000; Timberlake 2000; Davies 1986) below the Cahorra Bassa dam.

In addition to the impacts noted above, some dams used for hydropower generation include peak power generation. Peak power generation relies on the release of daily floods to allow for enhanced power generation during peak demand periods (usually early morning and early evening). In order to maximize power generation, it is possible that peak power generation may be considered for portions of at least the low flow season in this system. Peak hydropower generation typically involves even more extreme changes to the natural hydrology, including rapid changes in discharge and often highly elevated flood frequencies. The changes to the natural hydrology can be extreme, including rapid changes in discharge and often highly elevated flood frequencies, which can have severe implications for the morphology in the downstream river, such as vegetation loss, extensive bank slumping (Rountree 2009), increased channel width and decreased depth.

Not all reaches of a river are equally sensitive to the changes in hydrology and sediment alterations. Different river reaches have been shown to respond at different rates, and occasionally with different trends, to the same alterations of hydrology and sediment (Rountree et al. 2001; 2004). Thus, the rate and nature of the morphological changes downstream of an HPP is a combination of dam size, dam operation and the sensitivity of the downstream river reaches to flow-induced change.

An assessment of the study area was thus undertaken to describe the morphological character of the river and also assess the potential sensitivity to upstream hydropower dams and the associated changes caused to sediment loads and hydrology.

2.4.2 Impacts of dams on the Zambezi

The last unobstructed major Zambezi flood on the lower Zambezi occurred in 1958 (Tinley 1994) and was estimated to have a peak of approximately 16,000 m^3/s (Kovacs 1984). The closure of Kariba and Cahora Bassa dams resulted in the river flows downstream becoming increasingly regulated (Figure 3.3). The subsequent impacts on the lower Zambezi ecology are well documented (White 1993; Tinley 1994; Beilfuss and Davies 1999; Beilfuss et al. 2000; Davies et al. 2000; Timberlake 2000; Beilfuss and Santos 2001a; Beilfuss and Santos 2001b; Moore et al. 2007; Ronco et al. 2010) and these impacts mirror the geomorphological impacts on other large dams (e.g. Shalash 1982). Prawn catch rates off the Sofala banks also declined by 60% between 1978 and 1995 (Hoguane 1997), and this is assumed to indicate the reduced freshwater and sediment flows arriving from the delta.

However, the Batoka Gorge being investigated in this study is located upstream of Kariba. Here the Zambezi still experiences relatively natural flow conditions as there are no major dams upstream of the study area. Sediment loads are also largely natural, and are assumed to be low due to the trapping effect ofthe extensive floodplains and wetlands in the upper Zambezi above Victoria Falls. Suspended and bed load sediment measurements examining the sediment loads on the lower Zambezi prior to the closure of Cahora Bassa (BEH-MFPZ 1964, in Ronco *et al.* 2010) revealed that bedload was less than 1% of the suspended load, implying that bedload sediment inputs from tributaries and through lateral erosion of the banks and bars of the channel could provide significant contributions to downstream reaches as the overall bedload was small.

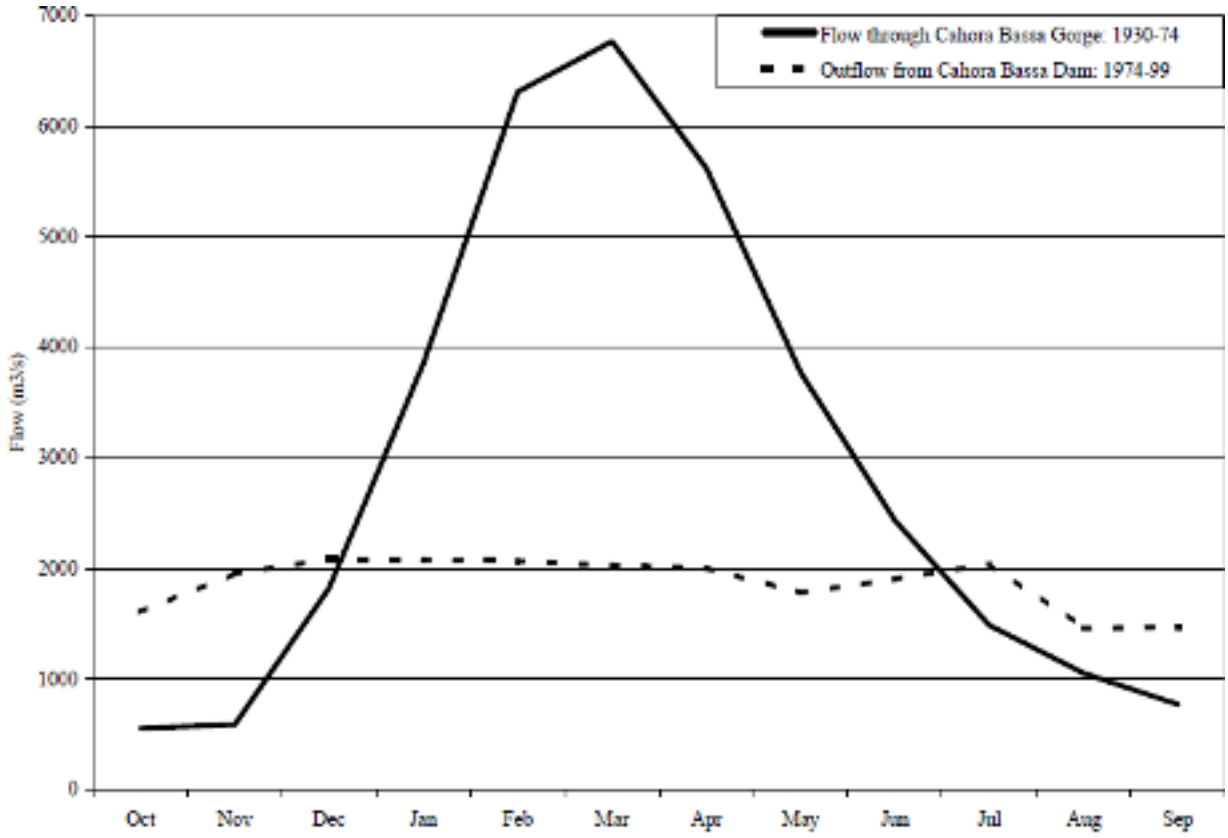


Figure 2-28. Hydrographs of mean monthly runoff at Cahora Bassa Gorge, before and after completion of Cahora Bassa Reservoir.

Figure 3.3 **Time series of mean monthly flows at Cahora Bassa Reservoir before dam closure (1930-1974) and after the dam was closed (1974-1999). The reduction in intra-annual flow variability through reduced flood flows and increased dry season flows was extreme (source: Beilfuss and dos Santos 2001).**

2.5 *DESCRIPTION OF THE EF SITES*

See Section 1.4 for a map showing the location of the EF sites.

2.5.1 EF Site 1

This site is located within the upper gorge. Morphological units include bedrock fall, cascades and pool-rapid sequences, but there are few sedimentary bars present as the trapping of sediment in the wetlands and floodplains upstream of Victoria Falls, combined with the high flow velocities in the steep, deep river channel of this gorge section, precludes the development of extensive lateral alluvial features. Bedrock and angular boulders dominate the bed and banks, with fine kalahari sands limited to small lee deposits. At the site these sand deposits are very small, but larger lee deposits of sediment are infrequently present upstream between the EF site and Victoria Falls. The zone between the low flow and high wet season water levels is almost devoid of all vegetation. Above the high water mark there is a narrow zone of riparian trees, dominated by *Combretum imberbe*.

There are small bedrock bars exposed at low flow, with some lower velocity marginal and backwaters created by the exposed bedrock of the lower banks and shallower channel areas. Very small areas of gravels can be found between the large boulders in slow flowing areas, but most of the channel is dominated by deep fast-flowing sections where bedrock and large boulders dominate.

Figure 3.4 EF Site 1 is dominated by bedrock controlled bars and banks.

2.5.2 EF Site 2

The lower EF Site is situated in the rejuventated cascades reach. This reach is characterised by a wider river valley with a more moderate slope. Although the river channel still flows within a confined channel, this channel is wider and has less steeply sloping banks and there is some development of sandy alluvial deposits in places. Typical morphological units would be cascades and pool-rapid sequences, but small gravel bars, sand bars and vegetated islands are present.

The upstream Matetsi tributary, and backup effects of the nearby large Deka tributary, would promote sediment deposition on the banks during floods. Within the main channel at low flow, low lying bedrock features are exposed during the lower flow season. These low lying rock habitats are important for the Rock Pranticole (Hockey et al. 2005). Rock

pranticoles, an intra-African migrant bird species, nest on low lying rock exposures in the river channel during the low flow season between August and November.

Figure 3.5 EF Site 2 has some sandy lateral deposits on the northern (Zambian) bank, with cobbles and bedrock dominant within he active channel.

2.6 *ECOSTATUS OF RIVER REACHES REPRESENTED BY THE EF SITES*

An assessment of the present ecological (geomorphological) status of EF sites was undertaken based on observations and data collected during the site visit undertaken in 2014, available maps, high resolution historical and current satellite imagery, literature sources, data from previous studies and discussions with regional experts. The Geomorphological Assessment Index (GAI) prescribed by the South African Department of Water Affairs and Forestry (Rowntree and du Preez, *in press*) was used for this assessment.

The GAI generates a percentage score that enumerates the deviation of the condition of the site from the expected natural (or Reference) condition. The output percentage scores are grouped into 6 Categories ranging from A (essentially in the Reference or historic natural Condition) to F (representing the most extremely degraded condition possible). For the purposes of this study, the Reference Condition was set as that condition of the river approximately 100 years ago, prior to any major catchment developments.

2.6.1 Ecostatus of EF Site 1

The PES category of geomorphology at EF Site 1 is an A (99%) and is regarded as essentially in the Reference condition. This very high score is due to the fact that:

- there are no large dams and thus relatively minor changes to flow upstream of Victoria Falls (i.e. upstream of the site);
- any changes in sediment loads are also similarly relatively small, and are moreover attenuated in the large wetlands and slow flowing depositional areas of the upper Zambezi; and,
- the gorge in which EF Site 1 is located is insensitive to small-scale changes in sediment and flow due to its resistant, bedrock dominated morphology.

2.6.2 Ecostatus of EF Site 2

The PES category of geomorphology at EF Site 2 is an A (97%) and is similarly considered to be close to the natural or Reference condition. This high score is due to the fact that

- there are relatively minor changes to flow upstream of the site through the gorge or above Victoria Falls;
- any changes in sediment loads are also similarly relatively small, and are moreover attenuated in the large wetlands and slow flowing depositional areas of the upper Zambezi, and
- the site where EF Site 2 is located is only moderately sensitive to changes in sediment and flow due to the widespread resistant bedrock outcrops alongside and within the channel.

There has been a minor degradation of the geomorphology at EF Site 2, but this is due to on-site (non-flow related) bank disturbances associated with landuse activities. The small pockets of riparian agriculture on the Zambian side and recreational/residential encroachment in to the upper riparian areas on the Zimbabwean side would have very slightly reduced the integrity of the riparian vegetation and bank stability.

2.7 FIELD DATA COLLECTION AND ANALYSIS

The EF sites were visited in September 2014. At each site, key alluvial morphological features were linked to surveyed cross sections and notes on the general condition of the site and reach, and likely issues with regard to habitat and channel maintenance, were made from these field observations. Google Earth and historical topographical maps were used to aid in the assessment of potential for change and dynamics of the geomorphology at the sites.

2.7.1 Determining flows to maintain channel morphology

Flow requirements for the maintenance of channel form, or geomorphology, can generally be determined using one, or a combination, of two possible approaches. The first relies on specialist knowledge and experience to identify alluvial morphological cues at the site and within the reach which are associated with regular flooding return frequencies (such as active, seasonal and ephemeral paired benches and terraces). The second approach uses the catchment hydrology and site-specific hydraulic characteristics to model the long term potential bed sediment movement within the river to identify geomorphologically effective discharges. These are ranges of flows which are responsible for a disproportionately large amount of the long term sediment transport (geomorphic work) which is happening at the site.

3.7.1.1 *Morphological Cues*

The rivers in this study area are not alluvial depositional systems. The EF sites have limited alluvia features present within their incised channels; with the channels themselves flowing along the underlying bedrock of the area. The development of morphological cues, usually associated with depositional alluvial environments, is thus limited. However, some key physical habitat types wee identified and these morphological features, such as backwaters, sedimentary bars and secondary channels, were used in conjunction with local site hydraulics and sediment data (such as the velocities required to activate or move sediments), as cues for the flows and floods required to maintain the channels.

3.7.1.2 *Sediment Transport and Geomorphologically Effective Flows*

The form (morphology) of a river channel is dependent on the interaction between the supply of sediment from its catchment, and the capacity of that section of the river to transport the sediment it is supplied with. The ability of the river to move sediment is referred to as its sediment transport capacity. Sediment supply and sediment transport capacity interact such that:

- where sediment supply is less than the sediment transport capacity, there is an excess of erosive energy, resulting in net erosion, causing the river channel to erode its bed/banks and incise; but
- where sediment supply is greater than sediment transport capacity, there is an excess of sediment, resulting in net deposition and the development of an aggrading river.

The interactions described above are generally considered over very long timescales. The rivers in this study are primarily erosional river systems, meaning that, in the very long term (hundreds of years), sediment supply is less than the transport capacity of the river channel. Over shorter timescales, which are of more interest to river managers (years and decades in southern Africa), studies in eastern southern African rivers have demonstrated that rivers experience periods of metastability or quasi-stability interrupted by periods of rapid change (Rountree et al. 2001; Rountree and Rogers 2004; Parsons *et al.* 2006). During these timescales, it is the discharge of water and sediment supply that determines channel form. Where changes in these driving factors occur, the channel form will adjust in sympathy with the imposed change. This is of significance as the channel form provides the physical habitat for riverine biota.

Geomorphologically effective flows are those discharges that, over the longer term, are responsible for transporting disproportionately larger proportions of the sediment load (relative to their duration). These are essentially the flows that do the most "work" in determining the sediment transport capacity of the channel, and therefore influencing its form. The calculation of these flows is essentially the sediment transport potential of a particular flow event, multiplied by its duration, which yields its potential contribution to the sediment transport of the system in the long term. The theoretical position taken in these

methods is that two sets of discharges are significant in maintaining channel form in southern African rivers:

- a set of geomorphologically effective discharges in the 5-0.1% range on the 1-day daily flow duration curve, which transport a disproportionately large volume of the sediment in the longer term, and
- larger 're-set' flood events such as the flood events of 2000, which can reshape the channel and remove vegetation from the banks and floodplain.

These methodologies for determining channel maintenance flows have been used in ecological flow assessment studies in South Africa, Mozambique, Namibia, Angola, Zambia, Sudan, Peru and Pakistan. The theoretical basis for these assumptions is presented in Dollar and Rowntree (2003).

3.7.1.3 Methods used to identify geomorphologically effective flows

The methods employed to determine geomorphologically effective flows are described below. The long term observed daily flows, regional slope, rating curves (provided by the hydraulician) and sediment characteristics for the site were used to model potential bed material transport at each site over the observed flow record, using Yang's (Yang 1973) total load equations to determine the effectiveness of discharges. This modelling technique assumes:

- The bed material sampled at the site is representative of the supply of bed material to the channel.
- Bed material sampling can be averaged at each EWR site and used to represent the cross-section.
- The supply of bed material to each EWR site is based on the existing bed material and its size distribution, and is available for transport at all discharges.
- Average conditions can be used.

The maintenance of bed sediment characteristics (river bed habitats) is important for instream biota. Bed sediment usually comprise a mix of boulders, cobbles, gravels sands and finer material which have been transported and deposited by the river channel at the site. Some bed sediment is derived *in situ* (in this case, from the cliffs of the gorge) and these very large bed elements are not indicative of the flow regime nor are they related to sediment transport patterns of the river. Only the mobile component of the bed material at this site – the boulders, cobbles, gravels and sands that overlay the bedrock/fixed boulder bed and are transported by contemporary flow regime. Potential Bed Material Transport (PBMT) modelling of these sediments is then undertaken at the EF sites, averaged for the duration of the flow record to provide indications of long term patterns. This method allows for geomorphologically effective flows for the maintenance of channel conditions to be determined. A full, detailed description of the technique can be found in Dollar and Rowntree (2003).

3.7.2 Likely impacts of the proposed Batoka HPP on downstream sediments

The proposed Batoka gorge will alter the flow patterns and sediment delivery to the downstream reaches and their representative EF sites. At EF Site 1 we anticipate a critical reduction in bedload and suspended sediments, with some minor amelioration at EF Site 2 due to inputs from tributaries (Table 3.4). Flushing of the reservoir is unlikely to be undertaken due to the relatively low sediment loads, but if seasonal flushing were to be contemplated, then this should be undertaken in the high flow season to mimic the naturally higher sediment loads of that flow season.

Table 3.4 Estimated changes in sediment delivery expected at EF Site 1 and 2 (as a percentage of Present Day levels, which is at 100%).

% sediment delivered to EF site	Fine suspended sediments (silts and clays)				Coarse suspended sediments (sands and larger)			
	Median		Maximum		Median		Maximum	
Flow season:	Flood	Dry	Flood	Dry	Flood	Dry	Flood	Dry
EF 1: PD	100	100	100	100	100	100	100	100
EF 1: Dam, no flushing	30	20	40	20	15	10	15	10
EF 1: Dam with flushing, flush in wet season	40	20	120	20	15	10	15	10
EF 1: Dam with flushing, Flush in dry season	30	30	40	300	15	10	15	10
EWR 2: PD	100	100	100	100	100	100	100	100
EF 2: Dam, no flushing	40	20	40	20	20	15	20	15
EF 2: Dam with flushing, flush in wet season	50	20	100	20	20	15	20	15
EF 2: Dam with flushing, flush in dry season	40	30	40	200	20	15	20	15

The reduced sediment loads and altered flow patterns, especially those associated with possible peak power generation, can be expected to cause changes in the availability of some types of physical habitats downstream. Indicators of the key habitat types were selected to be able to describe the processes upon which they are dependent in order to make predictions of the expected changes of these habitat types in response to altered flow and sediment regimes.

3.8 IDENTIFICATION OF INDICATORS

3.8.1 Indicator list for Geomorphology

The geomorphology features and their reason for selection as indicators in the EF assessments are given in Table 3.5. The expected responses to flow changes are outlined in Table 3.6.

Table 3.5 Indicators and reasons for their selection

Indicator	Reasons for selection as indicator
Rock exposures at low flow	Low elevation rock exposures adjacent to and within the low flow active channel are important for Rock Pranticoles, a rare locally endemic bird species which is dependent on these features during the dry season for nesting.
Lengths of cut banks	The extent of cut banks can be used to indicate channel incision and to indicate the potential for marginal vegetation to establish along the banks. Where dams are being considered, the reduced sediment availability downstream generally causes increases in erosion and the extent of cut banks.
Active channel bed sediment condition	Bed sediment size distribution indicates the condition of the instream physical habitat of the main channel bed
Backwater bed sediment condition	Bed sediment size distribution indicates the condition of the instream physical habitat of the backwaters and marginal channel areas. These are important refugia for many species in that they provide lower velocity areas.
Area of backwaters and secondary channels	Secondary channels and the marginal backwaters represent important instream habitats and offer refugia during high flow conditions.
Vegetated mid-channel bars	The sandy banks and open patches of large, stable vegetated bars are utilised by crocodiles for breeding. This is important around EF Site 2 where many crocodile breeding locations were pointed out within the study reach.
Depth of pools	The depth of pools indicates the extent of low flow/drought instream habitat refugia
Sand bars	Shallow, low elevation sand bars are dynamic and there is constant turnover of sediment. These shallowly inundated and exposed bars are the main habitat for bivalves (freshwater shellfish) and therefore are an important feeding area for wading birds which prey upon them.

Table 3.6 List of geomorphology indicators and their predicted direction of response to flow changes.

Indicator	Definition	Predicted change	Source of information
Rock exposures at low flow	The area of rocks exposed within the channel during the low flow season.	Reduced dry season flows would increase the area of rocks exposed. Increased dry season flows, or peaking power releases, would decrease habitat availability.	Hydraulics rating curves and field observations at the EF sites.
Lengths of cut banks	The length of cut (vertical) banks along the low flow channel.	Reduced sediment supply and peaking power releases would both result in an increase in the extent of cut banks due to increased erosion and bank slumping respectively.	Field observations on bank structure and susceptibility to erosion and slumping, Rountree (2009).
Active channel bed sediment condition	The proportion of sediment sizes, and extent of embeddedness, of the low flow active channel.	Increased baseflows and/or reduced sediments and/or peak power generation would lead to a reduction in fines and gravels within the active channel.	
Backwater bed sediment condition	The proportion of sediment sizes, and extent of embeddedness, of the backwaters and marginal areas during the low flow period.	Increased baseflows and/or reduced sediments and/or peak power generation would lead to a reduction in fines and gravels within the backwaters.	
Area of backwaters and secondary channels	Backwaters and secondary channels are areas of low velocity and shallow depth that provide refugia from predators and the fast velocities of the main channel.	Increased baseflows and/or peak power generation would lead to a reduction in this type of habitat, through either increased depths/velocities, or through increased flushing, making the habitat effectively unavailable as a refuge.	Hydraulics rating curves and field observations at the EF sites.
Vegetated mid-channel bars	Large bars and islands which are vegetated. The presence of vegetation indicates the morphological stability and higher elevation of these features relative to the lower lying, more dynamic sand bars.	Reduced sediment supply and peaking power releases would result in an increase in erosion and bank slumping respectively. Both processes could be expected to reduce the area of vegetated id-channel bars.	Hydraulics rating curves, field observations at the EF sites, Rountree *et al*, (2001), Rountree (2009).
Depth of pools	The average depth of the in-channel (active channel) pools along the river reach.	Reduced sediment supply may very slightly increase pool depth due to increased net scour. Similarly, peak power generation could slightly increase pool depth due to increased flood frequencies.	Analysis of hydrological records, hydraulic rating curves, Rountree (2009)
Sand bars	The area of low elevation sand bars exposed during the low flow season.	Reduced sediment supply and peaking power releases would result in an increase in erosion and bank slumping respectively, causing a loss of mobile sands.	

3.8.2 Description and location of indicators

This section describes the geomorphological indicators selected for the evaluation and prediction of changes linked to the proposed dam and hydropower generation.

3.8.2.1 Rock exposures at low flow

The rocky areas that become exposed during the low flow season are critically important for Rock Pranticoles (*Glareola nuchalis*). These rare, localised migratory birds use these rocky exposures for nesting in August through November, preferring sites in the river with deep, fast-flowing water around the rock outcrops as such sites provide protection from most predators (Hockey *et al.* 2005). Eggs are laid on a rock edge, under overhangs or in recesses or slight hollows, or on flat, exposed rock, just above the low flow water level. The nest may have a thin lining of plant debris, sand or dried mud.

Figure 3.6 Rocky areas that become exposed during the low flow season

3.8.2.2 Active channel bed sediment condition

This indicator provides an estimate of the bed sediment conditions within the active channel. Table 3.7 provides a description of the bed conditions linked to percentage of present day scores.

Table 3.7 Active channel bed sediment condition descriptions

% of PD condition	Description of the active channel bed condition
0	Surface is dominated by sand and silts, almost all cobbles are embedded
25	50% more embeddedness than the PD condition, extensive fine deposits
50	25% more embeddedness than the PD condition
75	10% more embeddedness than the PD condition
100	Conditions of the river bed as observed in September 2014
150	Doubling of the cobble bars with more, larger interstitial spaces, fewer fines.
200	The channel bed is dominated by boulders, cobbles and bedrock (no fines, very few, very small gravel deposits).
250	The active channel has a bedrock/large boulder bed.

1.1.1.1 Backwater bed sediment condition

This indicator provides an estimate of the bed sediment conditions within the backwaters and slow-flowing marginal areas of the channel. In the field it was discovered that deposits of fine sediments, of approximately 2 cm or more depth, allowed for a high diversity of invertebrate taxa to persist in the backwater habitats (Ewart-Smith, *pers. comm.*). Table 3.8 provides a description of the bed conditions linked to percentage of present day scores.

Table 3.8 Description of bed sediment conditions in the backwaters.

% of PD condition	Description of bed sediment conditions
0	All surfaces are covered by sand and silts
25	Extensive fines with 50% more embeddedness than the PD condition.
50	More extensive fines with 25% more embeddedness than the PD condition
75	More extensive fines with 10% more embeddedness than the PD condition
100	Conditions of the backwaters as observed in September 2014 - more than 50% of the backwater areas have silt/sand drapes.
150	25% reduction of the areas of fines in the backwaters
200	50% reduction of the areas of fines in the backwaters
250	Backwaters are clean bedrock - no sands, gravels and few cobbles/boulders

3.8.2.3 *Area of backwaters and secondary channels*

This indicator reflects the availability of inundated, low velocity, shallow marginal (at EWR1) and/or secondary channels (at EWR 2) and backwaters which provide critical hydraulic habitat refugia in the form of low or no velocity areas in the river. These shallow, low velocity areas are important for many species of fish and aquatic invertebrates. When peaking is in operation, these areas of the channel are scored as being unavailable since the several metres daily water level fluctuations would increase the velocities so much on these marginal areas that they would be rendered unsuitable as refugia.

3.8.2.4 *Lengths of cut banks*

Cut marginal banks are associated with the more alluvial sections of EF Site 2. The marginal banks are associated with the edges of the active channel and the lower extent of marginal vegetation. Where these banks are cut, this indicates important deeper slow flowing inchannel habitat which is usually associated with vegetation and therefore provides good cover. Extensive cut banks would also indicate increasing undercutting of the marginal vegetation.

3.8.2.5 *Depth of pools*

This indicator provides an estimate of the pool depth changes within the active channel. Due to limited sediment loads and the deep, confined and high velocity nature of the channel, this indicator should not show a great variation in depth through most scenarios as the potential for infilling (sedimentation) is very small.

3.8.2.6 Vegetated mid-channel bars

This indicator reflects large, stable, vegetated mid-channel bars. These sandy sedimentary features, found in the reach around EF Site 2, would almost always overlie a bedrock base. These larger sedimentary bars and banks are very important crocodile nesting sites.

3.8.2.7 Sand bars

At EF Site 1, these are higher elevation features that comprise sand deposits draped over underlying bedrock gorge slopes or the lower banks, usually in the lee of large rock outcrops or in the turbulence eddies at high flows. At EF Site 2, the sand bars are typically smaller scale, low elevation features which are partially exposed during the low flow season. These sandy areas are important bivalves (freshwater shellfish) and other aquatic fauna which are found here and the wading birds which feed on them.

3.8.3 Linked indicators

There are no linked indicators in the geomorphology suite of ecosystem indicators. All the geomorphology indicators link directly to the drivers (flow and sediment inputs).

3.8.4 Integrity weighting of indicators between sites

The weightings of indicators used in the calculation of integrity at the two sites are provided in Table 3.9.

Table 3.9 The weighting of indicators at the two sites

Indicator	Weight		Motivation
	EF Site 1	EF Site 2	
Rock exposures at low flow	1	1	These are morphologically very stable habitat features as they are formed from bedrock.
Active channel bed sediment condition	1	1	The condition of the channel bed is an important indicator of habitat conditions for most instream biota, and is thus generally weighted high.
Backwater bed sediment condition	3	3	The condition of the backwater bed is an important indicator of habitat conditions for most instream biota, and is thus generally weighted high.
Area of backwaters and secondary channels	2	2	Secondary channels provide important instream habitat, especially at EF 2 where more backwaters, and secondary channels, are present in the reach.
Lengths of cut banks	1	1	Cut banks are associated with deeper instream areas. Some instream species, as well as marginal vegetation, are associated with these areas where they are present.
Vegetated mid-channel bars	n/a	1	These are proportionally small features but important for crocodile breeding and for cover of riparian and, during the flood season, aquatic species.
Depth of pools	1	1	These are morphologically very stable habitat features as they largely controlled by the bedrock base of the channel.
Sand bars	1	1	These are proportionally small features but important for wading birds and some aquatic biota.

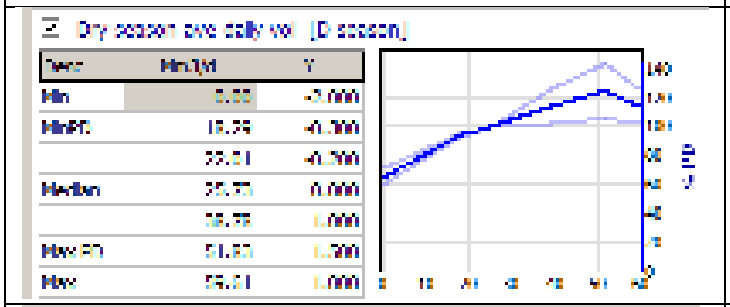
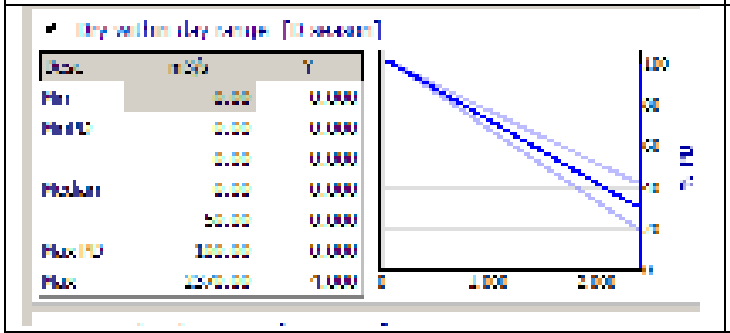
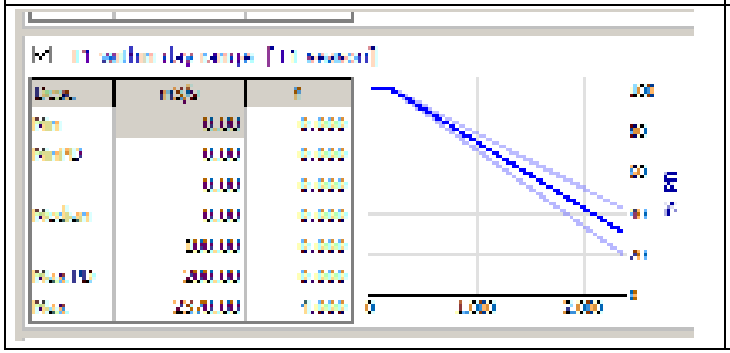
3.9 ASSUMPTIONS AND LIMITATIONS

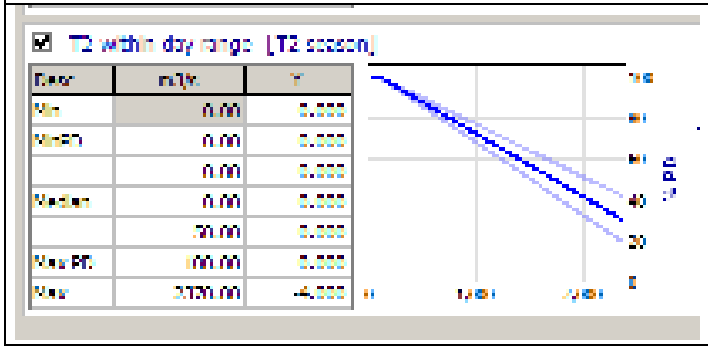
DRIFT is a powerful scenario evaluation tool that enables decision makers to evaluate the consequences for the downstream river ecosystem of numerous flow scenarios related to water relsource development. The model and subsequent predictions of change are highly dependent on the available modelled hydrology and the assumption that, in general, the median flow indicators accurately represent median Present Day flow conditions in the river. Modelled hydrology sometimes does not match well with observed flows, but there can equally be problems with observed flow data from gauges, such as where floods drown out the recorder and are therefore underestimated by the flow gauge. For this study, the hydrological record is deemed to provide an accurate and longer term reflection of real flow patterns.

Predictions of change to physical habitats based on hydrology alone will not take in to account the impacts of new dams if these are to be considered for future scenarios. To account for dams, an indicator of suspended sediment (representing all sediment inflows) to each site has been included in the DRIFT model. The values of this indicator should be adjusted if new dams are considered in the scenarios, with the degree of adjustment dependent on the proximity of the dam to the EF site.

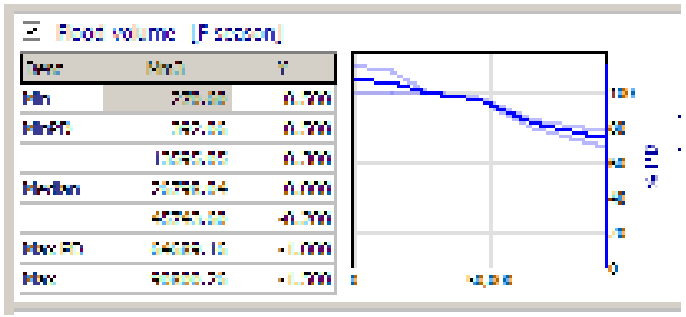
3.10 *MOTIVATIONS FOR RESPONSE CURVES*

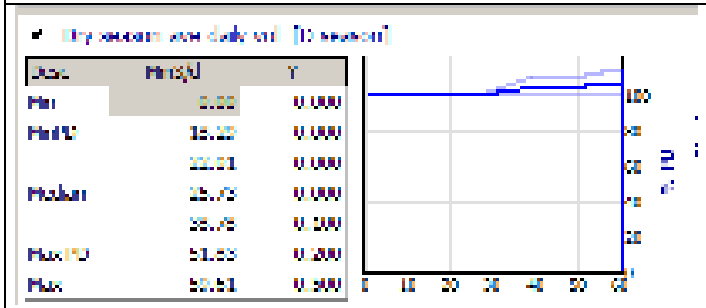
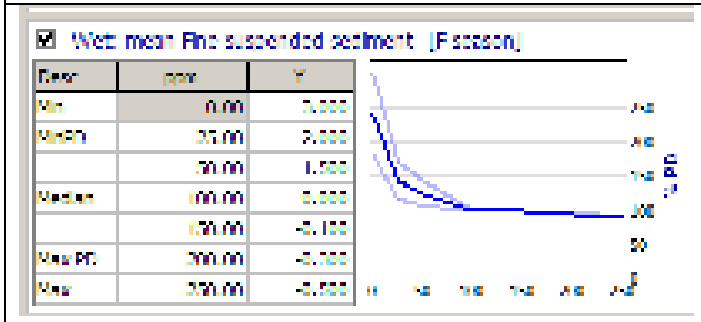
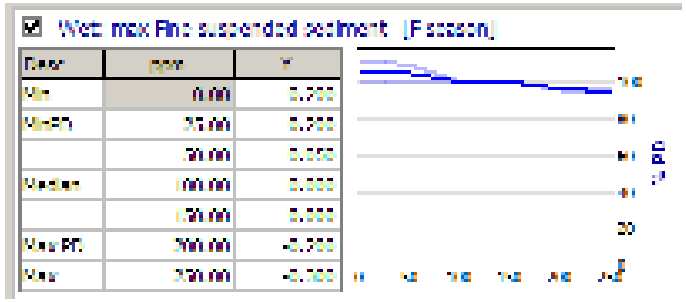
3.10.1 Rock exposures at low flow

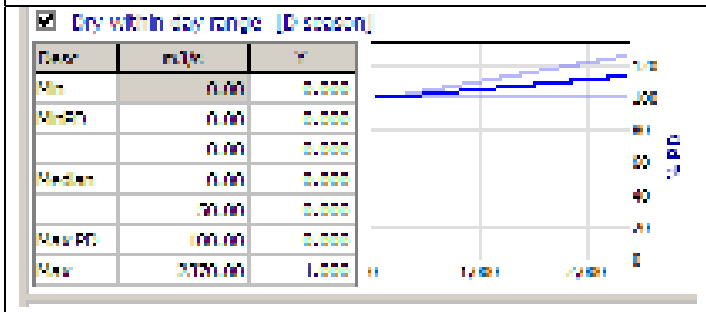
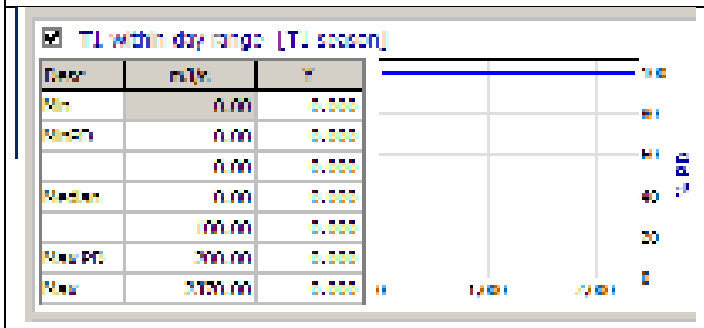
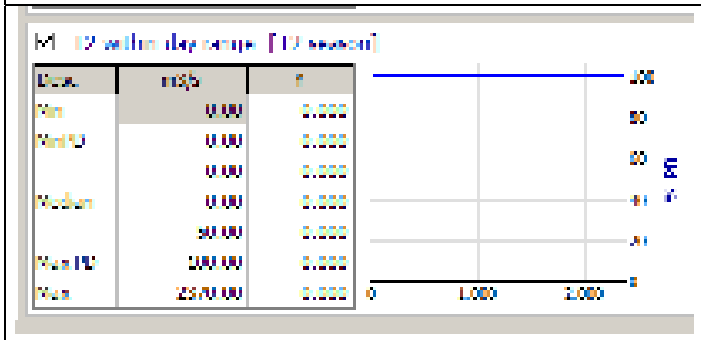
Response curve	Explanation
	At this site, higher dry season flows would create more cut off bedrock bars. These habitats are important for rock pranticole breeding (Hockey et al. 2005). Median and lower than median dry season flows cause limited change because the flows are primarily confined to a single channel, but increases above median flows cause wide areas of the primarily rocky lateral zones to be inundated.
	Hydraulic rating curves for the EF sites show that high intra-daily flow variations (potentially up to several metres of water level variation twice per day) would render rock exposures unavailable as breeding habitat (in the sense that they would not be exposed for long enough periods for breeding purposes) and therefore very high within daily ranges would drown most rock exposures.
	Hydraulic rating curves for the EF sites show that high intra-daily flow variations (potentially up to several metres of water level variation twice per day) would render rock exposures unavailable as breeding habitat (in the sense that they would not be exposed for long enough periods for breeding purposes) and therefore very high within daily ranges would drown most rock exposures.

Response curve	Explanation
	Hydraulic rating curves for the EF sites show that high intra-daily flow variations (potentially up to several metres of water level variation twice per day) would render rock exposures unavailable as breeding habitat (in the sense that they would not be exposed for long enough periods for breeding purposes) and therefore very high within daily ranges would drown most rock exposures.
References	Hockey, P.A.R., Dean, W.R.J. and Ryan, P.G. (Eds) 2005. Rock Pratincole. In: *Roberts Birds of Southern Africa,* VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

3.10.2 Active channel bed sediment indicator

Response curve	Explanation
	Applying the sediment transport analyses methods of Dollar and Rowntree (2003), important flow classes for sediment movement were identified. These results have been used to develop the relationship between bed sediment condition and max flood. Very large floods, associated with high rainfall years, would be associated with high sediment inflows and large amounts of sediment reworking of the bed. Larger floods would redistrubute more sediment across the channel (and in to the backwaters, creating finer habitats), whereas smaller flood years, associated with reduced local tributary inputs, would scour the channel and backwaters and could be expected to reduce the area of deposited fines.

Response curve	Explanation
	Lower average dry season flows would be associated with lower velocities and therefore more opportunities for fine sediments settling out on to the bed of the backwater habitats. Higher dry season discharges would flush the backwaters more effectively, thus reducing the areas of bed sediments.
	The mean suspended sediment load would be correlated with the area and depth of sediments deposited in the deep sections of the active channel.
	The peak suspended sediment load would play a minor role in the deposition of sediments in the main channel. Most fine sediment would however remain in suspension due to inchannel high velocities.

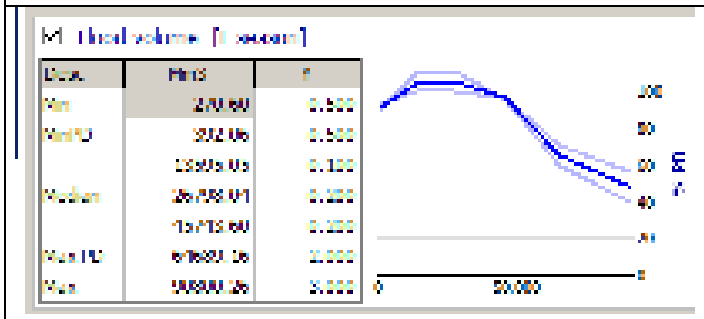
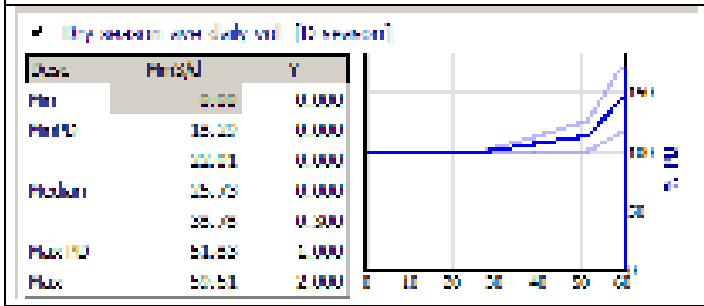
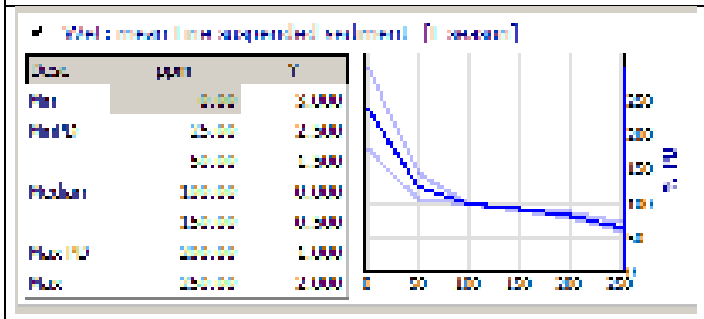
Response curve	Explanation
	A widely fluctuating daily range of discharges will scour out sediments from the margins of the channel, and the twice-daily flood peaks associated with peaking power generation would quickly erode finer sediments from the bed and banks (Rountree 2009), resulting in a clean, increasingly bedrock-dominated channel bed and bank.
	A widely fluctuating daily range of discharges will scour out sediments from the margins of the channel, and the twice-daily flood peaks associated with peaking power generation would quickly erode finer sediments from the bed and banks (Rountree 2009), resulting in a clean, increasingly bedrock-dominated channel bed and bank.
	A widely fluctuating daily range of discharges will scour out sediments from the margins of the channel, and the twice-daily flood peaks associated with peaking power generation would quickly erode finer sediments from the bed and banks (Rountree 2009), resulting in a clean, increasingly bedrock-dominated channel bed and bank.

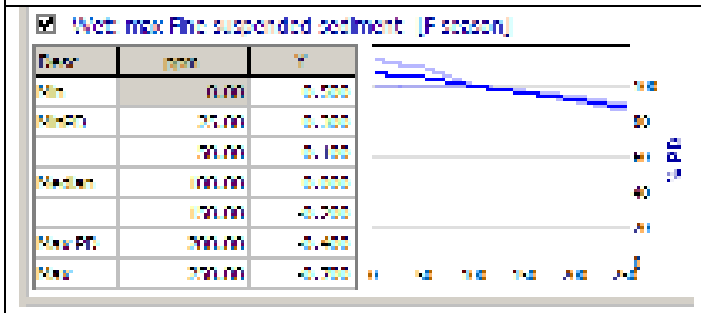
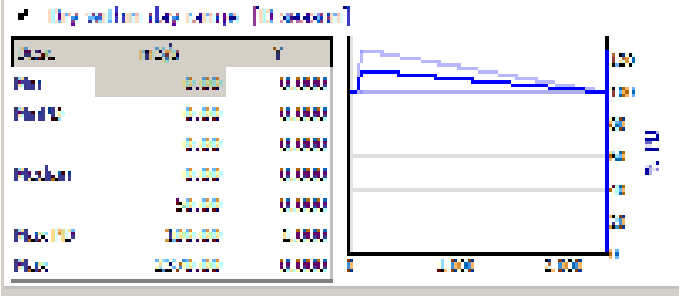
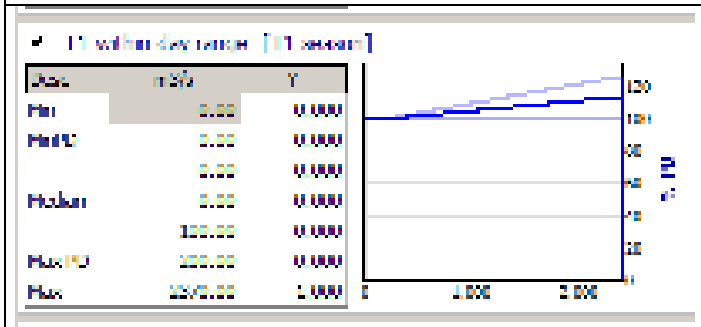
References

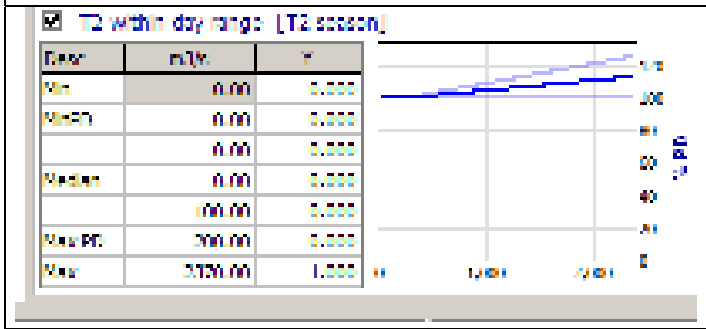
Dollar, E.S.J and Rowntree, K.M. (2003). Geomorphological Research for the Conservation and Management of Southern African Rivers. Volume 2: Managing Flow Variability: the geomorphological response. Water Research Commission Report No. 849/2/04, Pretoria.

Rountree, M. W. 2009. Assessing bank stability along the lower Kafue River, in Birkhead A.L., Rountree M., Rowlston, B. and Louw D (eds). Kafue Gorge Lower Hydropower Project, Zambia. Assessing hydraulic behaviour and bank stability along the lower Kafue River in response to peaking releases from the proposed Kafue Gorge Lower Hydropower Project. Prepared for the International Finance Corporation, August 2009.

3.10.3 Backwater bed sediment condition indicator

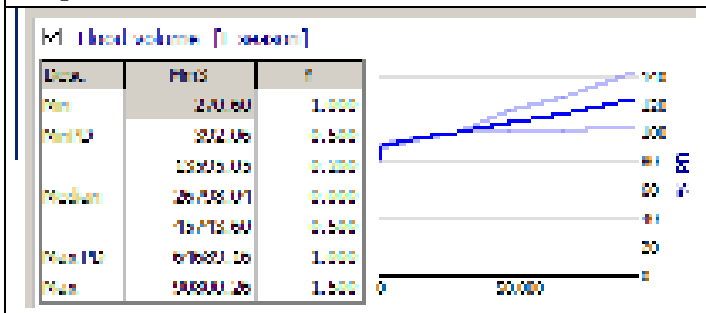
Response curve	Explanation
	Very large floods, associated with high rainfall years, would be associated with high sediment inflows and large amounts of sediment reworking of the bed. Very large floods would thus introduce many fines to the backwater areas. Median/moderate floods would do some scouring each year, but very small floods would not scour the backwaters, resulting in increasingly finer conditions developing.
	Lower average dry season flows would be associated with lower velocities and therefore more opportunities for fine sediments settling out on to the bed of the backwater habitats. Higher dry season discharges would flush the backwaters more effectively, thus reducing the areas of bed sediments.
	The mean suspended sediment load would be directly correlated with the area and depth of fines deposited in the slow velocity backwaters during the dry season.

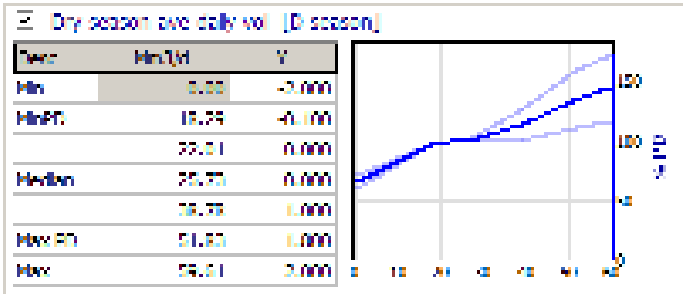
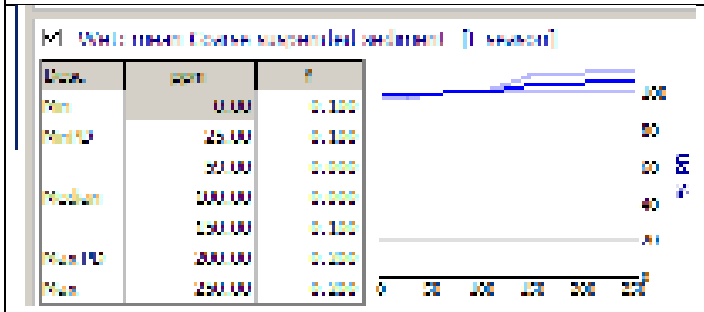
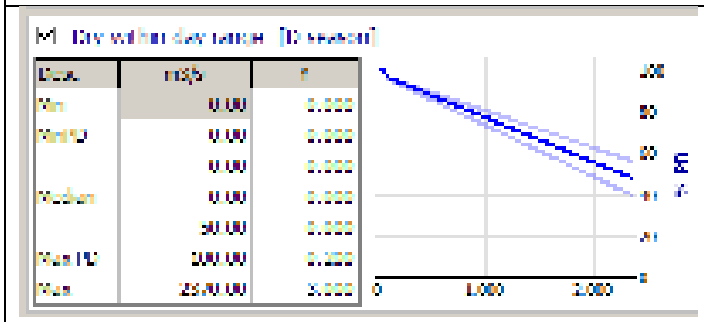
Response curve	Explanation
	The peak suspended sediment load would be weakly, but directly, correlated with the area and depth of fines deposited in the slow velocity backwaters during the dry season.
	A widely fluctuating daily range of discharges will scour out fines from the backwaters and increasingly result in a clean, bedrock surface (Rountree 2009).
	A widely fluctuating daily range of discharges will scour out fines from the backwaters and increasingly result in a clean, bedrock surface (Rountree 2009).

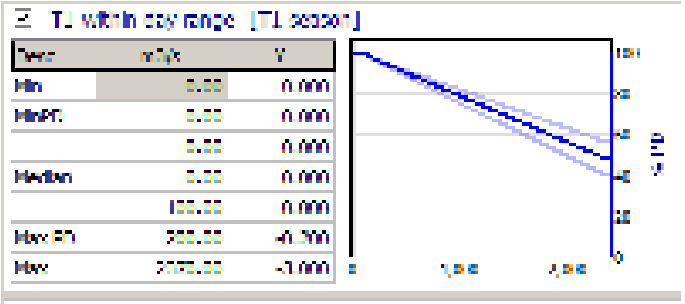
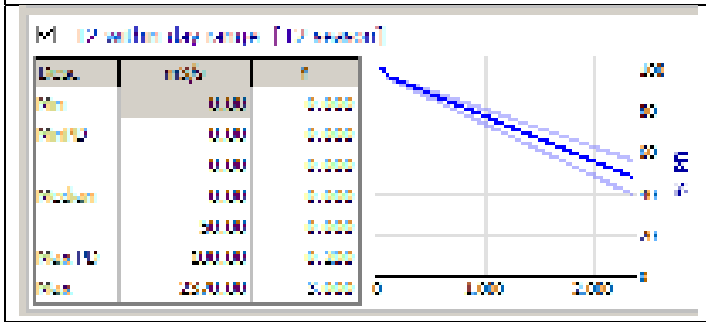
Response curve	Explanation
	A widely fluctuating daily range of discharges will scour out fines from the backwaters and increasingly result in a clean, bedrock surface (Rountree 2009).

References	Rountree, M. W. 2009. Assessing bank stability along the lower Kafue River, in Birkhead A.L., Rountree M., Rowlston, B. and Louw D (eds). Kafue Gorge Lower Hydropower Project, Zambia. Assessing hydraulic behaviour and bank stability along the lower Kafue River in response to peaking releases from the proposed Kafue Gorge Lower Hydropower Project. Prepared for the International Finance Corporation, August 2009.

3.10.4 Area of backwaters and secondary channels

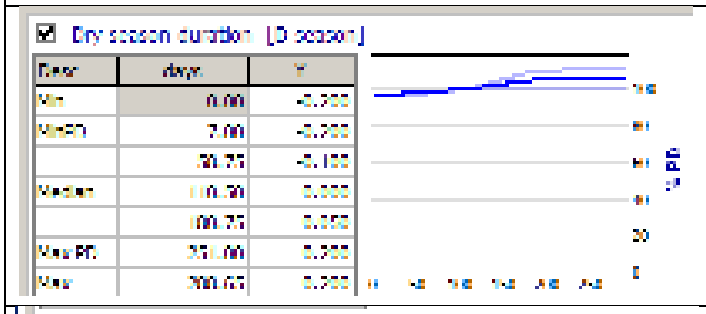
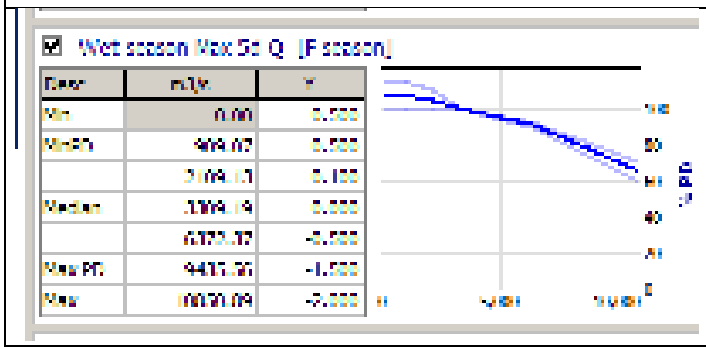
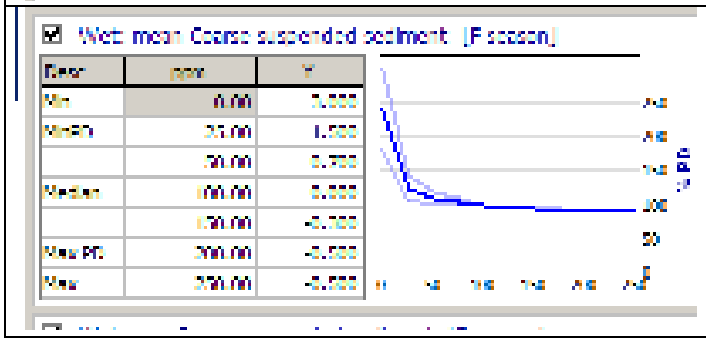
Response curve	Explanation
	Although the channel and backwaters are largely bedrock controlled, and therefore only small adjustments in area can occur in response to erosion and deposition, very large floods could be expected to be associated with higher sediment inflows. The large floods, and higher sediment loads, would scour lateral areas and slightly build the channel bed. Large floods would thus increase secondary channels and backwater areas in rives with bedrock controls (Rountree et al. 2001, Parsons et al. 2006). Very small floods would fail to inundate or replenish much of the marginal zone, making them unavailable for instream biota.

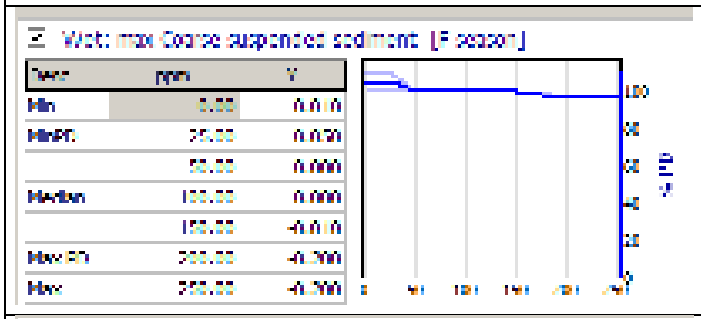
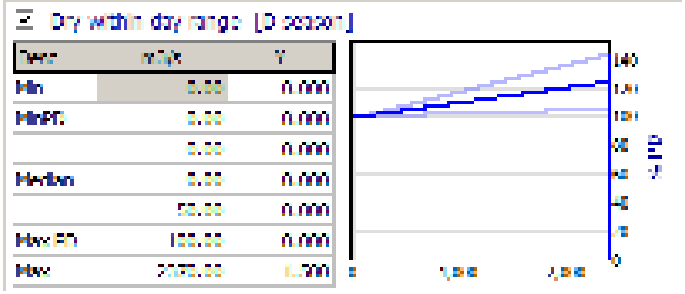
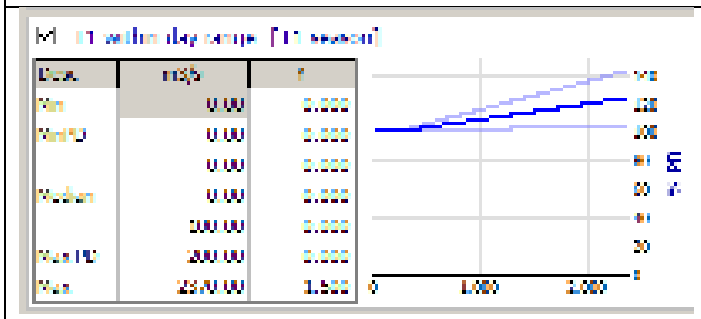
Response curve	Explanation
	This is the most important variable - the average dry season Q primarily determines the area of backwaters which are created in the low flow season. At zero flow, there would be few backwaters, and this increases as dry season average flows increase have been related to the consequent increases in width and associated areas of backwaters/slow marginal zones.
	The increase of sediment would create, through raised channel bed levels, a slight increase in backwaters/marginal habitat, but the impact of reduced sediment loads would be small as the underlyng channel morphology is primarily bedrock controlled and therefore not able to freely adjust (incise) when sediment is limiting.
	A widely fluctuating daily range of discharges will create a zone of high disturbance between the low and peak flows (Rountree 2009). When this water level fluctuation is very high, of up to a few metres per day, this would create a highly disturbed, scoured and fast velocity (associated with the rise and fall of the peaks) zone, effectively rendering the backwater refugia unavailable for most instream biota. With a more moderate fluctuation, some of the habitat can be expected to still be available.

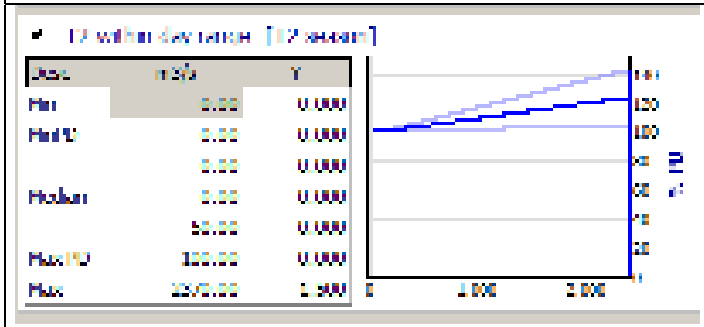
Response curve	Explanation
	A widely fluctuating daily range of discharges will create a zone of high disturbance between the low and peak flows (Rountree 2009). When this water level fluctuation is very high, of up to a few metres per day, this would create a highly disturbed, scoured and fast velocity (associated with the rise and fall of the peaks) zone, effectively rendering the backwater refugia unavailable for most instream biota. With a more moderate fluctuation, some of the habitat can be expected to still be available.
	A widely fluctuating daily range of discharges will create a zone of high disturbance between the low and peak flows (Rountree 2009). When this water level fluctuation is very high, of up to a few metres per day, this would create a highly disturbed, scoured and fast velocity (associated with the rise and fall of the peaks) zone, effectively rendering the backwater refugia unavailable for most instream biota. With a more moderate fluctuation, some of the habitat can be expected to still be available.

References	Rountree, M. W. 2009. Assessing bank stability along the lower Kafue River, in Birkhead A.L., Rountree M., Rowlston, B. and Louw D (eds). Kafue Gorge Lower Hydropower Project, Zambia. Assessing hydraulic behaviour and bank stability along the lower Kafue River in response to peaking releases from the proposed Kafue Gorge Lower Hydropower Project. Prepared for the International Finance Corporation, August 2009. Rountree, M.W., Heritage, G.L. and Rogers, K.H. 2001. In-channel metamorphosis in a semi-arid, mixed bedrock/alluvial river system: Implications for Instream Flow Requirements In M.C. Acreman (ed) Hydro-ecology, IAHS Publ. no. 26. Parsons, M., McLoughlin, C. A., Rountree, M. W. and Rogers, K. H. (2006). The biotic and abiotic legacy of a large infrequent flood disturbance in the Sabie River, South Africa. River Research and Applications, 22:187-201.

3.10.5 Length of cut banks

Response curve	Explanation
	Long dry seasons will promote incision of the low flow channel, creating more cut banks on the alluvial sections of the banks. Very short dry durations will not reset much of the wet season sediment deposits and may result in a net decrease in cut banks relative to median conditions.
	Very large floods erode the lateral zones and redistribute sediment across the channel floor, resulting in a small widening (and often shallowing) of the active channels (Parsons et al. 2006; Rountree et al. 2001, Tooth 2000; Rountree et al. 2000; Gupta et al. 1999; Bourke and Pickup 1999; Kochel 1988; Nanson, 1986; Baker 1977). This would actually flatten the banks and reduce the extent of cut/vertical banks in the marginal zone. Average floods could be expected to have little net impact, and very low floods may cause some incision of the low channel and undercut the marginal areas, increasing the extent of cut banks.
	Lower sediment loads will promote channel incision and therefore result in an increase in the extent of cut banks. Very large reductions in sediment supply will not however result in enormous increases in the extent of cut banks, since the bars associated with cut banks will begin to decline also. Increases in sediment supply have a relatively small impact since the river is largely sediment starved.

Response curve	Explanation
	Lower sediment loads will promote channel incision and therefore result in an increase in the extent of cut banks, although the peak sediment load alone would only have a minor impact relative the average sediment load values.
	Large fluctuations in the daily flow will rapidly cause bank slumping, bank retreat and rapidly increase the extent of cut banks along the channel margins (Rountree 2009).
	Large fluctuations in the daily flow will rapidly cause bank slumping, bank retreat and rapidly increase the extent of cut banks along the channel margins (Rountree 2009).

Response curve	Explanation
	Large fluctuations in the daily flow will rapidly cause bank slumping, bank retreat and rapidly increase the extent of cut banks along the channel margins (Rountree 2009).

References

Baker, V.R. 1977. Stream-channel response to floods, with examples from central Texas. *Geol. Soc. Am. Bull.*, 88: 1057-1071.

Dollar, E.S.J. 2002. Fluvial Geomorphology. *Progress in Physical Geography*, 26: 123-143.

Gupta, A., Kale, V.S. and Rajaguru, S.N. 1999. The Narmada River, India, through space and time. In Miller, A.J. and Gupta, A.(eds), *Varieties of Fluvial Form*. Wiley and Sons, Chichester, U.K, 113-144.

Kochel, R.C. 1988. Geomorphic Impact of Large Floods: review and new perspectives on magnitude and frequency. In Baker, V.R., Kochel, R.C. and Patton, P.C. (eds) *Flood Geomorphology*. Wiley-Interscience, New York, 169-87.

Rountree, M. W. 2009. Assessing bank stability along the lower Kafue River, in Birkhead A.L., Rountree M., Rowlston, B. and Louw D (eds). Kafue Gorge Lower Hydropower Project, Zambia. Assessing hydraulic behaviour and bank stability along the lower Kafue River in response to peaking releases from the proposed Kafue Gorge Lower Hydropower Project. Prepared for the International Finance Corporation, August 2009.

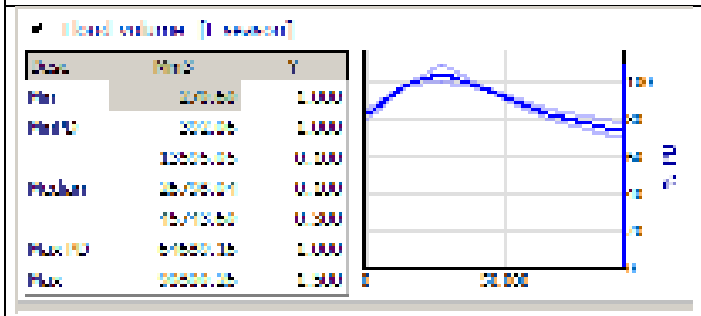
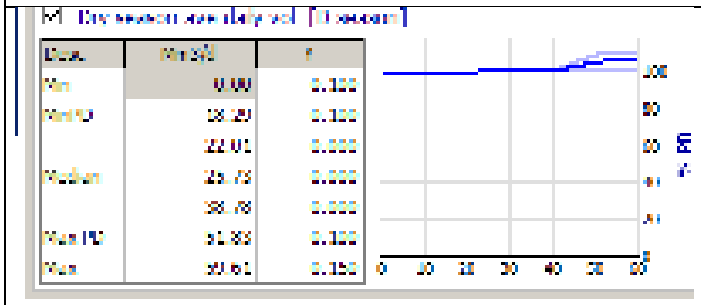
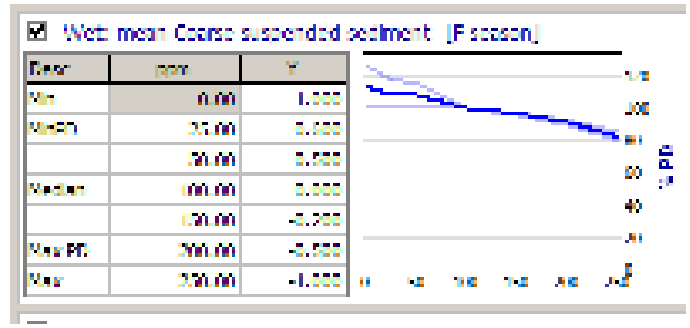
Rountree, M.W., Rogers, K.H. and Heritage, G.L. 2000. Landscape change in the semi-arid Sabie River in response to flood and drought. *South African Geographical Journal*, 82(3): 173-181.

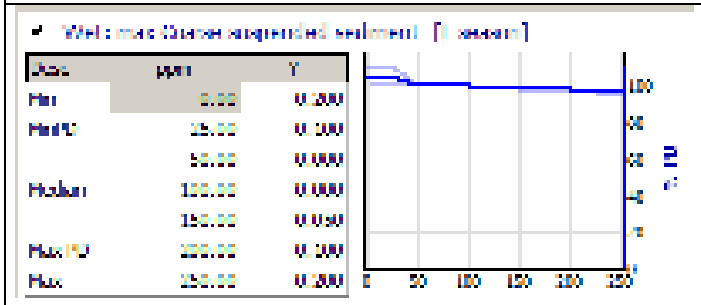
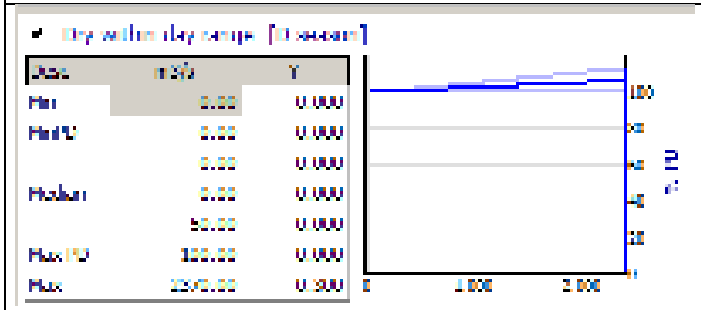
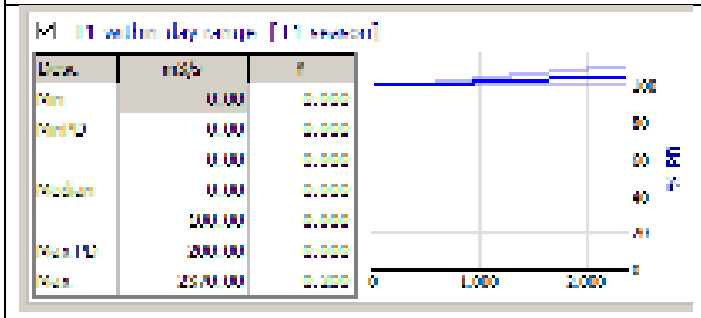
Rountree, M.W., Heritage, G.L. and Rogers, K.H. 2001. In-channel metamorphosis in a semi-arid, mixed bedrock/alluvial river system: Implications for Instream Flow Requirements In M.C. Acreman (ed) *Hydro-ecology*, IAHS Publ. no. 26.

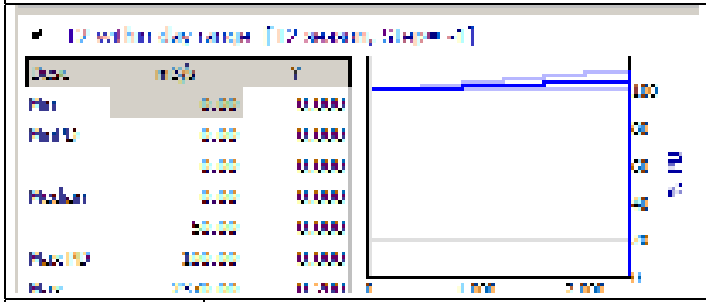
Parsons, M., McLoughlin, C. A., Rountree, M. W. and Rogers, K. H. (2006). The biotic and abiotic legacy of a large infrequent flood disturbance in the Sabie River, South Africa. *River Research and Applications*, 22:187-201.

Tooth, S. 2000. Process, form and change in dryland rivers: a review of recent research. *Earth Surface Reviews*, 51: 67-107.

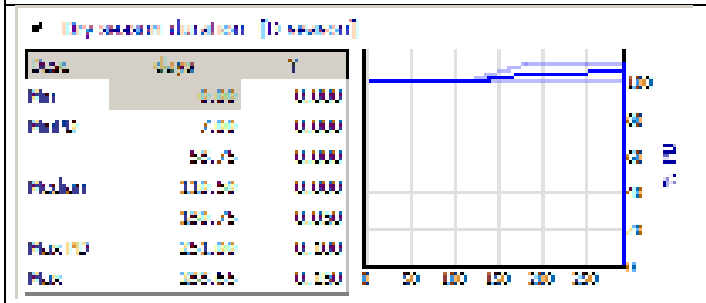
3.10.6 Depth of pools

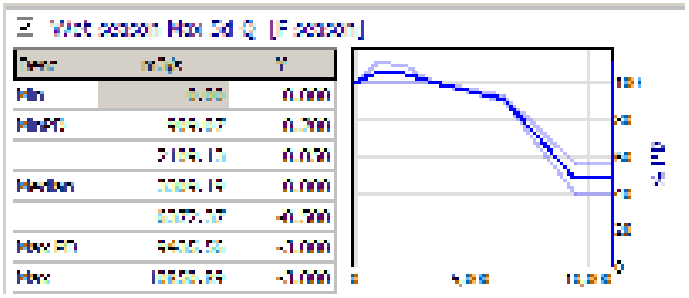
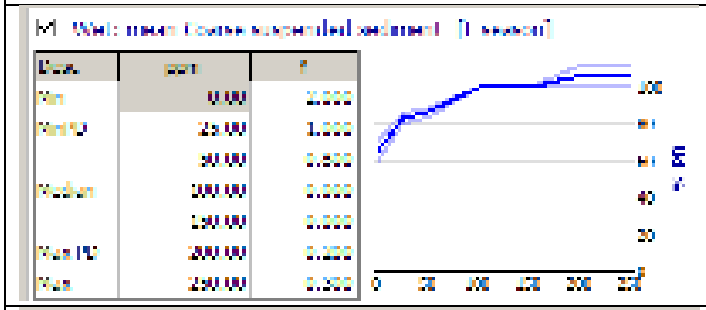
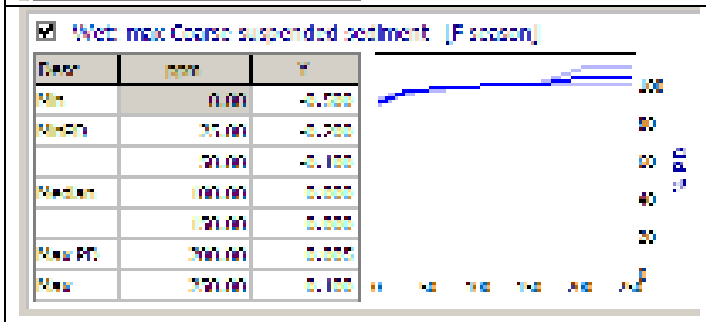
Response curve	Explanation
	The hysteresis of stage-discharge curves associated with large flood pulse systems indicates the buildup of the bed (from flood sediments) and subsequent incision of channel beds during the late wet and dry seasons. Pool beds in the main channel must therefore aggrade, with increasing aggradation in larger flood seasons due to higher sediment loads. These processes have been observed and measured by means of repeat cross-sectional surveys in river systems after very large floods (Rountree, unpublished data). Very small flood seasons could result in pool aggradation due to low velocities and lack of scour.
	Lower dry season flows will result in a decrease in pool depth in the dry season. AT EF Site 1 the range of maximum pool depth on the cross section only ranges from 18.4 to 20 metres for 212 to 690 m3/s - the minimum and maximum average dry season baseflows respectively.
	Higher sediment inputs would result in greater deposition and lower pool depths, and conversely lower sediment inputs would result in less deposition and therefore deeper pools (due to less infilling).

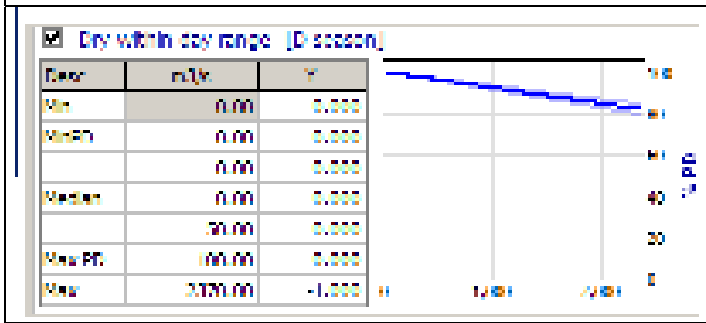
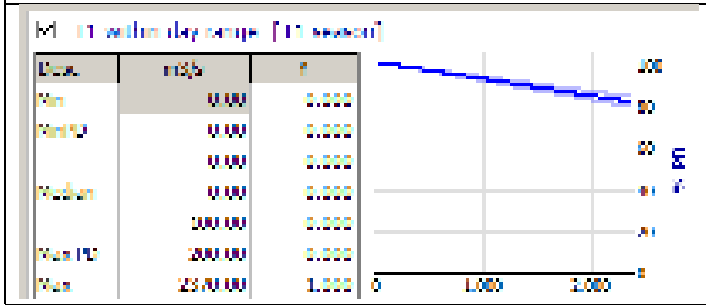
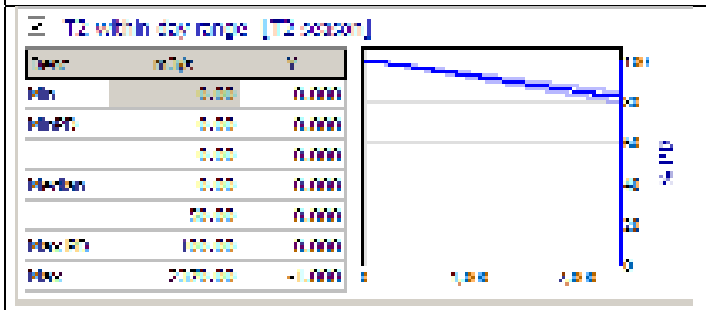
Response curve	Explanation
	Peak sediment inputs will have a small impact on deposition and pool depth: large peaks would infill pools and lower sediment peaks could be expected to be associated with net scour.
	High variations in water levels would initially result in increased bank erosion and infilling of pools as the marginal sediments are eroded and brought in to the main channel. However, this would only be a temporary impact, since the twice-daily flood peaks would increase sediment transport capacity of the channel and result in overall enhanced flushing of sediments and deeper pools.
	High variations in water levels would initially result in increased bank erosion and inilling of pools as the marginal sediments are eroded and brought in to the main channel. However, this would only be a temporary impact, since the twice-daily flood peaks would increase sediment transport capacity of the channel and result in overall enhanced flushing of sediments and deeper pools.

Response curve	Explanation
	High variations in water levels would initially result in increased bank erosion and inilling of pools as the marginal sediments are eroded and brought in to the main channel. However, this would only be a temporary impact, since the twice-daily flood peaks would increase sediment transport capacity of the channel and result in overall enhanced flushing of sediments and deeper pools.
References	Rountree, unpublished data. Cross-sectional survey data of the Sabie and Letaba rivers in the Kruger National Park, South Africa, following extreme floods in 2000.

3.10.7 Table 3.10Area of vegetated mid-channel bars

Response curve	Explanation
	Long dry seasons would promote vegetation encroachment in to the channel, as well as increasing mid-channel bar stabilisation through vegetation growth (Carter and Rogers 1995).

Response curve	Explanation
	Extremely large floods will scour the channel and remove vegetation from the river banks and bars. Small floods would, due to reduced velocities and flow depths, promote vegetation establishment and encroachment in to the channel (Rountree et al. 2000, Rountree et al. 2001, Parsons et al. 2006).
	Reduced sediment supply could be expected to reduce the extent of vegetated bars over time, since sediment eroded from the bars would no longer be completely replaced due to further limitations in sediment supply.
	Reduced sediment supply peaks could be expected to slightly reduce the extent of vegetated bars over time, since sediment eroded from the bars would no longer be completely replaced due to further limitations in sediment supply. The peak sediment supply could have otherwise replenished some of the sediments eroded over the course of the flow season.

Response curve	Explanation
	Large fluctuations in the daily flow will, at alluvial sections of the bank, rapidly cause bank slumping and bank retreat and would undercut and/or erode marginal vegetation from the banks and bars (Rountree 2009)
	Large fluctuations in the daily flow will, at alluvial sections of the bank, rapidly cause bank slumping and bank retreat and would undercut and/or erode marginal vegetation from the banks and bars (Rountree 2009)
	Large fluctuations in the daily flow will, at alluvial sections of the bank, rapidly cause bank slumping and bank retreat and would undercut and/or erode marginal vegetation from the banks and bars (Rountree 2009)

References

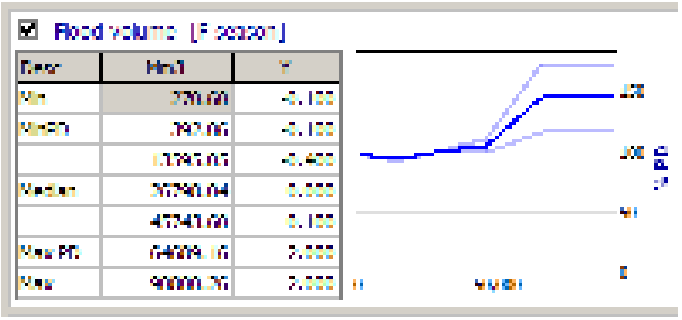
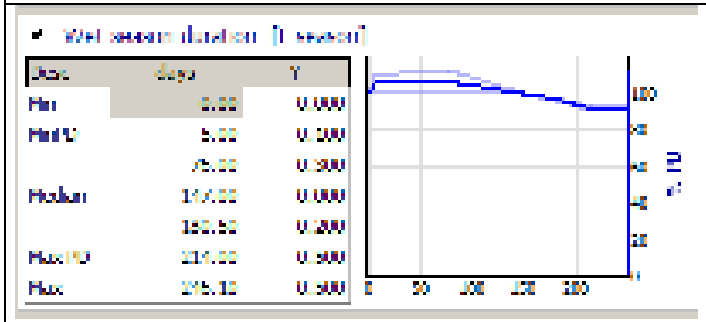
Carter, A.J. and Rogers, K.H. 1995. A markovian approach to investigating landscape change in the KNP rivers. Report no. 2/95, CWE, University of the Witwatersrand, Johannesburg.

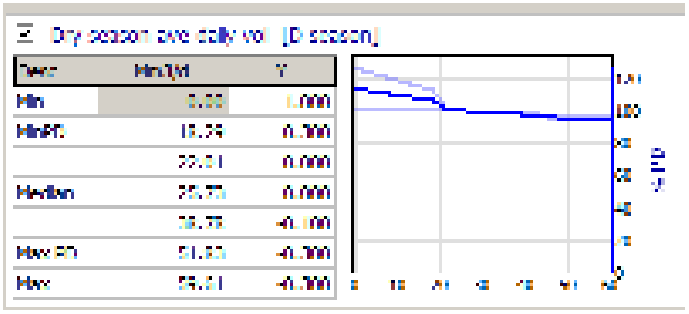
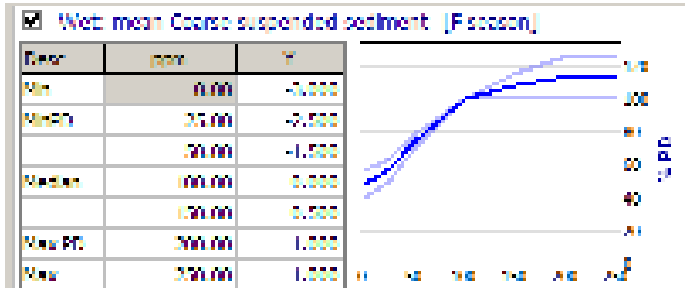
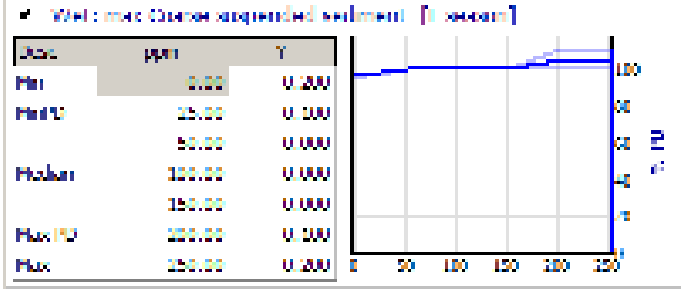
Rountree, M. W. 2009. Assessing bank stability along the lower Kafue River, in Birkhead A.L., Rountree M., Rowlston, B. and Louw D (eds). Kafue Gorge Lower Hydropower Project, Zambia. Assessing hydraulic behaviour and bank stability along the lower Kafue River in response to peaking releases from the proposed Kafue Gorge Lower Hydropower Project. Prepared for the International Finance Corporation, August 2009.

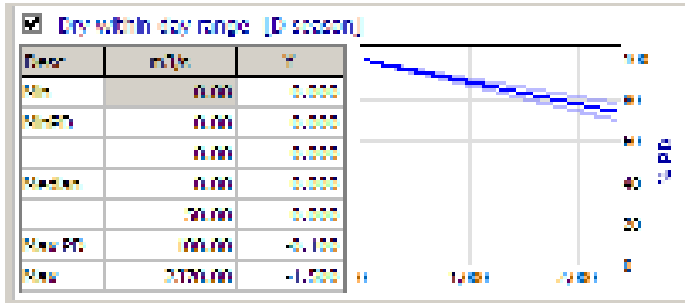
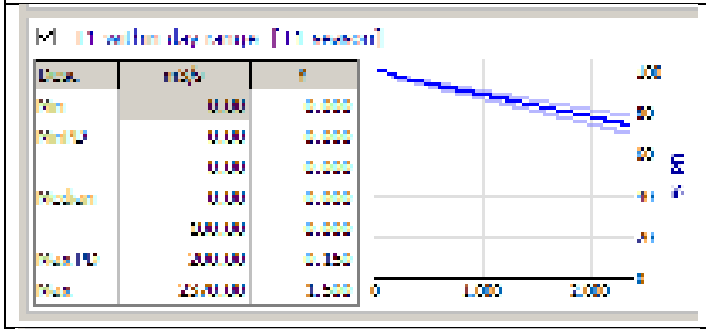
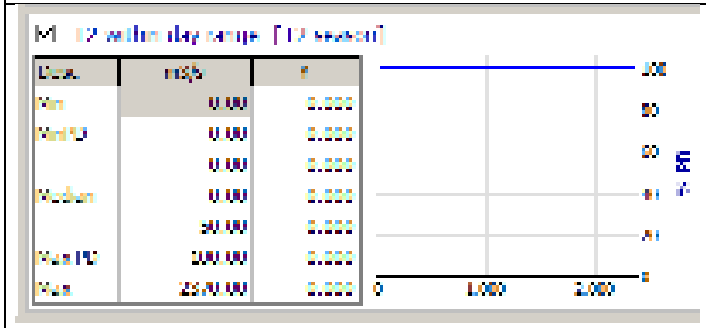
Rountree, M.W., Rogers, K.H. and Heritage, G.L. 2000. Landscape change in the semi-arid Sabie River in response to flood and drought. South

Response curve	Explanation
	African Geographical Journal, 82(3): 173-181. Rountree, M.W., Heritage, G.L. and Rogers, K.H. 2001. In-channel metamorphosis in a semi-arid, mixed bedrock/alluvial river system: Implications for Instream Flow Requirements In M.C. Acreman (ed) Hydro-ecology, IAHS Publ. no. 26. Parsons, M., McLoughlin, C. A., Rountree, M. W. and Rogers, K. H. (2006). The biotic and abiotic legacy of a large infrequent flood disturbance in the Sabie River, South Africa. *River Research and Applications*, 22:187-201.Tooth, S. 2000. Process, form and change in dryland rivers: a review of recent research. *Earth Surface Reviews*, 51: 67-107.

3.10.8 Area of sand bars

Response curve	Explanation
	Very large floods cause more sediment to be delivered to the channel, and would therefore be associated with the creation of larger sand deposits in the gorge (Baker, 1977; Carter and Rogers 1995; Kochel, 1988; Nanson, 1986; Rountree et al. 2000; Rountree et al. 2001, Parsons et al. 2006). The higher sediment loads would tend to be associated with the rising limb of the flood. Lower than average floods probably cause a net loss of sand bars, but very small (failed) wet seasons may cause some sand bars to be lost to vegetation encroachment.
	Long wet seasons erode progressively more of the deposited sand bars (as sediment deposition generally predominantly associated with the early wet season). Short, fast wet seasons could be expected to result in greater than median sand bar areas, but very short wet seasons may not cause any change.

Response curve	Explanation
	The flows in the dry season have low sediment loads and are erosive, albeit only at the points where they are in contact with the sand bars. Higher dry season flows will inundate and erode more sand bars and lower flows would expose more sand bars.
	Higher sediment inputs would result in the creation of more sand bars, and reduced sediment inputs would result in net erosion of sand bars. Reduced sediment supply would, due to the relative sediment starvation of the reach, quickly result in a decline in area of sand bars.
	Peak sediment inputs will have a small impact on sand bars: large peaks would create more sand bars and lower sediment peaks could be expected to be associated with fewer sand bars.

Response curve	Explanation
	High intra-daily flow variations (potentially up to several metres of water level variation twice per day) would cause a very rapid loss of sand bars from the river (Rountree 2009).
	High intra-daily flow variations (potentially up to several metres of water level variation twice per day) would cause a very rapid loss of sand bars from the river (Rountree 2009).
	High intra-daily flow variations (potentially up to several metres of water level variation twice per day) would cause a very rapid loss of sand bars from the river (Rountree 2009).

References

Baker, V.R. 1977. Stream-channel response to floods, with examples from central Texas. *Geol. Soc. Am. Bull.*, 88: 1057-1071.

Carter, A.J. and Rogers, K.H. 1995. A markovian approach to investigating landscape change in the KNP rivers. Report no. 2/95, CWE, University of the Witwatersrand, Johannesburg.

Kochel, R.C. 1988. Geomorphic Impact of Large Floods: review and new perspectives on magnitude and frequency. In Baker, V.R.,

Nanson, G.C. 1986. Episodes of vertical accretion and catastrophic stripping: a model of disequilibrium flood-plain development. Geol. Soc.

Response curve	Explanation
	Am. Bull., 97: 1467-1475. Rountree, M. W. 2009. Assessing bank stability along the lower Kafue River, in Birkhead A.L., Rountree M., Rowlston, B. and Louw D (eds). Kafue Gorge Lower Hydropower Project, Zambia. Assessing hydraulic behaviour and bank stability along the lower Kafue River in response to peaking releases from the proposed Kafue Gorge Lower Hydropower Project. Prepared for the International Finance Corporation, August 2009. Rountree, M.W., Rogers, K.H. and Heritage, G.L. 2000. Landscape change in the semi-arid Sabie River in response to flood and drought. South African Geographical Journal, 82(3): 173-181. Rountree, M.W., Heritage, G.L. and Rogers, K.H. 2001. In-channel metamorphosis in a semi-arid, mixed bedrock/alluvial river system: Implications for Instream Flow Requirements In M.C. Acreman (ed) Hydro-ecology, IAHS Publ. no. 26. Parsons, M., McLoughlin, C. A., Rountree, M. W. and Rogers, K. H. (2006). The biotic and abiotic legacy of a large infrequent flood disturbance in the Sabie River, South Africa. *River Research and Applications*, 22:187-201.

4 VEGETATION: SPECIALIST REPORT

4.1 OBJECTIVES OF THE VEGETATION STUDY

The main objective of the vegetation study was to identify the relationship between riparian and aquatic vegetation features and flow level changes, and to predict what impacts, if any, will occur with changes to the present-day flow regimes.

For the vegetation component of the EF assessment, 17 days were allocated to undertaking a literature review of previous information, a site visit, data analysis of the site information collected in the field, prediction of impacts (response curves) and report writing.

This report follows the ToR provided by Southern Waters *viz.*:

- Familiarise yourself to the extent possible with the study area, including:
    - The character of the Zambezi River in the study area.
    - Delineation of homogenous areas based on geology, reach slope, and vegetation.
    - The character of the reaches encompassing the proposed sites.
- Prepare a coarse-level reach analysis for the study river, focussing on the study area.
- Provide detailed information for two EF sites.
- Attend the field visit with the rest of the team to:
    - Ensure that the hydraulic cross-section surveys record whatever information you require for your analyses.
    - Record at each site, where relevant, (i) the dominant and sub-dominant vegetation, (ii) the arrangement of the vegetation relative to inundation and /or flow velocities, (iii) the nature and extent of instream or overhead cover (for fish).
    - Identify plant specimens collected, to species level where possible.
- If necessary, undertake one additional field visit to collect water level and discharge data for Dr Birkhead (2 days allocated).
- Take responsibility for the adequacy of the data collected and provided for the vegetation component of the EFA.
- Select key aspects as indicators for the DRIFT assessment, in liaison with the other specialists, and provide/develop information on:
    - changes in vegetation with changes in the flow regime;
    - any other relevant data as your experience suggests;
    - any other available information relevant to flow assessments;
    - relevant scientific references.
- Select linked indicators that can be used to explain flow-related changes for each of your indicators.
- Attend the DRIFT Workshop(s), prepared to populate the DRIFT response curves for your selected indicators and linked indicators.

- Compile a vegetation chapter for inclusion in the EFA Report, with particular reference to response curve motivation tables.
- Adhere to standard formatting, font and layout specifications provided for written submissions.

4.2 *LAYOUT OF THIS SECTION*

This Section comprises the summary report for vegetation, and provides:

- Literature review focused on riparian vegetation;
- For the EF sites:
    - Ecoclassification assessments for your discipline, with supporting evidence;
    - the DRIFT indicators chosen, and reasons therefor;
    - the relationships between the chosen indicators and flow or other, with referenced, supporting motivations.

Since flows from Batoka HPP are expected to impact on aquatic and riparian vegetation but not so much terrestrial vegetation, focus is directed to aquatic and riparian communities.

4.3 *LITERATURE REVIEW*

The majority of plants in the gorge and downstream of the gorge are terrestrial. In general, there are few aquatic macrophytes and the riparian area is very narrow. Since terrestrial plants grow away from the influence of the river and are not likely to be impacted by fluctuations in river stage due to the Batoka HPP, this review focusses on aquatic and riparian plant communities. All the terrestrial plant communities of the gorge area were competently reviewed in the updated feasibility studies completed by ZRA (1998).

First, a description of aquatic and riparian plant communities of Batoka Gorge is provided. This is followed by a description of flow related aspects of aquatic and riparian plant communities. The review concludes with a description of the effects of hydropower peaking on aquatic and riparian plants.

Aquatic vegetation is the riverine plant community sustained by perennial river flow within the confines of an active channel. This includes submerged species, such as unicellular (diatoms) and filamentous algae, and emergent species, such as mosses (Bryophtes) or macrophytes, such as lilies. Riparian vegetation, on the other hand, is the riverine plant community sustained by river flow or groundwater, or generally moist conditions along river margins, and is typically distinctly different in species composition from adjacent terrestrial communities. Typically, riparian vegetation consists of a mixture of graminoids, herbaceous perennials, annuals, shrubs and trees.

Both aquatic and riparian vegetation play a central role in the functioning of riverine ecosystems. Aquatic algae provide an important component of the diets of aquatic macroinvertebrates and fish and are important processors of nutrients in the water column.

Bryophytes and other emergent vegetation contribute toward better habitat quality for aquatic macroinvertebrates and fish. Riparian vegetation help reduce bank erosion through armouring; maintain water quality through trapping of sediment, nutrients and other contaminants, and shading regulates river water temperature and thus primary productivity; food is provided for riparian animals in the form of fruits, nuts and leaves, and for aquatic macroinvertebrates in the form of leaf litter; the plants themselves offer a diverse array of habitats as well as a corridor for the movement of migratory terrestrial and semi-aquatic animals (Prosser 1999, Terrill 1999). The riparian vegetation also acts as a moderator of water flow and sediment transport by intercepting precipitation and runoff; increasing infiltration; reducing soil moisture, water levels in alluvial aquifers and river flow through evapotranspiration; effecting changes to soil nutrient cycles by leaf litter inputs; and also altering channel structure through inputs of large woody debris.

The nature and extent of the aquatic and riparian vegetation is intimately linked to river channel structure and the occurrence of moisture, including: river water; groundwater, and; soil moisture. Aquatic vegetation is also particularly responsive to changes in water quality, such as changes in nutrient status, temperature and turbidity, which affects light penetrability and the depth of the photic zone in which aquatic plants may grow. Riparian vegetation, sediment transport and water flow interact and influence the kinds of plants suited to a particular river channel shape and water regime. Consequently, changes in the flow regime and its knock-on effects illicit a response in the nature and extent of aquatic and riparian vegetation.

4.3.1 River vegetation of Batoka Gorge

ZRA (1998) provided a comprehensive account of vegetation communities in the gorge of which five communities were described as aquatic/riparian and another five as terrestrial. The five aquatic/riparian communities are summarised in Table 4-1 and a short description of these (summarised from ZRA 1998) follows. In the table, reference is made to their dependence on river habitats, which was assigned on the basis of their habitat characteristics (Coates-Palgrave 1977, Curtis and Manheimer 2005, van Wyk and van Wyk 2009) as follows:

- species common on or near seeps, rivers and watercourses are obligate riparian (wet) species;
- species described as occurring in bush, woodland or forests and/or associated with water courses are facultative riparian (wet/dry) species;
- those occurring on rocky slopes and outcrops or mountain slopes are incidental upland (dry) species.

Categorising plants in this way helps us predict how plants are expected to respond to changes in habitat and/or flow. For example, if incidental species are found in wet environments it may mean their presence there is temporary or it could mean the nature of the wet environment has changed and become drier.

Table 4.1 Vegetation species expected in the gorge, separated by habitat and indicating dependence on river habitats as O = obligate, F = facultative, I = incidental and A = alien (ZRA 1998).

Pools	Bars	Main stem	Gorge Tribs	Scree slopes
Naja horribilis (O)	*Cyperus maculatus (O)*	*Diospyros mespiliformis (O)*	*Diospyros mespiliformis (O)*	*Acacia nigrescens (I)*
Potamogeton spp. (O)	*Ficus capreifolia (O)*	*Garcinia livingstonei (O)*	*Ficus sur (O)*	*Afzelia quanzensis (I)*
Vallisineria spiralis (O)	*Fimbristylis spp. (O)*	*Lonchocarpus capassa (O)*	*Garcinia livingstonei (O)*	*Boscia albitrunca (I)*
	Garcinia livingstonei (O)	*Phyllanthus reticulatus (O)*	*Minusops zeyheri (O)*	*Combretum apiculatum (I)*
	Mimosa pigra (A)	*Strychnos potatorum (O)*	*Nuxia opposotifolia (O)*	*Combretum mossambicense (I)*
	Sesbania sesban (A)		*Olax dissiflora (O)*	*Commiphora mossambicensis (I)*
	Panicum repens (O)	*Ficus ingens (F)*	*Olea europea (O)*	*Cordia pillosissima (I)*
		Flueggia virrosa (F)	*Oncoba spinosa (O)*	*Croton gratissimus (I)*
		Manilkara mochisia (F)	*Syzygium cordatum (O)*	*Croton meynhartii (I)*
			Trichelia emetica (O)	*Diospyros quiloensis (I)*
		Acacia nigrescens (I)		*Elephantorrhiza goetzei (I)*
		Afzelia quanzensis (I)	*Antidesme venosum (F)*	*Grewia flavescens (I)*
		Combretum mossambicense (I)	*Clerodendrum myricoides (F)*	*Kirkia acuminata (I)*
		Croton meynhartii (I)	*Erythroplyhlum zambeziacum (F)*	*Lannea schweinfurthiana (I)*
		Diospyros quiloensis (I)	*Ficus thonnongii (F)*	*Panicum maximum (I)*
		Grewia flavescens (I)	*Manilkara mochisia (F)*	*Sterculia africana (I)*
			Acacia nigrescens (I)	
			Combretum mossambicense (I)	
			Cordia pillosissima (I)	
			Diospyros quiloensis (I)	

Aquatic macrophytes, such as *Vallisineria spiralis, Potamogeton thunbergii, P. octandrus* and *Naja horribilis,* were said to occur in slow-flow pools. Given the strength of flows through the gorge and depth of the river channel, both in stark contrast to the slow/no flow and relatively shallow water depth preferred by aquatic macrophytes (Cheruvelil and Soranno 2008), these species were expected to form a small/insignificant component of the gorge vegetation overall.

Lateral alluvial sand bars were observed in places along the lower parts of the gorge and were more prevalent on the edges of the river, within the median annual flood line, downstream of the gorge. In the gorge the vegetation on these sand banks was sparse and tended to be patchy but consisted of the small trees *Mimosa pigra, Sesbania sesban, Garcinia livingstonei, Ficus capreifolia* and the grasses *Panicum repens* and *Cynodon dactylon.* Downstream of the gorge the common reed *Phragmites australis* and Cape willow *Salix mucronata* were more common on lateral sand bars and around the vegetated islands; both species well adapted to regular inundation during the wet season being flexible and reproducing sexually and vegetatively via plant fragments that root (Karrenberg et al. 2002).

The river channel was fringed by a narrow, riparian woodland inhabited by trees and shrubs. This riparian area varied in width along the river, was patchy in the gorge and better established downstream of the gorge. This woodland community was situated just above the median flood line on shallow rocky soils and will be inundated during large floods. Common tree species included *Diospyros mespiliformis, Acacia nigrescens, Ficus ingens, Afzelia quanensis* and *Garcinia livingstonei*. Characteristic shrubs included *Phyllanthus reticulatus, Flueggia virosa and Grewia flavescens* and the most common grass was *Panicum maximum.* There were some disturbances to this community in the gorge at the river rafting pick-up/drop-off points and downstream of the gorge there had been some clearing/harvesting for wood and fire as well as to create grazing areas with *Cynodon dactylon.*

Some of the perennial tributaries were also inhabited by a variant of the riparian woodland community with some of the common trees being *Ficus thonningii, Olea europea, Trichelia emetica, Diospyros mespiliformis, Garcinia livingstonei, Acacia nigrescens, Nuxia oppositifolia* and *Ficus sur.* Smaller trees and shrubs included *Syzigium cordatum, Cordia pillosissima, Combretum mossambicense* and *Antidesme venosum.*

The scree slopes of the gorge were inhabited by a *Commiphora-Sterculia africana* mixed woodland; an open, tall, dry, deciduous woodland on basaltic soils. Large trees included leadwoods such as *Combretum mossambicense* and *C. apiculatum* and the knob-thorn tree *Acacia nigrescens,* which occurred with smaller trees and shrubs such as *Diospyros quiloensis* and *Grewia flavescens. Panicum maximum* was the major grass species found in this community.

4.3.2 Flow related aspects of river vegetation

Flow is considered to influence the distribution of aquatic and riparian plants in three main ways (Van Coller 1992):

- as a resource necessary for growth and reproduction;
- as an agent of disturbance (floods); and
- as a stressor during periods of prolonged low flow.

Aquatic vegetation is an important component of the river food web as diatoms, filamentous green algae and aquatic macrophytes convert dissolved nutrients into a food source for aquatic organisms (Biggs 1996). Periphyton (diatoms, filamentous green algae) form an important component of the diet of snails (Rosemund et al. 1993), aquatic macroinvertebrates (Steinman et al. 1991), crustaceans (Pringle et al. 1993), tadpoles (Petersen and Boulton 1999) and fish (Power and Mathews 1983). Periphyton communities are dynamic and respond primarily to seasonal changes in flow and nutrients (Biggs and Close 1989). Rivers with seasonal floods that have periods of stability longer than 1 month with moderate supplies of nutrients and light allow for different successional phases of periphyton to develop (Yang et al. 2009). Periods of low flow are favourable for the proflieration of diatoms and filamentous green algae. Green algae are favoured over diatoms by higher light and nutrient conditions (Hill 1996). At the start of the wet season increased flows flush nutrients from the river bed and increase opportunities for growth (Larned et al. 2004). The disturbance of floods however overrides growth opportunities of light and nutrients (Biggs 1995) by turning over benthic substrata to which algae are attached (Holomuzki and Biggs 2006), by entraining suspended sediments that scour benthic algae from the surfaces of rocks (Grimm and Fisher 1989) and by shear stress (Biggs and Thomsen 1995). Flood reset algal communities between seasons and favour different species and ratios of diatoms/green algae between years (Ewart-Smith 2012). Diatoms are better adapted to regular high flows and turn over more rapidly than green algae, which tend to proliferate when nutrients and temperatures are higher (Larned 2010).

Riparian vegetation communities are dynamic and the relative dominance of species changes from river source to river mouth. Areas of broadly similar physical habitat contain broadly similar communities, but the species composition and density at any one site is affected by changes in soil moisture, nutrient status and topography (Van Coller 1992); the frequency and intensity of droughts and floods, fire, plant disease and grazing, biogeographical distributions (Naiman *et al.* 2005); and species interactions (Francis 2006).

Localised maintenance of populations and persistence depends upon site stability, site suitability for germination and establishment, and favourable ambient environmental conditions until the age of reproduction (Hupp and Osterkamp 1996). Successful recruitment depends upon (1) availability of seed or propagules, (2) colonisable habitat, (3) a recruitment window where moisture favours establishment and (4) resilience to high (floods) and low (drought) flow periods (Tabacchi *et al.* 1998). Sufficient flows are required

seasonally to recharge ground water levels at the end of the dry season and also to facilitate vegetation recruitment (dispersal, germination and seedling growth), which usually occurs as floods recede. Some specialist riparian species release seed to coincide with flood recession because moist seedbeds become available for colonisation (Naiman *et al.* 2008). Plants cued to release seed in this way are reproductive specialists that require specific conditions in order for recruitment to be successful. These reproductive specialists are the most sensitive to alterations in the flow regime, and may be subject to recruitment failure if the flow regime is altered. Scouring floods clear new areas for recruitment and newly established seedlings expand their roots to maintain contact with the gradually receding water table (Rood *et al.* 1999). Other riparian plants may be less specific in their response, flowering and setting seed over many months of the year, or in response to periods of high flow only. These generalists are often pioneers and the first species to colonise new habitat (alluvial deposits), as their seedlings are able to germinate on a variety of habitats and are less prone to recruitment failure as a result of changes to the flow regime.

There is a growing body of knowledge on the distribution and nature of vegetation along river banks and across floodplains. Naiman *et al.* (2005) reviewed much of this, describing how the vegetation changes with distance from the river's edge in a series of lateral zones. The primary drivers of zonation are usually seen as two-fold. Arguably, the main one of these is river flow, with the magnitude and timing of flow (Poff *et al.* 1997), the area of land it inundates, and the velocity, depth and duration of inundation all influencing what plant species can live where. The geomorphological nature of the river channel and surrounding land is also important, as is the nature of the soils, dictating where water can reach and for how long. Through the interplay of flows and landscape, river banks are inundated and exposed at different times of the year, providing a range of conditions that are exploited by different plant species.

River vegetation may be separated out into five zones that are variously inundated and inhabited by species that differ in their dependence on river habitats for their survival (Figure 4-1):

- the aquatic zone, inhabited by obligate diatoms, filamentous green algae and aquatic macrophytes;
- the marginal one, inhabited by obligate trees and shrubs;
- the lower zone, inhabited by facultative trees and shrubs;
- the upper zone, inhabited by a mixture of facultative and incidental trees and shrubs; and
- the terrestrial zone, inhabited by incidental and terrestrial species.

The lower and upper zones are sometimes grouped into a non-marginal zone (Kleynhans et al. 2007), which reduces the number of zones to four.

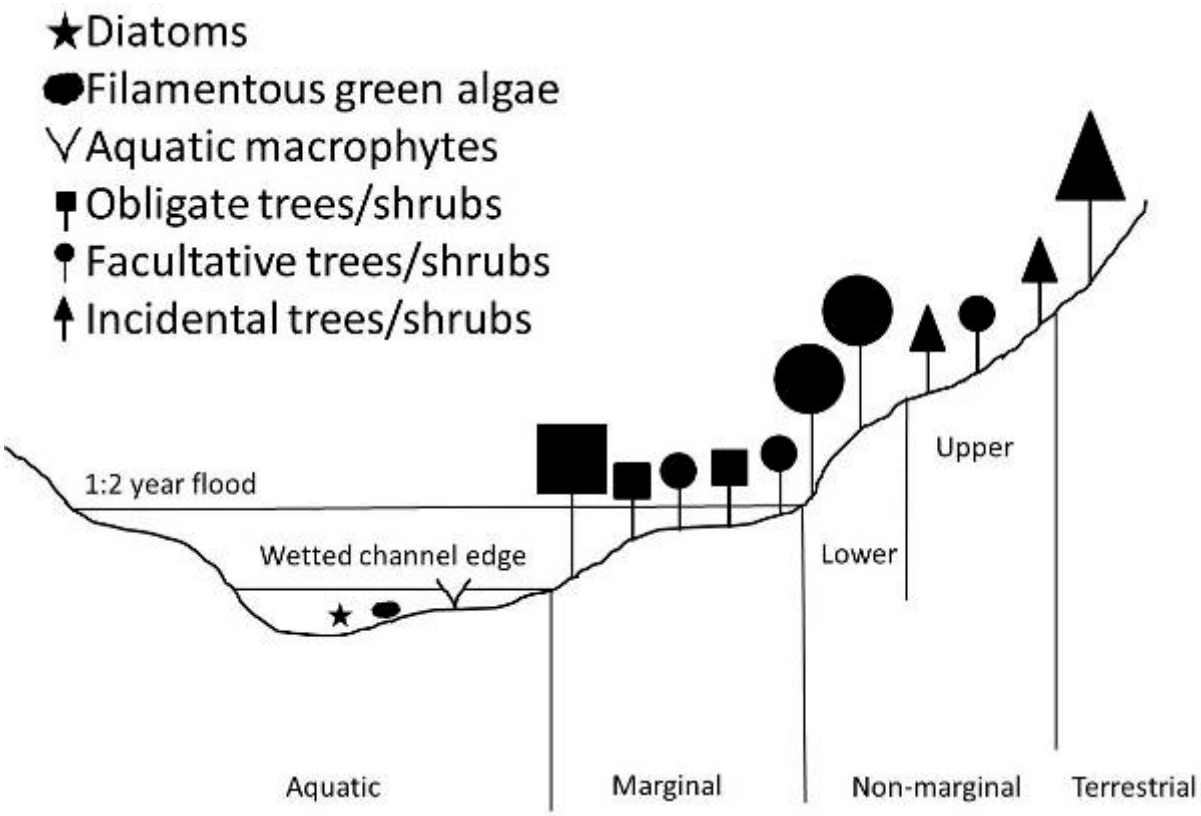


Figure 4.1 Stylised river vegetation zones.

In general, water availability decreases laterally away from the river channel as the depth to groundwater increases and the frequency of flooding and inundation duration of flood events decreases (Naiman *et al.* 2005). Inundation duration influences vegetation structure, with permanent to frequently inundated areas generally dominated by herbaceous perennials and graminoids, while those less frequently inundated are dominated by shrubs and trees and an understory of herbaceous perennials and graminoids (Toner and Keddy 1997, Merrit et al. 2010). The combination of a decrease in water availability and in the frequency of being flooded equates to a higher probability of experiencing a water shortage higher up the bank.

The life history strategies of species occupying the marginal, lower and upper zones differ. The life histories of marginal zone plants are more intimately linked with the flow regime than upper zone plants although the roles of density dependence, competition and other interactions between riparian plants are more important higher up the bank (Francis 2006).

4.3.3 Effects of hydropower flow regime alterations on river vegetation

Changes to vegetation communities downstream of dams are well documented (Carter Johnson 2002) and result from alterations to the natural flow regime. Upstream effects include habitat loss resulting from inundation and also the formation of new riparian zones (Richter and Thomas 2007). These are not considered here as the focus of this report is

downstream effects. Generally, downstream effects include a reduction in flow, and therefore a reduction in stream power and related sediment-transport capacity, as a result of storage abstraction and by evaporation from the water surface (Brandt 2000). As flows upstream of the dam are slowed suspended sediments drop out into the dam. As a result, water released from the dam is supply limited and thus highly erosive. Erosion of river banks, channel widening and down-cutting are common changes to river channel structure immediately downstream of dams (Grant et al. 2003). At some point, if there is sufficient sediment supply in the river basin downstream, equilibrium will again be reached as suspended sediment loads are replenished. Reduced base flows are particularly damaging during the low flow season and are usually coupled with a reduction in freshes (small dry season floods). Together these sustain groundwater levels during the dry season that lower and upper riparian species rely upon and also maintain the marginal riparian species that are less drought tolerant. The aquatic community is particularly sensitive to changes in flow during the dry season as this is their season of active growth and reproduction (Yang et al. 2009). Diatoms and algae increase in abundance during the dry season as disturbance to benthic substrata is reduced, nutrients are more readily available and temperatures are higher (Yang et al. 2009). Reduced flows in the dry season decrease the inundated/benthic habitat available for their proliferation.

Peak discharges are also commonly reduced (Potyondy and Andrews 1999). Peak discharges disturb benthic communities and this may reset the succession of aquatic plant, diatom and algal communities (Ewart-Smith 2012). Riparian species are also not favoured. Some riparian species are cued to high flows at particular times of the year, flowering, setting and dispersing seed over the period of the long-term average flood peak (Rood et al. 2005). These species suffer recruitment failure should the timing of this flood peak change. Others species increase growth, flowering and seed production in response to high flows and thus maintain sustained recruitment over decades of alternate wet and dry years. Should high flows be reduced, growth, reproductive success and recruitment in both of these groups of plants will be suppressed or fail.

Another impact of reduced peak discharges relates to a reduction in the capacity of the river downstream to transport sediment. Some riparian species require sediment of a large calibre (cobbles, boulders) or are adapted to grow on bedrock. Sedimentation will reduce the availability of these rocky habitats and will favour other species adapted to finer sediment. Reduced sediment transport may also favour the growth and persistence of aquatic species as coarse suspended sediments in the water column act like scours removing benthic diatoms, algae and bryophytes from rocks (Grimm and Fisher 1989).

Besides changed water quantities (storage effects) the release of water can create completely altered diurnal and seasonal patterns of flow (Brandt 2000). Diurnal changes may occur as more water is used during the day time for the generation of electricity. Seasonal (annual) changes may occur as water is stored during the rainy season as reservoirs are filled for use

during the dry season. Another characteristic of many regulated rivers is the sudden fluctuation of discharge that takes place during peaking (Renofalt et al. 2010).

Changes in the hydrological regime have predictable consequences on aquatic and riparian plant species since they are arranged along a gradient of inundation duration (Nilsson and Breggren 2000). In humid environments, inundation duration has been interpreted as a predictor of the degree to which roots are exposed. However, in more arid environments, it is correlated with a whole suite of environmental variables. These include shear stress, sediment deposition and erosion, soil moisture and depth to groundwater, in addition to soil oxygen concentration (Auble 1994).

Riparian plants are adapted to seasonally changing hydrological regimes. Aquatic species that are totally submerged tend to reproduce during the low flow season, when flowering plants of the plant emerge beyond the water's surface to be pollinated. Elevated base flows during the low-flow season may result in failure of these species to reproduce. Marginal zone species tend to be either graminoids or multi-stemmed shrubs adapted to withstand the force of regular annual floods. They generally reproduce sexually and asexually (via vegetative growth). Many of these soft and fleshy wet bank plants are able to disperse as vegetative diaspores, plant fragments that are able to root themselves. The fast rates of growth and their multi-reproductive strategy and dispersal mechanisms allows these wet bank plants to adapt to changes in the flow regime more quickly and easily than the woody trees and shrubs that dominate the dry bank. The woody trees and shrubs of the dry bank are more drought tolerant and able to withstand prolonged periods of no flow, provided that ground water levels remain. These plants are typically phreatophytic and rely on ground water to sustain their survival during periods of low flow and low soil moisture. Since many rely on periods of high flow to initiate flowering and seed production, and flood-recession for seed dispersal, over an annual cycle, changes that disrupt annual seasonality of flow may result in recruitment failure. Generalist species that flower and set seed aseasonally may not be as susceptible to recruitment failure by a change in the annual flood peak for example, but will still be susceptible to difficulties in seedling establishment if there are no periods of low flow over which seedlings may establish themselves in the absence of scouring floods.

Stabilisation of flows will prevent plants that require periods of low or high flow to complete some part of their life cycle from reproducing successfully. Similarly constant rapid fluctuations in discharge will mean that only the most robust, generalist and rapidly growing plant may survive.

4.4 DESCRIPTION OF THE EF SITES

EF Site 1 was located in the gorge while EF Site 2 was located downstream out of the gorge. The gorge differed in having extremely steep and rocky banks and also with very little/no alluvial sandy habitats in the marginal riparian area. Once out of the gorge the valley was wider and the river banks shallower. At EF Site 2 there was still much bedrock habitat

available in the marginal zone but this was balanced by an increase in the availability of alluvial sand in the lateral bars of the marginal zone (Table 4-2). Due to this there was a greater abundance of marginal zone species, such as *Phragmites mauritianus, Cyperus maculatus, Cynodon dactylon, Ficus capreifolia* and *Salix mucronata* at EF Site 2. The only common and prolific member of the marginal zone at EF Site 1 was the shrub *Stropanthus cf. speciosus,* which was present at EF Site 2 but at a reduced abundance. Trees common at both sites were *Cobretum imberbe, Diospyros mespiliformis, Garcinia livingstonei* and *Gymnosporia senegalensis.*

4.4.1 EF Site 1, Batoka Gorge

The riparian area along the gorge was narrow (Figure 4-2) and approximately 25 metres in width (Figure 4-3).

Figure 4.2 The riparian area at EF Site 1, L = left bank, R = right bank.

Table 4.2 Cover abundance of all species at EF Sites 1 and 2, m=marginal, l=lower and u=upper zone.

SITE	1						2					
BANK	Left			Right			Left			Right		
ZONE	m	l	u	m	l	u	m	l	u	m	l	u
Bedrock	50			45			20			50	10	
Boulder	20	70	40	35	60	60	15			10	10	
Cobble	20	20	40	15	30	30	5	10		5		30
Gravel	5	10	20	5	10	10		10			80	20
Sand	5						60	80	100	35		50
NON-TREES												
Bryophyta sp1	10									2		
Cynodon dactylon							30			20		
Cyperus maculatus										3		
Ehrharta sp1	1									1		
Panicum maximum		1	20				3			5		
Panicum repens							5			10		
Pentashistis sp1	11			7			2			2		
Phragmites mauritianus							25			10		

Sesbania sesban							4					
Stropanthus cf. speciosus	14	2		4	2		3			2		
TREES												
Acacia nigrescens			3			5		18	10			
Adansonia digitata									5			
Afzelia quanensis											2	
Antidesma venosum					5							
Bridelia cathartica		15										
Colophospermum mopane									10			5
Combretum imberbe			12			22		15	15		25	
Combretum imberbe juv												2
Cordia pillosissima			15			5					2	
Diospyros mespiliformis		2	10		20			15			5	
Diospyros mespiliformis juv		3					1					
Diospyros quiloensis						5						
Ficus capreifolia							2					
Ficus ingens				15	2							
Garcinia livingstonei		12					3	2			15	
Garcinia livingstonei juv	1	1										
Gymnosporia senegalensis		12			12						10	
Gymnosporia senegalensis juv		4			5			5				
Salix mucronata										1		
Salix mucronata juv										5		
Syzigium guineense juv					5			2				
Trichelia emetica			20			10						

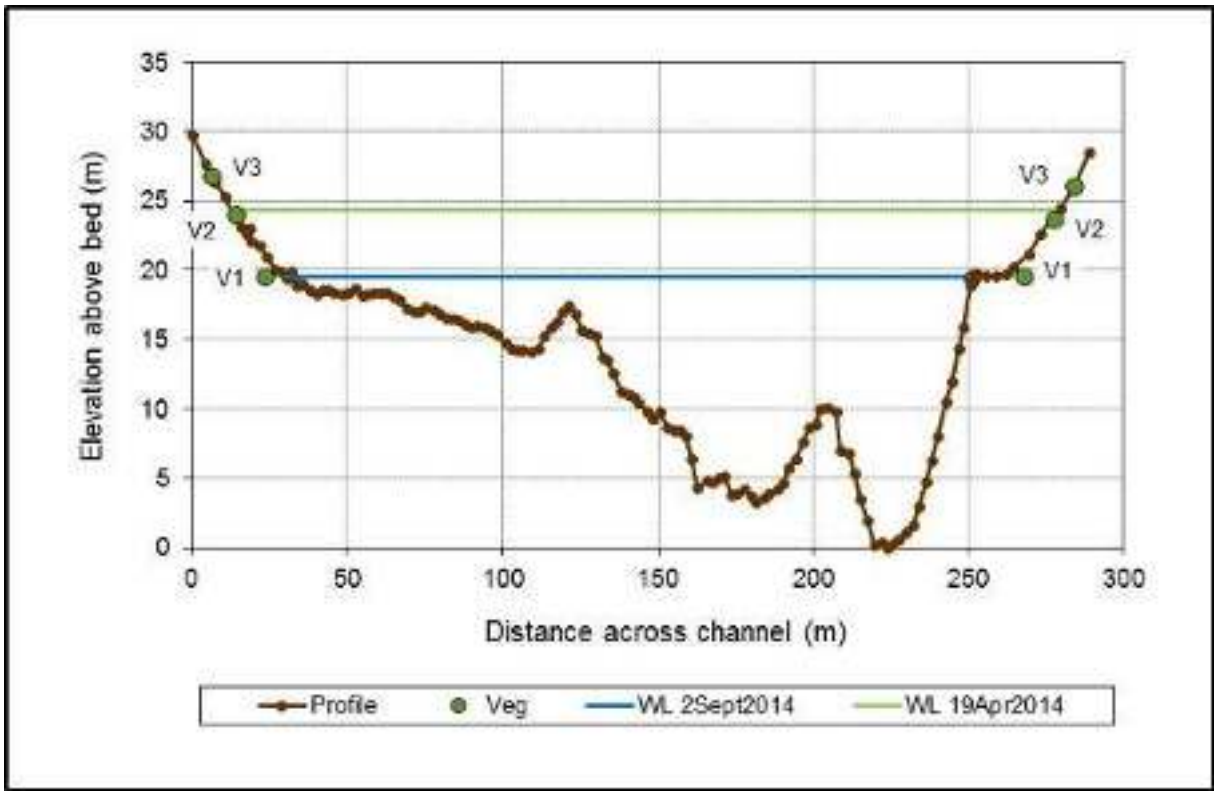


Figure 4.3 **Vegetation zones at both banks of EF Site 1. Lower limits of zones are: 1 = marginal, 2 = lower and 3 = upper.**

The marginal zone comprised bedrock, boulders and cobbles and was sparsely populated. The dominant vegetation was Bryophyta sp1 at the interface of the aquatic and marginal zones and *Stropanthus cf. speciosus* in the marginal zone. The lower and upper zones were narrow and patchy next to a scant terrestrial community.

4.4.2 EF Site 2, upstream of Kariba

The riparian area downstream of the gorge was patchy and narrow but considerably better vegetated (Figure 4-4) and wider, when compared to EF Site 1, being 100 metres in width on the left bank and 500 metres in width on the right bank (Figure 4-5).

Figure 4.4 **The riparian area at EF Site 2, L = left bank, R = right bank.**

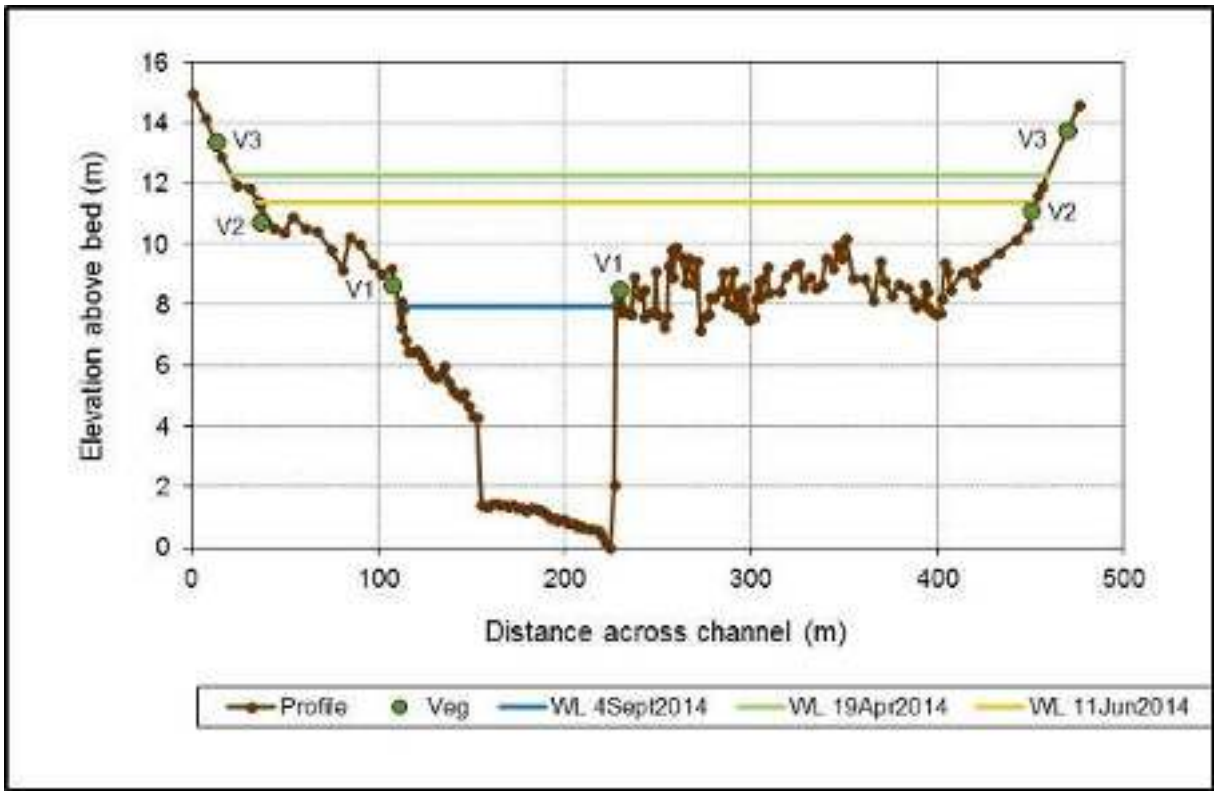


Figure 4.5 **Vegetation zones at both banks of EF Site 2. Lower limits of zones are: 1 = marginal, 2 = lower and 3 = upper.**

The left bank and right bank differed in that the left bank comprised a sandy alluvial lateral bar in between stands of *Phragmites mauritianus.* The right bank comprised a bedrock backwater area from the channel edge for a distance of *c.* 200 metres before a sandy alluvial lateral bar was found once the bank gradient had steepened. The lower and upper zones were narrow and better established on the left bank of the river. The adjacent terrestrial community was considerably more extensive than that of the gorge area.

4.5 ECOCLASSIFICATION OF RIVER REACHES REPRESENTED BY THE EF SITES

The Vegetation Response Assessment Index (VEGRAI) (Kleynhans et al. 2007) was used to assess the condition of the riparian vegetation at each EF Site[1]. The method compares the present day condition to that which would be expected under natural (reference) conditions, and considers how past impacts may have influenced the ecological condition over time. The reference condition (Section 4.3.1) was taken from ZRA (1998).

A level 3 assessment was conducted that assesses the impacts on two riparian zones; a marginal zone and a non-marginal zone. Riparian species expected in these two zones are listed for *bars* and *main channel* (Table 4-1) respectively. In the application of DRIFT the broader non-marginal zone was further separated into a lower and upper zone (Figure 4-1).

[1] Please note: this method does not take plants of the aquatic zone into account.

Each EF Site is discussed and the main influences on the ecological condition are compared between sites. Descriptions of the ecological categories used to describe the ecological condition are provided in Table 4-3.

Table 4.3 The ecological categories are used to describe the ecological condition of rivers (adapted from Kleynhans et al. 2007).

Ecological Category	PES % Score	Description of the habitat
A A/B	92-100% 87-92%	Still in a Reference Condition.
B B/C	82-87% 77-82%	Slightly modified from the Reference Condition. A small change in natural habitats and biota has taken place but the ecosystem functions are essentially unchanged.
C C/D	62-77% 57-62%	Moderately modified from the Reference Condition. Loss and change of natural habitat and biota has occurred, but the basic ecosystem functions are still predominantly unchanged.
D D/E	42-57% 37-42%	Largely modified from the Reference Condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E E/F	22-37% 17-22	Seriously modified from the Reference Condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	0-17%	Critically/Extremely modified from the Reference Condition. The system has been critically modified with an almost complete loss of natural habitat and biota. In the worst instances, basic ecosystem functions have been destroyed and the changes are irreversible.

4.5.1 EF Site 1, Batoka Gorge

There were no obvious disturbances to the ecological condition of the riparian area at EF Site 1, which scored 90%. This means the riparian area was very close to the reference condition (Table 4-3) and in an Ecological Category A/B. At this EF Site the riparian area was narrow and patchily distributed along the edge of the gorge. The marginal zone normally comprises a mixture of graminoids (such as reeds and sedges) and small trees (such as figs or willows) but here the marginal zone was sparse. There were however some marginal graminoids present on lateral bars (of alluvial sand) downstream of this EF Site but overall these constituted a small proportion of the gorges riparian flora. The non-marginal zone was narrow and comprised a mixture of trees, shrubs and their saplings, indicative of healthy relationship between the natural flow regime and the life histories of the plants (see 4.3.2).

Table 4.4 VEGRAI 3 scores and Ecological Condition (EC) for EF Site 1.

LEVEL 3 ASSESSMENT						
METRIC GROUP	CALCULATED RATING	WEIGHTED RATING	CONFIDENCE	RANK	% WEIGHT	NOTES: (give reasons for each assessment)
MARGINAL	93.3	46.7	3.3	2.0	100.0	Both zones are equally important.
NON MARGINAL	86.7	43.3	3.3	1.0	100.0	
	2.0				200.0	
LEVEL 3 VEGRAI (%)				90.0		
VEGRAI EC				A/B		
AVERAGE CONFIDENCE				3.3		

Table 4.5 VEGRAI scores and Ecological Condition (EC) for EF Site 2.

LEVEL 3 ASSESSMENT						
METRIC GROUP	CALCULATED RATING	WEIGHTED RATING	CONFIDENCE	RANK	% WEIGHT	NOTES: (give reasons for each assessment)
MARGINAL	86.7	43.3	3.3	2.0	100.0	Both zones are equally important.
NON MARGINAL	86.7	43.3	3.3	1.0	100.0	
	2.0				200.0	
LEVEL 3 VEGRAI (%)				86.7		
VEGRAI EC				B		
AVERAGE CONFIDENCE				3.3		

4.5.2 EF Site 2, upstream of Kariba

There were few disturbances to the ecological condition of the riparian area at EF Site 2, which scored 86.7%. This means the riparian area was slightly modified from the reference condition (Table 4-3) and in an Ecological Category of B. In contrast to EF Site 1, both the marginal and non-marginal zones of the riparian area were well established. The marginal zone comprised a mixture of marginal graminoids (such as reeds and sedges) and small trees (such as figs or willows) up- and downstream of the EF Site. The population of trees and shrubs of the non-marginal zone comprised a mixture of adults and saplings, indicative of a healthy relationship between the natural flow regime and the life histories of these plants (see 4.3.2). The only visible impacts were slight and related to use of woody plants, for firewood or construction material; grazing of saplings or reeds in the marginal area; and the presence of one alien species (*Mimosa pigra)*.

4.6 FIELD DATA COLLECTION AND ANALYSIS

Data collection occurred during low-flow conditions in September 2014.

4.6.1 Data collection

Vegetation data were collected from both banks at both EF Sites. Data were collected in belt-transects that were 10 m in length (longitudinally down the bank). The width of each plot differed according to the width of the zone being sampled. Zones were identified upfront on the basis of growth form characteristics and indicator species (Kleynhans et al. 2007, Kemper and Boucher 2008). Plots were laid out contiguously up the bank laterally through the extent of the riparian zone. The presence of terrestrial species indicated the outer boundary of the riparian zone. The centre of each vegetation transect was aligned along the hydraulic cross-sections surveyed by Dr Andrew Birkhead. The boundaries of each sample plot (for each lateral zone; marginal, lower and upper) were surveyed in on the cross-sections so that the location of each lateral zone could be related to flow using stage-discharge relationships.

The data on the structure of the vegetation community in each transect included:

- the number of lateral zones present;
- plant cover, estimated visually as a percentage for each plant species and maximum height of each species present in each zone;
- the number of woody trees in two height classes (<2.0 m saplings and >2.0 m trees); and
- the percentage frequency of the dominant substratum types in each vegetation plot.

Any species that could not be identified in the field was collected, pressed and submitted to the CE Moss Herbarium at the University of the Witwatersrand, South Africa for identification.

4.6.2 Data analysis

To facilitate comparison of the sparsely populated vegetation community data between EF sites, the percentage cover for each species recorded in each transect was converted to a percentage of the total cover recorded for that site. This allowed a ranking by cover per species, which was comparable across sites. The location of each lateral zone was transposed onto the cross sections and the upper and lower discharge limit of each zone determined using the rating curves and associated hydraulic data.

4.7 RESULTS

4.7.1 EF Site 1

Stropanthus cf. speciosus was the most commonly encountered and abundant shrub at EF Site 1. This shrub was situated in the rocky marginal area of the marginal zone that is inundated during the wet season. The next most abundant trees were *Diospyros mespiliformis, Combretum imberbe* and *Trichelia emetica,* all situated in the lower and upper zones above the median flood line.

Table 4.6 Dominant species by cover (T = total cover per species as a percentage of the total vegetation cover) and frequency of occurrence (F). Data are cover percentages per sample plot per species. L = left bank, R = right bank. m = marginal, l = lower and u = upper zone, sap = sapling.

Species	T	F	L-m	L-l	L-u	R-m	R-l	R-u
Stropanthus cf. speciosus	8	67	14	2		4	2	
Diospyros mespiliformis	11	50		2	10		20	
Combretum imberbe	12	33			12			22
Trichelia emetica	10	33			20			10
Gymnosporia senegalensis	8	33		12			12	
Panicum maximum	7	33		1	20			
Pentashistis sp1	7	33	11			9		
Cordia pillosissima	7	33			15			5
Ficus ingens	6	33				15	2	
Gymnosporia senegalensis sap	3	33		4			5	
Syzigium guineense sap	2	33				1	5	
Garcinia livingstonei sap	1	33	1	1				
Bridelia cathartica	5	17		15				
Garcinia livingstonei	4	17		12				
Bryophyta sp1	3	17	10					
Antidesma venosum	2	17					5	
Diospyros quiloensis	2	17						5
Diospyros mespiliformis sap	1	17		3				
Phyllanthus reticulatus	0	17	1					
Ehrharta sp1	0	17	1					

4.7.2 EF Site 2

Combretum imberbe and *Garcinia livingstonei* were the most frequently encountered trees at EF Site 2 and *C. imberbe,* along with *Cynodon dactylon,* were the most abundant species present, followed by *Phragmites mauritianus* and *Acacia nigrescens. P. mauritianus* and *C. dactylon* were situated in the marginal zone, *G. livingstonei* in the marginal and lower zones and the other species mentioned found in the lower or upper zone.

Table 4.7 Dominant species by cover (T = total cover per species as a percentage of the total vegetation cover) and frequency of occurrence (F). Data are cover percentages per sample plot per species. L = left bank, R = right bank. m = marginal, l = lower and u = upper zone, sap = sapling.

	T	F	L-m	L-l	L-u	R-m	R-l	R-u
Combretum imberbe	18	50		15	15		25	
Garcinia livingstonei	7	50	3	2			15	
Cynodon dactylon	17	33	30			20		
Phragmites mauritianus	12	33	25			10		
Acacia nigrescens	9	33		18	10			
Diospyros mespiliformis	7	33		15			5	
Panicum repens	5	33	5			10		
Colophospermum mopane	5	33			10			5
Stropanthus cf. speciosus	2	33	3			2		
Pentashistis sp1	1	33	2			2		
Gymnosporia senegalensis	3	17					10	
Gymnosporia senegalensis sap	2	17		5				
Adansonia digitata	2	17			5			
Salix mucronata sap	2	17				5		
Sesbania sesban	1	17	4					
Panicum maximum	1	17	3					
Cyperus sp1	1	17				3		
Bryophyta sp1	1	17				2		
Combretum imberbe sap	1	17						2
Cordia pillosissima	1	17					2	
Syzigium guineense sap	1	17		2				
Ficus capreifolia	1	17	2					
Triplochiton zambesiacus	1	17	2					
Afzelia quanensis	1	17					2	
Ehrharta sp1	0	17				1		
Diospyros mespiliformis sap	0	17	1					
Salix mucronata	0	17				1		

There were three discriminant species for each of the three zones (Table 4-8). Of these, the most common marginal zone graminoid *Phragmites mauritianus,* the marginal shrub

Stropanthus speciosus, the lower zone tree *Diospyris mespiliformis* and the upper zone tree *Combretum imberbe* were selected as indicators.

Table 4.8 Discriminating taxa for the three vegetation zones at both EF Sites.

Marginal zone	Lower zone	Upper zone
Phragmites mauritianus	***Diospyros mespiliformis***	***Combretum imberbe***
Cynodon dactylon	*Gymnosporia senegalensis*	*Colophospermum mopane*
Stropanthus cf. speciosus	*Garcinia livingstonei*	*Trichelia emetica*

4.8 IDENTIFICATION OF INDICATORS

Biophysical indicators are discipline-specific attributes of the river system that respond to a change in river flow by changing in their:

- abundance;
- concentration; or
- extent (area).

The indicators are used to characterise the current situation and changes that could occur with development-driven flow changes.

Within any one biophysical discipline, key attributes can be grouped if they are expected to respond in the same way to the flow regime of the river. For example, plant species that are tolerant of submersion and respond to increased moisture with increased growth rates and seed production may be grouped together as they would be expected to react to changes in the flow regime in the same way as one another. The discriminating taxa for the three vegetation zones determined in the vegetation analysis are provided in Table 4-8. From this, four species were chosen to represent four riparian indicators: marginal graminoids represented by *Phragmites australis* (common reed); marginal shrubs represented by *Stropanthus speciosus* (common poison rope); lower zone trees represented by *Diospyros mespiliformis* (Jackal-berry tree) and upper zone trees represented by *Combretum imberbe* (Leadwood tree).

Four other aquatic vegetation indicators were selected, in discussion with the other specialists, to provide linked indicators for important food sources of fish and macroinvertebrates. These were organic detritus, single-celled diatoms, filamentous green algae and Bryophyta sp1 (aquatic rock moss).

4.8.1 Indicator list for vegetation

There are eight vegetation indicators for this EF assessment and six of these were present in abundance at both EF Sites. *Phragmites mauritianus* was not observed at EF Site 1 but is expected to occur in the lower reaches of the gorge and so marginal graminoids were

modelled in the same was using DRIFT as at EF Site 2; on the basis of their position and how this relates to discharge on the cross-sections. Bryophyta sp1 was scant at EF Site 2 and therefore not considered an important food source and so was not modelled there using DRIFT.

A list of species/features and their reason for selection as indicators in the EF assessments is given in Table 4-9. Their expected responses to flow changes are outlined in Table 4-10.

Table 4.9 Indicators and reasons for their selection.

Indicator (site)	Reasons for selection as indicator
Organic detritus	Organic detritus provides food for a number of fish species, especially *Labeo* spp.
Single-celled diatoms	Single-celled diatoms are an important food source for aquatic macroinvertebrates and fish.
Filamentous green algae	Filamentous green algae affect the quality of aquatic macroinvertebrate habitat and also provide an important food source for fish.
Bryophyta sp1. (aquatic rock moss)	Rock moss was prolific at EF Site 1 and would provide important habitat/holdfasts for aquatic macroinvertebrates during the wet season and may also provide a food source for fish.
Marginal graminoids (*Phragmites mauritianus*)	There were few marginal graminoids in the gorge but this group of plants were well established at EF Site 2 and provide important habitat for aquatic macroinvertebrates and crocodiles as well as cover for fish from predators.
Marginal shrubs (*Stropanthus cf. speciosus*)	Marginal shrubs were present at both EF Sites and also provide important habitat for aquatic macroinvertebrates and cover from predators for fish.
Lower zone trees (*Diospyros mespiliformis*)	Lower zone trees form the majority of the riparian zone at both EF Sites and occur with a mixture of shrubs. Many will provide fruit, woody and leaf material for a variety of terrestrial and aquatic organisms as well as providing nesting sites for birds.
Upper zone trees (*Combretum imberbe*)	Upper zone trees occur with terrestrial species on the outer edge of the riparian area and also provide fruit, woody and leaf material for a variety of terrestrial and aquatic organisms as well as providing nesting sites for birds.

Table 4.10 List of vegetation indicators and their predicted direction of response to flow changes.

Indicator	Definition	Predicted change	References
Organic detritus	Organic detritus comprises plant material such as leaves, twigs, bark, flowers and fruits, that fall in from the riparian canopy, or which are washed or blown in from surrounding landscapes.	The dam will trap detritus transported from the Barotse flood plain reducing that available in the gorge. A decrease in the abundance reduces food available to fish and macroinvertebrates.	Davies and Day 1998.

Indicator	Definition	Predicted change	References
Single-celled diatoms	Unicellular algae (Bacillariophyta) that are enclosed in a frustule made of silica.	Peaking flows will flush diatoms from the benthos retarding growth, preventing succession and reducing their abundance. A decrease in abundance reduces food available to fish and macroinvertebrates.	Bell 1992, Grimm and Fisher 1989, Holomuzki and Biggs 2006.
Filamentous green algae	Colonial green algae (Chlorophyta) that contain chloroplasts with chlorophyll a and b and have cellulose cell walls.	The dam will trap nutrients transported from the Barotse flood plain. Peaking flows will flush green algae from the benthos retarding growth. A decrease in abundance reduces food available to fish.	Bell 1992, Biggs and Thomsen 1995, Ewart-Smith 2012.
Bryophtya sp1. (aquatic rock moss)	Small flowerless plants that do not have vascular tissue and grow in dense clumps/mats on rocks at the water's edge.	Rock moss grows slowly and when wet. Peaking flows are expected to increase the abundance of Bryophyta sp1. An increase in abundance provides habitat for macroinvertebrates.	Chambers et al. 1991, Bell 1992, Englund 1991, Vanderpoorten and Klein 2000.
Marginal graminoids (*Phragmites mauritianus*)	Graminoids (grasses, sedges and rushes) that grow in the marginal zone of the riparian area (Figure 4-1). These plants are reliant upon regular (seasonal) inundation.	Marginal graminoids are dormant in the dry season but grow in response to wetting in other seasons. Peaking flows (alone) will favour their growth if the lateral bars upon which they grow remain in place. An increase in extent provides habitat for fish and macroinvertebrates.	Kotschy et al. 2000, Kotschy and Rogers 2008, Reinecke 2013.
Marginal shrubs (*Stropanthus cf. speciosus*)	Woody plants (trees and shrubs) that grow in the marginal zone of the riparian area (Figure 4-1). These plants are reliant upon regular (seasonal) inundation.	Marginal shrubs grow in response to wetting. Peaking flows (alone) will favour their growth if the lateral bars upon which they grow remain in place. An increase in extent provides habitat for fish and macroinvertebrates.	Goldblatt and Manning 2000, Coates Palgrave 1977, Reinecke 2013.
Lower zone trees (*Diospyros mespiliformis*)	Woody plants that grow in the lower zone of the riparian area (Figure 4-1). These plants are favoured by regular inundation but not reliant upon it.	Lower zone trees grow in response to wetting and an increase in nutrient supply from floods. Peaking is expected to favour their growth. An increase in extent provides cover and browsing for terrestrial vertebrates.	Curtis and Manheimer 2005, van Wyk and van Wyk 2009, Reinecke 2013.

Indicator	Definition	Predicted change	References
Upper zone trees (*Combretum imberbe*)	Woody plants that grow in the upper zone of the riparian area (Figure 4-1). These plants are dessication tolerant and can grow just as well in a terrestrial environment.	Upper zone trees would be favoured by increased wetting but peaking is not expected to reach into this zone. No changes are expected.	Curtis and Manheimer 2005, van Wyk and van Wyk 2009, Reinecke 2013.

4.8.2 Description and location of indicators

4.8.2.1 Organic detritus

Organic detritus comprises plant material such as leaves, twigs, bark, flowers and fruits, that fall in from the riparian canopy, or which are washed or blown in from surrounding terrestrial vegetation (Davies and Day 1995). Organic detritus breaks down and provides nutrients for the growth of diatoms and filamentous green algae (Larned et al. 2004) but also is a food source for grazing fish such as *Labeo* species (Tweddle pers. comm.). A large supply of organic detritus is picked up through the Barotse flood plain during the wet season and transported into the gorge. During flood-onset this organic detritus, along with other localised supplies from gorge trees and shrubs, are transported through the gorge and deposited into the channel, backwater areas, pools and or other marginal aquatic habitats.

4.8.2.2 Single celled diatoms

Diatoms are unicellular algae (Bacillariophyta) that are enclosed in a frustule made of silica (Bell 1992). Together with other algae (see below) they form a component of the periphyton that grown on benthic substrata in the aquatic zone of the river channel (Ewart-Smith 2012). Diatoms convert dissolved nutrients into a food source for other aquatic organisms (Biggs 1996) and are grazed by snails (Rosemund et al. 1993), aquatic macroinvertebrates (Steinman et al. 1991), crustaceans (Pringle et al. 1993), tadpoles (Petersen and Boulton 1999) and fish (Power and Mathews 1983). Diatoms grow well under conditions of low nutrients, light and temperature and are primarily controlled by changes in flow (Ewart-Smith 2012). Floods disturb diatoms in a number of ways. They turn over benthic substrata upon which diatoms grow (Grimm and Fisher 1989); they entrain suspended sediments that scour diatoms from the surface of benthic rocks (Webb et al. 2006) and shear stress directly scours diatoms from the rock surfaces (Biggs and Thomsen 1995). In this way, flood disturbance overrides any positive effects of nutrients, temperature or light. Diatoms proliferate during the dry season when current velocities are low and if these periods persist for longer than 1 month different successional communities of diatom may develop (Yang et al. 2009). A low but constant biomass can persist under conditions of frequent flooding (up to 10 days) as diatoms are constantly scoured/flushed away and thus prevented from accruing biomass (Biggs 1995).

4.8.2.3 Filamentous green algae

Filamentous green algae (Chlorophyta) are colonial and contain chloroplasts with chlorophyll a and b and have cellulose cell walls (Bell 1992). Like diatoms, they form a component of the periphyton that converts available nutrients into a food source for a range of aquatic organisms and proliferate when velocities are lower in the dry season (see above). Unlike diatoms, they are favoured under conditions of increased light, temperature and/or nutrients (Hill 1996, Wilde and Tilly 1981) and are slower to recover from the disturbances associated with floods (Ewart-Smith 2012).

4.8.2.4 Bryophyta sp1.

Bryophytes are small flowerless plants that do not have vascular tissue and grow in dense clumps/mats on rocks (Bell 1992) at the water's edge. Aquatic bryophytes are well adapted to the forces of flowing water (Miler et al. 2012) and tend to dominate in habitats characterised by high flow velocities (Vanderpoorten and Klein 2000). The frequency of inundation at the bankfull discharge does not influence bryophytes (Suren and Duncan 1999) rather their distribution is associated with substrate stability, the key driver separating habitats for bryophtyes versus those suited to aquatic macrophytes (Chambers et al. 1991). Bryophytes attach directly to large substrates and require long periods of substrate stability to establish (Englund 1991).

4.8.2.5 Marginal graminoids (Phragmites mauritianus)

Marginal graminoids (grasses, sedges and rushes) grow in the marginal zone of the riparian area (Figure 4-1) and are reliant upon regular (seasonal) inundation (Reinecke 2013). *Phragmites mauritianus* is an obligate riparian plant with an extensive root system, which consolidates and maintains bank stability (Kotschy and Rogers 2008). It is also known for its aggressive and persistent survival strategies, which include vegetative growth through creeping runners that root at regular intervals (Brown et al. 2005). Dispersal occurs most successfully via vegetative diaspores (stem fragments) broken from the plant during flood events. The diaspores are able to root on sandy banks or newly cleared/disturbed areas (Kotschy et al. 2000). *P. mauritianus* will tolerate seasonal drying, is dormant during the dry season (Cross and Fleming 1989), can extend vegetative stems rapidly towards new areas of moisture and flowers in late spring and fruits in autumn (Fanshawe 1972).

Figure 4.6 ***Phragmites mauritianus*, selected indicator for marginal zone graminoids.**

4.8.2.6 Marginal shrubs (Stropanthus cf. speciosus)

Marginal woody plants (trees and shrubs) grow in the marginal zone of the riparian area (Figure 4-1) and are reliant upon regular (seasonal) inundation. *Stropanthus cf. speciosus* was the dominant shrub at EF Site 1 growing in the bare rock of the marginal zone. This plant is common at forest margins (van Wyk and van Wyk 2009) and flowers from September to October thereafter releasing wind-dispersed seeds (Coates Palgrave 1977). At EF Site 2, this shrub was present on the alluvial lateral bars and co-occurred with *Salix mucronata* and *Ficus capreifolia,* both pioneering riparian trees that are also well adapted to the regular inundation of their marginal zone habitats by being flexible (Reinecke 2013), good bank stabilisers (Karrenberg et al. 2002) and being able to disperse asexually via vegetative diaspores (Nilsson and Svedmark 2002).

Figure 4.7 ***Stropanthus cf. speciosus*, selected indicator for marginal woody plants.**

4.8.2.7 *Lower zone trees (Diospyros mespiliformis)*

Diospyros mespiliformis is a woody plant that grows in the lower zone of the riparian area (Figure 4-1). These plants are favoured by regular inundation but not reliant upon it (Reinecke 2013). *Diospyros mespiliformis* grows in the lower zone on the edge of lateral bars, which consist of cobbles and a surface layer of alluvial washed fines or sand (van Wyk and van Wyk 2009). *Diospyros mespiliformis* is a tall tree, found on the banks of rivers and on floodplains, that flowers from August to January during the dry season and into flood-onset and fruits over flood recession (Curtis and Manheimer 2005). The plants respond to increased soil moisture by increasing flowering and seed set (Curtis and Mannheimer 2005). Livestock, game and humans eat the fruits and the twigs and the bark is used medicinally (Coates Palgrave 1977, Van Wyk and van Wyk 1997).

Figure 4.8 ***Diospyros mespiliformis*, selected indicator for lower zone trees.**

4.8.2.8 *Upper zone trees (Combretum imberbe)*

Combretum imberbe is a woody tree that grows in the upper zone of the riparian area (Figure 4-1). These plants are desiccation tolerant and can grow just as well in a terrestrial environment (van Wyk and van Wyk 2009) as they are found growing in bushveld, alluvial sands along perennial and ephemeral rivers. It is tolerant of a wide range of soil conditions and flowers from November to February, fruiting all year round but mostly from December to June (Curtis and Manheimer 2005). This species also responds to increases in moisture by increasing seed production, such as during rainy periods. *Combretum imberbe* is utilised for fuel and construction materials in many parts of Africa.

Figure 4.9 ***Combretum imberbe*, selected indicator for upper zone trees.**

4.8.3 Linked indicators

Motivation for all linked indicators is provided in Table 4-11.

Table 4.11 Linked indicators and motivations

Indicator	Linked indicator	Motivation
Organic detritus	Dry duration Dry min 5-d Q Wet duration Wet average daily volume Dry within day range T1 within day range T2 within day range Q Wet mean fine suspended sediments	Deciduous leaves enter the river in the dry season. High flows in the dry season pick up riparian detritus. More detritus transported over a longer wet season. High flows in the wet season pick up riparian detritus. Continuous peaking scours and denudes detritus. Continuous peaking scours and denudes detritus. Continuous peaking scours and denudes detritus. Organic detritus is suspended at similar discharges.

Indicator	Linked indicator	Motivation
Single-celled diatoms	Dry duration Dry min 5-d Q Wet duration Wet average daily volume Dry within day range T1 within day range T2 within day range Q Wet mean coarse suspended sediments Wet mean fine suspended sediments Nutrients	Benthic diatoms proliferate in the dry season. High flows inundate more marginal habitat for growth. More diatoms are scoured over longer wet seasons. High flows disturb inundated rocks and scour diatoms. Continuous peaking scours and denudes diatoms. Continuous peaking scours and denudes diatoms. Continuous peaking scours and denudes diatoms. Coarse suspended sediments scour diatoms. Fine suspended sediments increase water turbidity. Nutrients influence growth of diatoms.
Filamentous green algae	Dry duration Dry min 5-d Q Wet duration Wet average daily volume Dry within day range T1 within day range T2 within day range Q Wet mean coarse suspended sediments Wet mean fine suspended sediments Temperature Nutrients	Filamentous green algae proliferate in the dry season. High flows inundate more marginal habitat for growth. More greens are scoured over longer wet seasons. High flows disturb inundated rocks and scour greens. Continuous peaking scours and denudes greens. Continuous peaking scours and denudes greens. Continuous peaking scours and denudes greens. Coarse suspended sediments scour greens. Fine suspended sediments increase water turbidity. Temperature influences growth of filamentous greens Nutrients influence growth of filamentous greens.
Bryophyta	Dry duration Dry min 5-d Q Wet duration Wet max 5-d Q Dry within day range T1 within day range T2 within day range Q Wet mean coarse suspended sediments Wet mean fine suspended sediments	Rock moss is exposed and dries out in the dry season. Higher flows inundate rock moss and it grows. More rock moss is scoured over a long wet season. High flows scour rock moss. Continuous peaking favours growth. Continuous peaking favours growth. Continuous peaking favours growth. Coarse suspended sediments scour rock moss. Fine suspended sediments increase turbidity.
Marginal graminoids	Dry duration Dry min 5-d Q Wet duration Wet max 5-d Q Dry maximum instantaneous Q T1 maximum instantaneous Q T2 maximum instantaneous Q Wet mean fine suspended sediments Length cut banks Vegetated mid-channel bars	Plants are dormant in the dry season. Plants incur desiccation stress in the dry season. More flushing takes place over a longer wet season. High flows flush marginal graminoids from the banks. Continuous peaking does not favour growth (dormant). Continuous peaking favours growth. Continuous peaking favours growth. Fine sediments carry nutrients that boost plant growth. Marginal graminoids inhabit lateral bars. Marginal graminoids inhabit vegetated bars.
Marginal shrubs	Dry duration Dry min 5-d Q Wet duration Wet max 5-d Q	Less stress occurs over a shorter dry season. Plants incur desiccation stress in the dry season. More flushing takes place over a longer wet season. High flows flush marginal shrubs/trees from the banks.

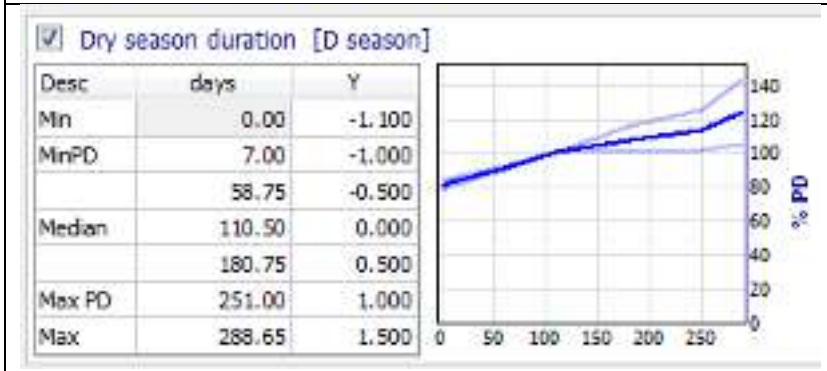
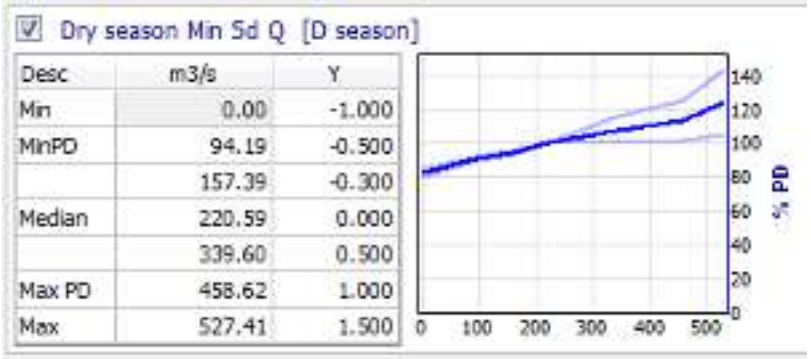
Indicator	Linked indicator	Motivation
	Dry maximum instantaneous Q T1 maximum instantaneous Q T2 maximum instantaneous Q Wet mean fine suspended sediments Length cut banks Vegetated mid-channel bars	Continuous peaking favours growth. Continuous peaking favours growth. Continuous peaking favours growth. Fine sediments carry nutrients that boost plant growth. Marginal shrubs/trees inhabit lateral bars. Marginal shrubs/trees inhabit vegetated bars.
Lower zone trees	Dry duration Wet duration Wet max 5-d Q Dry maximum instantaneous Q T1 maximum instantaneous Q T2 maximum instantaneous Q Wet mean fine suspended sediments	Less stress occurs over a shorter dry season. More flushing takes place over a longer wet season. High flows flush saplings from the banks. Continuous peaking favours growth slightly. Continuous peaking favours growth slightly. Continuous peaking favours growth slightly. Fine sediments carry nutrients that boost plant growth.
Upper zone trees	Wet max 5-d Q Wet duration	Growth and reproduction favoured by high flows. More wetting takes place over longer wet season.

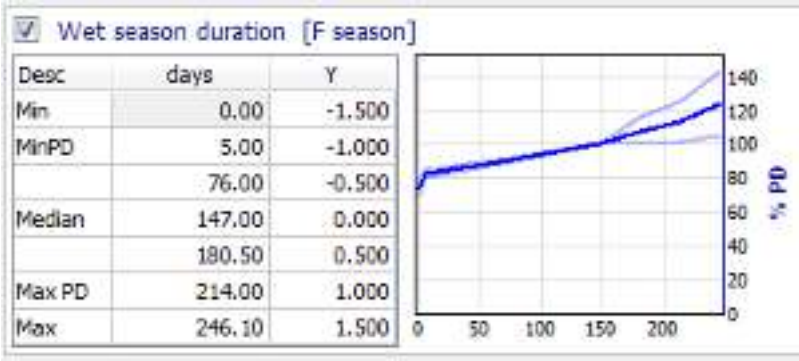
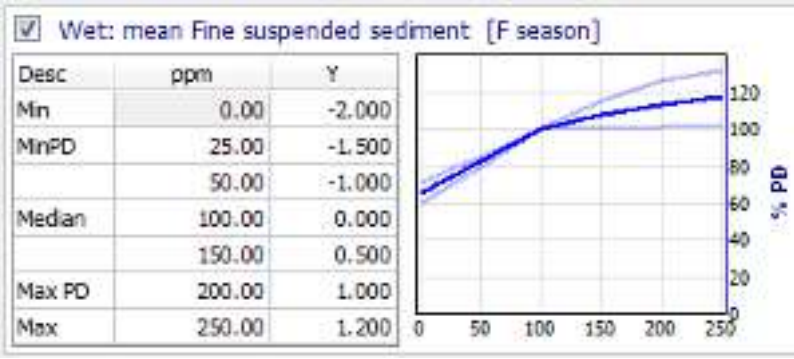
4.9 ASSUMPTIONS AND LIMITATIONS

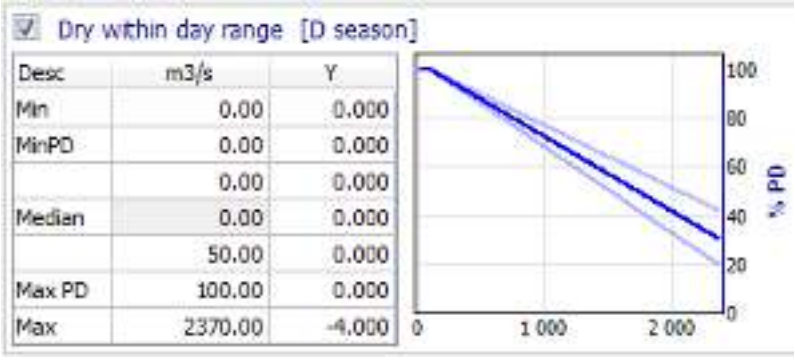
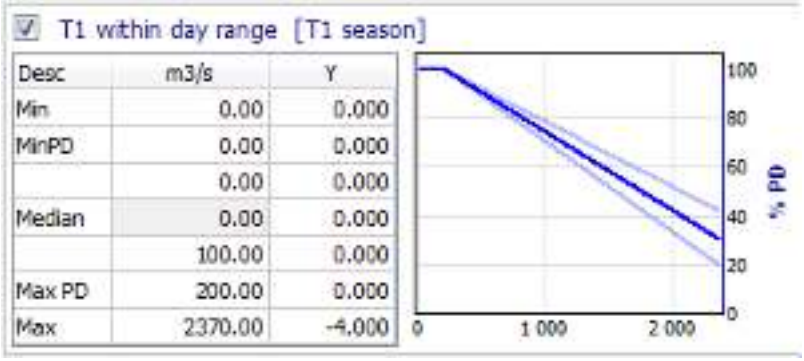
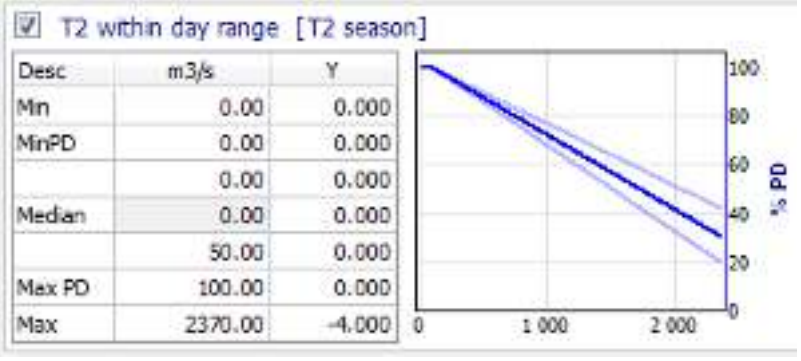
The study was limited in the extent to which observations could be made in the gorge as most of the gorge was inaccessible. The Google Earth imagery for the lower parts of the gorge were also of poor quality and this limited the extent to which generalisations about plant distribution and habitat types could be made along the gorges length. This was especially important for the assumptions about the extent to which marginal graminoids were present in the lower gorge and absent from the upper gorge.

4.10 *MOTIVATIONS FOR RESPONSE CURVES: EF SITE 2*

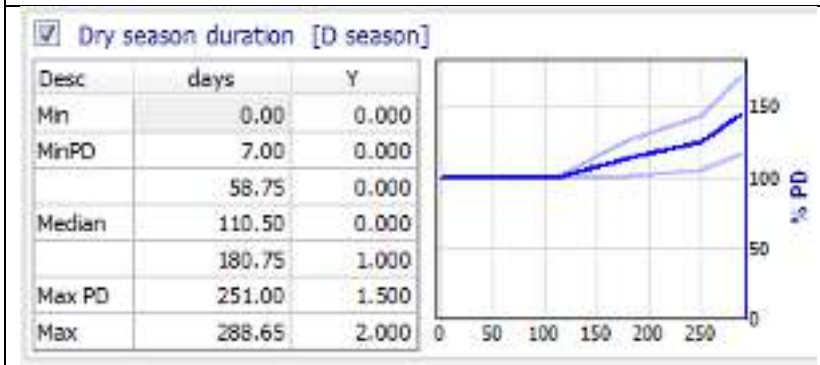
4.10.1 Organic detritus

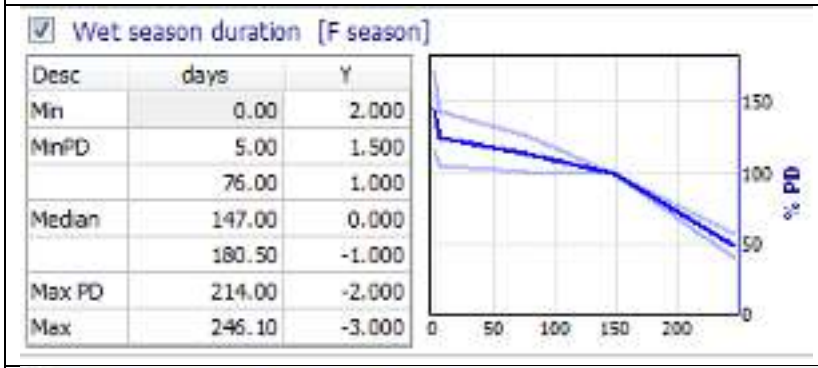
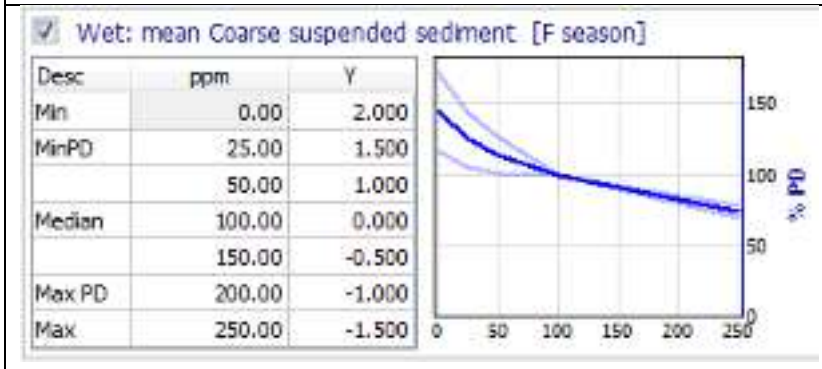
Organic detritus		
Response curve	Explanation	Confidence
 Dry season duration [D season] Desc / days / Y Min 0.00 -1.100 MinPD 7.00 -1.000 58.75 -0.500 Median 110.50 0.000 180.75 0.500 Max PD 251.00 1.000 Max 288.65 1.500 % PD	Many terrestrial and some riparian trees are deciduous and lose their leaves during the dry season when they enter growth dormancy (Davies and Day 1998). A longer dry season will contribute more leaf fine/coarse particulate matter into the river.	3
 Dry season Min Sd Q [D season] Desc / m3/s / Y Min 0.00 -1.000 MinPD 94.19 -0.500 157.39 -0.300 Median 220.59 0.000 339.60 0.500 Max PD 458.62 1.000 Max 527.41 1.500 % PD	The marginal zone is inundated at discharges between 480-2500 cumecs. Inundation of the marginal zone will pick up fine/coarse particulate matter from the riparian area and transport it into the river channel (Naiman et al. 2005). Greater discharges will lift coarse/fine particulate matter from channel bed and into the water column. Smaller discharges will not entrain fine/coarse particulate matter.	4

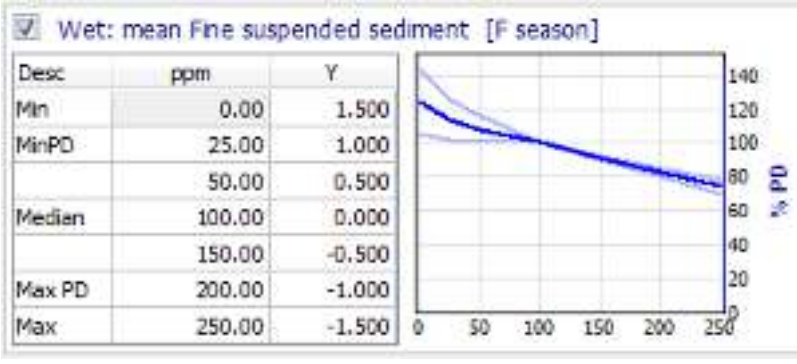
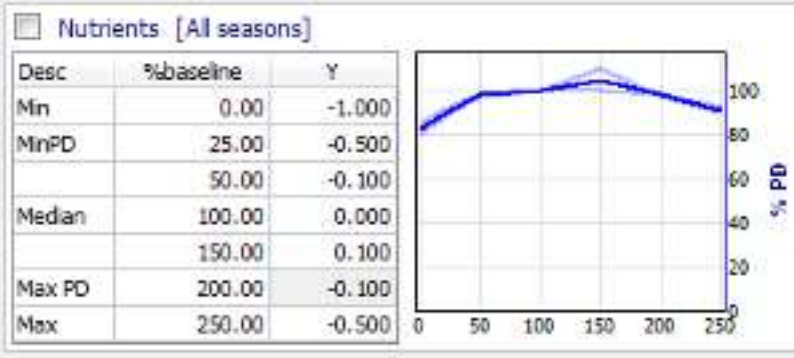
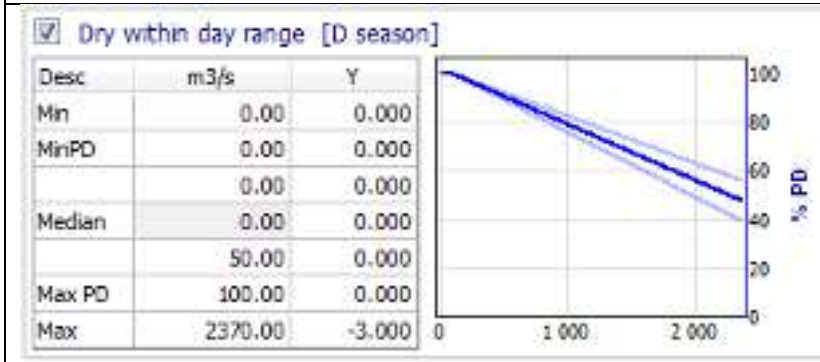
Organic detritus		
Response curve	Explanation	Confidence
	A longer wet season will carry/scour more particulate matter from the riparian area (Naiman et al. 2005). A shorter wet season will result in less particulate matter being delivered into the channel.	3
	Inundation of the riparian area picks up and delivers fine/coarse particulate matter to the river (Naiman et al. 2005). Greater discharges reach further into the riparian area covering a larger area and providing more particulates. Lower than median will reduce that available compared to PD.	4
	Detritus is transported along with suspended sediments in the water column. A reduction in suspended fines correlates to a reduction in detritus.	2

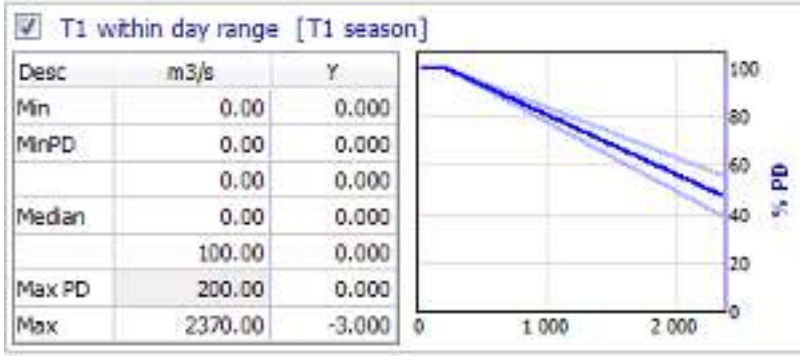
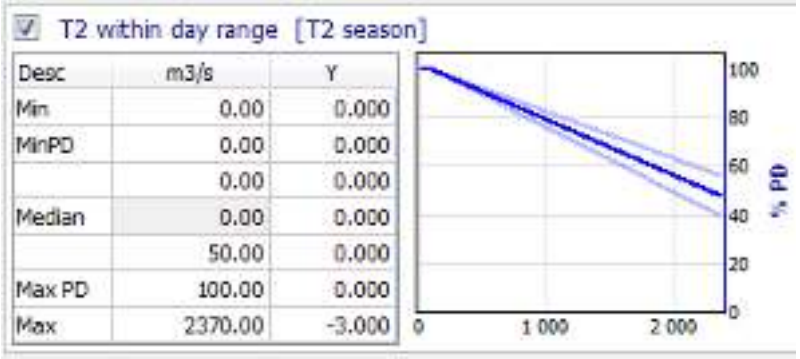
Organic detritus		
Response curve	Explanation	Confidence
	Peaking during the dry season at 2,500 cumecs inundates the entire marginal zone. Continuous inundation of the marginal zone will flush all organic particulate matter downstream leaving little available as a food source for biota.	3
	Peaking during the T1 season at 2,500 cumecs inundates the entire marginal zone. Continuous inundation of the marginal zone will flush all organic particulate matter downstream leaving little available as a food source for biota.	3
	Peaking during the T2 season at 2,500 cumecs inundates the entire marginal zone. Continuous inundation of the marginal zone will flush all organic particulate matter downstream leaving little available as a food source for biota.	3

4.10.2 Single-celled diatoms

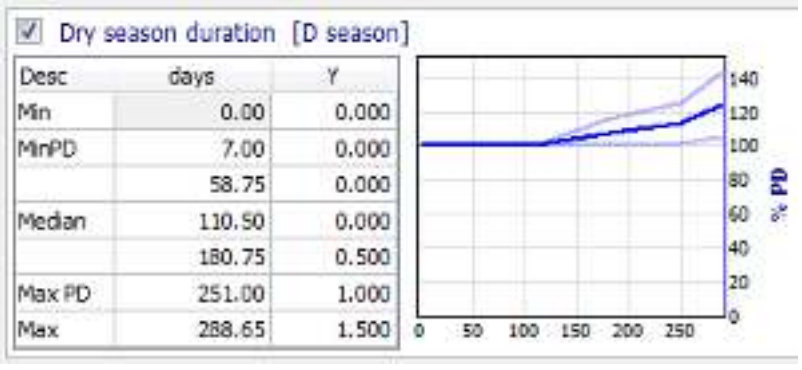
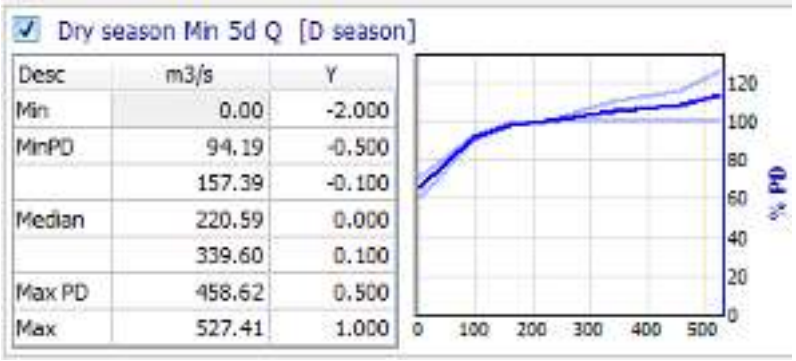
Single-celled diatoms		
Response curve	Explanation	Confidence
	Benthic diatoms grow best in the dry season (Ewart-Smith 2012), a longer dry season favours growth. Diatoms grow rapidly and turn over growth cycles within years.	4
	Diatoms grow in the aquatic zone (Biggs 1996) and larger discharges inundate more rocky benthic habitat upon which they grow. Lower discharges reduce the habitat available. Reduced flow reduces disturbance and favours a shift from edible unicellular diatoms to filamentous inedible diatoms.	4

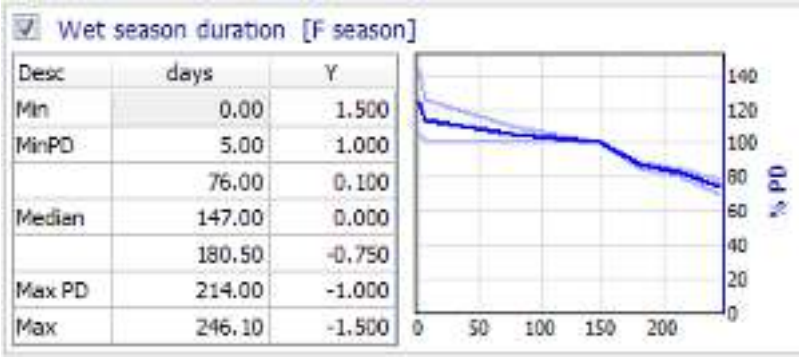
Single-celled diatoms		
Response curve	Explanation	Confidence
	Floods scour diatoms from the benthic rocks upon which they grow (Biggs and Thomsen 1995). The period over which flood scour exerts an influence is minimised over a short wet season and maximised over a longer wet season. Diatom growth is favoured by shorter wet seasons.	4
	Floods scour diatoms from the benthic rocks upon which they grow (Biggs and Thomsen 1995). The period over which flood scour exerts an influence is minimised over a short wet season and maximised over a longer wet season. Diatom growth is favoured by shorter wet seasons.	4
	Suspended coarse sediments act like sand paper scouring benthic diatoms from the surface of inundated rocks (Grimm and Fisher 1989). An increase in suspended coarse sediments will reduce benthic diatom abundance. A decrease in suspended coarse sediments favours the growth of diatoms.	4

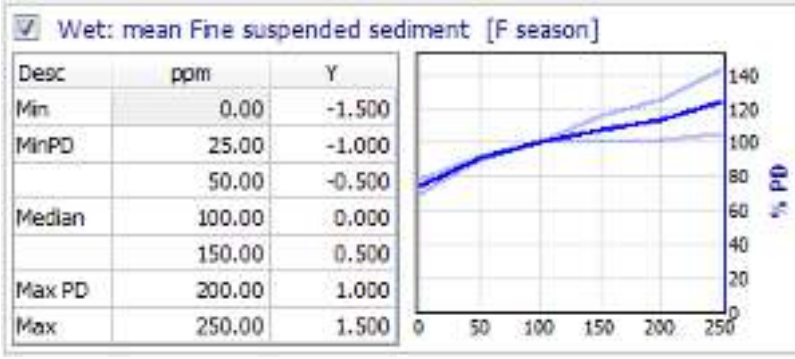
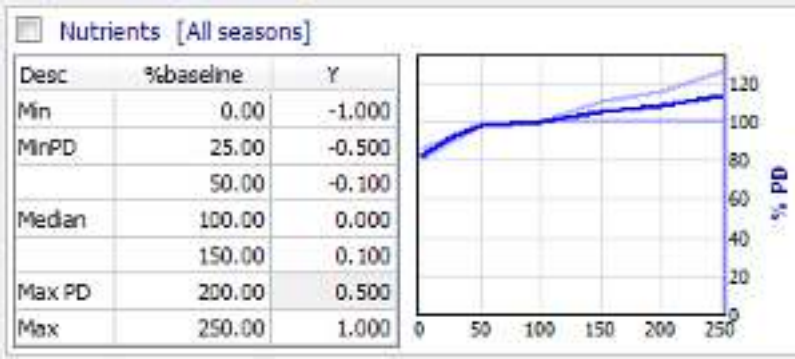
Single-celled diatoms		
Response curve	Explanation	Confidence
	Fine suspended sediments increase water turbidity which decreases light penetration, reduced light into the water column decreases diatom growth (Hill 1996). Reduced turbidity favours growth of diatoms.	2
	CAN BE SWITCHED ON IF AVAILABLE. An increase in nutrients will favour diatom growth up to a point beyond which the surplus of nutrients favours green algae over diatoms (Ewart-Smith 2012). A reduction in nutrients will reduce the abundance of unicellular diatoms.	2
	Diatoms require stable substrata upon which to grow (Holomuzki and Biggs 2006) and are scoured from rocks by shear stress (Biggs and Thomsen 1995). Continual inundation during the dry season disturb and flush diatoms downstream reducing their abundance.	3

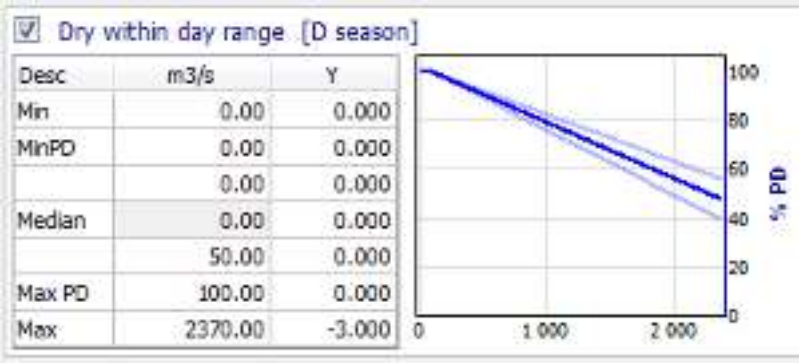
Single-celled diatoms		
Response curve	Explanation	Confidence
	Diatoms require stable substrata upon which to grow (Holomuzki and Biggs 2006) and are scoured from rocks by shear stress (Biggs and Thomsen 1995). Continual inundation during the transitional season 1 disturbs and flushes diatoms downstream reducing their abundance.	3
	Diatoms require stable substrata upon which to grow (Holomuzki and Biggs 2006) and are scoured from rocks by shear stress (Biggs and Thomsen 1995). Continual inundation during the transitional season 2 disturbs and flushes diatoms downstream reducing their abundance.	3

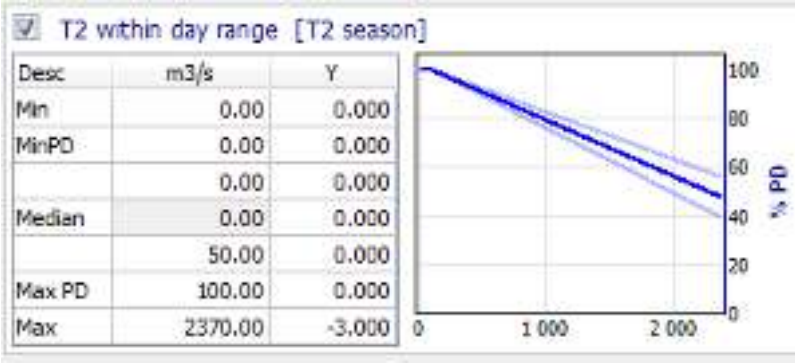
4.10.3 Filamentous green algae

Filamentous green algae		
Response curve	Explanation	Confidence
	Green algae grow best in the dry season (Ewart-Smith 2012) when flows are low; a longer dry season favours growth.	4
	Green algae grow on benthic (inundated) rocks (Biggs 1996). At lower discharges a smaller area of benthic substrata are inundated. Greater dry season discharges inundate a wider area of benthic substrata upon which green algae may grow.	4

Filamentous green algae		
Response curve	Explanation	Confidence
	Floods scour algae from the benthic rocks upon which they grow (Biggs and Thomsen 1995). The period over which flood scour exerts an influence is minimised over a short wet season and maximised over a longer wet season. Growth of green algae is favoured by shorter wet seasons.	4
	At discharges lower than 1000 cumecs, the marginal area is inundated providing a greater area of benthic substrata upon which green algae may grow. At higher discharges bed sediments turn over disturbing algal communities and also scouring them from the rocks (Biggs and Thomsen 1995).	4
	Suspended coarse sediments act like sand paper scouring green algae from the surface of inundated rocks (Grimm and Fisher 1989). An increase in suspended coarse sediments reduced algal abundance. A decrease in suspended coarse sediments favours the growth of algae.	3

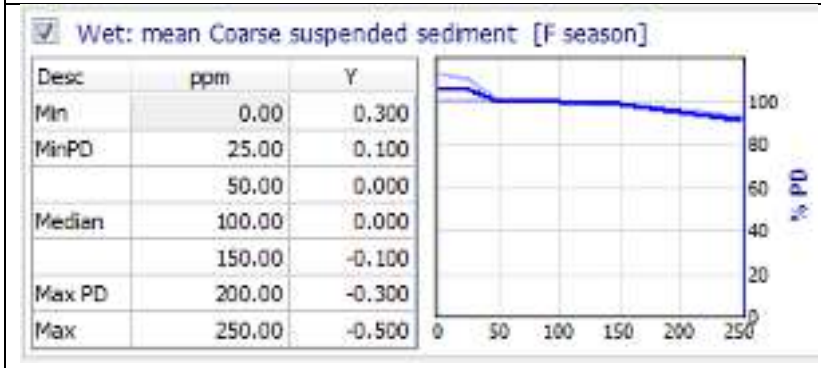
Filamentous green algae		
Response curve	Explanation	Confidence
	Fine suspended sediments increase water turbidity which decreases light penetration, reduced light into the water column decreases diatom growth (Hill 1996). Reduced turbidity favours growth of algae.	2
	CAN BE SWITCHED ON IF REQUIRED. Increases in temperature favour growth of green algae (De Nicola 1996). Growth is hindered at lower temperatures.	2
	CAN BE SWITCHED ON IF REQUIRED. An increase in nutrients will favour algal growth (Ewart-Smith 2012). A reduction in nutrients will reduce the abundance of green algae.	2

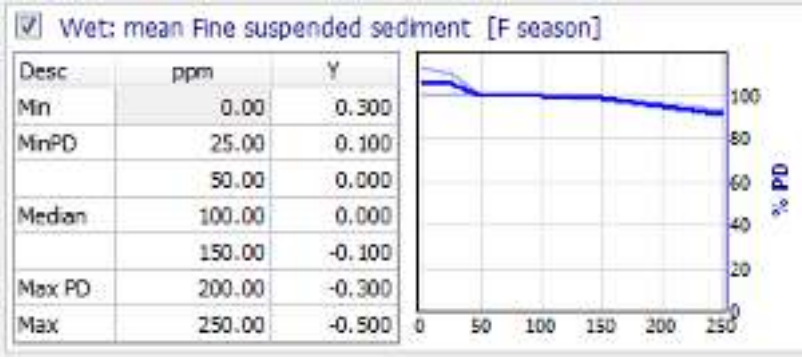
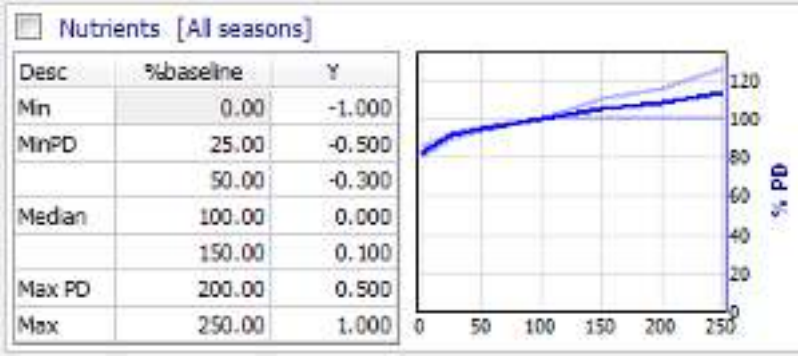
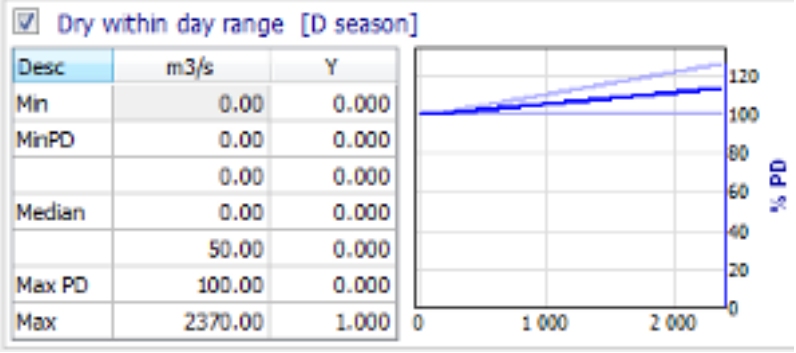
Filamentous green algae		
Response curve	Explanation	Confidence
	Green algae require stable substrata upon which to grow (Holomuzki and Biggs 2006) and are scoured from rocks by shear stress (Biggs and Thomsen 1995). Continual inundation during the dry season disturbs and flushes algae downstream reducing their abundance.	3
	Green algae require stable substrata upon which to grow (Holomuzki and Biggs 2006) and are scoured from rocks by shear stress (Biggs and Thomsen 1995). Continual inundation during the T1 season disturbs and flushes algae downstream reducing their abundance.	3

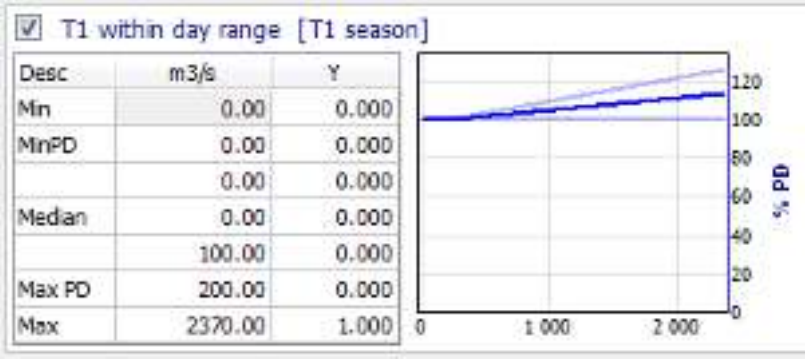
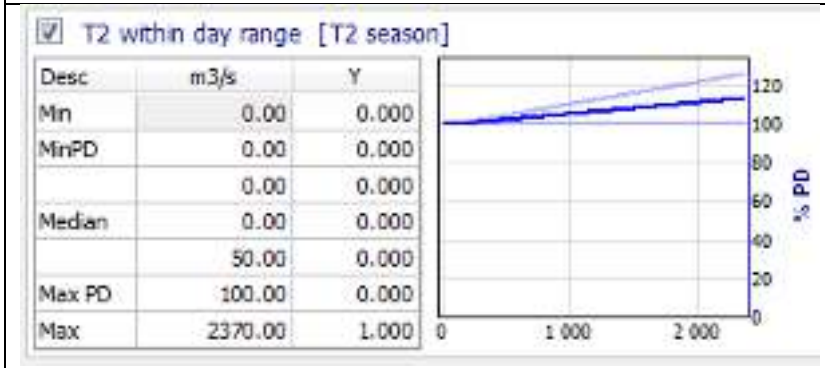
Filamentous green algae		
Response curve	Explanation	Confidence
	Green algae require stable substrata upon which to grow (Holomuzki and Biggs 2006) and are scoured from rocks by shear stress (Biggs and Thomsen 1995). Continual inundation during the T2 season disturbs and flushes algae downstream reducing their abundance.	3

4.10.4 Bryophta sp1. (EF Site 1 only)

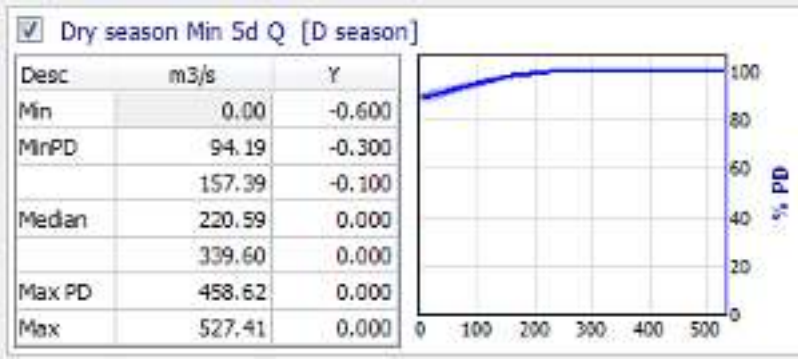
Bryophyta sp1.		
Response curve	Explanation	Confidence
	This moss is adapted to drying out and is dormant during the dry season (pers. obs). Rock mosses growth and reproduction is favoured over a shorter dry season.	2
	The rock moss is inundated between 200-600 cumecs. The moss dries out and is dormant when dry (pers. obs.). Growth and reproduction takes place when inundated. The moss grows slowly and spreads slowly mainly by vegetative reproduction (Bell 1992).	3

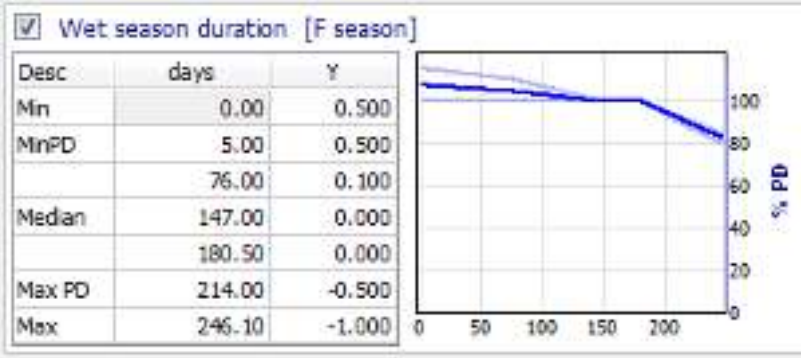
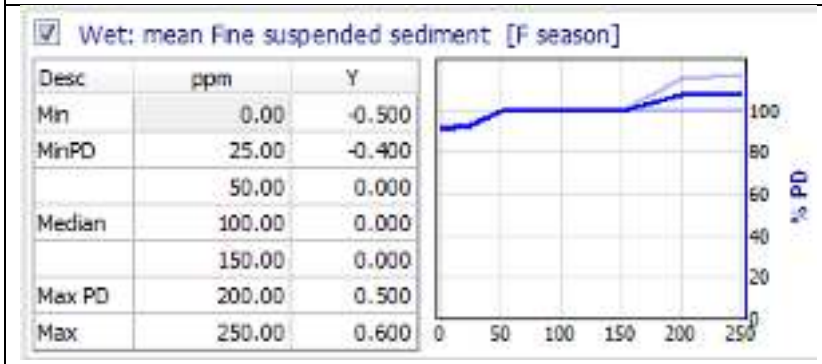
Bryophyta sp1.		
Response curve	Explanation	Confidence
	The rock moss is inundated between 200-600 cumecs. Growth and reproduction takes place when inundated (Bell 1992). The force of a large flood scours the moss from the rocks and turns rocks over which disturb the moss (Suren and Duncan 1999).	3
	Rock moss are scoured from the rocks during high flows (Suren and Duncan 1999). Less scouring takes place occurs over a shorter wet season and more scouring takes place during a longer wet season.	3
	Coarse suspended sediment particles act like sandpaper and increase the scouring force of the floods (Suren and Duncan 1999). Greater coarse suspended sediment loads = greater scouring force. Less coarse sediment favours growth.	3

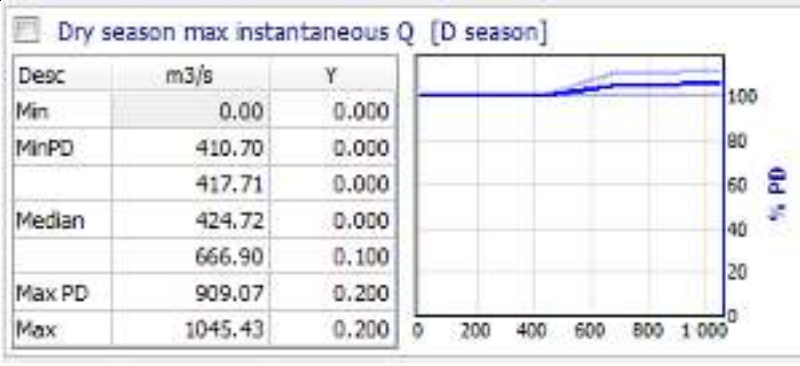
Bryophyta sp1.		
Response curve	Explanation	Confidence
	Suspended fines make water turbid so an increase in the suspended sediment load will limit light penetrating into the water column (Hill 1996). Reduced light will hinder growth of inundated rock moss. Less suspended sediment will favour growth of inundated rock moss.	2
	MAY BE TURNED ON IF BECOME AVAILABLE. Increased nutrients stimulate growth of the rock moss (Larned et al. 2004). A surplus of nutrients will favour rock moss growth. A decrease in nutrients will hinder rock moss growth.	2
	Continual wetting of rock moss favours growth (Bell 1992). Peaking at 2,500 cumecs inudates most of the marginal zone (upper limit 3000 cumecs) that consists of rocks available as benthic habitat for the rock moss. This discharge is not large enough to effect scouring. Continual inundation favours growth of the rock moss.	3

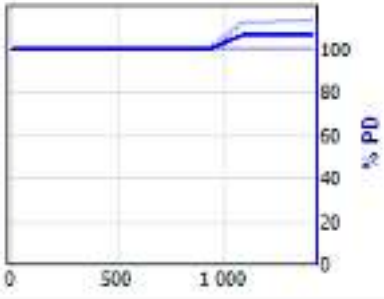
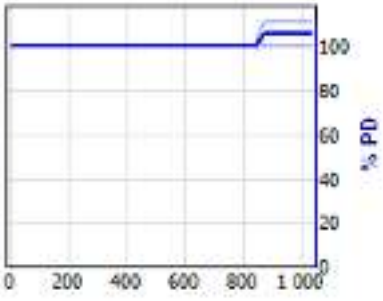
Bryophyta sp1.		
Response curve	Explanation	Confidence
	Continual wetting of rock moss favours growth (Bell 1992). Peaking at 2,500 cumecs inudates most of the marginal zone (upper limit 3000 cumecs) that consists of rocks available as benthic habitat for the rock moss. This discharge is not large enough to effect scouring. Continual inundation favours growth of the rock moss.	3
	Continual wetting of rock moss favours growth (Bell 1992). Peaking at 2,500 cumecs inudates most of the marginal zone (upper limit 3000 cumecs) that consists of rocks available as benthic habitat for the rock moss. This discharge is not large enough to effect scouring. Continual inundation favours growth of the rock moss.	3

4.10.5 Marginal graminoids

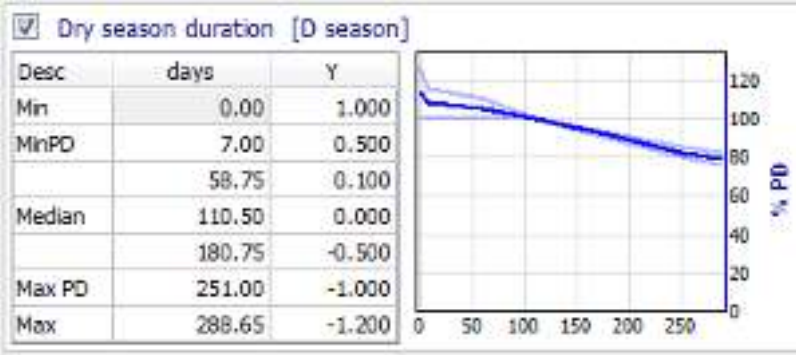
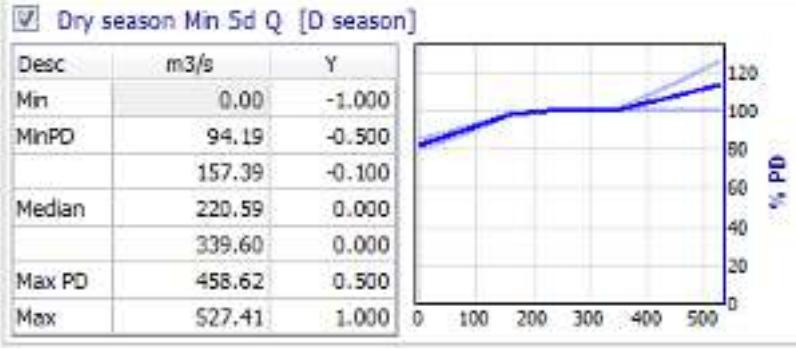
Marginal graminoids		
Response curve	Explanation	Confidence
	Extended dry season prolongs desiccation stress that may cause mortality. Marginal graminoids are dormant during the dry season (Cross and Fleming 1989) and so not favoured when this is shorter.	2
	The marginal zone is inundated between 480-2500 cumecs. Marginal species are dormant during the dry season (Cross and Fleming 1989) so little growth and no reproduction takes place in response to increased discharge. Persistent lower discharge may cause some mortality as wetting of marginal zone reduced.	2

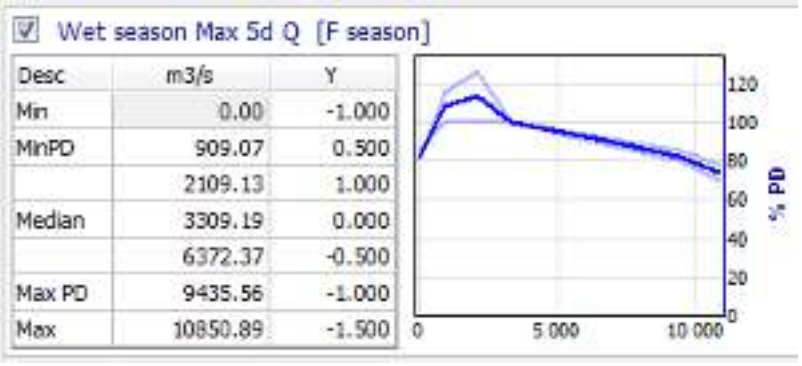
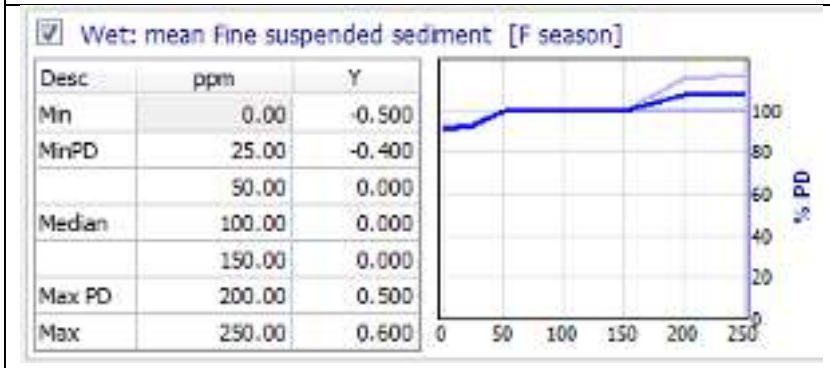
Marginal graminoids		
Response curve	Explanation	Confidence
	Marginal zone is inundated between 480-2500 cumecs. Discharges < 500 cumecs don't reach into the marginal area and hinder growth/reproduction. Plants grow and reproduce in response to wetting (Kotschy et al. 2000). Extreme floods cause stem snap or uproot root culms (Kotschy and Rogers 2008).	4
	Extreme floods cause stem snap or uproot root culms (Kotschy and Rogers 2008). Extended wet season flushes the marginal area for a longer period and more damage (stem snap, uprooting) takes place over a longer wet season. Less flushing out of graminoids takes place over a shorter wet season.	4
	Suspended fines carry nutrients that boost plant growth in the otherwise nutrient poor alluvial (washed) sands they inhabit (Naiman et al. 2005). An increase in suspended fines boost plant growth and vitality that increases reproductive output.	3

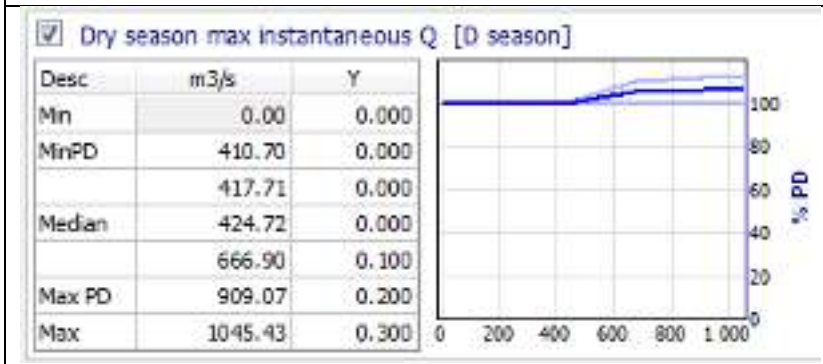
Marginal graminoids		
Response curve	Explanation	Confidence
	Marginal graminoids inhabit the edge of the active channel (van Ginkel et al. 2010). A reduction in the extent of the active channel edge will reduce the extent of marginal graminoids. Cut banks comprise c. 20% of the marginal habitat available to graminoids.	3
	Marginal graminoids inhabit the vegetated mid-channel bars (van Ginkel et al. 2010). An increase in extent of mid-channel bars provides more habitat for marginal graminoids. A reduced extent of mid-channel bars reduces marginal habitat for graminoids.	3
	Marginal graminoids are dormant during the dry season (Cross and Fleming 1989) so are not favoured by increased wetting.	2

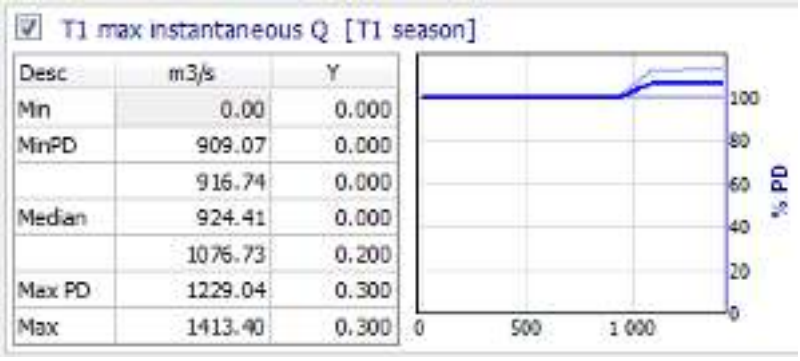
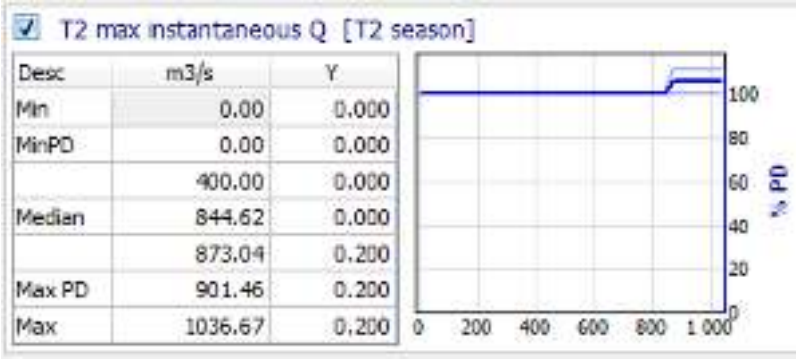
<table>
<tr><td colspan="2">Marginal graminoids</td><td></td></tr>
<tr><td>Response curve</td><td>Explanation</td><td>Confidence</td></tr>
<tr><td>T1 max instantaneous Q [T1 season]
<table>
<tr><th>Desc</th><th>m3/s</th><th>Y</th></tr>
<tr><td>Min</td><td>0.00</td><td>0.000</td></tr>
<tr><td>MinPD</td><td>909.07</td><td>0.000</td></tr>
<tr><td></td><td>916.74</td><td>0.000</td></tr>
<tr><td>Median</td><td>924.41</td><td>0.000</td></tr>
<tr><td></td><td>1076.73</td><td>0.200</td></tr>
<tr><td>Max PD</td><td>1229.04</td><td>0.300</td></tr>
<tr><td>Max</td><td>1413.40</td><td>0.300</td></tr>
</table>

</td><td>The marginal zone is inundated at discharges between 500-2500 cumecs. Increased wetting favours growth (Kotschy et al. 2000).</td><td>3</td></tr>
<tr><td>T2 max instantaneous Q [T2 season]
<table>
<tr><th>Desc</th><th>m3/s</th><th>Y</th></tr>
<tr><td>Min</td><td>0.00</td><td>0.000</td></tr>
<tr><td>MinPD</td><td>0.00</td><td>0.000</td></tr>
<tr><td></td><td>400.00</td><td>0.000</td></tr>
<tr><td>Median</td><td>844.62</td><td>0.000</td></tr>
<tr><td></td><td>873.04</td><td>0.200</td></tr>
<tr><td>Max PD</td><td>901.46</td><td>0.200</td></tr>
<tr><td>Max</td><td>1036.67</td><td>0.200</td></tr>
</table>

</td><td>The marginal zone is inundated at discharges between 500-2500 cumecs, increased wetting favours growth (Kotschy et al. 2000).</td><td>3</td></tr>
</table>

4.10.6 Marginal shrubs

Marginal shrubs		
Response curve	Explanation	Confidence
 Dry season duration [D season] Desc / days / Y Min 0.00 1.000 MinPD 7.00 0.500 58.75 0.100 Median 110.50 0.000 180.75 -0.500 Max PD 251.00 -1.000 Max 288.65 -1.200 	Extended dry season prolongs dessication stress that may cause mortality (Naiman et al. 2005). Marginal shrubs are favoured over a shorter dry season.	4
 Dry season Min Sd Q [D season] Desc / m3/s / Y Min 0.00 -1.000 MinPD 94.19 -0.500 157.39 -0.100 Median 220.59 0.000 339.60 0.000 Max PD 458.62 0.500 Max 527.41 1.000 	The marginal zone is inundated between 480-2500 cumecs. Growth and reproduction take place in response to increased water availability (Karrenberg et al. 2002). Persistent lower discharge may cause some mortality as wetting of marginal zone reduced.	4

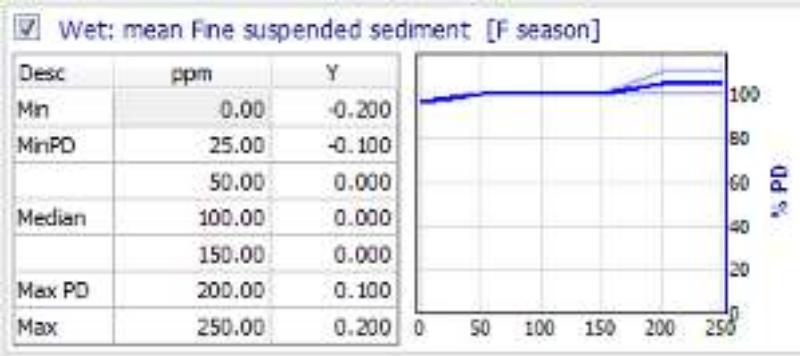
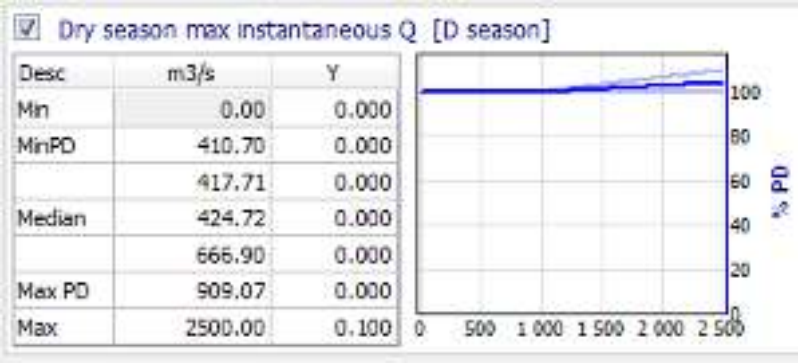
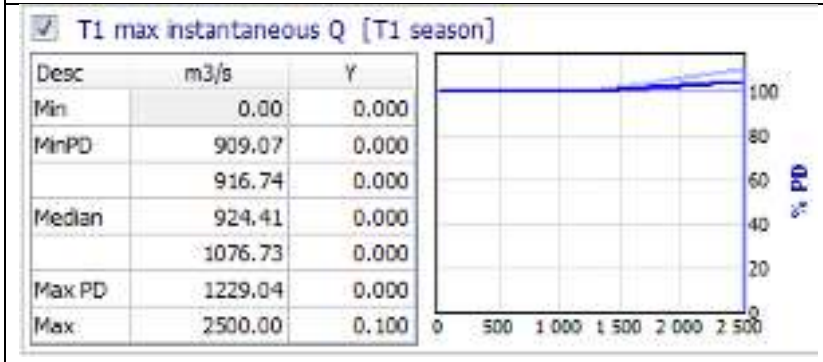
Marginal shrubs		
Response curve	Explanation	Confidence
	The marginal zone is inundated between 480-2500 cumecs. Growth and reproduction take place in response to increased discharge (Karrenberg et al. 2002). Persistent lower discharge may cause some mortality as wetting of marginal zone reduced. Stem snap and flushing takes place at higher discharges (Karrenberg et al. 2002).	4
	Stem snap and flushing takes place at higher discharges (Karrenberg et al. 2002). Less uprooting and stem snap takes place over a shorter wet season. A longer wet season causes more damage to marginal zone plants.	4
	Suspended fines carry nutrients that boost plant growth when deposited in the riparian area (Naiman et al. 2005). An increase in suspended fines increases vitality and reproductive output. Reduced nutrient delivery hinders growth and reproductive output.	4

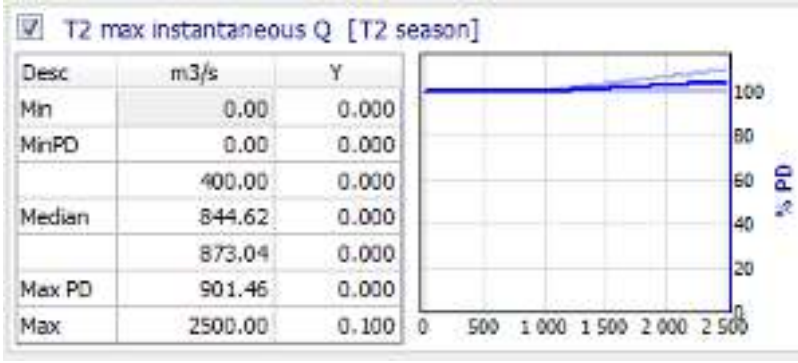
Marginal shrubs		
Response curve	Explanation	Confidence
	Marginal shrubs inhabit the edge of the active channel (Reinecke 2013). A reduction in the extent of the active channel edge will reduce the extent of marginal shrubs. Cut banks comprise c. 20% of the marginal habitat available to marginal shrubs.	3
	Marginal shrubs inhabit the vegetated mid-channel bars (pers. obs). An increase in extent of mid-channel bars provides more habitat for marginal shrubs. A reduced extent of mid-channel bars reduces marginal habitat for shrubs.	3
	The marginal zone is inundated at discharges between 500-2500 cumecs. Increased wetting favours growth (Karrenberg et al. 2002).	3

Marginal shrubs		
Response curve	Explanation	Confidence
	The marginal zone is inundated at discharges between 500-2500 cumecs. Increased wetting favours growth (Karrenberg et al. 2002).	3
	The marginal zone is inundated at discharges between 500-2500 cumecs, increased wetting favours growth (Karrenberg et al. 2002).	

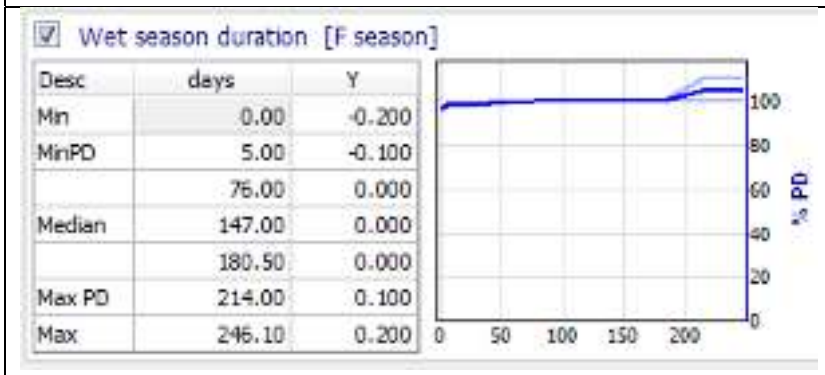
4.10.7 Lower zone trees

Lower zone trees		
Response curve	Explanation	Confidence
	Lower zone is inundated between 2500-4900 cumecs. Plants grow and reproduce in response to wetting (Curtis and Manheimer 2005). Discharges lower than median don't flood the lower zone and hinder growth/reproduction. Extreme floods may uproot saplings (Parsons et al. 2005).	3
	Wet season floods inundate the lower zone and provides water for growth and reproduction (Curtis and Manheimer 2005). Shorter wet seasons deliver less water and longer wet seasons deliver more.	3

Lower zone trees		
Response curve	Explanation	Confidence
	Suspended fines carry nutrients available to boost plant growth in the riparian area (Naiman et al. 2005). An increase in suspended fines increases plant vitality and stimulates reproductive output.	3
	Lower zone is inundated between 2500-4900 cumecs. Wetting favours plant growth. Continual wetting below this threshold may favour growth slightly by boosting ground water recharge but this will be minimal.	3
	Lower zone is inundated between 2500-4900 cumecs. Wetting favours plant growth. Continual wetting below this threshold may favour growth slightly by boosting ground water recharge but this will be minimal.	3

Lower zone trees		
Response curve	Explanation	Confidence
	Lower zone is inundated between 2500-4900 cumecs. Wetting favours plant growth. Continual wetting below this threshold may favour growth slightly by boosting ground water recharge but this will be minimal.	3

4.10.8 Upper zone trees

Upper zone trees		
Response curve	Explanation	Confidence
	The upper zone is inundated at discharges greater than 4900 cumecs. Upper zone trees are dessication tolerant (Curtis and Manheimer 2005). Plant growth and reproduction is favoured by wetting. Extreme floods may uproot saplings (Parsons et al. 2005).	3
	Extended wet season provides water for growth and reproduction (Curtis and Manheimer 2005). Less growth/reproduction occurs over a shorter wet season and more seeds are dispersed into the riparian area over a longer wet season.	3

5 MACROINVERTEBRATES: SPECIALIST REPORT

5.1 OBJECTIVES OF THE MACROINVERTEBRATE STUDY

For the macroinvertebrate component of the EFA assessment, 17 days were allocated to a site visit, data analysis of the site information collected in the field, prediction of impacts (response curves) and report writing.

The Terms of Reference provided were:

- Familiarise yourself to the extent possible with the study area, including:
  - the character of the Zambezi River in the study area;
  - the character of the macroinvertebrate communities.
- Provide detailed information for two EF sites.
- Attend the field visit with the rest of the team to:
  - ensure that the hydraulic cross-section surveys record whatever information you require for your analyses;
  - record at each site, where relevant, (i) the dominant and sub-dominant invertebrates, (ii) the arrangement of the invertebrate habitat relative to inundation and /or flow velocities.
- Identify invertebrate specimens collected, to the lowest taxonomic level relevant for the EF assessments.
- Take responsibility for the adequacy of the data collected and provided for the macroinvertebrate component of the EFA.
- Select key aspects as indicators for the DRIFT assessment, in liaison with the other specialists, and provide/develop information on:
  - changes in invertebrate populations with changes in the flow regime;
  - any other relevant data as your experience suggests;
  - any other available information relevant to flow assessments;
  - relevant scientific references.
- Select linked indicators that can be used to explain flow-related changes for each of your indicators.
- Attend the DRIFT Workshop(s), prepared to populate the DRIFT response curves for your selected indicators and linked indicators.
- Compile a macroinvertebrate chapter for inclusion in the EF Report, with particular reference to response curve motivation tables.
- Adhere to standard formatting, font and layout specifications provided by the Southern Waters for written submissions.

5.1.1 Layout of this Section

This Section comprises the summary report for macroinvertebrates, and provides:

- Ecoclassification assessments for macroinvertebrates, with supporting evidence;
- the DRIFT indicators chosen, and reasons therefore;

- the relationships between the chosen macroinvertebrate indicators and flow or other drivers, with referenced supporting motivations.

5.2 DESCRIPTION OF THE STUDY AREA, WITH THE FOCUS ON MACROINVERTEBRATES

The study area falls within an area described in most literature as the Middle Zambezi, which extends from Victoria Falls to Cahora Bassa. This study area therefore fall within the upper extent of the Middle Zambezi, immediately downstream of Victoria Falls where the Zambezi flows as a series of rapids within the Batoka Gorge before it widens further downstream and opens into the Kariba Dam. As a 'flood-pulse' system, the Zambezi is characterised by a single large flood event over the wet season. Within the Batoka gorge itself, lateral movement of flows is limited by the steep gorge and therefore, during high flows, most of the channel would be hostile for habitation by macroinvertebrates. Although fast flowing, deep rapids are still characteristic of the gorge during low flow periods, marginal slower flowing habitats play an important role in providing habitat for aquatic macroinvertebrates over this period.

Near the upstream extent of the Kariba Dam, the Zambezi River is no longer confined by the gorge and the slope is more gentle and typical of a large foothill river. The system widens into a broad channel with a diversity of habitats ranging from fast flowing rapids, to riffles and runs and slow flowing marginal habitats including vegetation and sand bars. During the flood season, flows can spread laterally into these floodplain areas thus creating refuge habitat for macroinvertebrates that is less prevalent (or absent) in the gorge.

5.3 LITERATURE REVIEW

Macroinvertebrates play a key role in the ecological functioning of rivers through processing organic matter, either by breaking down detritus or grazing algal biofilms. Macroinvertebrates are in turn food for fish and birds and are therefore important in the transport of energy along the stream channel both longitudinally and laterally into both floodplain and terrestrial habitats (Boulton and Lake 2008).

The flow regime is a fundamental part of rivers to which macroinvertebrates are acutely adapted (Hildrew and Giller 1997; Poff et al. 1997; Poff and Zimmerman 2010). Floods in particular are disturbance events that are important in regulating macroinvertebrate populations (Death 2008). There are many examples in the literature of life-history, morphological and behavioural adaptations of riverine macroinvertebrates to the frequency, timing, rate of change and magnitude of floods as a natural feature of rivers (e.g. Hart and Finelli 1999; Bunn and Arthington 2002; Lytle and Poff 2004; Konrad et al. 2008). It is not surprising therefore, that even small changes in the pattern of flooding can lead to significant shifts in macroinvertebrate community structure and a consequent change in the ecological functioning of a river.

Besides flood events, low flows are an important component of the natural habitat that support macroinvertebrate communities in rivers (Statzner et al. 1988; Statzner and Borchardt 1994; Hildrew and Giller 1994; Bunn and Arthington 2002). Habitat can be described as a combination of the flow characteristics and the substratum type, which together constitutes the hydraulic biotopes to which macroinvertebrates are adapted (Wadeson 1995). Whereas some taxa may be adapted to fast flow over cobbles or boulders typical of riffles, others are found only in backwaters where flow velocities are slow or zero and the substratum may be sandy or stony. By contrast, other taxa are only found on marginal vegetation typical of the channel margins. Changes in the flow regime can therefore affect the availability and diversity of different habitats which ultimately affects species richness and community structure of macroinvertebrates (Poff and Zimmerman 2010).

Considering that dams can affect the pattern of flooding and the heterogeneity of hydraulic habitats through changes in low flow conditions in rivers, major changes in macroinvertebrate communities and ecosystem functioning are often a consequence of dams constructed in rivers. Besides these direct impacts to macroinvertebrates, dams also have indirect impacts on community structure by altering water quality (e.g. temperature and dissolved oxygen), suspended sediment loads, organic matter from upstream, food quality (through changes in benthic algal biomass and composition) and changes in predation from fish species (King et al. 2000; Lytle 2008).

Macroinvertebrates of the middle reaches of the Zambezi River and their adaptations to the flow regime are largely unstudied. Taxonomic collections of Odonata (dragonflies and damselflies) have been undertaken in the Katombora to Victoria Falls section of the Zambezi River by Pinhey (1984) and Fitzpatrick (2000), while the freshwater molluscs of the upper Zambezi were studied by Appleton (1996). Freshwater snail diversity in the Middle Zambezi Basin was investigated by Mubita (2008) but her study focused on the main tributaries of the Zambezi River. More recently, Suhling et al. (2004) published a paper on the taxonomy of Odonata in southwestern Africa, which included collections from the 'swamps of the middle Zambezi basin', including the floodplains of the Zambezi River itself. In 2009, Suhling et al. (2009) reported on the status and distribution of dragonflies as part of a broader series by the IUCN on freshwater biodiversity of Southern Africa. Their report states that the middle reaches of the Zambezi are rich in dragonfly species, and both Suhling et al. (2004) and Suhling et al. (2009) emphasise the importance of the middle Zambezi River for the conservation of Odonata diversity. While Suhling et al. (2009) indicate that little is known about Odonata diversity and ecology of the Zambezi, it is evident that this statement is true for aquatic macinvertebrate community of the middle Zambezi as a whole. Despite the lack of knowledge of the distribution and ecology of the macroinvertebrates of the middle Zambezi River between Victoria Falls and Lake Kariba, the construction of large in channel dams is indicated as the biggest threat to macroinvertebrate diversity (with reference largely to Odonata).

5.4 *DESCRIPTION OF THE EF SITES*

See Section 1.4 for a map showing the location of the study sites.

5.4.1 EF Site 1

5.4.1.1 Hydraulic biotopes:

- Large cascades and rapids are a key feature of the Zambezi in the Batoka Gorge at EF Site 1. These habitats are characterised by fast-flowing, turbulent, clear water, which is highly oxygenated. For safety reasons, these areas could not be sampled in this study.

Figure 5.1 Relatively small cascades and riffles over boulders and large cobbles sampled along the edge of the main channel. The large cascades were inaccessible.

- Small cascade/riffles: characterise the margins of the cascades within the main channel and include fast-flowing, highly oxygenated broken water over boulders with some large cobble and bedrock (Figure 5.1).
- Runs: Moderately deep (> 70 cm), fast flowing areas over bedrock sheets covered with Bryophytes (aquatic moss). The main flow type in these areas was Smooth Boundary Turbulent (SBT) with areas of rippled surface flow (RSF) where the substratum was dominated by boulders.
- Secondary channels (backwaters) adjacent to the main channel which is recharged during the high flow season. At the time of sampling in September 2014, these seasonal channels were characterised as wide shallow backwaters or slackwaters (mean depth between 40-60 cm) with no or very slow flow. The substratum in these channels is predominantly bedrock sheets, covered by a fine layer of sand/silt in places or single celled diatoms in others. Oxygen levels tend to be low in such habitats and temperatures highly stratified.

- Sandy slackwaters along the margins of the main channel are characterised by turbulent, flickering flow over sands and gravel ranging in depth from about 40 cm to 60 cm.

5.4.2 EF Site 2

5.4.2.1 Hydraulic biotopes:

- Riffles: areas of shallow (mean depth between 20-40 cm), fast flowing broken water over cobbles. At the time of sampling in September 2014, riffles were found in the main channel.
- Runs: Included a range of depths from about 20-60 cm of rippled surface flow (RSF) over large cobbles embedded in finer material along the edge of the main channel (Figure 5.2).

Figure 5.2 RSF flow over cobbles embedded in finer sediments was characteristic of the runs sampled at EF Site 2 in September 2014.

- Secondary channels (backwaters) adjacent to the main channel which is recharged during the high flow season. In September 2014, the backwaters included isolated pools with no flow over cobbles embedded in fine material, as well as slow flowing slackwaters over cobbles and boulders (Figure 5-3).
- Sandy slackwaters along the margins of the main channel are characterised by turbulent, flickering flow over sands and gravel ranging in depth from about 40 cm to 60 cm (Figure 5.3).
- Sandbars: Most of the instream portion of the Zambezi River in the study area is characterised by highly mobile sandbars. The sands bars are characterised by slow-flowing, clear, good quality water. Faunal biodiversity is low, and is characterised by large populations of filter-feeding bivalves.

Figure 5.3 **Cobble backwaters with no flow - characteristic of the secondary channel at the time of sampling**

Figure 5.4 **Sandy slackwaters - characteristic of the channel margin in areas at EF Site 2**

- Vegetation-out-of-current: the channel margins are characterised by an abundance of emergent and submerged aquatic plants that grow in slow-moving water on the margins of the active channels. The marginal vegetation includes a diversity of structures such as stems and leaves of different sizes and densities and therefore this habitat supports a high diversity of aquatic fauna.
- Vegetation-in-current (Figure 5.5): clumps of sedges within the channel itself are characterised largely as stems with fast flowing unbroken water, typically Smooth Boundary Turbulent (SBT) or Rippled Surface Flow (RSF).

Figure 5.5 **(a) Vegetation-in-current (VIC) was characterised by clumps of vegetation in fast flowing water within the channel; (b) Vegetation-out-of-current (VOOC) characterised the channel margins at EF Site 2.**

5.5 ECOCLASSIFICATION OF RIVER REACHES REPRESENTED BY THE EF SITES

Aquatic macroinvertebrates were collected and identified to family level according to the Zambian Scoring System (ZISS) biomonitoring method (Lowe 2013). The ZISS method was developed specifically for aquatic macroinvertebrates expected in streams and rivers in Zambia. The ZISS method is essentially the same as the South African Scoring System version 5 (SASS5; Dickens and Graham 2002), but some of the sensitivity scores were adjusted and some additional molluscs were included to account for the taxa typical of more tropical rivers expected in this region.

This method provides an excellent index of species richness and water quality in perennial rivers with relatively natural habitats. The protocol allocates a predetermined score for each taxon according to its sensitivity to water quality perturbation. Sensitive taxa are allocated high weighting (maximum of 15) while taxa more common to degraded/disturbed systems receive low weightings. ZISS sampling was done separately for each available biotope (defined by flow and substratum characteristics). A description of the biotopes sampled for calculation of the ZISS scores is given in Section 5.4 above.

ZISS scores, Average Scores Per Taxon (ASPTs)[2] – calculated by dividing the ZISS score by the number of taxa - and total number of taxa were calculated for each biotope.

Essentially, an assessment of Present Ecological State for aquatic invertebrates was based on an assessment and interpretation of these data using the guidelines provided in Table 5.1.

Table 5.1 Definitions of Present Ecological State categories for aquatic macroinvertebrates applied in this study.

Category	Description
A	***Unimpaired***
	• Natural diversity of taxa, and;
	• numerous sensitive taxa, and;
	• abundance as expected under natural conditions, and;
	• no taxon dominating the fauna for extended periods.
B	***Slightly Impaired***
	• As above, but with fewer sensitive taxa and slightly lower diversity.
C	***Moderately Impaired***
	• Moderate diversity of taxa relative to diversity expected under natural conditions, or;
	• moderate numbers of sensitive taxa, or;
	• moderate reduction in abundance of some or all taxa relative to that expected under natural conditions.
D	***Considerably Impaired***
	• Low diversity of taxa relative to diversity expected under natural conditions, and;
	• mostly tolerant taxa, and;
	• considerable reduction in abundance of some or all taxa relative to that expected under natural conditions, or;
	• more than one taxon dominating the fauna for extended periods.
E	***Severely Impaired***
	• Very low diversity of taxa relative to diversity expected under natural conditions, and;
	• only tolerant taxa present, or;
	• severe reduction in abundance of some or all taxa relative to that expected under natural conditions, or;
	• only one taxon dominating the fauna for extended periods.
F	***Very Severely Impaired***
	• As above, but with Very Severe reduction in diversity and abundance.

[2] ASPTs are particularly useful as indicators of water quality of an aquatic system, as a low score will indicate that the community is dominated by species resistant to anthropogenic perturbations such as pollution, while high scores indicate the occurrence of more sensitive and, often rare, species, that would be expected to occur in undisturbed systems.

5.5.1 EF Site 1

In total, 21 taxa were recorded within the Batoka Gorge (EF Site 1) in September 2014. The "stones" habitat included riffles and cascades over boulder and large cobble, deep runs over bedrock and backwater pools over bedrock with no flow. The "Gravel-Sand-Mud" biotope included slackwaters with moderate flow over sands and gravels and sand and silt over bedrock in the backwaters. No vegetation was available for sampling at the time of the site visit and thus it was excluded from the ZISS assessment. Under lower flow conditions typical of the dry season, it is likely that more cobble habitat may have been available for sampling and thus the sample collected in September is likely to be an under representation of the taxa present in the Gorge.

The ephemeroptera were the most common fauna found at EF Site 1 with moderate numbers of baetid mayflies of which seven different species were identified. Moderate numbers of caenid mayflies as well as the Dipteran larvae, chironomidae and ceratopogonidae were also recorded. Taxa that are highly sensitive to water quality impairment included the Oligoneuridae, Heptageniidae and Baetidae, as well as the Trichopteran, Polycentropodidae. With an ASPT score of 6.81, this site supports a high proportion of moderately to highly sensitive taxa (Table 5.2). Also, no single taxon was particularly dominant. Nevertheless, the recorded number of taxa was lower than expected under natural conditions. Although this may, to some extent, be a consequence of the time of sampling when access to some habitats was limited, the data suggest a slight impairment from natural. Therefore, in terms of macroinvertebrates, the Present Ecological State of the Zambezi in the Batoka Gorge is rated as a Category A/B (Table 5.1).

Table 5.2 ZISS results for EF Site 1 sampled in September 2014

EF Site 1: Batoka Gorge	Stones	Veg	GSM	TOTAL
ZISS	123		57	143
Total number of families	16		11	21
ASPT	7.69		5.18	6.81

5.5.2 EF Site 2

In total, 33 taxa were recorded at EF Site 2 upstream of the Kariba Dam in September 2014. The "stones" habitat included riffles, runs and backwaters over large and small cobbles, either embedded in fine sediments (predominantly in the backwaters) or loosely moveable cobbles. The "Gravel-Sand-Mud" biotope included slackwaters with moderate flow over sands and silt either along the channel margin or mid-channel sand bars. Vegetation, both "in-current" and "out-of-current" was sampled at EF Site 2. The vegetation-in-current included clumps of *Cyperus* within the channel with moderate flow. Vegetation-out-of current included a mix of stalked vegetation such as *Phragmites* sp. as well as leafy vegetation such as *Salix* sp. and *Persacaria* sp.

Twenty two of the total macroinvertebrates taxa were recorded in the "stones" biotope and the majority of families present belong to the order ephemeroptera or mayflies.

As with EF Site 1, ephemeroptera were the most dominant group in terms of the number of taxa and overall abundance. Of these, six families are highly sensitive to water quality impairment and included stoneflies (Perlidae), Hepetegeniidae, Oligoneuridae, Polymitarcyidae, Prosopistomatidae and seven species of baetidae. Also, the sensitive Trichopteran, Philopotamidae were also found at this site. No single taxon was particularly dominant, although taxa that were moderately abundant included the freshwater shrimp (atydae) found only in the vegetation-out-of-current, some of the mayflies, the Dipertan, Simuliidae and bivalves (including mostly Sphaeiidae) which were highly productive in the sandbars and sandy channel margins. This site as a similar ASPT score to EF Site 1, but the total number of taxa is considerably higher (Table 5.3). Habitat heterogeneity was greater at EF Site 2, relative to EF Site 1, which could account for the high ZISS score. Also, no specific group was particularly dominant. There may however be a very slight impairment to the macroinvertebrate community structure due to slight water quality impairment because a higher ASPT score would be expected with a ZISS score of 224 as recorded in September 2014. In terms of macroinvertebrates, therefore, the Present Ecological State of the Zambezi upstream of the Kariba Dam at EF Site 2 is considered a category A/B.

Table 5.3 ZISS results for EF Site 2 sampled in September 2014

EF Site 1: Batoka Gorge	Stones	Veg	GSM	TOTAL
ZISS	167	140	33	224
Total number of families	22	21	9	33
ASPT	7.59	6.67	3.67	6.79

5.6 FIELD DATA COLLECTION AND ANALYSIS

Macroinvertebrate samples were collected in September 2014 at both EF sites 1 and 2 using a kick-sampling technique prescribed by the ZISS protocol (see section 1.6). The technique involves disturbing the streambed so that invertebrates are dislodged from the substratum and vegetation using a 1 mm mesh net with an aperture of 30 x 30 cm. Samples were collected from five separate biotopes at ef Site 1 and seven separate biotopes at Site 2. Kick sampling was undertaken for a total of 10 minutes within each hydraulic biotope.

Each sample was preserved in 70% ethanol and then, with the exception of Baetidae, sorted to family level back in the laboratory. Baetid mayflies were sorted to species level because this family was present in most hydraulic biotopes, although on visual inspection in the field, it was evident that specific baetid species were restricted to specific hydraulic biotopes. Understanding the diversity of this group therefore contributed to an understanding of habitat heterogeneity and macroinvertebrate species richness in this system. All taxa were

enumerated in the laboratory to provide an indication of the relative abundance of each taxonomic group.

5.7 RESULTS OF DATA COLLECTION

5.7.1 EF Site 1

A total of 30 taxa, identified mostly to family level (see Appendix A for a list of all taxa) were recorded at EF Site 1 in the Batoka Gorge in September 2014 (Table 5.4). The Ephemeroptera (Mayflies) represented the largest number of families (i.e. 6 families), with seven baetid species. The Ephemeroptera were also the most abundant taxon, represented largely by the baetids (Table 5.4; Figure 5-7). The Diptera (flies) were the second most speciose order, represented by four families (Table 5.4). Chironomids (midge larvae) were the most abundant taxon within this order.

The snails (Gastropoda) and bivalves (Pelecypoda) were relatively rare at EF Site 1, probably because there is little refuge habitat during the flood season for taxa that do have an adult phase. Similarly, Plecoptera and Trichoptera (caddis flies) were not abundant at EF Site 1 within the gorge. Neither group is particularly resistant to disturbance, particularly the caddis flies. Taxa typical of zero flow conditions in marginal vegetation such as shrimps (Atyidae) and ostracods were absent from the gorge, most likely due to a lack of favourable habitat.

Table 5.4 Summary of the number of families by order (with the number of baetid species in parenthesis) recorded at EF Site 1 in September 2014

Order	EF Site 1
Ephemeroptera	1
Plecoptera	2
Trichoptera	3
Odonata	3
Coleoptera	4
Diptera	2
Hemiptera	1
Oligochaeta	1
Gastropoda	1
Pelecypoda	0
Ostracoda	0
Atyidae	1
Total	30

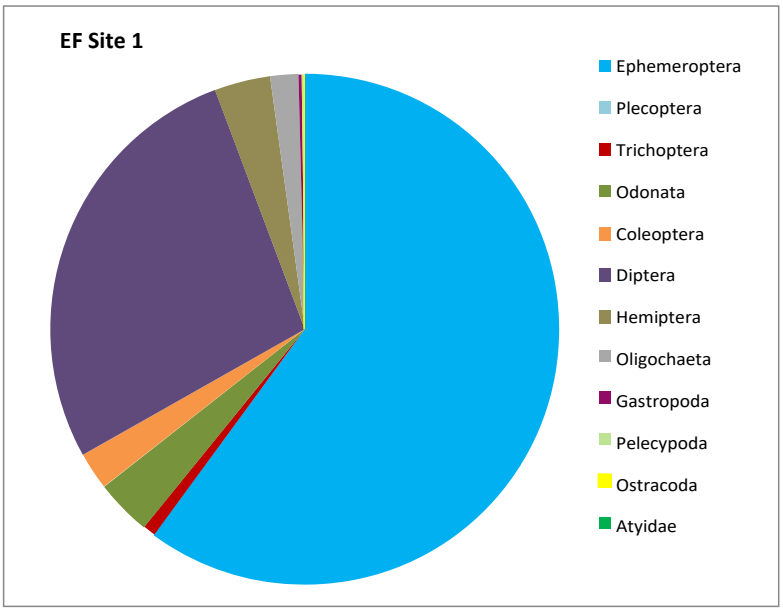


Figure 5.6 Proportional representation of macroinvertebrate orders by number of individuals at EF Site 1 in September 2014.

The relative proportion of macroinvertebrate abundance in each hydraulic biotope (Figure 1.7) shows a clear distinction in the dominant taxa between different biotopes as well as the overall abundance of macroinvertebrates within each biotope (Figure 5-8f).

In particular:

- the stones-in-current (SIC) biotopes (Figure 5-8a and b) were dominated by Ephemeroptera, although Diptera were far more abundant in the runs, compared to the riffles possibly due to the covering of bryophytes on the bedrock within the runs that provides refuge habitat for Diperan larvae, particularly Chironomids. Also, the refuge value offered by the thick bryophytes may account for the high overall abundance of macroinvertebrates recorded the SIC–run biotope (Figure 5-8f).
- the stones-out-of-current (SOOC) biotope was dominated by Diptera although Ephemeroptera were fairly abundant (Figure 5-8c).
- the SOOC with sand biotope (Figure 5-8d), like the SOOC without sand (Figure 5-8c), was dominated by Diptera with Ephemeroptera as the second most abundant taxon but Oligochaetes were far more prevalent in the backwaters with sand (Figure 5-8c and d).
- Ephemeroptera were completely absent from the sand and gravel slackwaters along the channel margin (Figure 5-8e), which were dominated by Oligochaetes and a relatively high proportion of both Odonata and Dipteran larvae. Although the overall abundance of macroinvertebrates was particularly low along these sandy margins. It is likely that the substratum along these margins is highly mobile and therefore offers little in the way of refuge from changes in discharge.

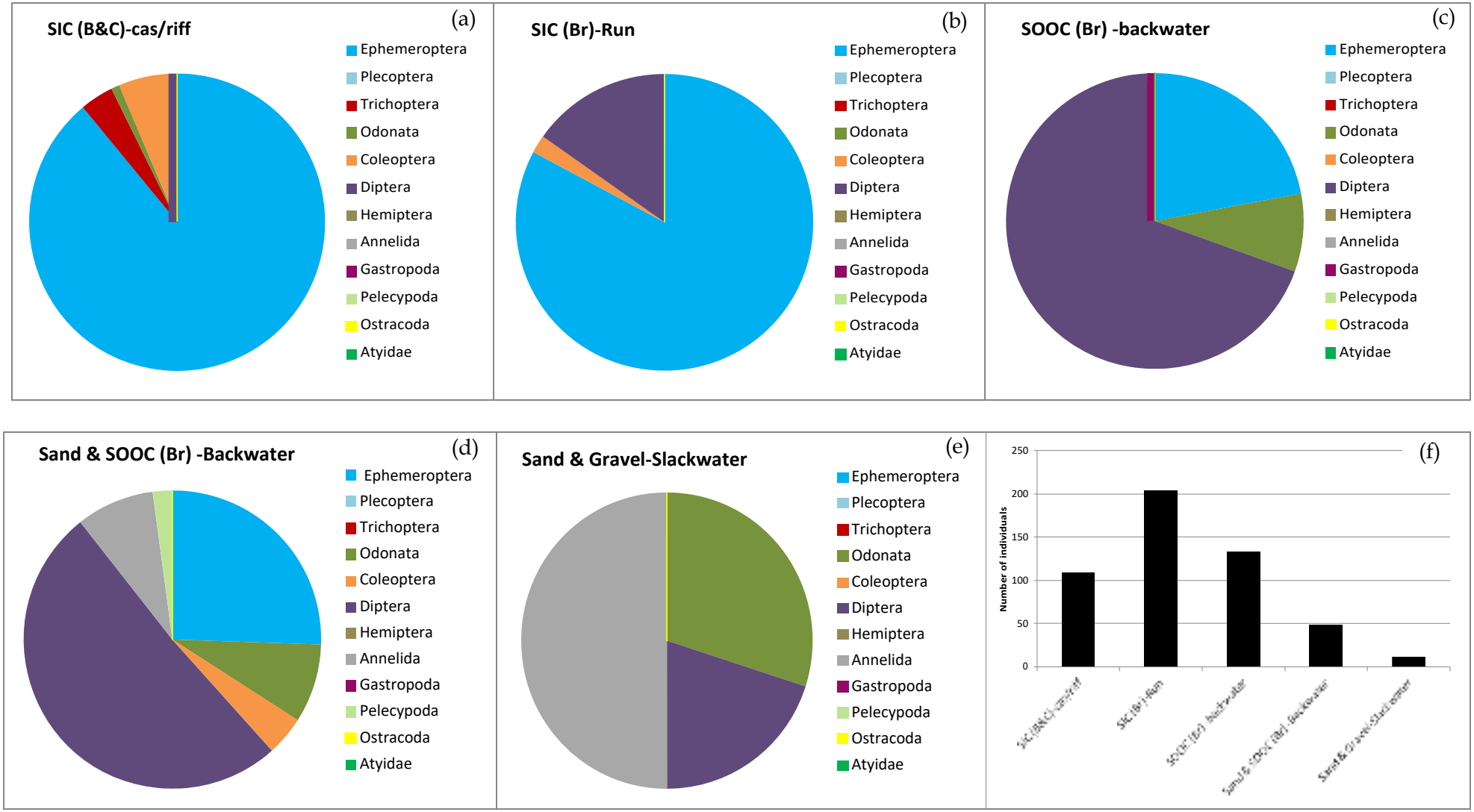


Figure 5.7 **Proportional representation of macroinvertebrate orders by number of individuals recorded in each hydraulic biotope sampled at EF Site 1 in September 2014.**

The overall Shannon-Wiener Diversity Index (H') for EF Site 1 was 2.5, although diversity varied between the different hydraulic biotopes ranging from 2.3 and 2.4 in the SIC-riffle biotope and SOOC with sand biotopes respectively, to 1.6 in the sand/gravel slackwaters (Figure 5-8). Considering the low taxonomic resolution of this study, these data indicate a system that is highly diverse in terms of macroinvertebrate fauna, with all hydraulic biotopes contributing to the overall diversity.

Macroinvertebrate community structure and the taxa driving the difference in community structure between each hydraulic biotope was analysed using multivariate statistical analyses in PRIMER 6.1. Three distinct communities were identified at EF Site 1, namely the Stones-in-current (SIC) community, the Stones-out-of-current (SOOC) community, and the Sand community (Figure 5-9). The percentage dissimilarity between these groups given in Table 5.5 indicates that the SIC and Sand communities were most dissimilar at 94% dissimilarity, while the SOOC and Sand communities were the least dissimilar, yet still distinct from each other at 73% dissimilarity.

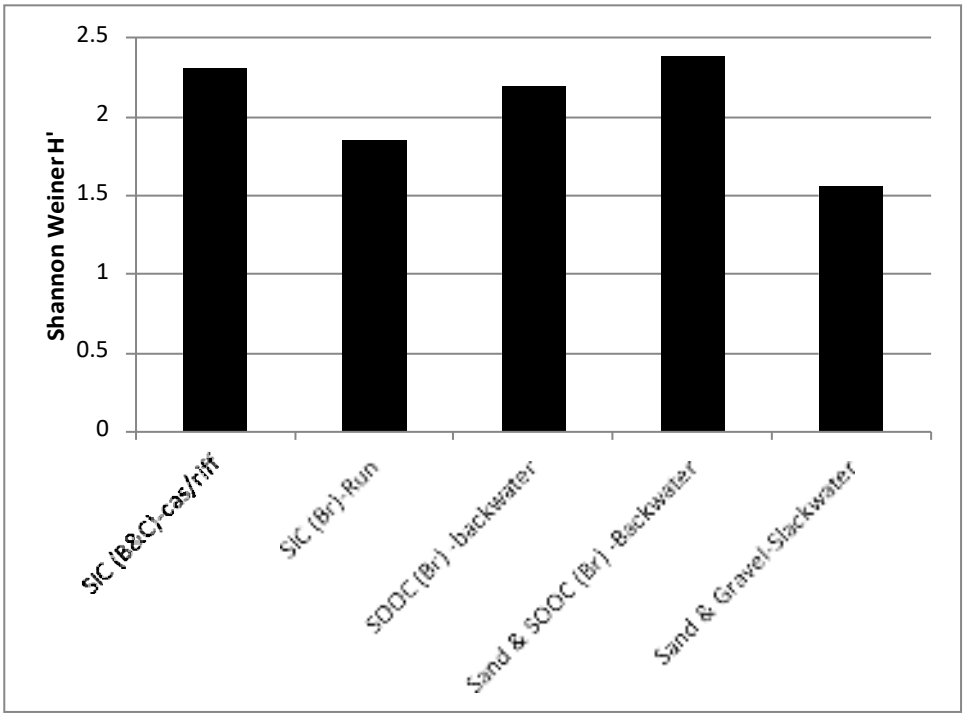


Figure 5.8 **Shannon-Weiner Diversity Index (H') calculated for each hydraulic biotope sampled in September 2014 at EF 1.**

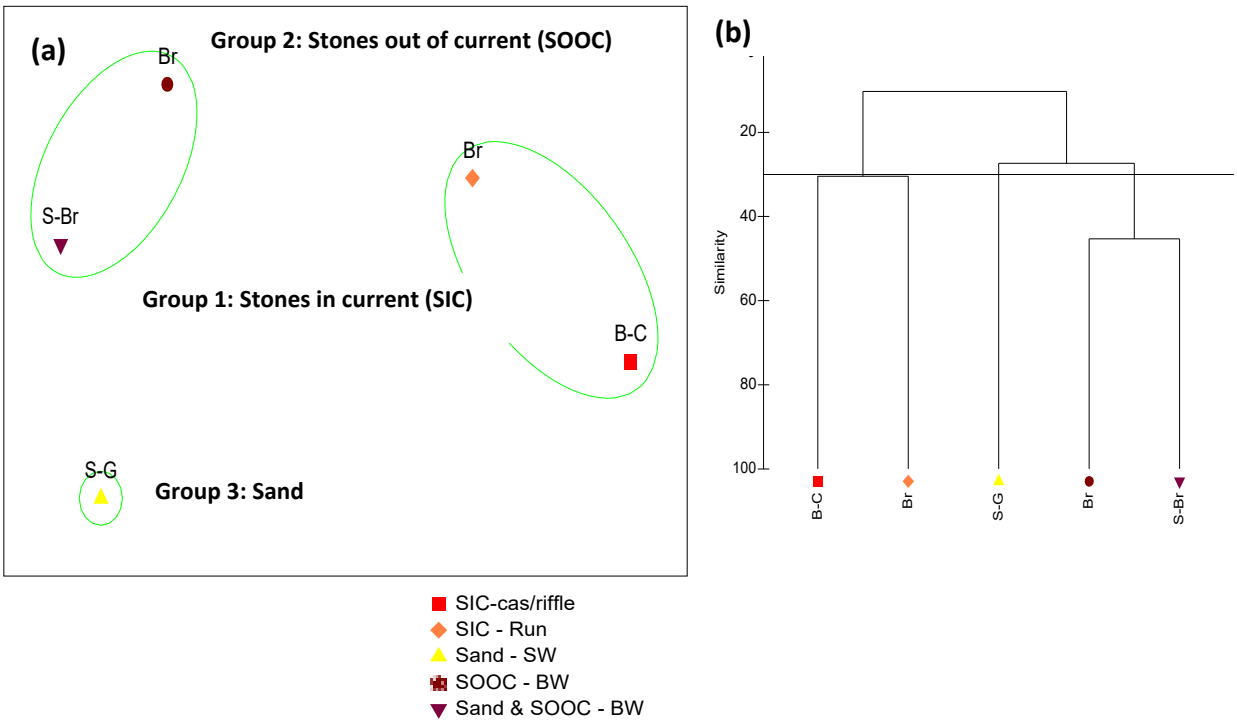


Figure 5.9 **a) Multi-dimensional Scaling (MDS) plot and b) Cluster analysis of the macroinvertebrate communities within each hydraulic biotope sampled at EF Site 1 in September 2014.**

Table 5.5 **Percentage dissimilarity in community structure between the three broad macroinvertebrates determined by the multivariate analyses shown in Figure 1.9**

	SIC	SOOC	Sand
SOOC	88		
Sand	94	73	

The SIMPER routine in PRIMER between these three communities showed that:

- The abundance of certain ephemeroptera taxa, including various baetid species and Trichorythidae in the SIC community and their absence in the SOOC and Sand communities accounted for the distinction of the SIC community at this site (Table 5.6a and b).
- The abundance of the Diperan larvae, Chironomidae is the main taxon that distinguishes the SOOC community from the others at this site (Table 5.6c).
- The abundance of Oligochaeta in the Sand community and the absence of Ephemeroptera made this community distinct from the other two (Table 5.6b and c).

Although these biotopes may group together under unaltered flow conditions, an alteration in flow and habitat characteristics may result in the shift in the communities represented by

Table 5.6 **SIMPER results from the multivariate analysis of (a) the Stones-in-current (SIC) and the Stones-out-of-current (SOOC) groups (b) The SIC and Sand groups; (c) the SOOC and Sand groups. % Diss = the % dissimilarity for a given taxon. Cum % diss = the cumulative % dissimilarity for each consecutive taxon.**

(b)

	SIC	SOOC		
on	mean Abund.	mean Abund.	% Diss.	Cum.% diss.
B sp4	50.98	0.00	12.31	14.02
Tricorythidae	19.36	0.00	7.69	22.78
Chironomidae	10.50	29.27	6.18	29.82
Baetidae sp2	7.84	0.00	4.86	35.35
Baetidae sp6	7.51	0.00	4.81	40.84
Dipteran pupa	0.00	6.35	4.26	45.69
Corixidae	0.00	5.95	4.01	50.26
Elmidae	4.93	0.00	3.87	54.67
Ceratopogonidae	0.00	3.76	3.67	58.85
Caenidae	0.25	6.40	3.59	62.94
Co	0.00	4.37	3.58	67.01
Ba p1	0.00	4.00	3.48	70.97

(c)

	SIC	Sand		
Taxon	mean Abund.	mean Abund.	% Diss.	Cum.% diss.
Baetidae sp4	50.98	0.00	18.31	19.53
Tricorythidae	19.36	0.00	11.50	31.8
Baetidae sp2	7.84	0.00	7.24	39.51
Baetidae sp6	7.51	0.00	7.23	47.22
Oligochaete	0.00	5.02	5.80	53.41
Elmidae	4.93	0.00	5.78	59.58
Chironomidae	10.50	1.99	5.73	65.69
Gomphidae	0.00	2.99	4.49	70.48

	SOOC	Sand		
Taxon	mean Abund.	mean Abund.	% Diss.	Cum.% diss.
Chironomidae	29.27	1.99	10.60	14.58
Caenidae	6.40	0.00	7.71	10.61
Diptera pupa?	6.35	0.00	7.19	9.89
Ceratopogonidae	3.76	0.00	6.68	9.19
Cordulidae	4.37	0.00	6.09	8.38
Baetidae sp1	4.00	0.00	5.98	8.23
Baetidae sp5	4.75	0.00	5.52	7.60
Corixidae	5.95	1.00	3.64	5.01

these biotopes as more flow sensitive taxa are lost. Therefore, SIMPER was used to assess the taxa that may account for any differences between the assemblages represented by each hydraulic biotope within each group.

The analysis showed that:

- The key difference between the communities found in the sandy backwaters covering stones-out-of-current (i.e. Sand and SOOC - BW) and the SOOC backwater with no sand (i.e. SOOC –BW) is the presence of the Dipteran larvae, Ceratopogonidae present in the latter (Table 5.7a). Ceratopogonidae flourish in still waters with fine sediments.
- Besides differences in the abundance of different baetid species between the cascade/riffle (SIC-cas/riffles) community and the Run (SIC – Run) community, particularly sensitive Ephemeroptera taxa, namely the Oligoneuridae and Heptageniidae were only found in the broken water biotope at EF Site 1 (Table 5.7b).

Table 5.7 **SIMPER results from the multivariate analysis of (a) the stony backwater (SOOC-BW) and the sandy backwater covering stones (Sand and SOOC – BW) samples and the cascade/riffle (SIC – cas/riffle) and run (SIC-Run) samples. % Diss = the % dissimilarity for a given taxon. Cum. % diss = the cumulative % dissimilarity for each consecutive taxon.**

	SOOC - BW	Sand & SOOC-BW		
Taxon	mean Abund.	mean Abund.	% Diss.	Cum.% diss.
Chironomidae	8.37	2.45	11.02	20.14
Baetidae sp5	4.36	0.00	8.12	34.98
Ceratopogonidae	0.00	3.87	7.21	48.16
Corixidae	3.87	1.00	5.35	57.94
Oligochaete	0.00	2.00	3.73	64.74
Baetidae sp7	1.73	0.00	3.23	70.64

	SIC-cas/riffle	SIC - Run		
(b) on	mean Abund.	mean Abund.	% Diss.	Cum.% diss.
Baetidae sp4	2.24	12.04	15.73	22.59
Baetidae sp6	5.48	0.00	8.79	35.22
Chironomidae	1.00	5.48	7.18	45.53
Tricorythidae	6.56	2.24	6.93	55.49
Baetidae sp7	0.00	3.46	5.56	63.47
Oligoneuridae	2.83	0.00	4.54	69.99
Heptageniidae	2.24	0.00	3.59	75.14

5.7.2 EF Site 2

A total of 42 taxa, identified mostly to family level (see Appendix A for a list of all taxa) were recorded at EF Site2 upstream of the Kariba Dam during September 2014 (Table 1.8). The Ephemeroptera (Mayflies) were the most speciose order with a total of eight families, including six baetid species. The Hemiptera (bugs) and Diperta (flies) each included five

different families, while four different families each represented the Odonata (dragonflies and damselflies) and Trichoptera (Caddisflies; Table 5.8).

In terms of abundance, 60% of the macroinvertebrates belong to the Ephemeroptera, which were mostly baetid mayflies although Trichorythidae and Oligoneuridae also occurred in significant numbers at this site. Plecoptera (Stoneflies) were relatively abundant at this site (Figure 6.x). Similar to EF Site 2, the Dipterans were relatively abundant although besides Chironomids, Simulids were also significantly abundant within this group.

Although absent at EF Site 1, Atyidae (shimps) were found within the overhanging vegetation along the channel margins in significant numbers at EF Site 2 (Figure 5-10). Also, molluscs were far more abundant at this site compared to EF Site 1, particularly the bivalves (Pelecypoda) which favoured the sandbars and sandy channel margins typical of this site.

Table 5.8 Summary of the number of families by order (with the number of baetid species in parenthesis) recorded at EF Site 2 in September 2014.

Order	EF Site 1
Atyidae	1
Annelida	1
Coleoptera	3
Diptera	5
Ephemeroptera	13(6)
Gastropoda	1
Hemiptera	5
Odonata	4
Ostracoda	1
Pelecypoda	3
Plecoptera	1
Trichoptera	4
Total	42

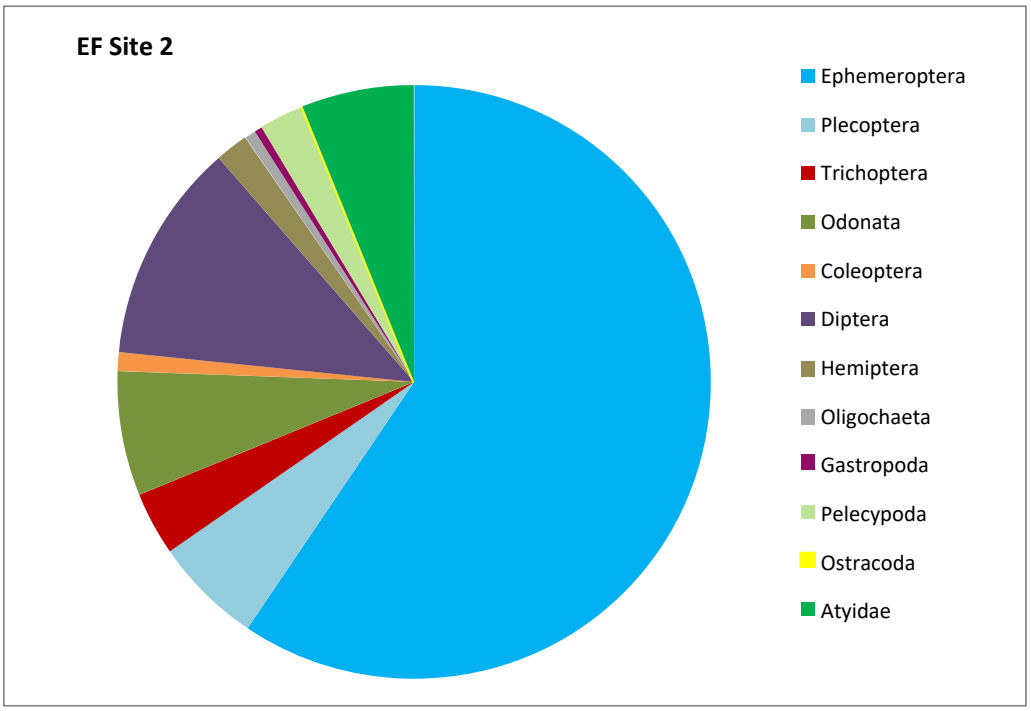


Figure 5.10 Proportional representation of macroinvertebrate orders by number of individuals at EF Site 2 in September 2014.

Both the relative proportion of macroinvertebrates (Figure 5-11a to g) and the overall macroinvertebrate abundance (Figure 5-11h) varied considerably between the seven different hydraulic biotopes sampled at EF Site 2. In particular it is evident that:

- Both the stones-in-current (SIC) and stones-out-of-current (SOOC) biotopes (Figure 1.11a to d) were dominated by Ephemeroptera, particularly the SOOC biotope with 91% of the overall macroinvertebrates belonging to this order (Figure 5-11d). Nevertheless, the overall abundance was relatively low in the SOOC (Figure 6.h).
- Unlike the SOOC community, the SIC communities, particularly the riffle (Figure 6.xa) and fast run (Figure 5-11b) included a relatively high proportion of Plecoptera (stoneflies), particularly in the fast run which was the most productive of all the biotopes at this site (Figure 5-11h).
- Although the relative proportion of Ephemeroptera was high in the Vegetation-in-current (Veg-IC) biotope, Diptera were the dominant order, largely due to high numbers of Simuliidae.
- Shrimps (Atyidae) dominated the Vegetation-out-of-current (Veg-OOC) biotope, contributing more than 50% to the overall number of individuals (Figure 5-11f).
- Bivalves (Pelecypoda) were particularly dominant in the Sandbars and sandy, slow moving biotope (Sand-Slackwater) (Figure 5-11g). Other orders represented by the Sand-Slackwater included the Odonates (mostly dragonfly larvae), Dipterans and Gastropods (snails). Unlike all other biotopes at Site EF 2, Ephemeroptera, Trichoptera and Plecoptera were completely absent from the Sand-slackwaters.

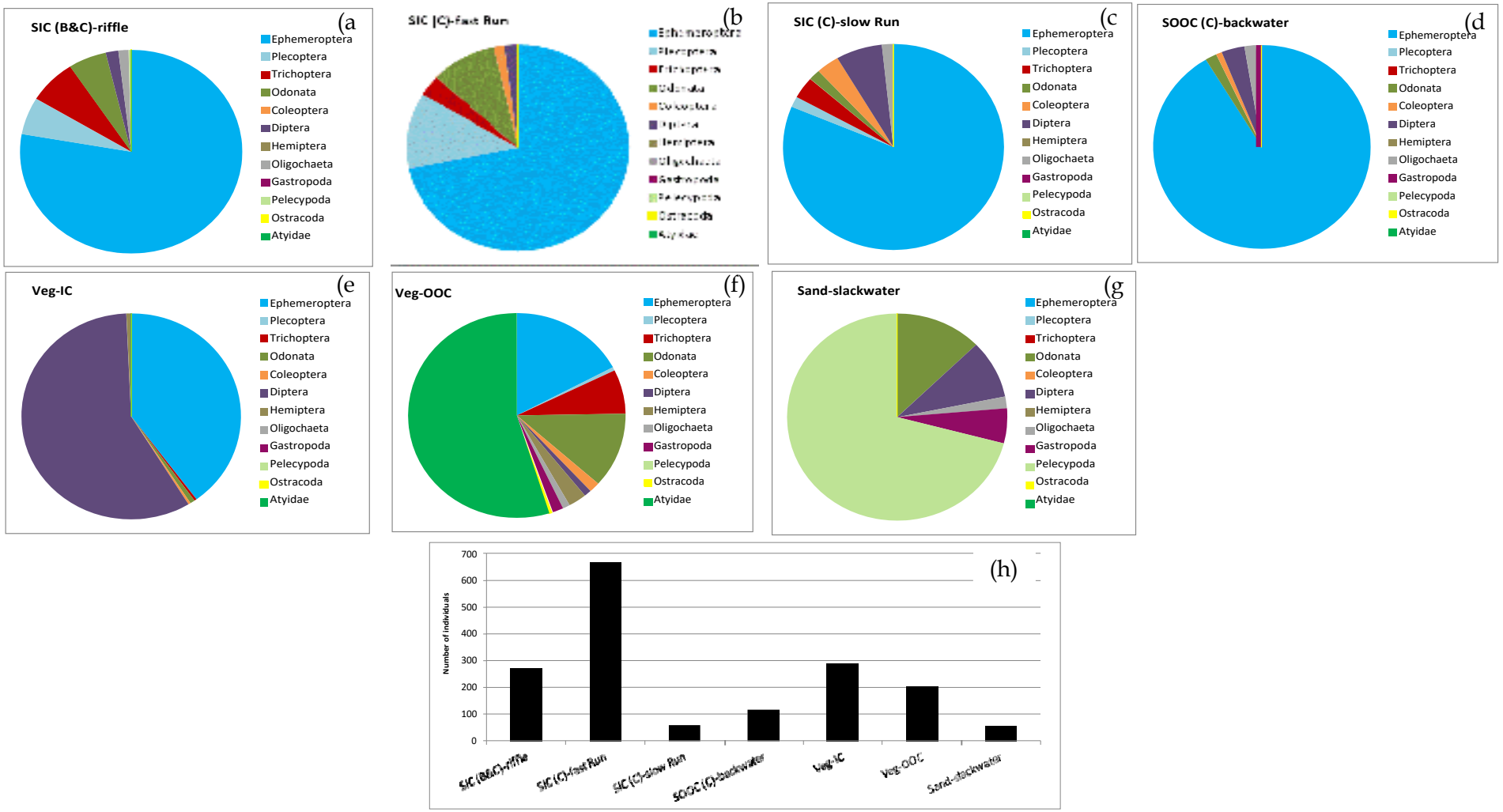


Figure 5.11 **Proportional representation of macroinvertebrate orders by number of individuals recorded in each hydraulic biotope sampled at EF Site 2 in September 2014.**

Annex K

Economic Assessment Specialist Study

Cost Benefit Analysis Specialist Study (2015)

Updated Cost Benefit Analysis Specialist Study (2019)

Economic Assessment Specialist Study

Batoka Gorge Hydro-Electric Scheme
Environmental and Social Impact Assessment

ECONOMIC ASSESSMENT (Amended – V2.0)

September 2019

Anchor Environmental Consultants Report No: AEC/1860/1

Batoka Gorge Hydro-Electric Scheme
Environmental and Social Impact Assessment

ECONOMIC ASSESSMENT (Amended – V2.0)

Prepared for
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September 2019

PREFACE AND ACKNOWLEDGEMENTS

This study was conducted as part of the Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydro-Electric Scheme (BGHES) in Zimbabwe and Zambia. The socio-economic assessment formed part of the ESIA being conducted by Environmental Resources Management (ERM).

This study was led by Dr Jane Turpie of Anchor Environmental Consultants. The tourism business survey instrument was designed by Jane Turpie. Gwyneth Letley and Kevin Coldrey were responsible for coordinating and arranging the interviews and data collection in Livingstone and Victoria Falls in 2015 and 2019, respectively, and were assisted by Megan Laird and Joshua Weiss.

We are grateful to Nadia Mol, Miana Capuano and Dieter Rodewald of ERM for providing stakeholder details and for assisting with providing tourism businesses with interview details during the stakeholder process and to Andrew Thurlow of ERM for providing the relevant GIS maps of the study area.

We would like to extend our thanks to the representatives of the tourism industries and the tourism businesses who willingly participated in the interviews and provided valuable information as well as to the other stakeholders who willingly met with Anchor staff and gave further input in private meetings.

ACRONYMS AND ABBREVIATIONS

BGHES	**Batoka Gorge Hydro-Electric Scheme**
ERM	Environmental Resources Management
ESIA	Environmental and Social Impact Assessment
FSL	Full Supply Level
GDP	Gross Domestic Product
GVA	Gross Value Added
JIMP	Joint Integrated Management Plan
LCCI	Livingstone Chamber of Commerce and Industry
LTA	Livingstone Tourism Association
KAZA	Kavango-Zambezi
ASL	Above Sea Level
SADC	Southern African Development Community
TFCA	Transfrontier Conservation Area
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNWTO	United Nations World Tourism Organisation
WTTC	World Travel and Tourism Council
ZAWA	Zambia Wildlife Authority
ZIPAR	Zambia Institute for Policy Analysis and Research
ZNCC	Zimbabwe National Chamber of Commerce
ZMTA	Zambia Ministry of Tourism and Arts
ZTA	Zimbabwe Tourism Authority

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1 BASELINE ECONOMIC ASSSESSMENT

1.1 INTRODUCTION

The Victoria Falls (or Mosi-oa-Tunya Falls) has been called the "world's greatest sheet of falling water" and was listed as a World Heritage Site in 1989 (UNESCO 2014). The transboundary site extends over 6860 hectares in Zambia and Zimbabwe. The Falls are protected within the Mosi-oa-Tunya National Park in Zambia and the Victoria Falls National Park and Zambezi National Park in Zimbabwe. The Victoria Falls, the eight steep sided gorges below the falls and the river and islands upstream of the falls provide a diversity of habitats for a wide range of flora and fauna. The area offers a range of tourism opportunities that are largely centred on nature-based and adventure activities. Tourism forms the backbone of the economy in this area and was therefore the main focus of this assessment.

The proposed Batoka Gorge Hydro-Electric Scheme (BGHES), located downstream of Victoria Falls, will change the Gorge environment significantly and have an impact on tourism in the area. The aim of this study is to estimate the value of tourism to the study area (defined below), to explore the contribution of the Batoka Gorge to this value and to estimate the potential magnitude of the socio-economic impacts of the proposed BGHES.

This study begins with a description of the socio-economic context of the project area, including the areas along the Batoka Gorge below the Victoria Falls. An overview of the tourism industry in Livingstone and Victoria Falls is provided with a particular focus on the proposed inundation area and a description about the activities currently offered in this area. The numbers and sizes of tourism activity businesses and accommodation establishments in the study area are identified and detailed information relating to sales, occupancy and employment is described. Businesses most likely to be directly impacted by the proposed BGHES are identified and the possible impacts on these businesses are discussed. The direct and indirect economic contribution of tourism to the study area is then quantified and the tourism value associated with the Batoka Gorge is also estimated. The last section of the report assesses the potential magnitude of negative socio-economic impacts resulting from the proposed BGHES and provides mitigation measures and recommendations. The potential positive economic impacts are also discussed.

1.2 STUDY APPROACH

This study was based on a desktop review of available information, existing statistics collected from relevant organisations and government departments, and information collected from a tourism business survey conducted in Livingstone, Zambia and Victoria Falls, Zimbabwe in February 2015 and July/ August 2019. The survey was repeated in 2019 as the impact assessment was

placed on hold following the initial submission of the socio-economic impact study report in 2015. No change was made to the tourism business survey but the dam operating levels have been changed since 2015 and have therefore been updated in the final report.

This study focussed on tourism, and in particular on the tourism activities most likely to be affected by the proposed BGHES. The following estimates were required for determining tourism value and potential economic impacts within the study area:

- numbers and descriptions of tourism businesses in the study area;
- total visitor numbers to the study area and bed nights sold;
- visitor expenditure on accommodation and tourist activities;
- direct income and employment generated as a result of this expenditure;
- the knock-on effects of this expenditure.

1.2.1 *Collation of existing information*

Existing statistics for the study area were obtained as follows:

- Annual park entry statistics (to view the Victoria Falls) supplied by tourism and park management authorities in both Zimbabwe and Zambia for the period 2004 – 2018.
- Zambezi National Park and Mosi-oa-Tunya National Park total visitor numbers 2012 – 2013 sourced from national tourism statistical reports.
- National and global tourism statistics from Zambian Ministry of Tourism and Arts, Zimbabwe Tourism Authority, the United Nations World Tourism Organisation (UNWTO) and the World Travel and Tourism Council (WTTC).
- Regional tourism statistics from a survey conducted by Africa Albida Tourism in the study area in 2017.
- Airport arrival statistics for Victoria Falls Airport and Harry Mwanga Nkumbula International Airport sourced from the Zimbabwe Tourism Authority and the Zambian Ministry of Tourism and Arts respectively.
- Room sales for eight of the main hotels in Victoria Falls 2004 – 2014 provided by the Victoria Falls Hospitality Association.
- Inventory of accommodation establishments and tourism activity businesses in the study area provided by the Zimbabwe Tourism Authority (ZTA) and Livingstone Tourism Board, and updated using the internet and interview data.

Very few studies have been carried out on tourism in the study area, and there are no recent studies that have actively estimated the value of tourism in the area. A study conducted in 2012 by Banda & Cheelo from the Zambia Institute for Policy Analysis and Research (ZIPAR) looked at the costs and pricing of tourism in Zambia with a case study on the Livingstone area. The aim of the study was to inform tourism policy and strategy by looking at the cost and price structures of tourism service operations in Livingstone and to compare them with the structures in Victoria Falls town.

There are a few studies from 2005/06 that focused on generating tourism data in the area. Suich *et al.* (2005) investigated the economic impacts of Transfrontier Conservation Areas (TFCA) by undertaking a survey of tourism in the Kavango-Zambezi TFCA. Suich *et al.* (2005) surveyed 19 accommodation establishments and 18 activity providers in Livingstone and 9 of the large hotel establishments in Victoria Falls, and provided some estimates of revenue, expenditure and employment.

In 2006, the Ministry of Tourism, Environment and Natural Resources (Zambia) appointed DCDM Consulting to undertake a tourism survey in Livingstone as part of the Support for Economic Expansion and Diversification Project (SEED). A total of 21 activity operators and 47 accommodation establishments were surveyed. This study did not make any extrapolations on the size, revenue generated or total employment in the tourism industry in Livingstone.

1.2.2 Tourism business survey

A list of tourism businesses active in Livingstone and Victoria Falls was compiled using online resources, stakeholder lists provided by Environmental Resources Management (ERM), site visits and information provided by the Zambian Tourism Board, the Zimbabwe Tourist Authority (ZTA) and the Livingstone Tourism Association (LTA).

Stakeholders were invited to book interview slots at Stakeholder Meetings held in Livingstone and Victoria Falls in January 2015, which resulted in several interview bookings. Further interviews were arranged by contacting all of the remaining known tourism businesses in the area by telephone or email. The businesses who volunteered or agreed to be interviewed were emailed the survey instrument ahead of the scheduled interview. A number of tourism businesses, especially accommodation establishments in Victoria Falls, did not respond to the initial emails or calls or would not agree to an interview. Of those that did, two did not turn up on the day for the scheduled interviews. The tourism businesses interviewed in 2015 were contacted again in 2019 and interviews were scheduled with the majority of them, as well as two businesses commencing operations since 2015.

A single survey instrument was designed for accommodation establishments and tourism activity providers. Information about the type of accommodation, types of activities offered, types of clientele, seasonality, occupancy, the factors influencing tourism demand, activity sales and employment and expenditure by these businesses were all included in the questionnaire (Box 1).

Box 1. ***Structure of the tourism business questionnaire for accommodation establishments and activity providers.***

Section 1: Description of business & occupancy/sales patterns • Type of establishment • Services/activities offered • Capacity • Rates • Seasonal patterns in occupancy & sales • Seasonal attractions • Occupancy/sales data (over time, seasonal, current annual) • Extent of business • Length of stay **Section 2: Description of the Clientele** • Origins • Activities • Proportion undertaking affected activities • Reasons for visiting	**Section 3: Business Impact on the Economy** • Staff numbers (by type & season) • Wages • Relationship between business turnover and employment • Expenditures (by type) • Location of spend **Section 4: Longer Trends** • Age of business • Planned changes to business • Fluctuations in business and reasons for this • Impacts of proposed dam on business

In total 15 interviews were conducted in each of Victoria Falls and Livingstone in 2015 and 80% of these were re-interviewed in 2019. The total number of each type of business interviewed is shown in Table 1. Although no independent restaurants or retail shops were interviewed directly, many of the accommodation establishments as well as the tourist activity providers owned restaurants and shops as part of their businesses, and information was provided on these in those interviews. The interviews were carried out face-to-face as far as possible but two respondents who could not make an interview submitted their responses via email. These were followed up with a telephonic interview for clarification of responses. Meetings were also held with the Zimbabwe National Chamber of Commerce (ZNCC) Victoria Falls branch, the Livingstone Chamber of Commerce and Industry (LCCI), the Zambia Tourism Board, The Rafting Association of Zimbabwe and the Zimbabwe Tourism Authority whilst in the study area.

Table 1. ***Numbers of different types of businesses interviewed***

Type of business interviewed	Number in Livingstone (2015)	Number in Livingstone (2019)	Number in Victoria Falls (2015)	Number in Victoria Falls (2019)
Accommodation establishments	10	6	4	4
Activity providers	2	3	7	6
Accommodation & activity provider	2	2	3	2
Local online tourism media provider	1	1	1	

It should be noted that many of the businesses in Zimbabwe in the 2015 round of interviews were reluctant to provide details or confidential information relating to their business which made the interview process relatively challenging as well as influencing the amount of data collected. However, we were able to obtain data on rates and bed occupancy for eight of the main hotels from the Victoria Falls Hospitality Association to supplement the interview data collected and in 2019 the interview data was supplemented with a tourism study in the area by Africa Albida Tourism (2017).

1.2.3 *Visitor numbers, activities and expenditure*

Total annual visitor numbers into the study area were estimated from numerous sources, including park gate statistics, occupancy numbers, and average recorded length of stays and compared to the available regional or provincial statistics provided by Zimbabwe Tourism Authority (ZTA) and the Zambian Ministry of Tourism and Arts (ZMTA), as well as the tourism survey in the Victoria Falls region by Africa Albida Tourism (2017).

Total expenditure by visitors in the study area was estimated as the daily spend multiplied by number of visitor days in the area. The daily spend was separated into accommodation, activities and other expenses. Other expenses included food, beverage and retail (e.g. on curios). Expenditure on accommodation was calculated by using data gathered during the business interviews as well as information from previous tourism studies. The recorded accommodation prices for both the high and low season as indicated in the accommodation questionnaire and on advertised online rates were used to calculate an average room rate. Average rates were then multiplied by the total number of bed nights. Expenditure on activities was calculated by estimating the number of companies offering different activities and using information on sales to derive an estimate of overall expenditure.

1.2.4 *Direct and indirect economic impacts*

Tourism value in the study area was described in terms of its direct and indirect impacts on economic output. The direct impacts are the overall expenditure of tourists and number of jobs created directly by businesses supplying the goods and services that are being purchased by the tourists. The indirect impacts estimate the knock-on effects of expenditure created by businesses supplying tourism goods and services on other businesses that supply goods and services to them. For example, activity providers and tour operators requiring boat maintenance provide business to boat engineers and mechanics who maintain and repair their boats.

Direct impact is identified as the money spent by tourists in the study area on activities and attraction services (all tourist activities, park entrance fees) and accommodation.

- Direct economic effects are the changes in local tourism activity (i.e. increased or decreased bed nights, increased or decreased activity sales).

- Increased/decreased visitor spend has a direct impact on monetary gains/losses for individuals (employees and business owners within the trade, catering and accommodation sector) within the study area.
- For affected businesses there may be losses in terms of tourism product quality and availability, due to changes in how and when activities are able to operate.
- For affected locals, impacts may include job loss and a decrease in the availability and variety of job opportunities in the area and related decreases in disposable income. Or benefits may include job creation through new activities developed in the project area.
- All of these effects can ultimately lead to growth or decline of business sales and income in the affected study area.

The indirect effects of economic activity in the tourism sector are experienced as the backward and forward linkages along the value chain (Table 2).

Table 2. Examples of backward and forward linkages in the tourism sector

Subsector	Linkages
All Tourism Products	Travel agents, tourism activity businesses
	Roads, airports, rail, immigration
	Human resources and skills training
	Banking and finance, health services, legal services, health and safety
	Customs
Accommodation	Construction industry, plumbers, electricians in order to build extensions or maintain facilities
	Utilities such as water and electricity
	Retail – such as homeware needed to stock accommodation facility
Boat based activity providers	Boat repair and maintenance
	Natural resource management such as National Park permits and fees
Safari tour operators	Automotive industry for safari vehicle supply and maintenance
	Natural resource management such as National Park permits and fees

The indirect impacts of economic activity were estimated using multipliers derived from data presented in the WTTC National Reports (2014a, 2018a, 2014b, 2018b) for Zimbabwe and Zambia. The multiplier used for Victoria Falls was 0.85 in 2014 and 0.89 in 2018, while for Livingstone it was 0.91 in 2014 and 0.85 in 2018.

1.2.5 Contribution of Batoka Gorge to tourism value

The contribution of the Batoka Gorge to the economic value of tourism in the study area was estimated on the basis of visitor activity sales reported in the surveys and the business owners' perceptions of visitor interests as well as

information collected from safari lodges located along the edge of the gorge. The following activities were considered:

- White water rafting
- Guided birding and angling, hiking and camping trips
- Jet Extreme boating
- Helicopter and microlight flights

Helicopter and microlight flights were also considered because they fly above and over the gorges and from interviews it was determined that these views contribute significantly to the overall enjoyment experienced by tourists whilst flying over the area. Many of the elderly tourists who are unable to hike into the gorge or white water raft down the gorge rely on the scenic flights for this experience.

1.3 STUDY AREA AND ITS SOCIO-ECONOMIC CONTEXT

This description is based on a desktop review of available information collated from previous studies done in the area and statistics gathered from relevant government publications. For more detailed information about the social description of the study area see Section 9 of the ESIA. The study area includes the towns of Livingstone and Victoria Falls, the areas surrounding both these towns and the areas both sides of the Batoka Gorge.

1.3.1 Zimbabwe

Victoria Falls is situated in the province of Matebeleland-North in north-western Zimbabwe (Figure 1) in an area where Botswana, Namibia and Zambia meet. The town of Victoria Falls is situated in the larger district of Hwange but as part of the Zimbabwe Provincial Census (2012) was included as a separate urban district. Population statistics for each District are included in Table 3 below.

Table 3 Population Statistics- District Level

District	Population (2012 census)	No. of Households (2012 census)	Average Household Size
Hwange Rural	62,670	15,488	4.0 persons per household
Hwange Urban	37,522	9,992	3.8 persons per household
Victoria Falls	33, 748	9.262	3.6 persons per household

Subsistence crop farming and livestock rearing is the most important livelihood activity within the Project Area, however tourism and associated sectors are a significant contributor to income and employment in Hwange and Victoria

Falls. The large hotels and safari lodges employ a significant number of local people, as do the restaurants and activity providers. Associated sectors such as transport, manufacturing and mechanics also contribute towards employment in the district. The largest contributor to employment in the province is agriculture accounting for 55% but in Victoria Falls district agriculture accounts for only 1.5% of employment (Zimbabwe Census 2012).

Outside of the small urban district of Victoria Falls, the entire population downstream of the Falls along the Batoka Gorge are considered rural (Zimstats 2012). Almost 50% of the district population are employed in agriculture and 8.4% are employed in services (Zimbabwe Census 2012). During periods of poor rainfall the villages situated along the Batoka Gorge rely on tourism to supplement their income, through part time or casual work with activity providers (e.g. rafting guides and porters). The local villages also benefit from tourism in the area through concession fees and royalties. Other important social characteristics in the Project Area include:

- The most commonly spoken language in the Project Area are Ndebele, Shona and Tonga.
- The majority of people in the Project Area are Christian.
- Communal land is held under the custodianship of the state and is managed under both local and decentralised government arrangements, as well as traditional leadership of Chiefs, Headmen and Village Heads;
- Crops and gardening, animal husbandry and curio trade serve as primary livelihood activities. Other activities included fishing and brick making.
- The main source of water is boreholes and rivers, and most villages did not have access to National grid electricity;
- Health, education and service infrastructure is average to poor and there is a shortage of secondary schools.

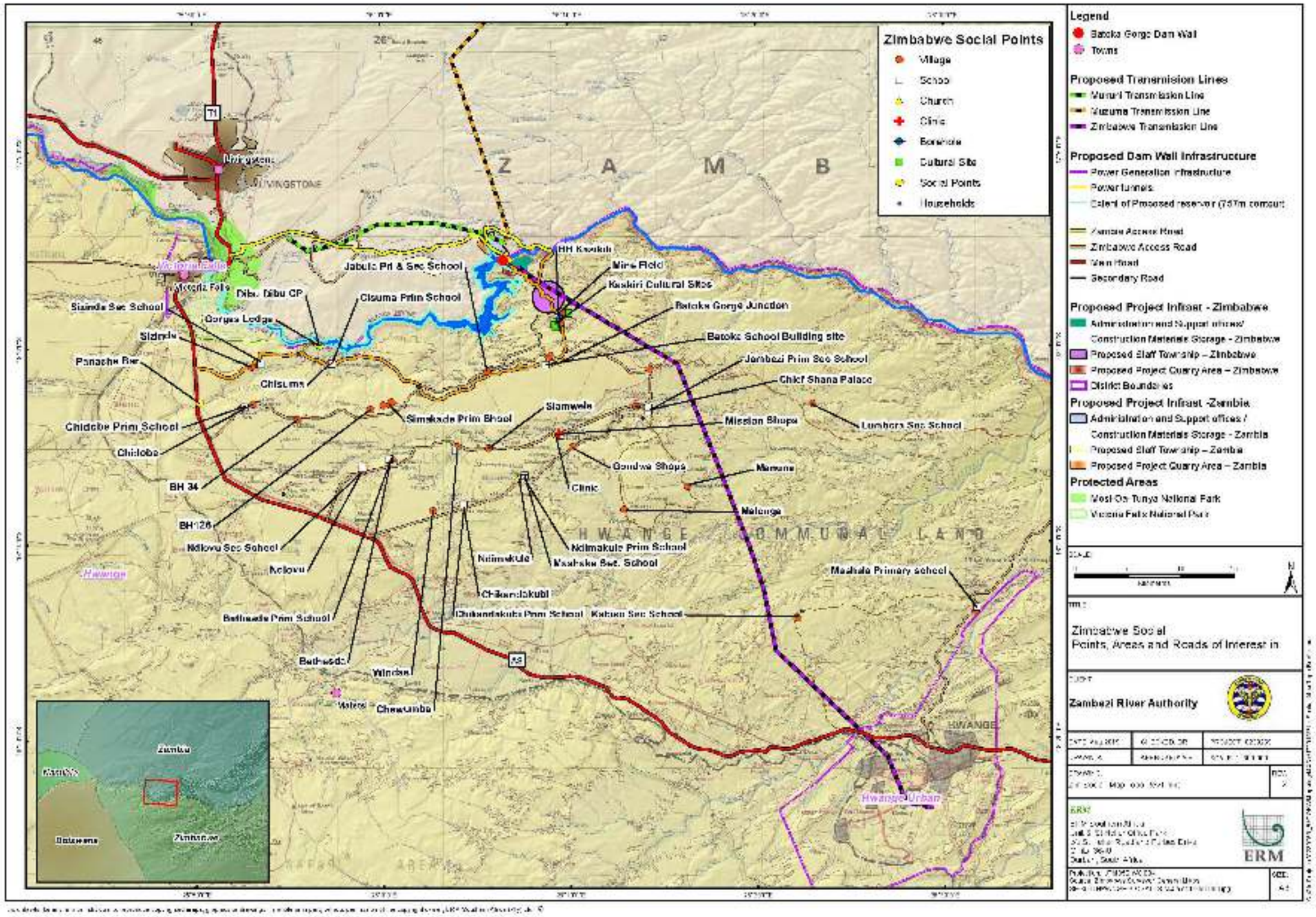

Figure 1. Social points of interest in the districts of Victoria Falls and Hwange in Matebeleland-North Province, Zimbabwe

Average literacy rates are 92% and the unemployment rate is approximately 30% (Zimbabwe Census 2012). Almost 50% of the district population are employed in agriculture and 8.4% are employed in services (Zimbabwe Census 2012). Approximately 31% of the district population are communal farmers. During periods of poor rainfall the villages situated along the Batoka Gorge rely on tourism to supplement their income, through part time or casual work with activity providers (e.g. rafting guides and porters). The local villages also benefit from tourism in the area through concession fees and royalties.

1.3.2 Zambia

Livingstone is located 12 km from the Mosi-oa-Tunya Falls in the Southern Province of Zambia (Figure 2) and was, until 2011, the provincial capital. Livingstone has a population of approximately 185,003 people as per the 2019 Projections from the Central Statistical Office Zambia (2018). The annual population growth rate in Livingstone is 3.2 and the average household size is 5 people, slightly higher than the provincial average (Zambia Census 2010).

Unemployment is high in Zambia (estimated at 12.5% in 2018), particularly amongst youth, defined as those aged between 15 to 25 years (22.9%). Unemployment rates in the Southern Province are slightly below the National average at 7.5% (ZamStats, 2018). The majority of employment is within the informal sector, which is characterised by low pay and poor working conditions. Economic activity has been traditionally dominated by small-scale subsistence agriculture, which provides employment to just under two thirds of the population (ZamStats, 2018).

Across the Project Area, livestock rearing is the most popular livelihood activity. The majority of Livestock are largely reared for income purposes, unlike crops, which are largely generated for subsistence. The most commonly owned livestock include poultry, goats, cattle, pigs and donkeys. Cattle and donkeys were observed to be primarily used for ploughing and ox cart transport purposes. Livestock are also an important form of bartering and are used for a number of payments, ranging from dowries to traditional healer consultations. Livestock are also central to sacrifices in rituals.

Similarly to Zimbabwe, the villages located along the Batoka Gorge rely on tourism during times of low rainfall and failed crops. Part time and casual work helps to supplement household income when crops fail. Although undertaken all year round, charcoal production was described as a particularly important drought time livelihood activity for 2018/19 and was undertaken to substitute normal livelihood activities hampered by drier conditions (crop farming and fishing most notably).

The Zambezi and other tributaries located downstream from the proposed BGHES are used by villagers from Mulola, Madyongo, Sikatali, Simanyonge, Posani, Siampondo and the Ng'andu cluster for fishing. Fishing is done by men only and is undertaken at fishing camps along the Zambezi River and other rivers in the Project area where men stay between a few days and a week. These

camps are located up to 15 km from the valley village cluster and beyond depending on the time of the year. The valley and Ng'andu village clusters said that fishermen came in season from as far as the DRC to make use of fishing camps in the Project area. Fishermen reportedly catch a wide variety of species including bottle fish, tiger fish and Kariba bream. Fishing is undertaken in both the rainy and dry season however, the catch is reported to be larger in the rainy season (between December to March), Fish are caught using both traditionally woven nets and baited fishing lines. Once caught, fish is commonly processed to preserve it, either through drying, frying or smoking.

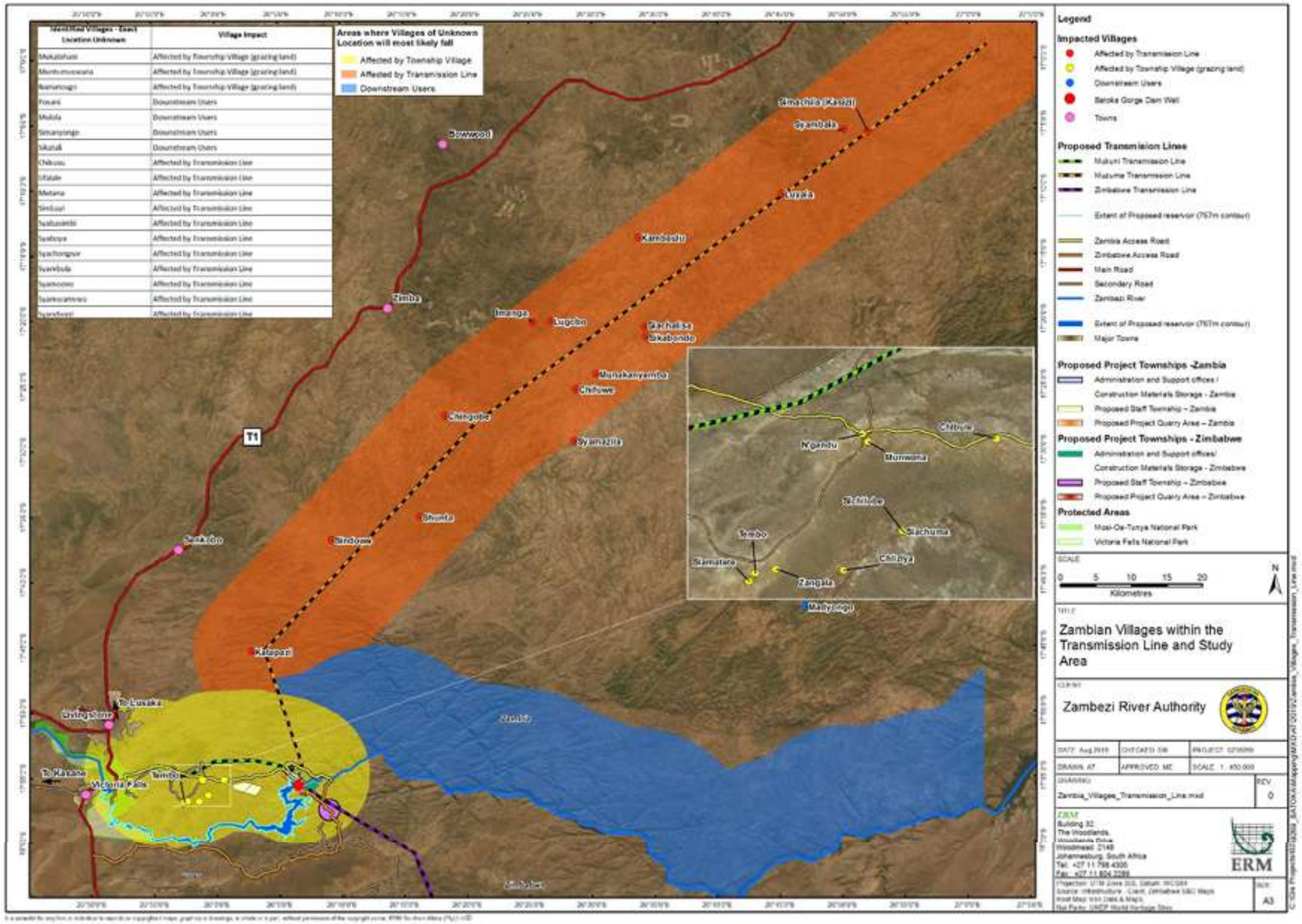

Figure 2. Social points of interest in and around Livingstone Southern Province, Zambia

1.4 TOURISM USE OF THE AFFECTED AREA

The Batoka Gorge is a unique environment characterised by sheer cliffs and endemic flora and fauna. The steep cliffs and rapids of the Zambezi River below provide a rare setting for a number of activities. The proposed BGHES will inundate a large proportion of the gorge below Victoria Falls, having an impact on the tourist activities that are currently offered in the gorge. It is envisioned that the dam will operate at the full supply level of 757 m during the high-water season (Figure 3; generally from January/ February to July/ August) and at 730 m during the dry, low-water season (***Figure 4***; generally from July/ August to December/ January). The potential magnitude of these impacts are discussed in detail in the Impact Assessment Section (2) of this report. This section provides a description of the activities currently offered in the gorge.

1.4.1 Activities in Batoka Gorge

A number of tourist activities take place in the Batoka Gorge downstream of Victoria Falls. The scale of the gorge is an attraction in itself and the activities that take place appeal to both the adventure- and nature-based tourist.

White water rafting

White-water rafting has been a popular tourist activity below the Victoria Falls for more than 35 years. It is considered to be one of the best white water rafting experiences in the world because of the number of high grade rapids in succession over such a short stretch of river. The rafting industry in Victoria Falls and Livingstone has played a vital role in establishing adventure tourism in the area (Rogerson 2004) and was one of the first activities offered to tourists. Many tourists from other rafting nations such as Canada, United States of America (USA) and New Zealand come especially to raft down this stretch of river.

Rafting numbers were at their highest back in the 1990s when more than 50 000 rafting trips were sold each year. Numbers since then have decreased to approximately 20 000 trips a year (the average over the past five years). There are a number of reasons for the decrease in numbers. Firstly, the type of tourist has changed significantly due to the international economic climate. In the 1990s a significant proportion of tourists were young travellers and gap-year students keen on adventure and new experiences. Over the years as travel became more and more expensive, the type of tourist changed and became dominated by older, wealthier travellers and young professionals. This change had an impact on the number of tourists coming to the area solely to raft. Secondly, over the last decade the number of activities available to tourists in the study area has significantly increased. This created competition within the adventure tourism market and resulted in tourists choosing other activities on offer. Rafting is one of the most expensive activities in the area and for a number of tourists cheaper activities that can still offer some form of adventure are chosen above rafting. Although rafting tourist numbers have fallen since the

1990s, rafting still plays a major role in attracting tourists to the area. All of the rafting companies interviewed indicated that rafting attracts a large proportion of clientele.

The Zambezi River is classified as a high-volume, pool-drop river, meaning there is little exposed rock in the rapids themselves or in the pools of water that lie below the rapids. At the starting point for rafting, the gorge is approximately 400 feet (122 m) deep. Over the 25 kilometres covered during a day of rafting the river drops approximately 400 feet (122 m) so that at the end point the gorge is 750 feet (229 m) deep. The first section of rafting (rapids 1 to 8) is classified as "Grade 5" rapids characterised by steep gradients, big drops and pressure areas (Figure 5). The rapids decrease in size and difficulty as one moves further down the river. Rafting is not constant throughout the year and is dependent on annual flow conditions which are dependent on the timing and quantity of catchment rainfall. The following is a summary of how the flow conditions influence rafting on the Zambezi:

- Rafting is able to run from rapid 1 when the water levels are at their lowest from August to early January.
- For the first half of January and the second half of July rafting can run from rapid 8 when flows are intermediate.
- From late January to the end of February and for the first half of July rafting runs from rapid 10.
- During March and June rafting runs from rapid 14 when flows are high, often called the "splash and dash" run.
- Usually during April and May, when flows are at their absolute highest, no rafting takes place.

Therefore, flow conditions play a major role in the operating of rafting on the Zambezi. These conditions change annually with some years having higher than average flows compared to other years dominated by low flows. The rafting trips offered are either a half-day, full-day, full day plus overnight or a 2 - 5 day trip throughout the main low water season from August to December. Between 2007 and 2018, the average low-water season lasted 136 days (4.5 months), the closed season lasted 55 days (2 months) and the high-water season lasted 174 days (5.5 months) (pers. comm. Representatives of The Rafting Association of Zimbabwe, 2019). The half day trip during low water is offered on both the Zambian and Zimbabwean sides and involves rafting from rapid 1 – 10/11. From the Zimbabwean side the low water full day trip goes from rapid 1 to rapid 19 and during high water from rapid 11 to rapid 23. From the Zambian side the low water full day trip goes from rapid 1 to 24/25 and during high water from rapid 10 – 24/25 (Figure 5). Both sides offer overnight camping in the gorge and 2 – 5 day rafting trips which end just above the start of Lake Kariba.

In 2015 there were a total of 11 rafting companies that operated on the Zambezi and in 2019 there were 10. Many more licenses have however been awarded on both the Zimbabwe and Zambian sides. These range in size from small operators that only offer rafting, take fewer than 100 trips a year in hired boats, to the larger activity providers that offer a wide range of activities within the study area and sell more than 3000 rafting trips per year and own their own boats and equipment. Most of these companies started out only offering rafting but have diversified over the years in order to remain competitive in the changing tourism market within the study area.

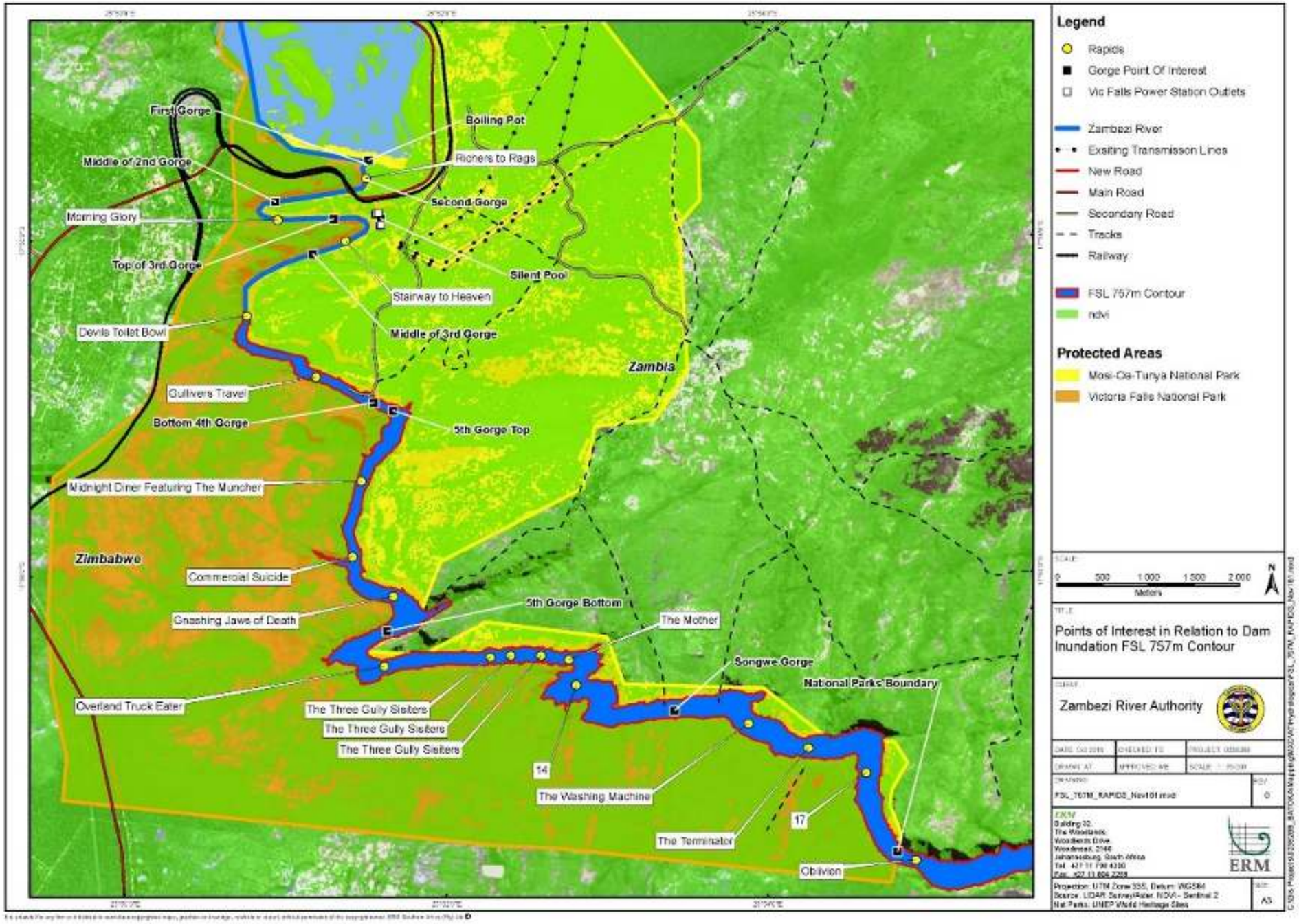

Figure 3. Map of rapids and other points of interest downstream of Victoria Falls in relation to the dam inundation 757m contour. This is the level that the dam is envisioned to operate at during the high-water season (generally from January/ February to July/ August).

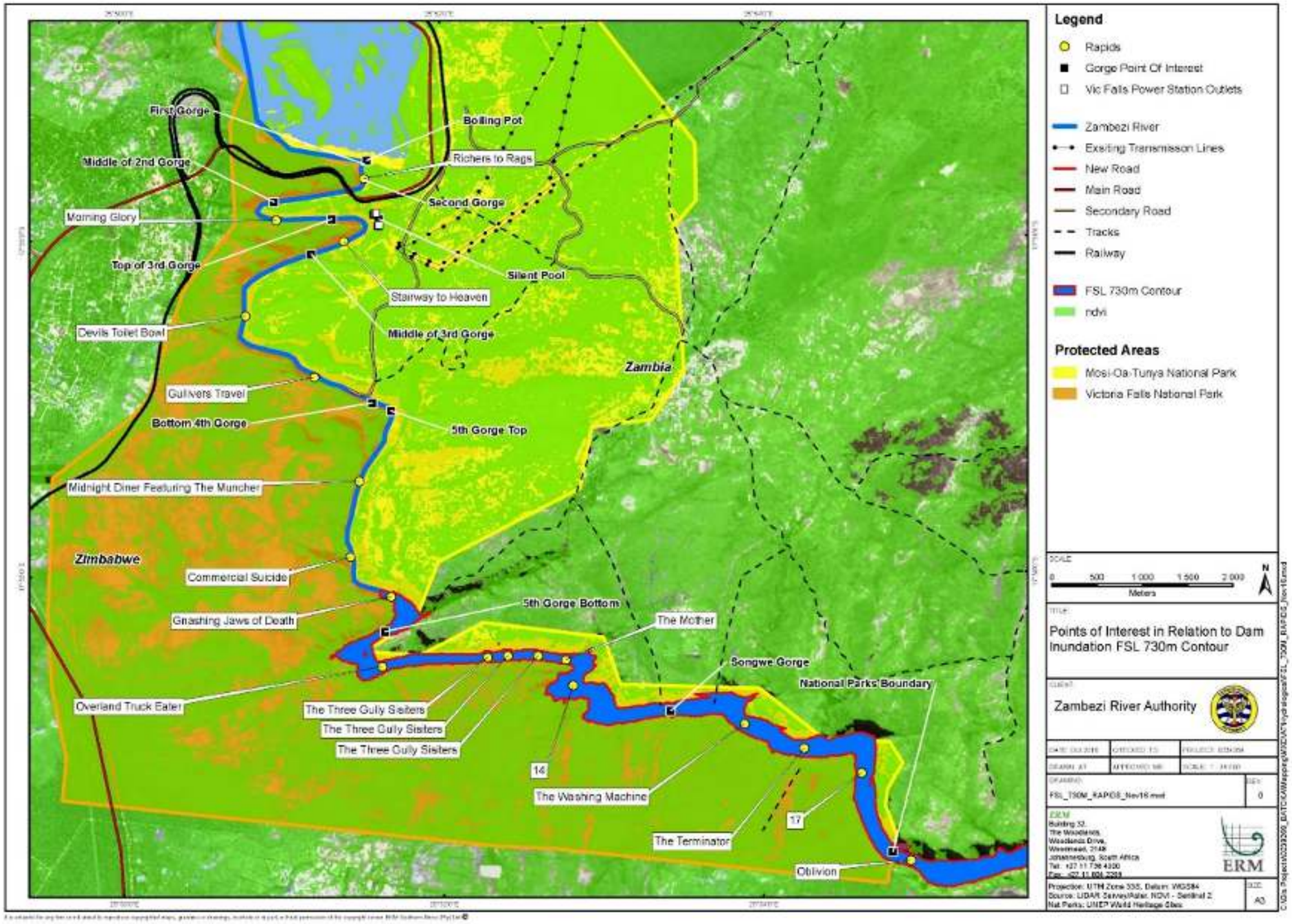

Figure 4. Map of rapids and other points of interest downstream of Victoria Falls in relation to the dam inundation 730m contour. This is the level that the dam is envisioned to operate at during the low-water season (generally from July/ August to December/ January).

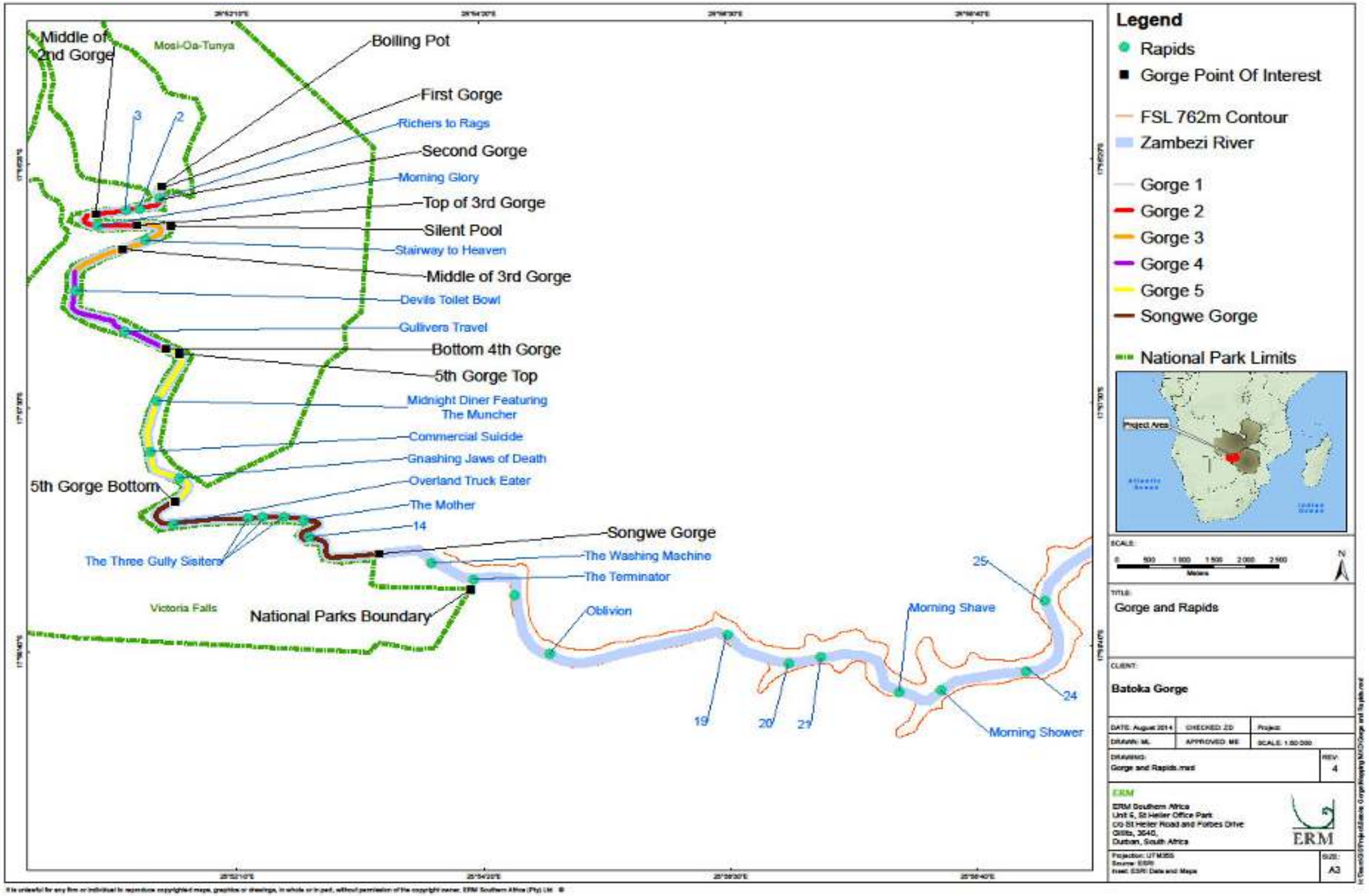

Figure 5. Current map of rapids 1 to 25 along the Zambezi River downstream of Victoria Falls.

The rafting industry employs approximately 250 staff as river guides, porters, drivers and assistants. A large proportion of them are either part time or casual staff. This number also includes staff employed through other companies that are directly associated with rafting, such as media sales companies that film the daily rafting trips and take photographs. After each rafting trip, the rafters can watch the footage of their trip down the river and can purchase the DVD and photographs.

Almost 100% of staff are from the local communities in the study area. Many of the rafting guides have been involved in the industry since it started and have over the years developed further into managerial and operational roles within the rafting companies. The villages along the gorge are well connected to the rafting industry and rely on the industry for employment opportunities. For example, local villagers who rely on agricultural crops for food and income are able to seek employment in the rafting industry when crops fail due to poor rains. These villagers are able to find casual or part time work as porters to supplement their income during times of hardship. This was emphasised during a conversation with one of the long-standing rafting guides in Livingstone. Through this the rafting companies have formed good relationships with local communities and have worked with them through social and environmental development projects to improve community infrastructure and development. These projects include funding for schools and clinics, health-care and sanitation initiatives and scholarship programs within the community. Suich *et al*. (2005) reported in their study that 63% of tour operator and activity provider businesses made both financial and non-financial contributions to local communities.

All of the rafting companies interviewed were of the opinion that impacts to the rafting industry would have knock-on effects throughout the tourism sector as well as impact communities within the study area. They also emphasised the significance of the Batoka Gorge as being one of the last remaining untouched wilderness sites with important environmental and natural heritage characteristics and that the loss of this site would be damaging to tourism in the region.

Other Gorge activities

Other activities in the gorge include birding, angling, hiking and, up until very recently, Jet Extreme Boating. Jet Extreme Boating is no longer offered on the Zambian side as declining tourist numbers have made it unfeasible. There is however an operator on the Zimbabwean side that operates at the base of the falls. Although these activities employ fewer people than the rafting industry, they are nonetheless very popular activities amongst nature- and adventure-based tourists that are visiting the area specifically for a high-quality birding, angling or hiking experience and contribute to direct tourism expenditure.

Birding in the area is popular and birders travel considerable distances in order to see a number of endemic and rare raptors found in the Batoka Gorge. These include the Taita Falcon, Peregrine Falcon, Verreaux's (Black) Eagle and the

Augur Buzzard. A further 363 bird species have been recorded in or near to the Gorge over the past 12 years (D. Tiran, pers. comm.). Many birding day trips are taken from Victoria Falls to Gorges Lodge on the Zimbabwean side or from Taita Falcon Lodge on the Zambian side. Both these lodges have excellent strategic points for viewing the raptors and the dramatic gorge scenery. Approximately 30% of the guests that come to stay at these lodges are birders and it is estimated that birding tourists amount to around 800 – 1000 visitors per year.

A very unique ecosystem exists within the Batoka Gorge. This interconnected food web is important for the birdlife in the gorge and any disruption along the food chain could have knock-on effects throughout the ecosystem. The well-aerated river waters flowing over the rocks are home to an abundance of aquatic insect larvae and nymphs. These transform into an abundance of aerial insects that form the main food source for insectivorous bats and birds, and making the gorge an ideal breeding habitat for African Black Swift and Rock Pratincole. In early April an annual bat migration takes place where the Egyptian Free Tailed Bat feeds entirely on the airborne insect life from the river. These swifts, pratincoles and bats are in turn important prey items for the raptors. The loss of river borne insect life would have a cascade effect along the food chain, impacting on bat and bird numbers in the gorge and ultimately birding tourism in the area. The possible magnitude of these impacts is discussed in in Section 2.

Angling is a popular tourist activity both upstream and downstream of the Victoria Falls. However, the angling experience upstream of the Falls is very different to angling experience downstream in the Batoka Gorge. This activity involves hiking and sometimes camping in the Gorge in order to find the most productive fishing spots. Although most of the angling trips sold are upstream of the Falls, it is estimated that approximately 20% of the total angling trips sold are downstream of the Falls.

Hiking in the Batoka Gorge is often done in combination with another activity, such as birding, angling or local village tours. Hikers are attracted to the Gorge as it offers steep climbs and extensive scenic views of the river, rapids and sheer cliffs. Hiking is the best way to experience the vastness of the Gorge. Taita Falcon Lodge on the edge of the Gorge offers a range of hiking and walking trips. The lodge also receives regular international and regional school groups who come to do 1-3 day hiking excursions into the Gorge. Hiking activities are usually a half day or full day trip but multi-day hiking trips can be organised from Victoria Falls and Livingstone.

Jet Extreme Boating was an activity run from the Zambian side of the Falls up until 2018 when it became unfeasible to operate owing to declining tourist numbers. Jet Extreme Boats are powerful speed boats that can reach speeds of 100 km an hour as they fly over the water between rapids 23 and 27. The boats are custom-built 22-seaters with super twin engines. A cable car transports guests into the gorge and back out again to avoid the steep 220 metre hike,

allowing guests of all ages to enjoy the activity. During high water levels, when rafting is not available, Jet Extreme provided an alternative adventure activity to tourists wanting to experience the Batoka Gorge.

1.5 THE TOURISM INDUSTRY WITHIN THE STUDY AREA

1.5.1 Background

Victoria Falls, Zimbabwe

The Victoria Falls settlement was founded in 1901 and expanded further when the railway from Bulawayo extended to the town crossed into Zambia when the Victoria Falls Bridge was constructed in 1905. The town has always been the main gateway to viewing the world-renowned Victoria Falls.

The tourism industry in Zimbabwe has gone through a number of significant changes over the last few decades. During the period 1980 – 2000 tourism was amongst the fastest-growing sectors in the country, contributing significantly to GDP (Karambakuwa *et al.* 2011) and providing high quality reliable tourism products. However, political instability starting in 2001/02 and the global recession in 2008 saw tourism in Zimbabwe decrease substantially over this period, with travel bans and negative international media coverage impacting heavily on the tourism sector (Karambakuwa *et al.* 2011). International arrivals started to recover in 2010 but then pre-election violence and instability in 2012 resulted in a 25% reduction in total tourist arrivals. Numbers have started recovering again, and a total of 2,579,974 international arrivals were recorded in Zimbabwe in 2018 (Figure 6). The direct contribution of travel and tourism to GDP in 2017 was USD 512.3 million, 3% of total GDP in Zimbabwe (WTTC 2018a). This was forecast to rise by a further 3.5% in 2018 (WTTC 2018a).

Tourism is the main industry in Victoria Falls and contributes significantly to the local economy. The town has been the main gateway for exploring the area and a wide range of activities both above and below the Falls have been available to tourists for a number of decades. Impacts on the tourism industry are felt heavily in the town and during interviews businesses explained that the last decade had been a challenge for them. A large number of tourists wanting to view Victoria Falls and participate in activities in the area started to fly directly into Livingstone and for the most part avoided Zimbabwe altogether during the unstable periods. This impacted heavily on Victoria Falls' local tourism market and only over the last five years have tourist numbers to Victoria Falls started to increase again to promising levels. Interviews and informal conversations with locals revealed that a number of smaller businesses were forced to close down during this time and other smaller businesses explained that they closed over the quieter periods and went and worked overseas to supplement their income. Larger businesses were able to adapt by offering specials and discounted prices to attract local and regional tourists. However, there has now been a shift in sentiment where tourists are choosing the Zimbabwean side over the Zambian side as activities are cheaper and the

new Kaza Uni-Visa allows tourists to visit both countries without paying double visa fees. It was noted by several interviewees that tourists are flying in to Livingstone (Harry Mwanga Nkumbula International Airport), for which flights are cheaper than in to Victoria Falls, and boarding busses at the airport which are headed straight to the Zimbabwean side.

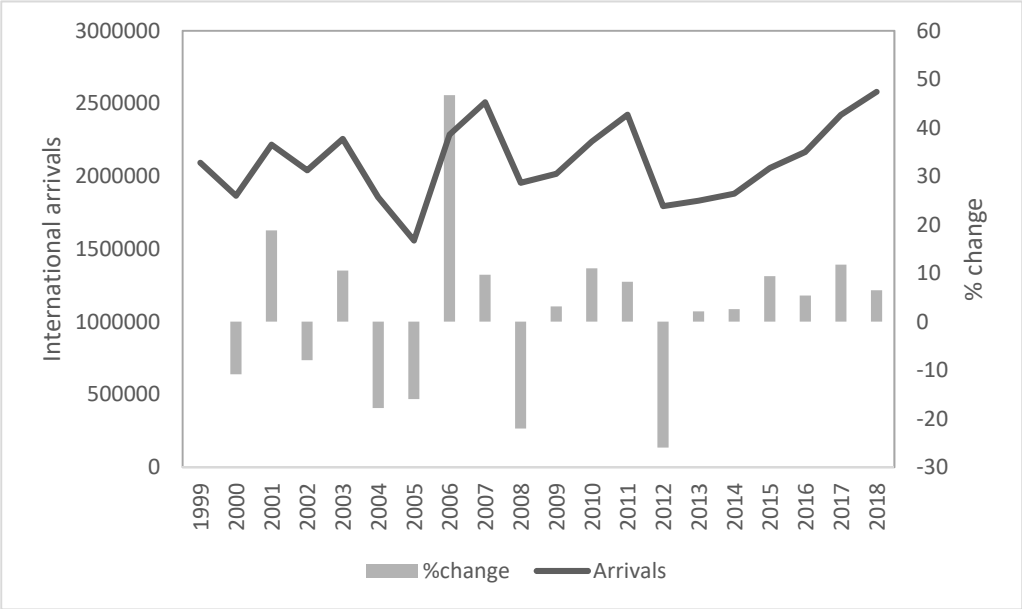

Figure 6. ***Annual international arrivals to Zimbabwe from 1999 – 2018, and the year on year percentage change in growth (Source: Zimbabwe Tourism Authority).***

Tourist arrival statistics from the Victoria Falls International Airport have shown increased arrivals over the period 2014 - 2018 (Figure 7).

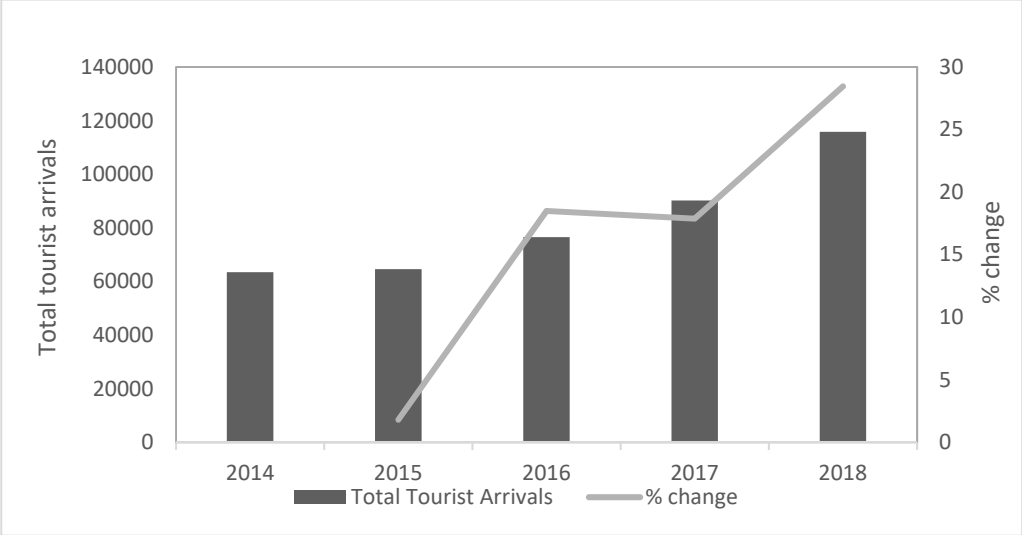

Figure 7. ***Total tourist arrivals to Victoria Falls International Airport from 2014 - 2018 and the year on year percentage change in growth.***

Many of the businesses interviewed indicated that although visitor numbers were not close to those of the 1990s, they believed that international tourist numbers had increased over the past five years in Victoria Falls, as evidenced by improved average hotel occupancy levels at 58% in 2018 (Table 4).

Table 4. ***Trends in national and Victoria Falls hotel occupancy data (Source: ZTA Annual Tourism Trends & Statistics Reports)***

Year	National Occupancy	% change	Victoria Falls Occupancy	% change
2007	45		34	
2008	41	-9	28	-18
2009	46	12	40	43
2010	52	13	46	15
2011	52	0	50	9
2012	52	0	45	-10
2013	48	-8	53	18
2014	48	0	49	-8
2015	47	-2	52	6
2016	46	-2	49	-6
2017	48	4	55	12
2018	53	10	58	5

Livingstone, Zambia

The town of Livingstone was founded in 1905 and became the capital of what was then Northern Rhodesia in 1911. In 1935 the capital was moved to Lusaka and from then and until after independence Livingstone focused on light-industrial and manufacturing trade. The timber and textile trade and the automobile industry were also relatively large and contributed to employment

in the town. In the late 1970s, after the collapse of the national economy, most of the light-industry and manufacturing businesses closed (McGowen 2007). In the 1990s the economic reforms of the time flooded the economy with cheap imported goods such as textiles and food from the East (McGowen 2007), resulting in the eventual collapse of the local manufacturing and textile sector and the loss of thousands of jobs in Livingstone.

It was after this collapse that the government started to focus on the tourism potential associated with the Mosi-oa-Tunya Falls. Through large investments in the hotel industry and in marketing, tourism in Zambia and particularly in Livingstone started to grow (McGowen 2007). In Zambia tourism is now one of the fastest-growing sectors and has been identified by government as a priority growth area for the national economy (Zambian Development Agency 2014). Many believe tourism to potentially be one of Zambia's best prospects for economic growth and diversification (Banda & Cheelo 2012, Rogerson 2004). The tourism sector is still relatively small but has been growing steadily over the last decade and has huge potential to develop even further (Dixey 2005, Chaunga *et al.* 2013). The tourism sector has, and still is to an extent, faced with a number of challenges and inhibitors to development (Pope 2005, Chaunga *et al*. 2013). These include inadequate investment and budgetary allocations, poor management and coordination between the public and private sectors, lack of research, data and inadequate statistical collection databases, lack of infrastructure and high destination costs when compared to other countries in the region (Pope 2005, Chaunga *et al*. 2013).

Regional political instability, the international recession and health concerns such as the 2014 Ebola outbreak in West Africa have all impacted Zambian tourism. The world-wide recession saw visitor numbers drop drastically in 2008/09 (Figure 8) but since 2009 numbers have slowly increased. In 2017 a total of 1,083,000 international arrivals were recorded in Zambia. The direct contribution of travel and tourism to GDP in 2017 was USD 777.6 million, 3.2% of total GDP in Zambia and was forecast to rise by a further 6.5% in 2018 (WTTC 2018b).

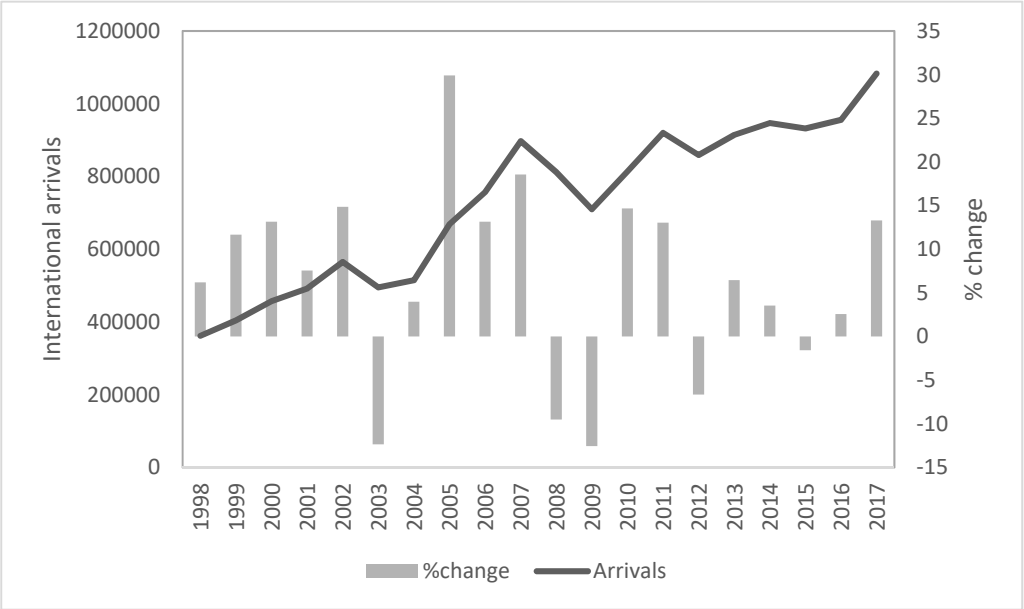

Figure 8. ***Annual international arrivals to Zambia from 1998 – 2017, and the year on year percentage change in growth (Source: Zambian Ministry of Tourism & Arts)***

Livingstone is considered the tourism capital of Zambia (Rogerson 2004). The town and surrounding communities rely extensively on the tourism industry, and similarly to the town of Victoria Falls, any impacts on tourism are felt heavily. Although Livingstone has benefited from the political instability in Zimbabwe, interviews with tourism businesses indicated that numbers are now declining and that occupancy is falling as Zimbabwe becomes more attractive.

Tourist arrival statistics for Harry Mwanga Nkumbula International Airport (in Livingstone) indicate that arrival numbers have been declining steadily since 2013, apart from a sharp rise in 2018 (Figure 8). Interviews with tourism businesses indicated that, because flights into Harry Mwanga Nkumbula International Airport are relatively less expensive than flights into Victoria Falls, Livingstone is still a popular in-flight destination. However, foreign tourists are seen boarding busses at the airport en-route to Zimbabwe where accommodation and activities are relatively cheaper. The UNI VISA system has made this affordable as tourists are no longer required to pay for two separate visas on arrival at either entry point.

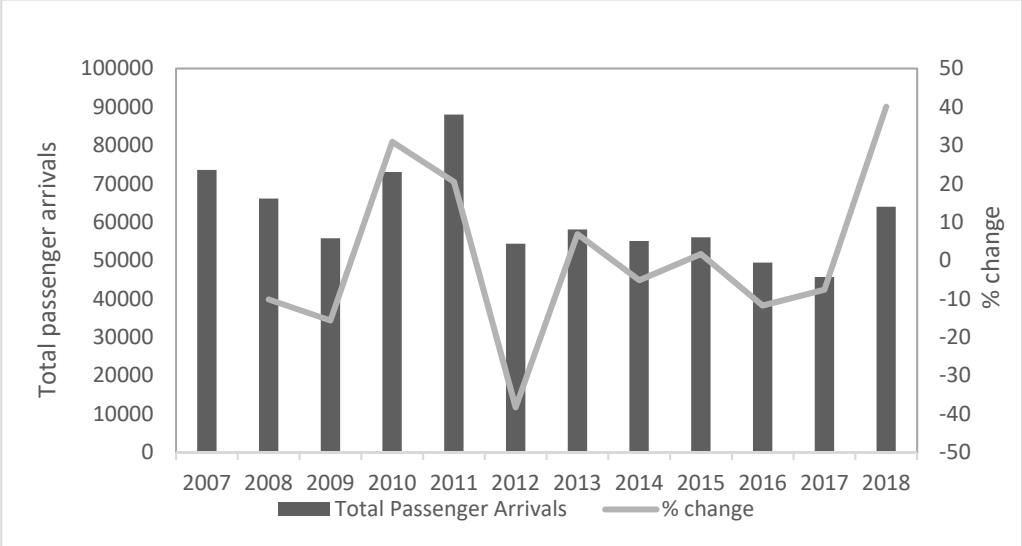

Figure 9. ***Total tourist arrivals to Harry Mwanga Nkumbula International Airport from 2007 - 2018 and the year on year percentage change in growth.***

1.5.2 Victoria Falls/Mosi-oa-Tunya: a UNESCO World Heritage Site

The Victoria Falls/Mosi-oa-Tunya is one of the world's greatest waterfalls and was listed as a World Heritage Site in 1989 (UNESCO 2014). It is the largest curtain of falling water in the world with up to 500 million litres of water per minute falling over the almost 100 m high steep wall. There are eight steep-sided gorges below the Falls that zigzag for a distance of approximately 150 km (UNESCO 2014).

The Falls have a Joint Integrated Management Plan (JIMP) which was approved in 2007 and is implemented within a participatory framework (UNESCO 2014). The property is protected by the Zimbabwe Parks and Wildlife Act and the National Heritage Conservation Act and Zambia Wildlife Act. The management plan addresses transboundary coordination and management in terms of urban, tourism and funding schemes.

During surveys and business interviews concerns about the delisting of Victoria Falls as a World Heritage Site were raised. A significant number of businesses believe that the delisting of the Falls would have a disastrous impact on tourism. Apart from the potential negative impact on tourism demand as a result of losing World Heritage Site status, stakeholders were concerned that, without the UNESCO World Heritage Site management and development criteria, Vic Falls could become over-commercialised and lose the 'wildness' that attracts many of the tourists. It is important to note here that these concerns need to be addressed and that communication with UNESCO, if not already initiated, should take place.

1.5.3 Tourism facilities and activities offered in Victoria Falls, Zimbabwe

Location and arrangement of facilities

The town, Victoria Falls, is situated approximately 1.25 km away from the world-famous waterfalls and is the main gateway for exploring the area from the Zimbabwean side. The town is small and compact with most amenities and accommodation establishments within walking distance of the centre of town where cafes, restaurants and tourist activity providers are found (***Figure 10***). The Rainforest Park is situated to one end of town and is the main entrance for visiting the Falls and exploring the natural fauna and flora in the forest along the walkways found within the park. The Zambezi National Park runs along the edge of the Zambezi River upstream of the Falls and downstream to just below Songwe Gorge.

A number of attractions and activities are available in and around town. A large proportion of these activities are river-based, such as white-water rafting, river cruises, guided angling and canoe trails. Activity providers and tour operators provide the necessary transport for accessing these and other activities offered outside of town. There is a small tourism office in the centre of town providing maps, information and advice. The Victoria Falls International Airport is located 20 km from the town and the A8 road links Victoria Falls to Bulawayo in the south. The Zambian border is situated across the Victoria Falls Bridge approximately 2.5 km from the town centre and the Kazangula Road links Victoria Falls to Botswana in the west.

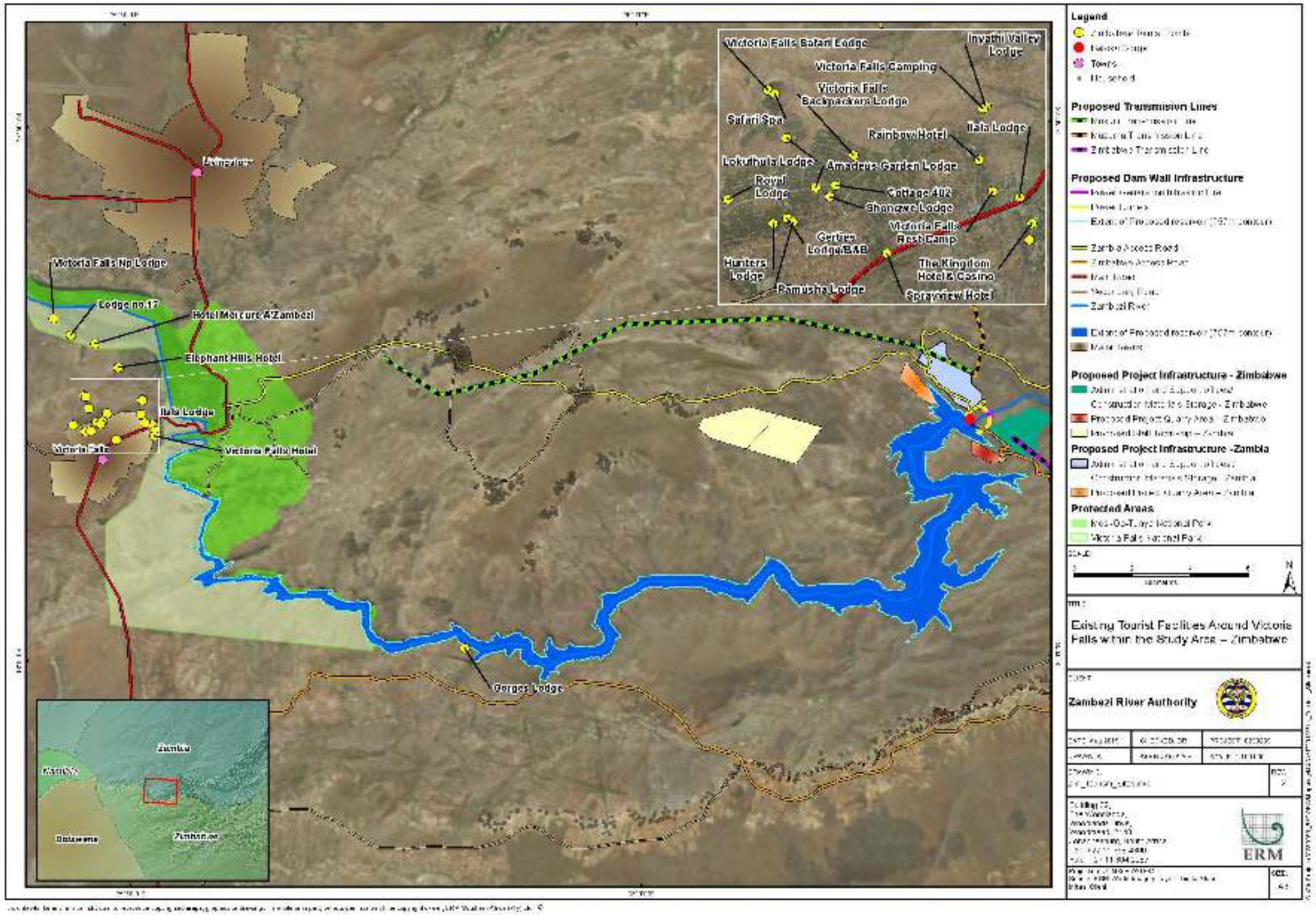

Figure 10. Location of tourist facilities in and around Victoria Falls, Zimbabwe

Accommodation establishments

There are a wide range of accommodation options in Victoria Falls ranging from budget accommodation in the form of campsites and backpackers to large hotel resorts and upmarket safari lodges. The accommodation sector in Victoria Falls is characterised by a number of very large hotels and resorts which contribute approximately 60% of the total beds in the town.

In 2019 there were approximately 67 registered accommodation establishments and nearly 4 900 beds in Victoria Falls (Table 5), representing a nearly 25% increase since 2015, a result of a substantial increase in tourist numbers staying in Victoria Falls (Figure 7). Of these, 35% are smaller guest lodges, guest houses and B&B's and 43% represent hotels and upmarket safari lodges combined. Hotels, however, represent the largest number of beds available with 12 hotels providing 2679 beds in total. Low-budget accommodation such as self-catering cottages, backpackers and camping are popular and represent 22% of establishments and provide 851 beds in Victoria Falls. The majority of hotels and lodges interviewed had three, four or five star ratings but a number of accommodation establishments were not graded at all.

Table 5. Estimated number of accommodation establishments and beds in Victoria Falls (Source: Africa Albida Tourism 2017 and surveys in 2019)

Type	Number of establishments (2015)	Number of establishments (2019)	Number of beds (2015)	Number of beds (2019)
Backpackers and campsites	5	7	229	636
Self-catering	7	7	382	215
Guest Lodge/ House/B&B	22	24	713	890
Hotel	6	12	1806	2679
Upmarket Safari Lodge	5	17	724	448
TOTAL	**45**	**67**	**3854**	**4868**

Activity providers

There are a wide range of activities and tours offered in Victoria Falls. Many of the activity providers offer all of the main activities that are available, owning some and outsourcing others. In total there were approximately 89 activity providers, river cruise operators and safari operators operational in the Victoria Falls area in 2015 and have not changed considerably since then. These activity providers offer around 23 different activities (Table 6). A significant proportion of the safari operators, hunting operators and inbound tour operator businesses are either very small or work from small offices in the town or are solely online booking agents and service more than just Victoria Falls, offering tours and safaris to a number of regional destinations.

Approximately 40% of the activities are provided by multiple-activity providers. These operators range in size and tend to offer all of the activities and tours described in Table 6. Some of these businesses do not own any of the activities and are purely operating as booking agents and tour organisers. Other businesses own some of the activities that they offer and outsource the rest, and certain businesses own all the activities that they offer to tourists. Around 18% of the businesses are single-activity providers, focusing on only one activity or tour that they own and market. Single-activity providers include, for example, helicopter operators, croc – cage diving operators, white-water rafting providers, guided angling safaris, canoe trails and private hiking and walking tours.

Table 6. ***Approximate number of tour operators and activity providers operating in Victoria Falls in 2015 (Source: ZTA Annual Tourism Trends & Statistics Reports).***

Type	Number	Description
River cruise operators	4	These operators solely provide river cruises on the Zambezi River
Safari operators	9	These operators focus solely on providing safari holidays and game drives
Inbound tour operators (incl. travel agencies)	20	Inbound tour operators organise travel, accommodation and activities for inbound tourists
Single activity providers	16	These businesses focus on providing a single activity or tour, such as only helicopter rides or only white water rafting
Hunting safari operators	4	These operators provide hunting safari tours
Local activity providers (multiple)	36	Local tour operators focus on providing and booking a wide range of activities for tourists. These businesses may own some of the activities but also offer and outsource other activities.
TOTAL	**89**	

A total of nine activity providers were interviewed in 2015 and eight in 2019. Although this represents only about 10% of the activity/tour businesses in Victoria Falls, all of the larger, more prominent activity providers were captured in this sample.

There are six white-water rafting companies in Victoria Falls and all of these businesses were interviewed in 2015, while four of these businesses were interviewed in 2019, as well as the Rafting Association of Zimbabwe. Two out of the six are solely involved in white-water rafting and do not offer any other activities. During the interviews the four companies that do offer other activities highlighted the importance of white-water rafting to their business. Three of the four originally only provided white-water rafting and two of these businesses pioneered the industry almost 30 years ago. Rafting therefore plays a crucial

role in their businesses and most of these companies indicated that white-water rafting attracts the largest number of hits on their websites, drawing tourists to their company and to the other activities that they offer.

1.5.4 Tourism facilities and activities offered in Livingstone, Zambia

Location and arrangement of facilities

Livingstone is situated in the Southern Province of Zambia approximately 11 km away from Mosi-oa-Tunya Falls. The town is larger than Victoria Falls in Zimbabwe and is more spread out (Figure 11). Most of the amenities, such as restaurants, shops and banks, are located in the town centre and are within walking distance from one another. However, the larger hotels and upmarket safari lodges are situated further out of town either closer to the Falls off the main Mosi-oa-Tunya Road or along the banks of the Zambezi River upstream of the Falls (Figure 12). In the Livingstone town centre there are a large number of smaller guesthouses and B&B's as well as campsites and backpackers. The Avani and Royal Livingstone hotels are situated less than one kilometre from the Falls. The Mosi-oa-Tunya National Park is 66 km^2 in size and stretches 12 km upstream of the Falls and extends to the end of the 5th Gorge downstream of the Falls.

Just as in Victoria Falls, there are a wide variety of activities for visitors and the activities offered in Victoria Falls and listed Table 6 are also offered in Livingstone. Most of the activities are river based and activity providers offer packages and special offers for those visitors interested in doing more than one activity. Overland organised tour groups often stay in the same campsites or chalets and take part in a number of different activities. In the town centre there is the Livingstone Tourism Association office which provides maps, information and brochures for a wide range of accommodation establishments and activity providers.

The Harry Mwanga Nkumbula International Airport is located north-west of the town centre approximately 5.5 km away, and the M10 Nakatindi Road links Livingstone to Botswana and Namibia in the west.

Accommodation establishments

There is a wide choice of accommodation establishments in Livingstone. Unlike Victoria Falls in Zimbabwe, the hotels are on average smaller in size offering a fewer number of beds per establishment. In 2019, there were approximately 88 accommodation establishments and about 3 900 beds in Livingstone (Table 7), representing a decline of about 20% since 2015. Hotels accounted for 17% of the total number of accommodation establishments. There are numerous smaller guesthouses, guest lodges and B&B's in the town and these accounted for 47% of the establishments and 23% of the total beds. Upmarket safari lodges accounted for 18% of the establishments and 9% of the total beds. In total there are 88 accommodation establishments and 3851 available beds in Livingstone

(Table 7). In Livingstone the accommodation sector is more focused to smaller, high-end establishments and the majority of high-end safari lodges are situated upstream of the Falls along the Zambezi River (Figure 12). Accommodation statistics were estimated using available data from previous tourism studies in Livingstone and updated using information collected during tourism business interviews and online accommodation booking sites.

Table 7. ***Estimated number of accommodation establishments and beds in Livingstone (Source: Africa Albida Tourism 2017 and surveys in 2019)***

Type	Number of establishments (2015)	Number of establishments (2019)	Number of beds (2015)	Number of beds (2019)
Backpackers and campsites	7	6	85	523
Self-catering	59	10	1312	318
Guest Lodge/ House/B&B	6	41	1332	872
Hotel	26	15	1142	1804
Upmarket Safari Lodge	12	16	967	334
TOTAL	**110**	**88**	**4838**	**3851**

Activity providers

In Livingstone there are fewer activity providers and inbound tour operators than in Victoria Falls. In total it was estimated that 42 activity providers operated in Livingstone in 2015 and there has been no considerable change since then. These activity providers offer a wide range of local and regional activities (Table 8). Half of these offer local activities in and around Livingstone. The number of activity providers in Livingstone was estimated using data collected from the tourism business surveys, previous tourism studies and from online accommodation booking and travel sites.

A total of five activity providers were interviewed in both 2015 and 2019. Although this represents only about 12% of the activity tourism businesses in Livingstone, all of the larger, more prominent activity providers were captured in this sample.

Table 8. ***Approximate number of tour operators and activity providers operating in Livingstone in 2015 (Source: Suich et al. 2005, LTA and internet search).***

Type	Number	Description
River cruise operators	2	These operators solely provide river cruises on the Zambezi River
Safari operators	7	These operators focus solely on providing safari holidays and game drives

Type	Number	Description
Inbound tour operators (incl. travel agencies)	13	Inbound tour operators organise travel, accommodation and activities for inbound tourists
Single activity providers	10	These businesses focus on providing single activities or tours, such as only helicopter rides or only white water rafting
Local activity providers (multiple)	10	Local activity providers focus on providing and booking a wide range of activities for tourists. These businesses may own some of the activities but also offer and outsource other activities.
TOTAL	**42**	

There are four white-water rafting companies in Livingstone and all of these were interviewed. Two rafting companies are solely involved in white-water rafting and do not offer any other activities. During the interviews companies that do offer other activities emphasised the importance of rafting to their business as it attracts tourists to partake in other activities that are also on offer. Although two of the four companies do offer other activities, these do not make up the largest proportion of their sales and most of the rafting companies rely heavily on the income received from rafting.

Table 9. Tourist activities offered in Victoria Falls and Livingstone.

Tour/Activity	Description
Victoria Falls guided tour	This includes entry into the Rainforest Park and a tour of the Falls with historical, environmental and geographical information about the Falls described by a knowledgeable guide.
River cruises	There are a variety of cruise options, from breakfast, lunch and dinner cruises to sunset cruises. They depart from the small riverside jetties located upstream of the Falls. The cruises are two and half hours long and are usually inclusive of drinks and snacks. They take place daily throughout the year.
White water rafting and kayaking	Rafting is offered as a half-day, full-day or up to five day activity which includes camping in the Batoka Gorge for tours longer than the standard one day excursion. Half-day rafting includes rapids 1 – 10 and full-day includes rapids 1 – 18 (Zimbabwe) and 1 – 25 (Zambia). White water rafting is seasonal and dependent on the level of water. During December to May water levels are high and only certain rapids can be rafted. From August to December water levels are low and all rapids are open.
Game drives	A variety of safari game drives are offered in and around the study area. A number of these operate in local National Parks and game reserves and others offer day trips and overnight trips to Chobe National Park in Botswana.
Gorge swing & Zip Line	These activities take place below the Victoria Falls from the edge of the gorge. The gorge swing is suspended across the gorge and a harness is attached to the jumper. The jumper leaps off the

	edge of the gorge, free falling before going into a long pendulum type swing across the gorge. For the zip line activity, the individual is harnessed in and attached to a pulley system. The zip line extends across the gorge from one end to the other. The zip line canopy tour extends through a section of forest.
Horseback safari	This is either a three hour morning or afternoon activity which involves horseback riding through a game reserve to experience wildlife from a different perspective.
Elephant back safari / walking with elephants	This safari experience gives guests an up close and personal insight into elephants. The elephant back safari involves riding on the back of an elephant with a trained guide and elephant handler. The activity takes place in the National Park and involves walking through the bush and the rivers with views of the Zambezi River. The elephant experience involves meeting the elephants and interacting with them as well as learning more about elephants and elephant conservation.
Lion encounter	This activity lasts about three hours and involves one on one interaction with lions that are in a rehabilitation program. Visitors meet the lion handlers and are briefed about safety before being able to interact and walk with the lions.
Canoe trails	The canoe trail tours take place above Victoria Falls along the upper Zambezi. These can be half day, full day or overnight canoe trips and guests paddle along the river viewing game and birds.
Guided angling	Guided angling can be a half day, full day or overnight excursion which involves guided boat trips along the river to well-known fishing spots. The most sought after and well renowned fish in the river is the Tiger Fish, which most guests hope to catch.
Guided nature walking	Walking safaris can be in the National Parks or smaller game reserves or in the Batoka Gorge with a focus on game or on birding.
Scenic flights	Scenic flights over Victoria Falls and surrounding areas can be done from a helicopter, a microlight or a fixed wing plane. The flights can be short (15 min), medium (22 min) or long (30 min). The flight gives a 365 degree view of the Falls, the upper river and the Batoka Gorge below.
Croc-cage diving	The croc-cage diving activity involves being completely submerged in a large pool and observing crocodiles from within a cage as they swim around you. The activity focuses on crocodile interaction from the safety of a cage but provides the guest with an up close and personal view of how impressive crocodiles are.
Bungee Jumping & Bridge Swing	The bungee jump and bridge swing take place from the top of the Victoria Falls Bridge in front of the Falls and above the rapids of the gorge below. The bungee jump is approximately 111 metres high. The bridge swing is an 80m freefall and a pendulum swing in an arc below.
Victoria Falls Bridge Tour	The historic bridge tour involves an informative talk about the history of the famous Victorian engineered bridge with views from the bridge of the Victoria Falls and the rapids below as the tour takes place on the walkways below the bridge.

Cultural village tour	These tours involve visiting one of the local villages to learn more about the local cultures and village life. The tours are informative providing historical and cultural information. Guests get to observe and interact with the local community members to learn more about their daily activities and way of life within the village.
Livingstone Island Tour (Devils Pool)	Livingstone Island is located on the Zambian side above the Falls. This activity involves catching a small boat to the island from the banks of the Zambezi. The view from the island of the top of the Falls is impressive. From the island the guests either walk across or swim to the Devils Pool which is a large deep natural rock pool at the edge of the Falls. Guests can swim in the pool and sit on the edge overlooking the Falls.
Under the Spray Tour (Zambia)	This activity involves viewing Victoria Falls from below at the bottom of the gorge under the spray of the waterfall. Guests swim in the rock pools and sit under the spray.
Quad Biking	Quad biking along an eco-trail through the bush exploring with the possibility of viewing game along the way.
Jet Extreme	Below the falls, power boats with jet engines shoot over the first few rapids at speeds of 100km per hour. This activity was also offered between rapids 23 – 27 in the gorge up until 2018, after which it became unfeasible. The gorge operations involved an hour drive to the entry point and a steep hike down into the gorge. A cable car was installed to lift tourists out of the steep gorge.
Boiling Pot hikes (Zimbabwe)	This activity on the Zimbabwean side is similar to the "Under the Spray" tour offered on the Zambian side. It involves hiking down into the gorge below the Falls where guests are ferried on a raft to the rock outcrops below the Falls where they can swim in the rock pools and get showered by the spray.
Royal Livingstone Express Steam Train Tour & Dinner	The stream train tour involves boarding the historical steam train in Livingstone and enjoying a trip to the Victoria Falls Bridge. Enjoy some sparkling wine with views of the Falls from the bridge. The tour with dinner involves a 15km train journey through the Zambezi River Valley while enjoying fine dining and drinks. This tour operates on certain days of the week and is only available from Livingstone.
Raft Float/Drift	Guests' board small inflatable rafts upstream of the Falls, each raft has its own guide. The guides paddle and point out various fauna and flora while guests sit back and enjoy the scenery, drinks and snacks. The rafts slowly drift downstream towards the Falls.

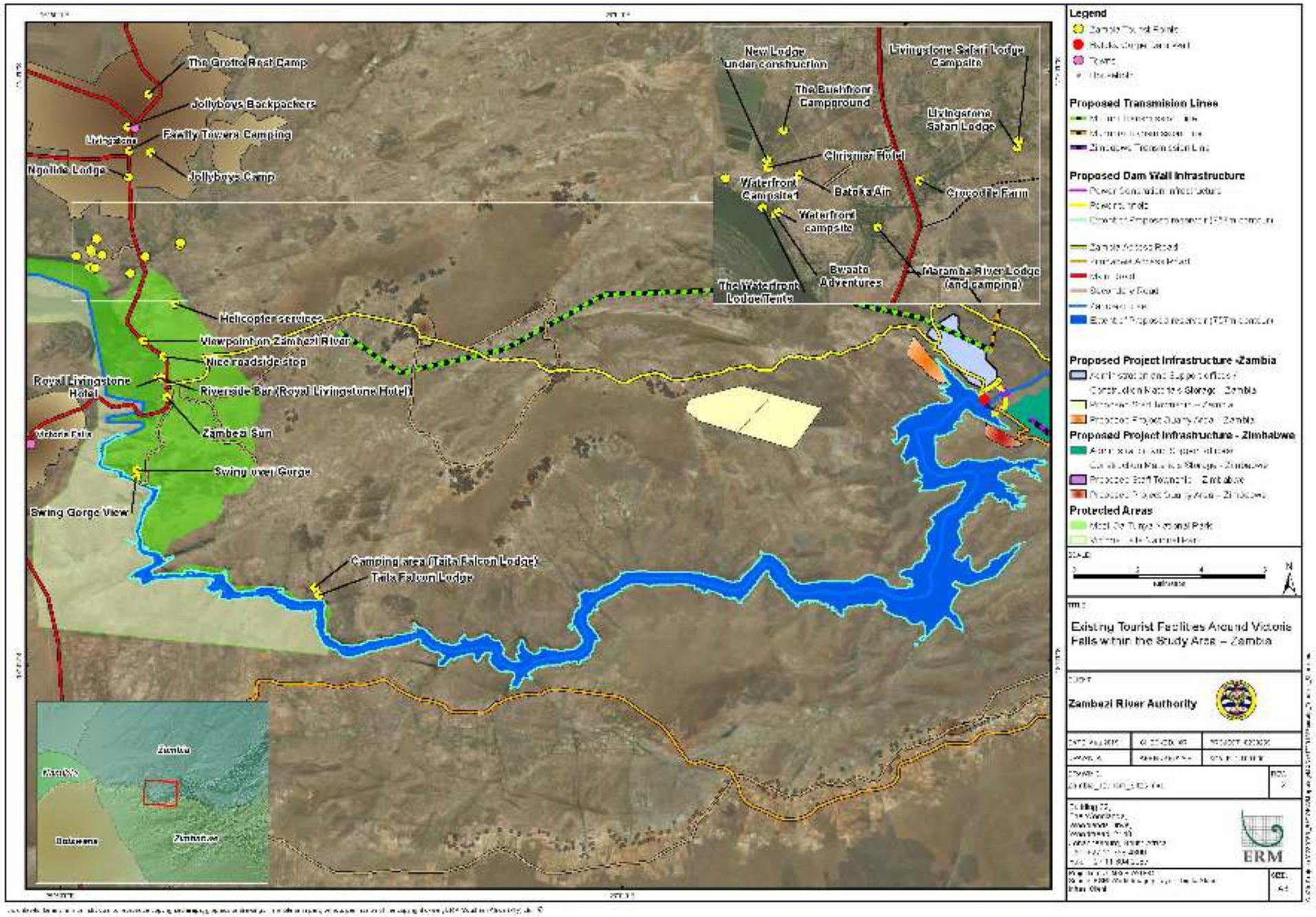

Figure 11. Location of tourist facilities in and around Livingstone, Zambia

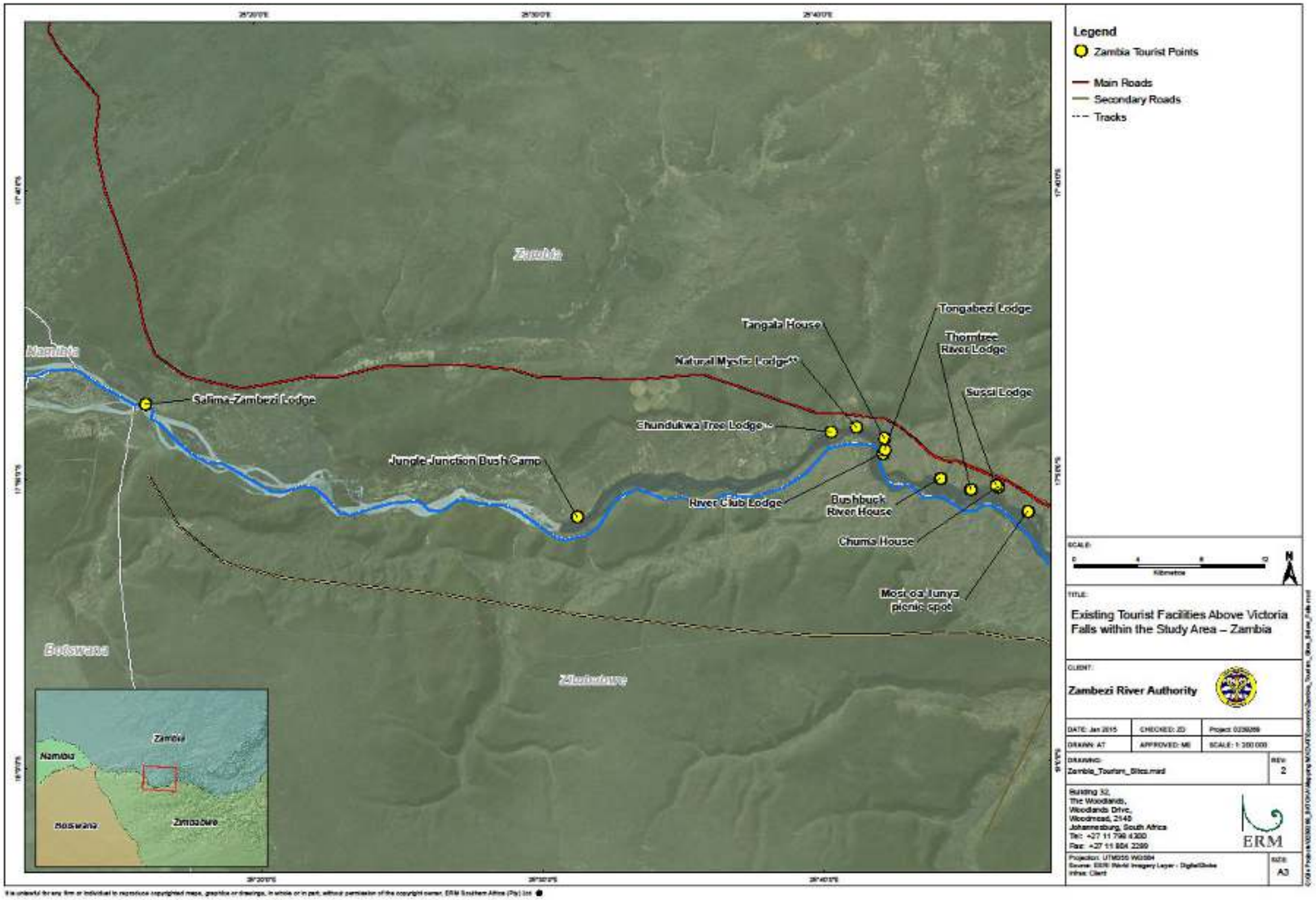

Figure 12. Location of some of the tourist facilities along the upper Zambezi River above Victoria Falls, Zambia

1.6 *VISITOR NUMBERS, OCCUPANCY & ACTIVITY SALES IN VICTORIA FALLS*

There are no statistics on the total numbers of visitors to Victoria Falls *per se*. However, there are some statistics available for the numbers of visitors entering the Rainforest Park which could be used to derive total estimates in combination with using accommodation statistics and information collected from the interviews with tourism businesses.

1.6.1 *Visitor numbers*

An annual average of 212 636 visitors entered the Rainforest Park gates during the period 2010 – 2017 (Table 10). Data for 2014 was not available. International visitors, on average, represented 65% and domestic visitors 35% of visitors entering the park every year. Interviews with tourism businesses and casual conversations with tourists suggested that 98.5% of tourists to Victoria Falls visit the Rainforest Park. Business and conference visitors, although in the area for work, do also take the time to visit the Rainforest Park.

Table 10. ***Total numbers of international and domestic visitors entering the Rainforest Park gates in Victoria Falls (Source: ZTA Annual Tourism Trends & Statistics Report 2015 and Africa Albida Tourism 2017)***

Year	International	Domestic	Total
2010	110 300	50 217	160 517
2011	72 151	48 100	120 251
2012	136 980	60 796	197 776
2013	144 680	51 361	196 041
2015	173 561	59 913	233 474
2016	192 307	70 305	262 612
2017	246 204	71 574	317 778
Average	**153 740**	**58 895**	**212 636**

Seasonal data were not available for the Rainforest Park, but from interviews with the tourism businesses, the visitor high season was established to be from June – October with peaks in local and regional tourist numbers in April over the Easter period and December over the Christmas and New Year period.

From the interviews and tourist conversations it was established that approximately 97.5% of visitors to Victoria Falls overnight in the area. There are small numbers of day visitors that come to see Victoria Falls from Botswana but the majority of visitors stay overnight and participate in the many activities on offer. The average length of stay for visitors to Victoria Falls is 2.6 days, as indicated by the accommodation establishments, activity providers and previous tourism studies.

1.6.2 *Occupancy of accommodation establishments*

On average, accommodation establishments reported similar trends in occupancy over the year (Figure 13; based on data collected in 2015). The high season was reported to be from June to September, with all accommodation establishments recording their highest occupancy levels in August with an average of almost 80%. Businesses reported that on average they receive 70% of their turnover during the high season months. April and December see peaks over the Easter and Christmas holiday period but remain quiet over the rest of the month. The quietest months are January and February. International guests from beyond the SADC region made up approximately 60% of the occupancy each month with local and regional guests making up 20% each.

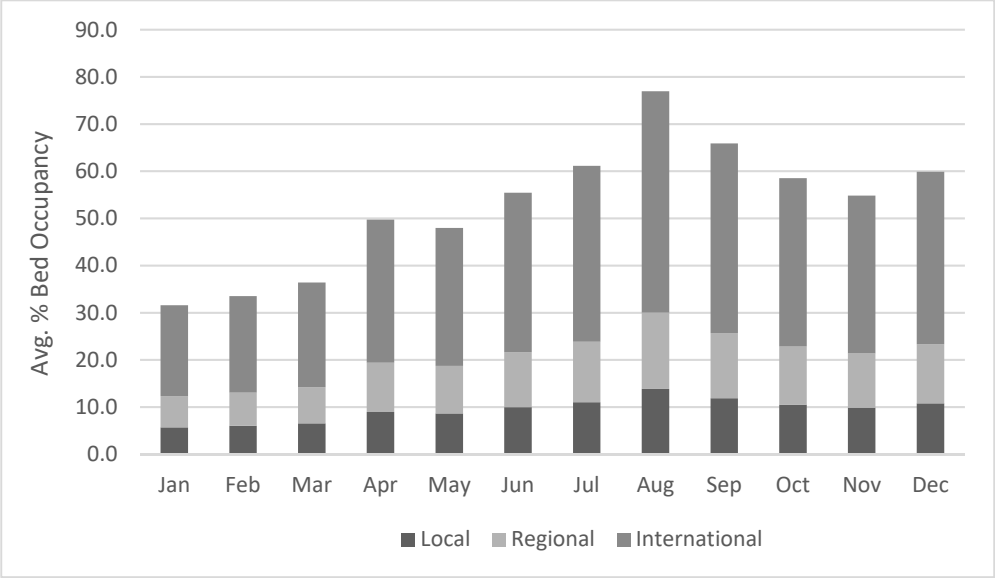

Figure 13. ***Seasonal patterns in bed occupancy in Victoria Falls reported by the accommodation establishments interviewed, broken down by local, regional and international guests.***

Average annual bed occupancy rates reported by the accommodation establishments were in the range of 37-67%, and were similar in both years of data collection. The overall annual occupancy rate in Victoria Falls was estimated to be 50% for all types of accommodation. This was based on reported occupancy figures, figures provided for the main hotels and lodges in town and figures reported by ZTA in the annual tourism statistic reports. This translates into an estimated 872 715 bed nights sold per annum (Table 11).

Table 11. ***Average bed occupancy rates for accommodation establishments and estimated overall annual bed nights in Victoria Falls (Source: Africa Albida Tourism 2017 and surveys in 2019).***

Type of accommodation	Number of beds	Estimated annual bed nights
Backpackers and campsites	636	116 070
Self-catering	215	39 238
Guest Lodge/Guest House/B&B	890	162 425
Hotel	2679	488 918
Upmarket Safari Lodge	448	81 760
TOTAL	**4 868**	**888 410**

1.6.3 Estimated demand for tourist activities

On average activity providers reported similar trends in activity sales over the last year. The high season for these companies is June – October and the last two weeks in December (Figure 14). Business is at its busiest in the month of August with 66% of sales and companies indicated that on average 65% of their turnover is generated during the high season months.

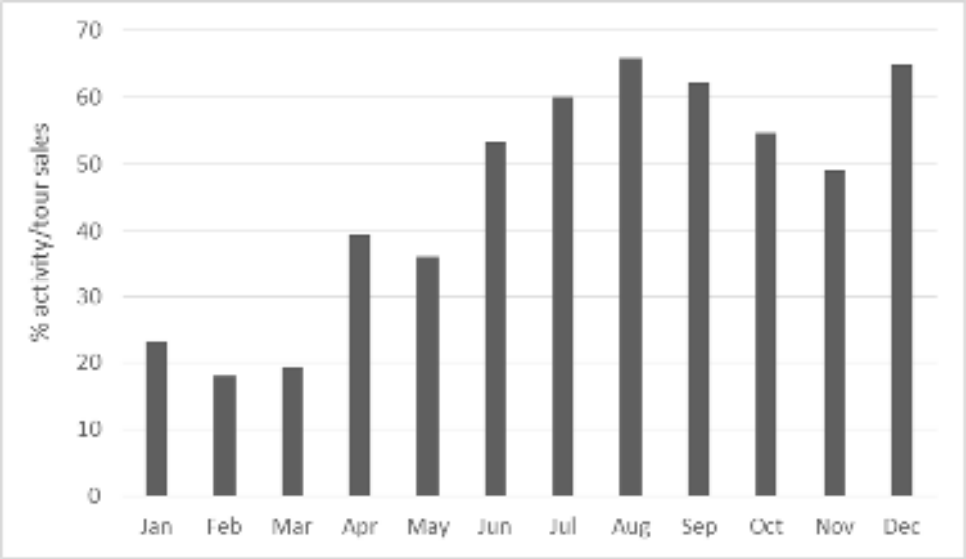

Figure 14. ***Seasonal patterns in activity and tour sales in Victoria Falls as reported by activity providers and tour operators.***

All businesses reported that February is their worst month for selling activities. The low activity sales during the low season months are a combination of not just decreased tourist numbers to the area over this time, but also due to the availability of certain activities at this time of year. From January river water levels become too high and the availability and extent of some river activities become compromised. White water rafting and kayaking is only available for a half day trip from rapid 10, Livingstone Island (Devil's Pool) tours are not

available and some hiking and angling activities in the gorge are suspended due to the high water levels. In most years from March to May the water levels become dangerously high and white-water rafting is closed completely for a few weeks.

Tourism businesses estimated the percentage of their clients participating in different activities whilst in Victoria Falls. Approximately 98% of clients to the area visit the Rainforest Park (Figure 15). Wildlife safaris and river cruises are also very popular with 75% of clients choosing to do these activities. Just under 50% of visitors take part in white water rafting and scenic flights over the Falls.

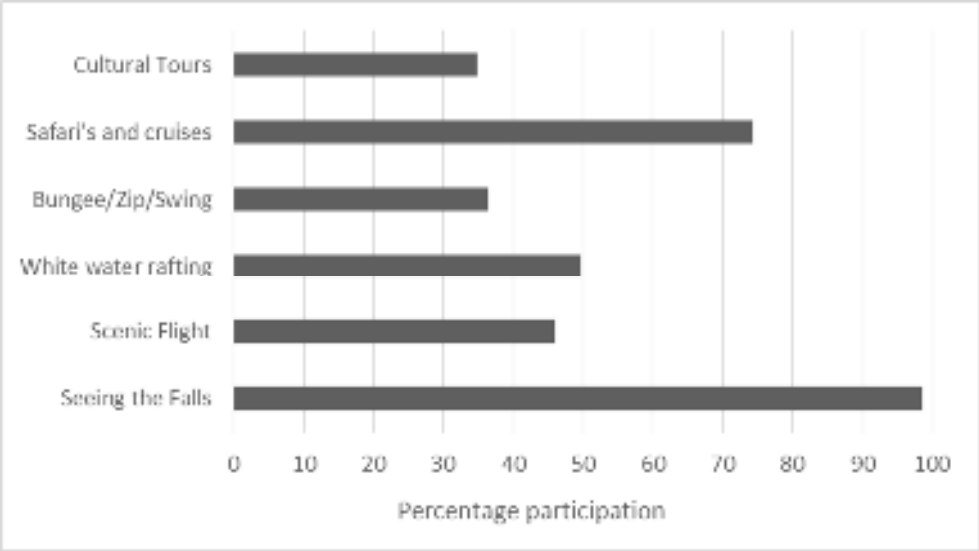

Figure 15. ***Percentage visitor participation for some of the most popular activities offered in Victoria Falls as recorded from business interviews***

The estimated total number of different activities and tours provided by tourism businesses in Victoria Falls are outlined in Table 12. While it was not possible to obtain exact data on the numbers of tours offered by every activity provider or the exact number of people taking part in each activity, information obtained from tourism activity businesses and accommodation establishment interviews, the internet and previous tourism studies was used to generate our estimates which provide a baseline for the approximate activities sold.

The river cruises are extremely popular and it is estimated that around 130 000 cruises are sold to visitors each year. White water rafting sees a total of approximately 11 500 customers per year, while scenic flights sees approximately 60 000 customers per year. The average price paid for an activity in Victoria Falls was $87 (estimated total revenue from activities in Victoria Falls divided by the estimated total number of users per year).

Table 12. Estimates of the total numbers of customers and average prices for the main activities offered by locally-based tourism businesses in Victoria Falls (Source: tourism business survey 2015 and 2019).

Tours	Average duration	Estimated total annual users	Average Price (US$)
Victoria Falls guided tour (excl. Rainforest entry)	2.5 hours	40 000	20
Standard river/sunset cruise	2.5 hours	129 186	50
White water rafting and kayaking	1 day	11 500	150
Game drive (local parks)	half day	2 500	100
Game drives: Chobe day trips	1 day	4 000	180
Gorge swing & Zip Line	30 minutes	3 100	90
Horseback safari	2.5 hours	620	85
Elephant back safari	3 hours	18 000	150
Lion encounter	3 hours	10 500	150
Canoe trails	1 day	4 050	144
Guided angling	3 hours	3 300	130
Guided nature walking	3 hours	800	75
Scenic flights	15 min	60 000	150
Croc-cage diving	20 min	400	70
Bungee Jumping/Bridge Swing	30 minutes	7 500	145
Cultural village tour	2 hours	5 500	50
Boiling Pot hikes	2 hours	400	48

1.7 *VISITOR NUMBERS, OCCUPANCY & ACTIVITY SALES IN LIVINGSTONE*

Similarly, there are no statistics on the total numbers of visitors to the Livingstone area. There are some statistics available for the numbers of visitors entering the National Park to view the Victoria Falls which can be used to derive total estimates in combination with using accommodation statistics and information collected from the interviews with tourism businesses.

1.7.1 *Visitor numbers*

On average just less than 154 200 visitors entered the Park in Zambia each year from 2010 - 2018 (Table 13). From 2012, visitor numbers increased to upwards of 150 000 and only dropping below that in 2015 and 2017.

Table 13. ***Total numbers of international and domestic visitors entering the Rainforest Park gates in Zambia from 2010 to 2018 (Source: Zambia Tourism Board 2019)***

Year	International	Domestic	Total
2010	51 411	86 737	138 148
2011	40 206	92 847	133 053
2012	42 090	108 915	151 005
2013	51 969	100 983	152 952
2014	45 303	108 487	153 790
2015	29 575	112 354	141 929
2016	51 450	116 260	167 710
2017	35 964	113 666	149 630
2018	68 523	130 986	199 509
Average	**46 277**	**107 915**	**154 192**

From the interviews and conversations with tourists it was established that approximately 98.2% of visitors to Livingstone overnight in the area. Similarly to Victoria Falls, there are a small number of day visitors that come to the study area from Botswana but the majority of visitors stay overnight and participate in the activities. The average length of stay for visitors in Livingstone is 2.9 days, as indicated by the accommodation establishments, activity providers and previous tourism studies.

1.7.2 Occupancy of accommodation establishments

Accommodation establishments in Livingstone reported similar seasonal trends in bed occupancy (Figure 16) with the high season occurring from May to September with peaks over the Easter period in April and Christmas/New Year period in December and early January. Businesses indicated that they receive on average 72% of their annual turnover during the high season months. All of the accommodation establishments interviewed recorded their highest levels of occupancy in July and August and their lowest levels in February. International guests from beyond the SADC area made up 60%, regional guests 24% and local guests 16% of the occupancy on average each month.

Average annual bed occupancy rates for Livingstone reported by accommodation establishments were in the range of 30 – 66%. The overall annual bed occupancy rate for hotels and upmarket safari lodges in Livingstone was estimated to be 49.3% and for self-catering, guesthouses, B&B's and backpackers/camping was 30%. This was based on reported occupancy figures, previous Livingstone tourism studies and figures reported by the Ministry of Tourism and Arts in the annual tourism statistic reports. This translates into an estimated total of 572 296 bed nights sold per annum in Livingstone (Table 14).

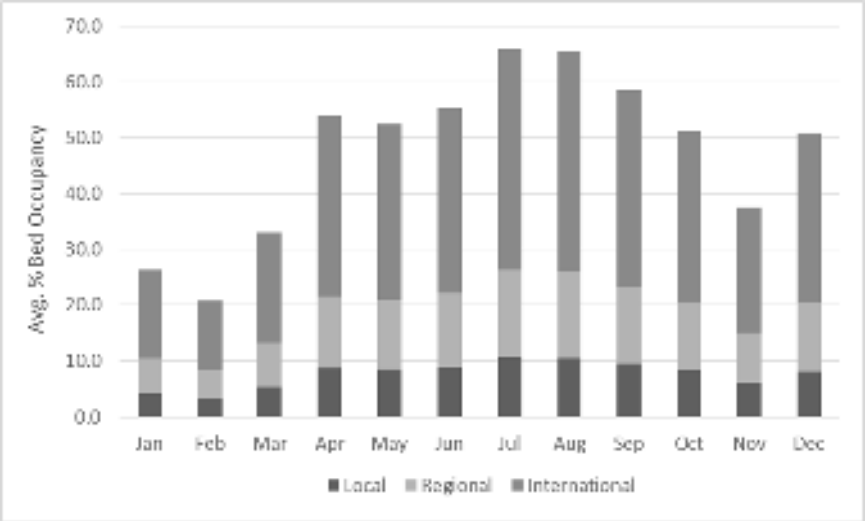

Figure 16. ***Seasonal patterns in bed occupancy in Livingstone reported by the accommodation establishments interviewed, broken down by local, regional and international guests.***

Table 14. ***Average bed occupancy rates and estimated overall annual bed nights in Livingstone (Africa Albida Tourism 2017).***

Type of accommodation	Number of beds	Average annual bed occupancy	Estimated annual bed nights
Backpackers and campsites	523	30.00%	57 269
Self-catering	318	30.00%	34 821
Guest Lodge / Guest House / B&B	872	30.00%	95 484
Hotel	1 804	49.30%	324 621
Upmarket Safari Lodge	334	49.30%	60 102
TOTAL	**3 851**		**572 296**

1.7.3 Estimated demand for tourist activities

In Livingstone the activity providers reported similar trends in activity sales over the year (Figure 17). The high season was reported to be from June to October and the last two weeks in December. This is the same as what was reported by the activity providers in Victoria Falls. July and August are the busiest months with more than 70% of sales. During the high season months, businesses reported that they receive on average 70% of their annual turnover.

All businesses reported that February is their worst month for selling activities. The low activity sales in Livingstone during the low season months are similar to activity sales patterns in Victoria Falls, which are a combination of not just decreased tourist numbers to the area over this time, but are also due to the availability of certain activities at that time of year. From January river water levels become too high and the availability and extent of some river activities

become compromised. White water rafting and kayaking is only available for a half day from rapid 10, Livingstone Island (Devil's Pool) tours are not available and some hiking and angling activities in the gorge are suspended due to the high water levels. In most years from March to May the water levels become dangerously high and white-water rafting is closed completely for a few weeks.

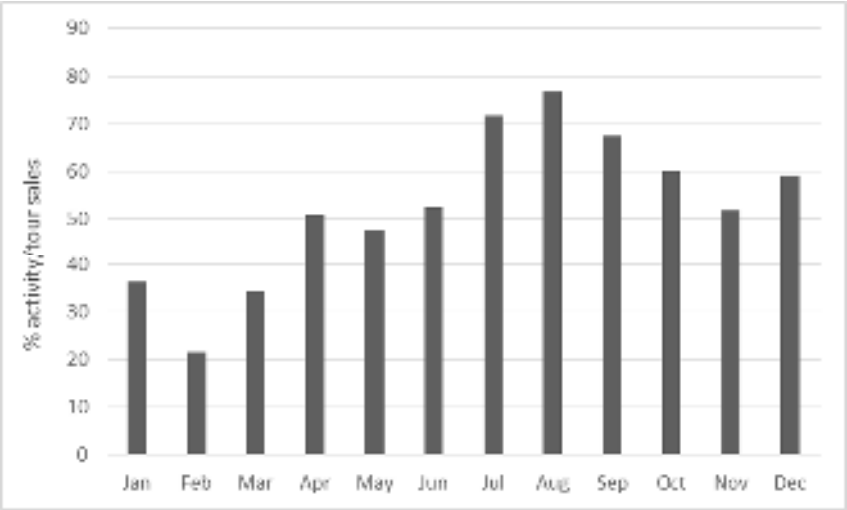

Figure 17. ***Seasonal patterns in activity and tour sales in Livingstone as reported by activity providers and tour operators.***

Tourism businesses estimated the percentage of their clients participating in different activities whilst in Livingstone. Approximately 98% of clients visit the National Park to view the Victoria Falls (Figure 18). Wildlife safaris and river cruises are also very popular with 63% of clients choosing to do these activities. Just under 45% of visitors take part in white water rafting and 29% choose to do the scenic flights over the Falls. Percentage participation in bungee jumping, cultural tours and scenic flights was reportedly less in Livingstone than in Victoria Falls.

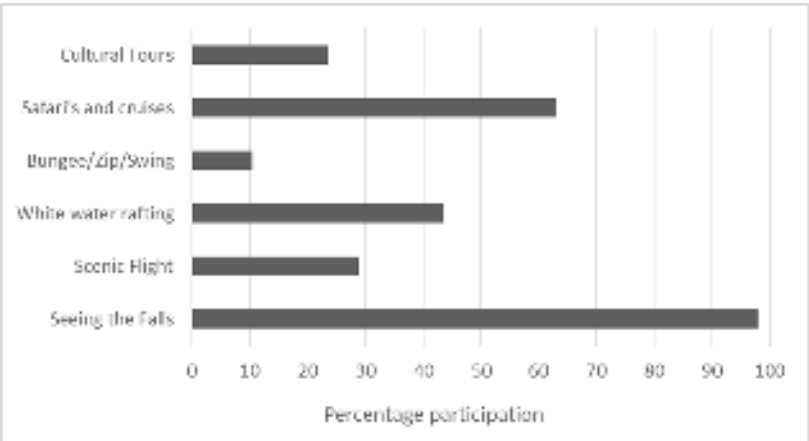

Figure 18. ***Percentage visitor participation for some of the most popular activities offered in Livingstone as recorded from business interviews***

Table 15. ***Estimates of the total numbers of customers and average prices for the main activities offered by locally-based tourism businesses in Livingstone (Source: estimates from tourism business survey in 2015 and 2019).***

Activities & Tours	Average duration	Estimated total annual users	Avg. Price (US$)
Victoria Falls guided tour (excl. Park entry)	2.5 hours	20 000	30
River cruises	2.5 hours	75 000	65
White water rafting and kayaking	1 day	9 500	170
Game drive: local parks	half day	1 500	65
Game drive: Chobe day trips	1 day	4 000	190
Horseback safari	2.5 hours	1 500	80
Elephant back safari	3 hours	10 000	175
Lion encounter	3 hours	5 000	160
Canoe trails	1 day	2 200	145
Guided angling	half day	2 500	145
Guided nature walking	3 hours	2 140	85
Scenic flights	15 min	25 000	180
Abseil/Gorge Swing/High wire	half day	5 000	140
Cultural village tour	2 hours	3 000	50
Under the Spray Tour	3 hours	375	70
Livingstone Island Tour (Devils Pool)	2 hours	2 900	95
Raft Float/Drift	half day	200	80
Quad Biking trails	1.5 hours	1 050	80

The estimated total number of different activities and tours provided by tourism businesses in Livingstone are outlined in Table 15. Data on the exact numbers of trips and activities being offered by all activity providers in Livingstone or the exact number of tourists taking part in each activity were not available. However, information obtained from tourism activity businesses and accommodation establishment interviews, the internet and previous tourism studies was used to generate our estimates which provide a baseline for the approximate number of activities sold.

In Livingstone there are fewer river boats offering cruises than in Victoria Falls but these still form a significant amount of activity sales with approximately 75 000 cruises sold annually. There were approximately 9 500 white water rafting sales and 25 000 scenic flight sales. The average price paid for an activity in Livingstone was $101 (estimated total revenue from activities in Livingstone divided by the estimated total number of users per year). This was slightly more than the average price of an activity in Victoria Falls, owing to the fact that in Livingstone activities are taxed at 15% whereas in Victoria Falls activities are not taxed and there are two entities charging fees for activities (Parks and Wildlife Authority and the National Heritage Conservation Commission) in Livingstone.

1.8 SUMMARY OF TOTAL VISITOR NUMBERS TO THE STUDY AREA

A summary of the estimated number of people visiting the area is given in Table 16. Based on the average length of stay in both towns, and the proportion of day visitors estimated from business surveys, it was estimated that approximately 545 000 people visit the study area annually, spending a total of 1.47 million bed nights (Table 16).

Table 16. Estimation of the total annual visitors to the study area and the total number of bed nights spent in the study area.

	Victoria Falls	Livingstone	Total
Total bed nights in study area (Table 10, Table 13)	888 410	572 296	1 460 706
Average nights per overnighting visitor	2.6	2.9	
Number of overnight visitors	341 696	197 343	539 040
Number of day visitors to area	8 607	3 617	12 224
Total number of visitors to the study area	**350 303**	**200 960**	**551 264**
Total visitor days	897 017	575 913	1 472 930

The day visitor numbers were estimated using data collected from the tourism business surveys and the Rainforest Park visitor numbers, however the number of day visitors to the area that do not visit the Rainforest Park cannot be estimated, as no visitor surveys have been conducted in the area. Tourism businesses estimated that approximately 1.8% of visitors to Livingstone and 2.5% to Victoria Falls are day visitors. This low percentage is expected given the distance from other major centres to the study area and that the activities on offer are time consuming and often start early in the morning requiring visitors to overnight.

1.9 DIRECT AND INDIRECT ECONOMIC IMPACTS

1.9.1 Visitor expenditure in Victoria Falls and Livingstone

Individual tourist surveys were not conducted in the study area and therefore average daily expenditure was not captured. The total expenditure of tourists in the study area was therefore estimated using information from the accommodation and activity business interviews, in conjunction with the total tourist numbers and bed nights estimated above in Table 16. The calculations are shown in the tables below.

Average expenditure on accommodation for tourists was calculated by taking into account the recorded accommodation prices for both the high and low season as indicated in the accommodation questionnaire and on advertised online rates which were used to get an average room rate in each category. The

average rate per night was estimated to be the same for both Livingstone and Victoria Falls accommodation establishments. The average rates for each type of accommodation were multiplied by the total estimated bed nights to reach a total accommodation spend of $105 million in Livingstone, $157 million in Victoria Falls and **$262 million** in the study area (Table 17).

Table 17. Estimated total annual accommodation spend in Livingstone, Victoria Falls and the study area as a whole in 2018 (US $ '000)

Type	Avg. per night spend (US$)	Total accommodation spend Livingstone	Total accommodation spend Victoria Falls	Total accommodation spend in study area
Backpackers & campsites	40	2 291	4 643	6 934
Self-catering	50	1 741	1 962	3 703
Guest Lodge Guesthouse B&B	50	4 774	8 121	12 895
Hotel	250	81 155	122 230	203 385
Upmarket Safari Lodge	250	15 026	20 440	35 466
TOTAL		**104 987**	**157 396**	**262 383**

While it was not possible to obtain comprehensive data on the total number of people participating in activities and tours annually, customer numbers and activity sales were estimated for the most popular activities in the study area using data collected from interviews with the activity businesses and previous tourism studies. Based on these data it was estimated that about 301 000 activities and tours were purchased in Victoria Falls and about 171 000 in Livingstone annually from locally based activity providers (Table 12, Table 16). This includes activities such as full-day game drives into Botswana from the study area. The expenditure on tours was estimated to be in the order of $43.3 million for the study area as shown in Table 18. White-water rafting activities generated approximately $3.4 million, with only scenic flights, river cruises and elephant back safaris generating more than this (Table 18).

Park revenues were estimated by multiplying Rainforest Park visitor numbers in Zimbabwe by the entrance fee of $30 for international tourists, $20 for regional tourists and $8 for local tourists and Rainforest Park visitor numbers in Zambia by the entrance fee of $20 for international tourists and $2 for local tourists. A total of $6.7 million is spent by tourists who enter the Rainforest Park (Table 19). These values do not include the extra park fees that are paid by tourists when participating in any of the activities within the National Parks. For example, all river cruises have a $10 park fee as part of the activity price as do all the other water-based activities, such as white water rafting. White water

rafting on the Zambian side faces two fees: an entry fee which is paid to the National Heritage Conservation Commission and exit fee which is paid to Parks and Wildlife Management Authority. Including these extra fees becomes difficult because some activities have the park fee already included in the selling price whereas others do not. Therefore, these estimations are conservative as they do not, for the most part, consider the extra park fees included in activity sales.

Table 18. ***Estimate of total numbers of different types of activities purchased from local activity providers in Livingstone and Victoria Falls, and the overall revenues generated in the study area (US$)***

Activities & Tours	Total Expenditure Livingstone	Total Expenditure Victoria Falls	Estimated Total Expenditure in study area
Victoria Falls guided tour (excl. Rainforest/Park entry)	600 000	800 000	1 400 000
River cruises	4 875 000	6 459 300	11 334 300
White water rafting and kayaking	1 615 000	1 725 000	3 340 000
Game drive: local parks	97 500	250 000	347 500
Game drive: Chobe day trips	760 000	720 000	1 480 000
Horseback safari	120 000	52 700	172 700
Elephant back safari	1 750 000	2 700 000	4 450 000
Lion encounter	800 000	1 575 000	2 375 000
Canoe trails	319 000	583 200	902 200
Guided angling	362 500	429 000	791 500
Guided nature walking	181 900	60 000	241 900
Scenic flights	4 500 000	9 000 000	13 500 000
Abseil/Gorge Swing/High wire	700 000	279 000	979 000
Cultural village tour	150 000	275 000	425 000
Under the Spray Tour /Boiling Pot hikes	26 250	19 200	45 450
Livingstone Island Tour (Devils Pool)	275 500		275 500
Raft Float/Drift	16 000		16 000
Quad Biking trails	84 000		84 000
Croc-cage diving		28 000	28 000
Bungee Jumping/Bridge Swing		1 087 500	1 087 500
TOTAL	**17 232 650**	**26 042 900**	**43 275 550**

Table 19. ***Total annual expenditure (US$) on park fees for the Rainforest Park and for the study area.***

Type	Zimbabwe park fees (US $)	Zambia park fees (US $)	Park fees expenditure Victoria Falls	Park Fees expenditure Livingstone	Total Park Fees expenditure Study Area
International	30	20	3 074 800	925 540	4 000 340
Regional	20		2 049 867		2 049 867
Local	8	2	471 160	215 830	686 990
TOTAL			**5 595 827**	**1 141 370**	**6 737 197**

The other expenditure reflected in (Table 20) is additional spend by tourists on food, retail and beverage services as well as on local crafts and curios. The figure of $80 per person per day in Vic Falls and $75 per person per day in Livingstone was developed using the average cost and pricing structures for food and beverages (Banda & Cheelo 2012) and curios (DCDM 2006) in the study area. This figure does not include any accommodation or activity expenditure. This estimate of additional spend is considered conservative as it does not include other services such as taxi rides or fuel.

Table 20. ***Estimated total tourism expenditure in the study area (US$ '000)***

Description	Vic Falls	Livingstone	Study Area
Expenditure on accommodation (Table 16)	**157 396**	**104 987**	**262 383**
Total expenditure on activities (Table 17)	**26 043**	**17 233**	**43 276**
Total expenditure on park fees (Table 18)	**5 596**	**1 141**	**6 737**
Total tourist days	881 322	575 913	1 457 235
Other expenditures per tourist per day	$ 80	$ 75	
Total other expenditure	**70 506**	**43 194**	**113 700**
Estimated total expenditure in study area	**259 541**	**166 555**	**426 096**

Overall annual expenditure by tourists to the study area on accommodation, activities, food and beverages and local curios was estimated to be $260 million in Victoria Falls (a substantial increase on the 2015 estimate of $158 million), $167 million in Livingstone (an increase on the 2015 estimate of $145 million) and **$426 million** within the study area in 2018 (Table 20).

1.9.2 Employment

The direct contribution of tourism to the regional economy includes the total expenditure by tourists in the study area and the total number of jobs created. In addition, the direct contribution also considers direct employment generated by accommodation and tourism activity businesses.

The tourism business survey findings indicated that 77% of staff employed in Victoria Falls were full time, 15% were part time and 8% were employed casually. In Livingstone the findings were almost identical with 78% of staff full time, 14% part time and 8% employed casually. Full time staff numbers remain relatively constant over the year with businesses employing more part time staff and casual staff over the high season months. In Victoria Falls 75% of full time staff, 98% of the part time staff and 91% of the casual staff are originally from the area whereas in Livingstone it was indicated that 93% of the full time staff, 96% of the part time staff and 98% of the casual staff are originally from the area.

Data collected from the tourism business surveys, previous tourism studies in the area and government statistics were used to estimate employment numbers. In Victoria Falls, larger hotels and safari lodges employed on average 189 staff and self-catering establishments, guesthouses and backpackers employed on average 10 staff per establishment. In Livingstone the larger hotels employed on average 155 staff, the upmarket safari lodges 35 staff and the smaller guesthouses, self-catering establishments and backpackers on average 10 staff per establishment. Activity provider businesses were estimated to employ on average 25 staff in Victoria Falls and 26 staff in Livingstone.

Accommodation establishments in the study area therefore employed approximately 8 750 staff and the activity providers in the study area employed approximately 3 320 staff (Table 21). This equates to a little over 12 000 employees in the study area. However, approximately 1 800 of these are estimated to be part time workers and 970 casual workers. The employee to bed ratios for accommodation establishments in both Victoria Falls and Livingstone was 0.5, but when self-catering and campsites were not included the ratio increased to 0.7.

Table 21. Approximate employment in the study area

	Victoria Falls Total	**Livingstone Total**	**Study Area Total**
Accommodation	5 300	3 450	8 750
Activity providers	2 220	1 100	3 320
Total	**7 520**	**4 550**	**12 070**

From the business interviews it was understood that in Victoria Falls approximately half of the 2 220 activity business jobs were provided by six local tourism activity businesses, four of which operate white water rafting tours. In Livingstone it was estimated that three activity businesses employed roughly half of total estimate, one of which operates white water rafting tours.

Based on the employment data (Table 20), the national minimum wages in Zambia and Zimbabwe, and the estimated gratuity for both accommodation

and activity provider employees, total annual wages comes to about $42 million for the study area (Table 21). From the interviews, it was estimated that accommodation employees would receive on average 15% of their monthly wages in gratuities, while activity provider employees would receive on average 50% of their monthly wages in gratuities.

Table 22. ***Estimated total annual wages for accommodation and activity provider employees in the study area ($ '000).***

	Victoria Falls Total Annual Wages	Livingstone Total Annual Wages	Study Area Total Annual Wages
Accommodation	19 945	7 629	27 573
Activity providers	10 934	3 145	14 079
Total	**30 878**	**10 774**	**41 652**

In Victoria Falls tourism businesses indicated that if customer levels decreased consistently by one third of current levels they would on average be forced to lose 20% of their staff. In Livingstone businesses indicated that this figure would be 26%. This equates to approximately 2 700 jobs that would be lost if tourist numbers decreased by a third of current levels.

1.9.3 Overall economic impacts

The total impact of tourism in the study area is much greater than the direct expenditure by tourists described above. The businesses providing tourism services purchase input goods and services from other businesses. This expenditure is the indirect impact of the direct tourism expenditure. The tourism sector has both forward and backward linkages with industries such as agriculture, manufacturing, and transport. Growth in tourism therefore has a direct impact on the performance of a wide range of downstream sectors that are linked to the tourism sector (Abel *et al.* 2013).

Tourism businesses reported that the following expenses contribute most to their monthly costs:

- Maintenance and repairs to buildings, vehicles, equipment and boats
- VAT
- Other taxes/rates such as water and electricity
- Permits such as National Park and tourism permits to be able to operate a tourist activity
- Fuel
- Marketing and advertising
- Catering
- Royalties
- Insurance and accounting services

Businesses in Victoria Falls indicated that 67% of this is spent locally, 27% nationally and 6% internationally. In Livingstone 84% was spent locally, 7% nationally and 9% internationally.

Based on ratios and multipliers from WTTC (2018a, b), the direct value added by tourism was estimated to be $148 million for Victoria Falls and $89 million for Livingstone (Table 23). When the indirect impacts are considered, the total contribution of tourism in the study area is estimated to be in the order of $281 and $164 million to the GDP of Zimbabwe and Zambia, respectively (Table 23).

Table 23. ***Overall direct and indirect economic impacts of tourism in the study area (US$ millions), based on multipliers derived from the WTTC (2018a, 2018b)***

Business Sales	Gross output	Direct value added	Indirect value added	Total contribution to GDP
Victoria Falls	260	148	133	281
Livingstone	167	89	76	164

The direct and total contribution of travel and tourism to GDP in Zimbabwe during 2017 was $512 million (3.0%) and $1 200 million (7.1%), respectively (WTTC 2018a). In Zambia the direct and total contribution was $778 million (3.2%) and $1 787 (7.3%), respectively (WTTC 2018b). The direct GVA reflects the income generated by industries such as hotels, airlines and travel agents but also includes activities associated with restaurant and leisure industries directly supported by tourists (WTTC 2018a, b). This study has estimated that tourism in the study area accounts for 23% of the value of tourism in Zimbabwe and 10% in Zambia.

1.9.4 The tourism value of the Batoka Gorge

This study set out to investigate the current value and economic contribution of tourism to the study area with a focus of trying to estimate, in particular, the contribution that the tourism activities offered in the Batoka Gorge make to this overall tourism value. This was estimated on the basis of visitor activity sales reported in the business interviews and the business owners' perceptions of visitor interests as well as information collected from lodges located along the gorge and other local experts in the area.

The Batoka Gorge is estimated to contribute just less than $6.5 million in direct tourism expenditure (excluding park fees generated by the activities undertaken in the gorge) in 2018, down from the estimated $7.5 million in 2015 (Table 24). When park fees are included, this amount is just less than $7 million, down from just less than $8 million in 2015. Accommodation establishments located along the edge of the Batoka Gorge have extensive views of the Gorge and the river below. A number of the guests staying at these lodges are birders and hikers choosing to stay at these lodges for this reason. These lodges contribute approximately $1.4 million in tourism expenditure. White water

rafting is the most popular activity downstream of the Falls and is the largest contributor to tourism value with almost $3.4 million in tourist expenditure annually. Angling, birding, hiking and canyoneering are estimated to contribute over $250 000 dollars annually.

Business interviews with flight operators indicated that a proportion of their clients choose to do the scenic flight with a particular interest in seeing the Batoka Gorge. A number of these tourists are elderly, and this provides the only opportunity for them to experience the Gorge. Based on these interviews it was assumed that 10% of the scenic flight clientele would choose not to do the flight if views of the Batoka Gorge were significantly different to what they are today. Therefore, it is estimated that 10% of the total scenic flight expenditure is attributable to the Gorge.

Table 24. Total annual tourism expenditure attributable to the Batoka Gorge (US$)

Type	Estimated Value
Accommodation	1 407 805
White water rafting	3 340 000
Birding and hiking	82 279
Angling	158 300
Scenic Flights	1 350 000
Canyoneering	16 000
Subtotal	**6 354 384**
Park Fees	506 600
TOTAL	**6 860 984**

The above figures represent only the direct tourism expenditure on these activities and do not include the full impact of these tourists in terms of their expenditure on accommodation, restaurants and retail outlets. Many of the gorge activities start early in the morning, and most visitors undertaking them are overnighting in the area. Based on data collected during the tourism business interviews a weighted average of 19.7% was used as an estimate for tourists to the study area taking part in at least one of the gorge activities (white-water rafting, scenic flight, fishing, hiking, and birding). Based on the average expenditure and length of stay in each town, it is estimated that tourists participating in gorge activities spend approximately **$74 million,** up from the estimated $50 million in 2015.

The lodges along the Gorge employ about 60 staff and contribute a total of about $190 000 per annum to wages. The white water rafting companies are estimated to employ approximately 250 staff (full time, part time and casual). It is not possible to quantify exactly how many are part time and casual because of the lack of employment data provided by some of the businesses and also because of the dynamics of the rafting industry. Every season is different and is dependent on tourist numbers and length of rafting season. Part time and casual staff change every year and the numbers fluctuate regularly depending

on the tourist market and also on the numbers of local villagers looking for extra income. It is estimated that 100 staff in the rafting industry are full time employees.

1.10 NON-USE VALUE

The above analysis focuses on the tangible benefits generated as a result of the attributes of the study area, which are directly measurable in terms of contribution to the economy. It is important to recognise that individuals and communities also derive value from environmental assets in many other ways which are not as easily measured in monetary terms (Perman *et al.* 2011). Environmental economics considers the "total economic value" (TEV) of an environmental asset to include both "use" and "non-use" values. Use values can be consumptive use such as fishing, or non-consumptive, such as photographic tourism (Perman *et al*. 2011). Non-use values include the value of having the option to use the resources (e.g. genetic) within an area in the future (option value), and the value of knowing that the biodiversity associated with an area or ecosystem is protected (existence value). The latter values are theoretically reflected in society's willingness to pay to conserve these resources, and are at least partly revealed by donations, non-government and government expenditure on the maintenance of these assets. Although the methodology is less than perfect, non-use value can be estimated through stated-preference methods, but this was beyond the scope of this study. However, it is important to highlight that in the case of a unique asset such as this, the non-use value to global society is likely to be high.

2 IMPACT ASSESSMENT

2.1 IMPACT ON WHITE WATER ACTIVITY BUSINESSES

Based on the flow descriptions and data provided in Section 10.2.3 of the Biophysical Environment Impact Assessment included in the ESIA, the following was concluded about the extent to which the operating of white-water rafting would be impacted with the proposed BGHES impoundment in place (FSL 757m ASL during the wet, high-water season and FSL 730m ASL during the dry, low-water season):

- Based on the hydraulic analysis the proposed BGHES would prevent any rafting during the high-water season (between January to July) since the river reach from rapid 10 would be submerged by the reservoir
- Rafting would be compromised throughout January and July due to flow velocities being significantly affected from rapid 7b
- Rafting would only operate from rapid 1 to rapid 9 or 10 during the low-water season (between August to December)

Note that this has changed since 2015, when only FSL 757m ASL was being considered year-round. This would have resulted in rafting only taking place from rapid 1 to rapid 5 during the low-water season, a situation considered to be unviable for all rafting operators.

With the proposed amendments to the operating levels, rafting would be available for approximately 136 days per year, between August and December, and would include rafting from rapid 1 to rapid 9/10. The practicality and feasibility of this for rafting companies makes rafting less viable under such conditions but, according to the diversified activity provider businesses interviewed, they would still operate under these conditions but would likely have to downsize and therefore retrench some employees. The white-water rafting companies not providing alternative activities indicated that this will likely force them to close their businesses in the study area.

The low-water season is where rafting companies make the majority of their annual revenue, however, the bulk of this is made up of full-day rafting trips. Using the proportion of activity sales during the low-water season provided by businesses, Vic Falls would receive approximately 6 900 rafters a year and Livingstone would receive approximately 6 175 rafters a year, for a total of 13 075 rafters a year (62.3% of the average annual number of rafters; Table 25). Using the same average rafting rates of $150 for Vic Falls and $170 for Livingstone, the total value generated by rafting would decline by 37.5% to just over $2 million per year. The economic impact of this would be significant and losses in direct tourism expenditure would be around $2 million. Indirect expenditure lost would be much larger than this. Many of those working in the rafting industry would lose their jobs. Retrenchment costs could be substantial for rafting companies.

Table 25. ***The estimated number of rafters per year and the value generated for rafting businesses if the BGHES were to go ahead at the proposed operating levels.***

	Vic Falls	Livingstone	Total
Number of rafters	6 900	6 175	13 075
Value ($)	1 035 000	1 049 750	2 084 750

Significance of impact (pre-mitigation)

Based on the analysis provided above, it is assessed that the socio-economic impact relating to white water activities on the Zambezi River upstream of the reservoir impoundment will be a "**Major Impact**" pre-mitigation (refer to Table 26). This is based on the magnitude of the impact being assessed as Large, as the impacts effect all white water activity companies, their staff and other businesses associated indirectly with the rafting industry.

Table 26. ***Rating of Impacts Related to White Water Activities (Pre-Mitigation)***

Type of Impact		
Direct Negative Impact		
Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact affects white water businesses in Victoria Falls and Livingstone and will adversely affect local communities in the study area.
Duration	Permanent	The impact will be permanent.
Scale	Large	Impact to businesses and local communities will be significant: job losses, decreased daily income, and complete closure of some businesses. Indirect impacts include the losses experienced in other sectors associated with the rafting industry (e.g. maintenance and servicing).
Frequency	Constant	The impact will be permanent
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Large		
Sensitivity/Vulnerability/Importance of the Resource/Receptor		
High		
The vulnerability and importance of this receptor is rated as high		
Significance Rating Before Mitigation		
Major		

Mitigation

The impacts described in this section are a direct consequence of the reservoir impoundment and, because lowering the operating level to below 730m ASL would not be feasible for power generation, there is no option to mitigate the impact by altering the operating level of the dam. However, to compensate rafting companies for the expected loss in revenues, rafting companies could be granted operating licences, as well as being provided with tax incentives, for

other tourism products and activities which could take place on the reservoir, such as houseboats or lakeside lodges and campsites. This would allow rafting companies to create a full-day trip for tourists by rafting a half day from rapid 1 to 9/10 and then moving guests to a houseboat for a fishing trip or sunset cruise on the reservoir.

Therefore, the compensation that would need to be paid to white-water activity companies that will either go out of business as a result of construction of the dam or that will have to retrench employees would need to be evaluated by ERM as part of the RAP process. In theory, such compensation can fully address the direct white-water rafting business impact. However, note that it would be necessary to compensate all other losers as well. This includes all other companies and employees in associated sectors that gain from the rafting businesses, other businesses that benefit from use of the gorge and more pertinently, the rest of society that suffers a loss of welfare. It will be very difficult and costly to adequately compensate all affected parties.

Residual Impact

Based on the analysis provided above, it is assessed that the impact relating to white water activity businesses upstream of the reservoir impoundment will be a "**Major Impact**" post-mitigation (refer to Table 27). This is based on the magnitude of the impact remaining as Large.

Table 27. Rating of Residual Impact Related to White Water Activities (Post-Mitigation)

Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact affects white water businesses in Victoria Falls and Livingstone and will adversely affect local communities in the study area.
Duration	Permanent	The impact will be permanent.
Scale	Large	Large impact to white water rafting businesses and local communities as there may be complete closure of some businesses with associated job losses but for others. Losses from white water rafting could be compensated for by other tourism opportunities and incentives on the reservoir; however, the impact would remain large.
Frequency	Constant	The impact will be a permanent occurrence as long as the reservoir remains.
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Large		
Significance Rating After Mitigation		
Major		

2.2 *IMPACT ON OTHER TOURISM ACTIVITY BUSINESSES MAKING USE OF THE GORGE*

Based on the flow descriptions and data provided in Section 10.2.3 of the Biophysical Environment Impact Assessment included in the ESIA, the following was concluded about the extent to which other activities such as scenic flights, hiking and birdwatching would be impacted with the proposed BGHES impoundment in place (FSL 757m ASL during the wet, high-water season and FSL 730m ASL during the dry, low-water season):

- Based on the hydraulic analysis the extent of the flooded area from the reservoir extends well into the Victoria Falls National Park and Mosi-oa-Tunya National Park
- The backwater effect from the reservoir causes a rise in the natural water levels extending as far as the bottom of the third gorge (after rapid 5) during the high-water season and as far as the bottom of rapid 9/ 10 during the low-water season.

As a result of the inundation of the rapids, it is expected that the available habitat for river borne insects will be severely reduced. With fewer river borne insects to feed on, insectivorous birds and bats will move out of the gorge, further impacting on the larger raptors relying on them for prey. The increased water levels up the Gorge will remove prime habitat along the sheer cliff faces. Decreased food availability and the removal of prime nesting sites will force raptors such as the Taita Falcons and Peregrine Falcons to move out of the gorge. Without these rare raptors and other birds in the Gorge, birders will no longer be attracted to the area and guided birding trips in the gorge will no longer operate. These trips form a significant part of guided birding activities in the area.

Hiking in the gorge will be affected in that hikers will only be able to hike for a few months of the year (during the low-water season) and for a short distance (to rapid 9/10) along the bottom of the Gorge due to the increased water levels from the reservoir. Overnight hiking and camping trips will also be impacted as water levels rise and remove hiking trails and camping sites along the edge of the river. Even during the low-water season when the dam is operating at FSL 730m ASL, the areas previously inundated by water will be muddy, slippery and unconducive to hiking and camping. Again, these activities form a major component of guided hikes in the area.

While the Falls are the main attraction of scenic flights, the gorge also adds significant value to this visitor experience, and the inundation of the gorge could reduce the demand for these flights.

Significance of impact (Pre-mitigation)

Based on the analysis provided above, the tourism activity businesses making use of the gorge for activities other than white-water activities will suffer a "**Major Impact**" pre-mitigation (refer to Table 28). This is based on the magnitude of the impact being assessed as Large, as the impacts of the reservoir are likely to prevent hiking and birding in the long term and could reduce the demand for scenic flights. It is understood that once the birds move off due to lack of food and nesting sites the probability of them returning is extremely low.

Table 28. Rating of Impacts Related to Birding and Hiking (Pre-Mitigation)

Type of Impact		
Direct Negative Impact		
Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact affects activity businesses and other tourism businesses in Victoria Falls and Livingstone and will adversely affect local communities in the study area.
Duration	Permanent	The impact will be permanent.
Scale	Large	Impact to businesses offering birding and hiking activities and loss in birding tourists to the area. Local communities will incur job losses and decreased daily income. Indirect impacts include the losses experienced in other sectors associated with birding and hiking (e.g. accommodation sector).
Frequency	Constant	The impact will be a permanent occurrence as long as the reservoir remains.
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Large		
Sensitivity/Vulnerability/Importance of the Resource/Receptor		
High		
The vulnerability and importance of these receptors (and the National Parks themselves) is rated as high, in both ecological and socio-economic terms.		
Significance Rating Before Mitigation		
Major		

Mitigation

The impacts described in this section are a direct consequence of the reservoir impoundment and the only mitigation would be to alter the height of the dam wall and in so doing reduce the extent of the upstream impacts. However, as mentioned above, power generation becomes ineffective below a certain dam wall height and therefore there is no mitigation measure that will adequately alleviate the loss of birding and hiking habitat.

In order to compensate the affected businesses, it would be necessary to establish the amount of turnover that would be lost as a result of inundation. This is likely to be more straightforward in the case of activities involving direct use of the gorge, than in activities such as scenic flights. As discussed above, this does not consider the non-use value associated with the Gorge and the potential permanent loss of an ecosystem and associated endemic flora and fauna.

Residual Impact

Based on the analysis provided above, it is assessed that the tourism activity businesses making use of the gorge for activities other than white-water activities will be a "**Major Impact**" post-mitigation (refer to Table 29). This is based on the magnitude of the impact being assessed as Large.

Table 29. Rating of Impacts Related to Birding and Hiking (Post-Mitigation)

Type of Impact		
Direct Negative Impact		
Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact affects activity businesses and other tourism businesses in Victoria Falls and Livingstone and will adversely affect local communities in the study area.
Duration	Permanent	The impact will be permanent.
Scale	Large	Impact to businesses offering birding and hiking activities and loss in birding tourists to the area. Local communities will incur job losses and decreased daily income. Indirect impacts include the losses experienced in other sectors associated with birding and hiking (e.g. accommodation sector).
Frequency	Constant	The impact will be a permanent occurrence as long as the reservoir remains.
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Large		
Sensitivity/Vulnerability/Importance of the Resource/Receptor		
High		
The vulnerability and importance of these receptors (and the National Parks themselves) is rated as high, in both ecological and socio-economic terms.		
Significance Rating After Mitigation		
Major		

2.3 *IMPACT ON TOURIST ACCOMMODATION ESTABLISHMENTS IN THE GORGE*

Based on the flow descriptions and data provided in Section 10.2.3 of the Biophysical Environment Impact Assessment included in the ESIA, the following was concluded about the extent to which water levels in the Gorge would change with the proposed BGHES impoundment in place (FSL 757m ASL during the wet, high-water season and FSL 730m ASL during the dry, low-water season):

- Based on the hydraulic analysis the extent of the flooded area from the reservoir extends well into the Victoria Falls National Park and Mosi-oa-Tunya National Park
- The backwater effect from the reservoir causes a rise in the natural water levels extending as far as the bottom of the third gorge (after rapid 5) during the high-water season and as far as the bottom of rapid 9/ 10 during the low-water season.

Taita Falcon Lodge on the Zambian side of the river is located just downstream of Songwe Gorge above rapids 15 to 17 (Figure 19). The lodge is located on the edge of the Gorge with views upstream to rapid 15 and downstream to rapid 17. Gorges Lodge is located further downstream on the Zimbabwean side of the river above rapid 18 (Figure 20). Both lodges are built on communal land and concession fees and royalties are paid to the local village communities.
The accommodation establishments along the Gorge will be impacted in the following ways:

- The views from these lodges will be significantly altered as water levels rise and the Gorge environment is completely changed
- The views offered by these lodges as well as their proximity to the Gorge for hiking and birding are their main selling points
- Compromised views, altered landscape and lack of birding/hiking will influence tourist's decision to stay at these lodges
- Tourists will choose to stay at lodges either closer to the Falls or upstream of the Falls where the views are uninterrupted and natural

Acknowledging the above, it is estimated that tourist numbers to these lodges may decrease after the construction of the proposed BGHES. This will result in a loss of revenue as well as the potential loss of staff due to decreased bed occupancy. A further consideration is the potential impact of earthquakes caused by the inundation process which may put these establishments in jeopardy as they are located on the edge of the Gorge walls.

Figure 19. Location of Taita Falcon Lodge in Zambia on the edge of the Batoka Gorge

Figure 20. Location of Gorges Lodge in Zimbabwe on the edge of the Batoka Gorge

Significance of impact (Pre-mitigation)

Based on the analysis provided above, it is assessed that the impact relating to accommodation establishments upstream of the reservoir impoundment will be a "**Moderate Impact**" pre-mitigation (refer to Table 30). This is based on the magnitude of the impact being assessed as medium, as the impacts of the reservoir are likely to change the current views as well as disrupt activities offered by these establishments.

Table 30. Rating of Impacts Related to Accommodation Establishments in the Gorge (Pre-Mitigation)

Type of Impact		
Direct Negative Impact		
Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact affects accommodation establishments located downstream of Victoria Falls and along the Batoka Gorge, as well as local communities in the study area.
Duration	Permanent	The impact will be permanent.
Scale	Medium	Impact to lodges offering birding and hiking activities and loss in birding tourists. Local communities will incur job losses and decreased daily income. Indirect impacts include the losses experienced in other sectors associated with accommodation establishments (e.g. food and beverage industry).
Frequency	Constant	The impact will be a permanent occurrence as long as the reservoir remains.
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Medium		
Sensitivity/Vulnerability/Importance of the Resource/Receptor		
Medium		
The sensitivity and importance of these resources is rated as medium as there is some ability to adapt.		
Significance Rating Before Mitigation		
Moderate		

Mitigation

Currently both of these lodges are marketed for their views and are also very popular amongst birding and hiking tourists. After construction of the proposed BGHES, the views from these lodges will be altered and the birding and hiking opportunities no longer available. The only available mitigation option would be to market the lodges differently to attract visitors coming to the area to enjoy the activities available on the dam. Compensation for altering marketing material should be assessed by ERM as part of the RAP.

The lodges are situated close to the proposed reservoir and visitors to the area wanting to participate in the new activities available on the reservoir would be attracted to these accommodation options. The lodges could provide activities themselves, such as fishing trips and reservoir cruises. Predicting whether

tourists will be attracted to the new activities and the dam, when these activities are currently available upstream of Victoria Falls and on Lake Kariba, is difficult and therefore this mitigation measure needs to be approached with caution. The shaded nature of the gorge, and the fact that the appearance of the gorge sides will be unattractive due to fluctuations in water level leading to vegetation die-off, means that the attractiveness of the inundated gorge area is likely to be limited. If visitors are not attracted to the new activities and visitor numbers decrease over time, then these accommodation establishments could be impacted without mitigation.

Residual Impact

Based on the analysis provided above, it is assessed that the impact relating to accommodation establishments upstream of the reservoir impoundment will be a "**Minor-Moderate Impact**" post-mitigation (refer to Table 31). This is based on the magnitude of the impact being assessed as Small-Medium.

Table 31. Rating of Residual Impact Related to Accommodation establishments in the Gorge (Post-Mitigation)

Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact affects accommodation establishments located downstream of Victoria Falls and along the Batoka Gorge, as well as local communities in the study area.
Duration	Permanent	The impact will be permanent.
Scale	Small to Medium	Small to medium impact to lodges offering birding and hiking activities. Local communities may still incur job losses and decreased daily income. Indirect impacts include the losses experienced in other sectors associated with accommodation establishments (e.g. food and beverage industry). New activities could provide opportunities for new visitors to stay at these lodges.
Frequency	Constant	The impact will be a permanent occurrence as long as the reservoir remains.
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Low to Medium		
Significance Rating After Mitigation		
Minor to Moderate		

2.4 *IMPACT ON LOCAL ECONOMY*

This section describes the overall economic impacts of the proposed BGHES in the study area, focusing on all the possible negative and positive impacts and any mitigation options available. The estimated magnitudes of the impacts are described qualitatively based on information obtained during the tourism business interviews and the site visit.

Based on the flow descriptions and data provided in Section 10.2.3 of the Biophysical Environment Impact Assessment included in the ESIA, the

following was concluded about the extent to which water levels in the Gorge would change with the proposed BGHES impoundment in place (FSL 757m ASL during the wet, high-water season and FSL 730m ASL during the dry, low-water season) and the resulting economic impacts in the study area:

- Based on the hydraulic analysis the extent of the flooded area from the reservoir extends well into the Victoria Falls National Park and Mosi-oa-Tunya National Park.
- The backwater effect from the reservoir causes a rise in the natural water levels extending as far as the bottom of the third gorge (after rapid 5) during the high-water season and as far as the bottom of rapid 9/ 10 during the low-water season.
- Rafting would only operate from rapid 1 to rapid 9 or 10 during the low-water season (between August to December)
- Views of the Gorge will be severely altered downstream of the third gorge, even during the low-water season owing to vegetation die-off along inundated areas during the high-water season. Views of the Gorge from accommodation establishments such as Gorges Lodge and Taita Falcon Lodge will change.
- Flight operations offering scenic views of the Victoria Falls and the Gorge will be affected as the untouched natural vistas of the Gorge are replaced with views of a reservoir.
- Tourism activity businesses offering white water rafting, birding, hiking, camping, and angling will be adversely affected by the rising water levels and inundation in the Gorge.
- Employment associated with these businesses and any service providers linked to these tourism businesses will most likely be negatively affected.
- Knock-on effects of changes in the tourism sector will be significant.
- The overall tourism product offered in the study area will change.

It is estimated that the direct tourist spend on activities in the Gorge is almost $7 million. However, the Batoka Gorge activities currently attract tourists to the area and also encourage further spend as tourists stay longer in the area to participate in a number of activities on offer, spending more on accommodation, food and services. It is estimated that the total tourist spend attributable to the activities offered in the Gorge is close to **$74 million**, about 17% of the total direct tourist expenditure in the study area. Although not all of this will be lost if the BGHES is built, it is expected that a significant portion will be as those tourists that come to participate in gorge activities will either no longer come or will stay for a shorter period of time. Other economic impacts not estimated here include the taxes and permits paid by all activity providers to operate activities in the National Parks and in the Batoka Gorge. These fees are paid to the relative Zimbabwean and Zambian government departments and form a significant part of the expenditure paid each month by the activity businesses. Accommodation establishments and certain activity providers also pay local communities concession fees and royalties to be able to operate tourism businesses on the communal lands. These make a significant contribution to community development with the money contributing to schools, clinics and improved sanitation.

Currently the tourism product offered in Victoria Falls and Livingstone takes the form of adventure and wilderness tourism with a focus on offering unique

adrenalin- and nature-based tourist activities, not offered elsewhere in the region. This study has estimated that tourism in Victoria Falls contributes 29% of the value added by tourism in Zimbabwe, i.e. directly and indirectly contributing approximately 0.9% of the country's GDP. In Livingstone the corresponding figure represents 11% of the value added by tourism in Zambia contributing approximately 0.4% to total GDP. The tourism activities in the Gorge contribute approximately 17% to the total tourism GVA in the study area. Therefore, these activities alone contribute approximately 0.1% of the GDP in Zimbabwe and 0.1% of the GDP in Zambia.

The natural landscapes both above and below Victoria Falls contribute significantly to tourists deciding to visit the area. The Batoka Gorge is one of the very few remaining untouched and completely wild stretches of river in the region, and in the world, and it is this exclusivity and "wow factor" that contributes hugely to the appeal of the area as a tourist destination. Changes to these landscapes and to the activities offered in the area are expected to impact tourism significantly. Construction of the proposed BGHES will potentially alter the tourism product on offer and will also possibly alter the type of tourist expected to visit. The type of tourist will potentially change from younger more adventurous tourists to older, less active tourists interested in visiting the area mainly with the intention of viewing Victoria Falls, a trend already observed but will likely be exacerbated. This will result in fewer activity sales throughout the year as well as a decrease in the average number of days tourists spend in the area. Tourists visiting a number of countries in the region, such as Botswana, Namibia and South Africa could decide to spend longer in these countries and not visit the study area if certain activities were no longer offered. Younger tourists spoken to whilst in the study area in 2015 indicated that they enjoyed the experience of the adventure and cultural activities more than they did the viewing of Victoria Falls, and indicated that they would definitely spend less time in the area if the activities changed. One of the most popular of these adventure activities is white-water rafting which has been operating in the Batoka Gorge for more than 30 years. Construction of the proposed BGHES at the proposed FSL 757m ASL during the wet, high-water season and FSL 730m ASL during the dry, low-water season will alter white-water rafting, birding and hiking, and will change the landscape downstream of Victoria Falls permanently.

The white-water rafting industry as well as other activity providers and accommodation establishments operating in the Gorge provide employment to a significant number of people, most of which are from the communities situated along the Gorge. Based on data collected from tourism businesses that operate in the Gorge, it is estimated that between 400 and 450 staff are employed by the accommodation establishments and activity providers together. This represents a significant contribution to employment and daily household income in the study area. The majority of accommodation establishments and activity providers have been in operation for longer than 20 years and the relationships formed with local communities are well developed. Those employed in the tourism industry are able to contribute significantly to household income. Whilst in the study area, a local rafting guide who has been employed in the rafting industry for 15 years explained how rafting had contributed significantly to daily income and had also contributed positively to the livelihood of his extended family. Part time and casual employment also offers an alternative when agriculture is limited or when crops fail in seasons

of poor rainfall. Loss of employment is estimated to have far reaching negative impacts in an area already struggling with low household income and unemployment.

In Livingstone the majority of tourism businesses interviewed, as well as other locals spoken to whilst on site, were against the construction of the proposed BGHES and believed that the impacts would be catastrophic for their businesses and for the tourism industry in Livingstone. For a small few, they saw the proposed dam as a way to 'kick-start' the recently lacklustre tourism industry in Livingstone. However, every person spoken to believed that the impacts of the proposed BGHES would be much greater and more widespread than anticipated. Many voiced their concerns over the possible delisting of the Falls as a UNESCO World Heritage Site as well as the international perception that the construction of the proposed BGHES will have on tourism. In Victoria Falls the tourism businesses interviewed were not as candid in their responses. One third of the businesses were of the opinion that the proposed BGHES could provide new opportunities and have some positive impact in terms of power generation and local development but also emphasised that the impacts of the dam on tourism should be kept to an absolute minimum where possible. Two thirds were of the opinion that the proposed BGHES should not go ahead and that the impacts on their businesses and on tourism in Victoria Falls would be significant. A number of these businesses were also concerned about the delisting of the Falls as a UNESCO World Heritage Site and the impact this would have on tourism in the area.

The construction of the proposed BGHES could result in a number of negative social implications resulting in economic impacts to the area. These include increased crime rates as a result of easier access between Zambia and Zimbabwe across the Gorge and the proposed reservoir as part of the proposed BGHES. Currently the river and the Gorge are very difficult to cross and illegal crossings are rare. Monitoring this and other criminal activities, such as prostitution, which will arise if new towns either side of the dam are developed and trucks are diverted to this crossing point (see Social Impact Report). These social impacts could influence new business development in the study area and would also influence tourist perceptions of the area.

Based on the above and the baseline data collected during this study, it is estimated that the local area economic impacts associated with the proposed BGHES (FSL 757m ASL during the wet, high-water season and FSL 730m ASL during the dry, low-water season) will be significant and will alter the "sense of place" and tourism product currently offered in Livingstone and Victoria Falls. Certain adventure- and nature-based activities that have been offered for more than thirty years will no longer operate and the knock-on effects of this are estimated to be large. However, tourism is adaptive and estimating the magnitude of the impact is difficult due to the uncertainty involved.

Significance of impact (Pre-mitigation)

Based on the analysis provided above, it is assessed that the economic impact relating to the construction of the proposed BGHES will be a "**Moderate - Major Impact**" pre-mitigation (refer to Table 32). This is based on the magnitude of

the impact being assessed as **Medium to Large**. There is some uncertainty involved in trying to estimate the magnitude of the impacts due to the knock-on effects associated with tourism.

Table 32. Rating of Socio-economic Impacts (Pre-Mitigation)

Type of Impact		
Direct Negative Impact		
Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact will be largest in Victoria Falls and Livingstone but is not completely confined to these two towns and will affect users on both sides of the river/border and the communities along the Batoka Gorge.
Duration	Permanent	The impact will be permanent.
Scale	Large	Direct and indirect economic impacts such as job losses, decreased household income, decreased business revenue and the complete loss of certain activity businesses. Possible change to tourism product and change in type of tourist visiting the area. Possible social implications as a result of the proposed BGHES could see decreased investor and business confidence in the area.
Frequency	Constant	The occurrence will be permanent once the dam is built
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Medium - Large		
Sensitivity/Vulnerability/Importance of the Resource/Receptor		
Medium		
The vulnerability and importance of these resources is rated as medium, as there is some opportunity to adapt within the tourism industry.		
Significance Rating Before Mitigation		
Moderate - Major		

Mitigation

The tourism sector is relatively dynamic and constantly changes as a result of both local, regional and international influences and impacts, such as economic recessions and political instability. The tourism sectors in Zambia and Zimbabwe are sensitive to these changes, as experienced over the last decade. Significant changes to the current tourism product, as a result of the proposed BGHES, are estimated to have significant impacts on the current tourism market.

The only available mitigation measures for the tourism industry in the study area include developing and promoting a new type of tourism market. Most tourists are coming to the area with the intention to view the Victoria Falls. The change in the activities that are available below the Falls will change the type of tourist interested in coming to the area and may also have an impact on the overall numbers of visitors to the area.

New tourist activities could be developed and promoted in the affected area. These new business ventures would be expected to offer new employment opportunities in the area. It is anticipated that these new activities cannot

simply replace the activities currently offered in the Gorge as the experience and product offered will be completely different. The new activities might be similar to the activities already on offer upstream of Victoria Falls and on Lake Kariba which is approximately 50 km away from the proposed BGHES site.

Potential activities offered on the reservoir could include house boats, motor boat activities, dam cruises, canoeing, birding (waterfowl) and angling. All of these are on offer in the area already and it is therefore very unlikely that they will form the primary reason for tourists to visit the area like white-water rafting currently does. It is important however to ensure that the activities developed on the reservoir do not flood the market and impact negatively on the activity businesses upstream of Victoria Falls or on Lake Kariba. In order for these activities to be successful the tourist market and visitor numbers need to be assessed to determine accurately the carrying capacity of the reservoir area and the supply and demand of the market. It is recommended that a comprehensive tourist survey be conducted during the high season months to determine accurately what activities would be the most popular amongst tourists and which activities would not. In doing so, a more focused tourism product can be developed that will attract tourists to the area and will encourage the promotion of new activities.

The construction of small to medium sized safari lodges and tented camps downstream of Victoria Falls in the vicinity of the proposed reservoir could encourage tourists to overnight in the area and to participate in new activities developed on the reservoir. These accommodation facilities would be expected to benefit local communities through employment opportunities and local community development projects.

The very limited mitigation options available focus on tourism marketing and the development of new tourism activities. As described above, these activities are not very promising, especially when compared to the current activities on offer. The businesses and people that lose out from the construction of the proposed BGHES therefore need to be fully compensated (as explained in Section 2.1and 2.2above). Some of these businesses will be forced to shut down completely, whereas others may lose in the form of decreased business sales. In certain cases, compensation may be relatively straightforward to calculate, but in other cases will prove to be extremely difficult. Further consultation with these stakeholders will be required in order to establish acceptable terms.

Residual Impact

Based on the analysis provided above, it is assessed that the socio-economic impacts of the proposed BGHES will be a "**Moderate Impact**" post-mitigation (refer to Table 33). This is based on the magnitude of the impact being assessed as Medium. There will be a resultant clear difference from baseline conditions and the impacts will affect a number of people and businesses in the region but there is some ability to adapt to change brought on by the Project.

Table 33. Rating of Residual Socio-economic Impacts (Post-Mitigation)

Rating of Impacts		
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	The impact will be largest in Victoria Falls and Livingstone but is not completely confined to these two towns and will affect users on both sides of the river/border and the communities along the Batoka Gorge.
Duration	Permanent	The impact will be permanent.
Scale	Medium	Direct and indirect socio-economic impacts such as some possible job losses and decreased business revenue and the potential loss of certain activity businesses. Improved by the possible development of new activities and facilities surrounding the reservoir which will have positive impacts on employment.
Frequency	Constant	The occurrence will be permanent
Likelihood	Likely	The impact is a direct consequence of the reservoir impoundment.
Magnitude		
Medium		
Significance Rating After Mitigation		
Moderate		

2.5 *IMPACT ON BROADER SOCIETY*

It is important to note and consider the cumulative effects of the proposed BGHES. These effects relate to both the use and non-use values associated with the Batoka Gorge and the impacts they have on broader society.

A very similar project is currently underway in the upper Nile Valley near Jinja in Uganda and highlights the complexities involved and the impacts that are felt by locals and by broader society. Tourism businesses and locals are petitioning hard to prevent the complete loss of white-water rafting and associated tourism in the Jinja area. These petitions have garnered signatures from people all over the world, who have either visited the area before or who want to visit the area in the future. Construction of the proposed Isimba Hydro Power Project downstream of the Bujagali hydro-electric dam is underway and once built will remove all rapids currently used for white-water rafting. When the Bujagali Dam was constructed and eliminated some of the white-water rafting, one of the mitigation measures and agreements was to ensure that the stretch of river downstream be protected so that rafting, kayaking and other tourism activities were not impacted further. However, this agreement has not been upheld and construction of Isimba is already underway. The tourism and economic impact assessment recommended that the lowest wall height option be considered to allow white-water rafting and other activities to continue operating on the river. The economic assessment found that tourism generated by the area was a major contributor to the national economy, as is the case with this study, and that the area has important existence and option value associated with it. It is anticipated that white-water rafting on the Upper Nile will be completely lost and the associated tourism sector in Jinja will be significantly negatively affected. Similar ramifications can be expected for this

project. The fact that the main alternative site in Africa for high quality white-water rafting is also under threat further exacerbates the impacts of this project.

Given the rarity of natural features of this kind, the existence value associated with the Batoka Gorge is likely to be significant at a global scale, and it is expected that society's willingness to pay for its protection and continued existence would be considerable. The proposed BGHES will have an irreversible and permanent impact. The non-use value associated with the Batoka Gorge is difficult to quantify and is, to a degree, invaluable and needs to be considered when estimating and describing the overall magnitude of the economic impact associated with the construction of the proposed BGHES.

Option value, the value of having the option to use the resource within an area in the future, also needs to be considered. Members of society who wish to visit the Batoka Gorge in the future, or to white-water raft the Zambezi, will no longer have the option available to them if the dam is constructed. Such losses will impose changes to an individual's or community's future options. Although difficult to quantify, the option value would be significant and is viewed as extremely important by individuals and society as a whole. These losses are unlikely to ever be adequately compensated, if at all.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 CAVEAT

This study was focused on the local economic impacts of the proposed BGHES. It does not consider the broader economic implications of electricity and associated income generation for Zambia and Zimbabwe, or the region as a whole. It is assumed that the ultimate decision as to whether construction of the proposed BGHES should go ahead will take this into account. At a local level, the impacts of the proposed BGHES will be significant and negative. Mitigation options that do not affect the viability of the project are limited. It must be noted that compensation will not be able to cover all of the residual negative impacts that remain after other forms of mitigation. This includes the loss of sense of place, loss of non-use values held by society as a whole, and the loss of livelihoods for people that have few alternatives, even after retrenchment, or for people who obtained benefits informally who may fail to be considered in the compensation process for various reasons. Thus, even with mitigation, the project can only go ahead if the overall benefits make all of these costs strongly justifiable. Should this be the case, then the following should be considered.

3.2 MITIGATION OF IMPACTS

This study has evaluated the proposed BGHES at the lowest viable dam height. In other words, mitigation in terms of lowering the dam height has already been spoken for. The only further mitigation may be to develop alternative tourism ventures in the Gorge and in the area as a whole, that focus on the new reservoir created by the dam, as well as on other attractions. While this will not reduce the loss of the sense of place of the area, it may help to reduce losses in tourism-related income and employment in the area. However, since tourism development within the gorge is unlikely to hold much potential (as discussed above), it may be better to develop and/or improve other forms of tourism in the area. This would have to be done very carefully, so as to improve the attractiveness of the area as a destination, without further impacting on its existing sense of place.

3.3 COMPENSATION

Certain activity businesses are expected to cease, and many other businesses in the area are expected to suffer losses in trade as a result of changes in tourism demand in the area. Thus impacts on businesses will range from total closure to minor losses. Such losses that are incurred as a result of the Project should be compensated. This should include the payment of retrenchment packages by those employers.

Once approval for the Project has been granted all affected parties (businesses and employees) within the study area become eligible for compensation.

Qualified social and economic consultants should be appointed to help with the investigative compensation process and with helping those affected parties who are unsure about compensation to understand the process fully. The following procedural guidelines are recommended:

- **Registration**: all affected parties and potential claimants must be identified and formally registered on a Project register database.
- **Details of claim:** all potential claimants must be interviewed and the nature and details surrounding each claim should be documented with documentation as provided by the claimant (extent of loss, impact on livelihood). The information collected about the individual or the business must be as detailed as possible.
- **Investigation**: Each claim must be investigated thoroughly and this should include cross-referencing information collected from each claimant with records obtained from local government departments, baseline survey information, and other formal structures such as community leaders where applicable.
- **Decision**: each claim must be individually addressed and investigated. Once this process in complete a decision on whether to award or decline the claim should be made. Details about how the claim will be paid out should be decided at this point. Compensation offers should be formulated and signed by both parties.
- **Recording:** All claims decisions should be recorded and kept for auditing and reference purposes.

3.4 MONITORING

If the Project is approved, it is recommended that the potential impacts of the BGHES on tourism in the study area be monitored over time. Monitoring should include an annual survey of tourists visiting Victoria Falls and Livingstone and the annual collection of data from tourist accommodation establishments in the study area. Monitoring should commence before the start of the Project and should continue throughout the construction process.

A detailed tourist accommodation inventory for the study area needs to be developed and should include information about the type and size of every establishment found in Victoria Falls and Livingstone. This information should be monitored and updated annually. A selection of different accommodation establishments (large hotels, backpackers, lodges and guesthouses) should be monitored each year and bed occupancy data collected from each establishment selected for monitoring. All of the accommodation establishments located along the Gorge or with views of the Gorge should be included in the monitoring process. It is also recommended that these establishments record information about their guests, such as nationality, average length of stay and the activities guests participate in. This information should be collected and monitored along with bed occupancy rates. Through this approach any changes to tourism in the study area can be consistently evaluated over time.

4 REFERENCES

Abel, S., Nyamadzawo, J., Nyaruwata, S. & Moyo, C. 2013. Positioning the Zimbabwe tourism sector for growth: issues and challenges. Report prepared by Nathan Associates for USAID Strategic Economic Research & Analysis – Zimbabwe (SERA).

Africa Albida Tourism. 2017. A tourism survey of the Victoria Falls region.

Banda, B. & Cheelo, C. 2012. The costs and pricing of tourism in Zambia. The case of Livingstone. Zambia Institute for Policy Analysis and Research.

Chaunga, C., Morel, M., Kaunda, A., Siwale, A., Mwila, B. S., Mtawali, M. 2013. Efficient and effective marketing of Zambia as a globally recognised leading tourist destination. Tourism and Wealth Series. Policy Monitoring and Research Centre. Policy Brief Two.

DCDM Consulting. 2006. Livingstone Tourism Survey. Support for Economic Expansion and Diversification (SEED) Project. Submitted to Ministry of Tourism, Environment and Natural Resources, Zambia. SEEDPCU/SP/08-05/RFP.

Dixey, L. 2005. Inventory and analysis of community based tourism in Zambia. Report prepared for: Production, Finance and Technology (PROFIT) A USAID Private Sector Development Programme.

Karambakuwa, R. T., Shonhiwa, T., Murombo, L., Mauchi, F. N., Gopo, N. R., Denhere, W., Tafirei, F., Chingarandem, A. & Mudavanhi, V. 2011. The impact of Zimbabwe Tourism Authority initiatives on tourist arrivals in Zimbabwe 2008 – 2009. *Journal of Sustainable Development in Africa* 13(6): 68-77.

McGowen, G. J. 2007. Strategic planning for pro-poor tourism: a case study of Livingstone, Zambia. MSc Thesis, University of British Columbia.

Pope, A. 2005. Luangwa Safari Association Tourism Study. Whydah Consulting Ltd.

Rogerson, C. M. 2004. Adventure Tourism in Africa: The Case of Livingstone, Zambia. *Geography* 89(2): 183-188

Suich, H., Busch, J. & Barbancho, N. 2005. Economic Impacts of Transfrontier Conservation Areas: Baseline of Tourism in the Kavango-Zambezi TFCA. Conservation International South Africa and Swiss Agency for Development and Cooperation.

UNESCO 2014. Mosi-oa-Tunya/Victoria Falls. Advisory Body Evaluation Report. http://whc.unesco.org/en/list/509/ Accessed 23.02.15.

World Travel and Tourism Council (WTTC). 2014a. Travel and Tourism Economic Impact 2014: Zimbabwe

World Travel and Tourism Council (WTTC). 2014b. Travel and Tourism Economic Impact 2014: Zambia.

World Travel and Tourism Council (WTTC). 2018a. Travel and Tourism Economic Impact 2018: Zimbabwe

World Travel and Tourism Council (WTTC). 2018b. Travel and Tourism Economic Impact 2018: Zambia.

Zambia Central Statistical Office. 2012. 2010 Census of Population and Housing: National Analytical Report.

Zambia Ministry of Tourism and Arts. 2014. 2013 Tourism Statistical Digest.

Zambian Development Agency. 2014. Tourism Sector Profile Report.

Zimbabwe Tourism Authority (ZTA). Annual Tourism Trends and Statistics Reports 2000 – 2013. www.zimbabwetourism.net.

Zimbabwe Tourism Authority (ZTA) Database. Provided by the local Victoria Falls ZTA office for this study.

ZimStat. 2012. Zimbabwe Population Census 2012: National Report.

ZimStat. 2012. Zimbabwe Population Census 2012: Matebeleland North Provincial Report.

Cost Benefit Analysis Specialist Study (2015)

Stratecon

Applied Economic Research

Economic Feasibility - Batoka Gorge Hydroelectric Scheme

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Economic Feasibility: Proposed Batoka Gorge Hydroelectric Scheme

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3 February 2016

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Revision History

This section outlines the revisions to the report that was tabled on 3 February 2016

Date	Page/Section	Made by:
5 Feb 2106	iii) ESIA needs	Barry/Antony
	Abbreviations moved to above ES	Barry/Antony
	P29 Two Peak load cases	Barry/Antony
	P34 footnote 12 elaborated	Barry/Antony

Abbreviations

BCR	Benefit Cost Ratio
CBA	Cost Benefit Analysis
ESIA	Environmental and Social Impact Assessment
FSL	Final Supply Level
GDP	Gross Domestic Product
GWh	Gigawatt hour
HES	Hydroelectric Scheme
IRR	Internal Rate of Return
MW	Megawatt
NPV	Net Present Value
PV	Present Value
REA	Rural Electrification Agency [Zimbabwe]
REMP	Rural Electrification Masterplan [Zimbabwe]
SAM	Social Accounting Matrix
SAPP	Southern African Power Pool
ZESCO	Zambia Electricity Supply Corporation
ZRA	Zambezi River Authority

Executive Summary

ERM Southern Africa is currently conducting an Environmental and Social Impact Assessment (ESIA) of the proposed Batoka Gorge Dam and Hydroelectric Scheme for the Zambezi River Authority (ZRA). The hydroelectric scheme is situated upstream of the existing Kariba Dam scheme on the Zambezi River and approximately 50km downstream of the Victoria Falls, a world heritage site. A number of specialist studies have already been completed, including a specialist economic assessment by Anchor Environmental Consultants that focuses on the localised microeconomic impact on the affected tourism related firms in the gorge. The ZRA has requested an economic cost benefit analysis to weigh the potential negative localised economic impact and the environmental impact of the hydroelectric scheme against the positive regional impacts.

This economic report is not a full Economic Specialist report as required by an ESIA. It focusses purely on the economic efficiency of the project and the distribution of the costs and benefits through Zambia and Zimbabwe. An economic specialist report should be coached within the equity, efficiency and sustainability parameters. This report not assess alternative electricity generation plants, the fit with the legislative, regulatory and policy framework of the two countries nor the economic equity and sustainability of the various alternatives (and their associated risks).

Project Description and Study Approach

The key components of the proposed scheme are:

- Dam wall, impoundment and spillway: the proposed high gravity arch dam wall would be 181m in height. The full supply level (FSL) of the reservoir would be 762m above mean sea level;
- Power houses: Two powerhouses, each with an installed capacity of 1 200 MW, would be constructed on each river bank;
- Transmission lines in Zambia and Zimbabwe;
- Access roads in Zambia and Zimbabwe;
- Permanent villages and other ancillary infrastructure (such as quarries, spoils area, construction camps and batching areas).

The underlying assumption in the analysis is that both Zambia and Zimbabwe currently have insufficient electricity. The electricity generated by the proposed Batoka Gorge Hydroelectric

Scheme would be used to service the unserved demand and future economic growth. Any surplus would be exported to the Southern African Power Pool (SAPP).

The following cases are evaluated in the cost benefit analysis:

- Case 1 – base case. The scheme as presented in the Options Assessment Report with an FSL of 762m, producing 10 215 GWh of annual electricity.
- Case 2. Variations in final supply levels. These are 757m, 740m and 730m in the FSL;
- Case 3. Variations in electricity demand.
- Case 4. Lower water storage during the dry season.
- Case 5. This is the base case with peak load electricity exported to the SAPP at peak power prices. Two cases were investigated here.

Baseline Assessment

In Zambia, a number of new generation options are either being planned or commissioned. A number of smaller power stations (maximum installed power of 300 MW) began generating in 2014 and 2015. Two larger power plants, Batoka Gorge (800 MW or 1 200 MW) and Kafue Gorge Lower (750 MW) are expected to begin generating electricity in 2022 (Studio Pietrangeli, 2015, p. 123). It is expected that there would be an estimated unserved demand of 227 MW in Zambia when the proposed Batoka Gorge hydroelectric scheme starts operating in 2022.

At the same time, it is estimated that there would be unserved demand of 444 MW in Zimbabwe that would be supplied by Batoka Gorge. A number of power stations, the majority of which are coal fired, are expected to be commissioned between 2016 and 2020 (Studio Pietrangeli, 2015, p. 121). The larger ones, include CASECO (600 MW) and Hwange 7 & 8 (600 MW).

The generation capacity of Batoka Gorge needs to be seen in the context of the total power generation and demand of the two countries. Under the base case the:

- Installed Power (MW) of Batoka Gorge would cover:
    - 38% of the peak demand for Zambia in 2025 and 29% in 2030.
    - 37% of the total peak demand for Zimbabwe in 2025 and 32% in 2030.
- The generation in GWh would generate sufficient electricity to supply:
    - 23% of the generation forecast in Zambia in 2025 and 18% in 2030.
    - 29% of the generation forecast of Zimbabwe in 2025 and 25% in 2030.

The motivation for the proposed Batoka Gorge Hydroelectric Scheme is that it would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives:

- In Zambia Batoka Gorge:
- is expected to generate the fourth cheapest electricity of the seventeen planned power plants in Zambia (Studio Pietrangeli, 2015, p. 130);
- It is only slightly more expensive than the cheaper options;
- It is the largest planned power generation plant estimated to produce electricity less than half the price of electricity produced by Kafue Gorge Lower, the other large planned power station.
- In Zimbabwe:
- None of the power stations in Zimbabwe are expected to generate electricity at a lower cost than Batoka Gorge;
- The cost of electricity generation from large coal fired power stations (such as CASECO and Hwange) would be up to four times higher than Batoka Gorge.

Costs and Benefits

There are four types of costs:

- The first are those that are the direct result of the building and running of the proposed Batoka Gorge Hydroelectric Scheme. These are divided into construction (capital), running (operation and maintenance) and financing costs.
- The second are those for households which, faced with being able to use newly supplied electricity, need to spend on connection costs and electrical appliances.
- The third is firms which have three types of costs. These are connections cost, fuel for generators and the cost of lost productivity.
- The final cost is the potential negative impact on tourism in the area around the proposed hydroelectric scheme.

There are many benefits from new electrical connections or more reliable electricity generation. These accrue to both households, firms and the electricity utility:

- Firms:
    - Savings in generator costs;

  - Savings from fewer power outages.
- Households:
  - Alternative fuel savings;
  - Increased income;
  - Health benefits.
- Electricity Utility:
  - Export revenue.

Results of the Economic Analysis

Cost Benefit Analysis

- Case 1: Base case, with an FSL of 762m:
  - The NPV is R11 625m. This is economically efficient and would benefit both Zambia and Zimbabwe.
  - The BCR is 4.71. This means that for every $1.00 spent on the project society would benefit by $4.71. This is a robust result.
  - The IRR is 28%.
- Case 2: Different dam heights: There are lower costs and benefits with a lower dam wall. Benefits reduce more proportionately than costs. The BCR and IRR for an FSL of:
  - 762m (base case) are 4.71 and 28% (as reported above);
  - 757m are 4.63 and 28%;
  - 740m are 4.08 and 26%;
  - 730m are 3.77 and 25%.
- Case 3: Variations in electricity demand: The proposed scheme remains economically efficient even with substantial changes to projected demand.
- Case 4: Lower water storage in the dry season:
  - The NPV would drop from $11 625m to $9 296m;
  - The BCR reduces from 4.71 to 3.98 and the IRR from 28% to 26%.
- Case 5: Exporting peak load power: The efficiency of the proposed scheme increases if the peak load could be generated and exported at a premium to the SAPP. The BCR and IRR for:
  - Peak case 2 increase to 5.19 and 32%;
  - Peak case 3 increase to 5.17 and 32%

The conclusion to the cost benefit analysis is that:

- Operating the dam at its highest level is economically the most efficient.
- Variations in demand for electricity would not change the economic efficiency provided surplus electricity could be exported to the SAPP.
- Operating at less than capacity during the dry season reduces the economic efficiency. It also would make hardly any difference to the impact on the income of tourist operators. Mitigation would be improved by financial compensation to these operators. This would remain efficient so long as the compensation is not relocated to other countries.
- Exporting peak load electricity to the SAPP would improve the efficiency of the project.

A sensitivity analysis was conducted on a number of assumptions for the base case (FSL of 762m) and case 4 (lower water storage in the dry season). The results were most sensitive to changes in the distribution of unserved demand (between households and firms) and the cost of lost production for firms without generators. However, the results remained economically efficient for the tested range.

Macroeconomic Analysis

In Zambia the total contribution to GDP of the base case:

- Is largely constant over construction - between $107m and $105m.
- Increases to $706m by 2022 in the first year of operation and continues to increase until 2030 as a result of savings from fewer power outages.
- By 2030 contribution to GDP is $1 117m.
- This drops slightly to $1 113m by 2035 because of falling tourism revenues.

In Zimbabwe the total contribution to GDP of the base case:

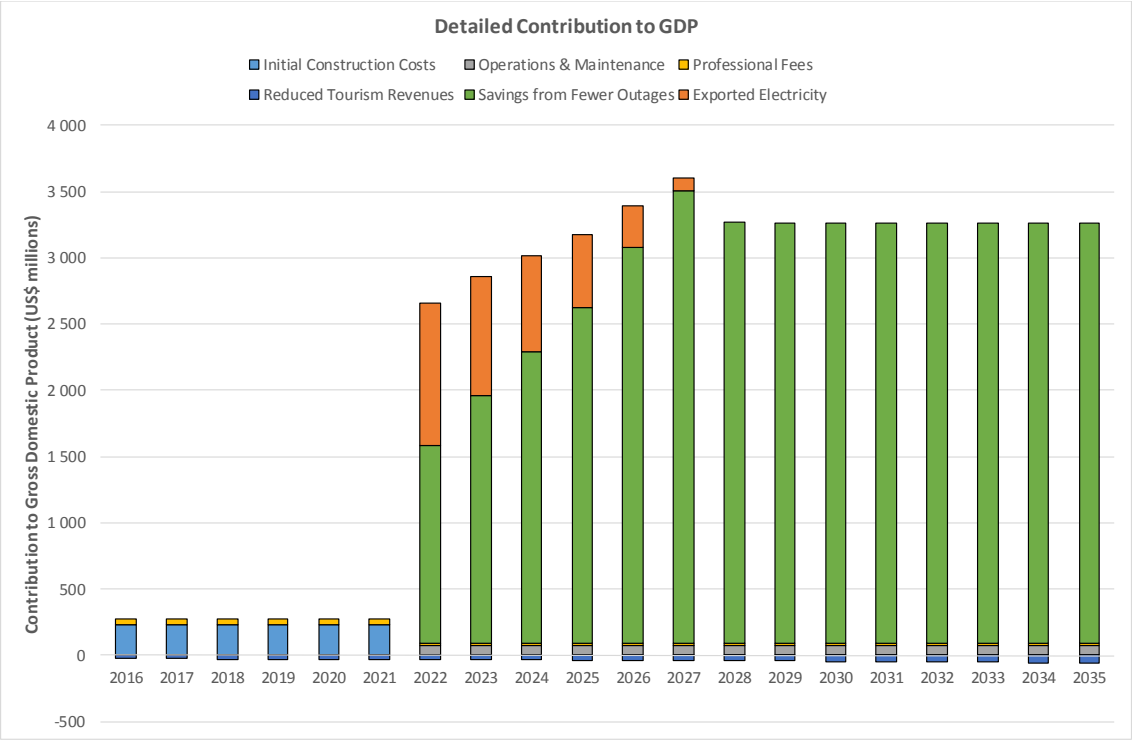
- Is largely constant over construction - between $139m and $135m.
- Increases to $1 920m by 2022 in the first year of operation and continues to increase until 2030 as a result of savings from fewer power outages.
- By 2030 contribution to GDP is $2 101m.
- This drops slightly to $2 095m by 2035 because of falling tourism revenues.

In total, contribution to GDP:

- Is largely constant over construction - about $240m.
- Increases to $2 627m by 2022.

- This is $3 208m by 2035.

Figure ES1: Detailed Contribution to Gross Domestic Product



In aggregate the proposed Batoka Gorge hydroelectric scheme would have added a cumulative $1 458m to the GDPs of the two countries at the end of construction. By 2035 this cumulative contribution is estimated at $45 670m. The detailed contribution to GDP is shown in Figure ES1.

The contribution of the proposed Batoka Gorge Hydroelectric scheme to job creation:

- Total direct jobs in the two countries are estimated to exceed 1 500 from the third year of construction. The number of direct jobs then increases until stabilizing at approximately 54 000 in 2030. The bulk of these jobs would be in the economies at large of the two countries as a result of the improved supply of electricity.
- Total indirect jobs in the two countries are set to increase from around 11 900 in 2016 to approximately 94 000 in 2022. As business productivity increases so too do the indirect jobs, until they total almost 110 000 by 2030 and 2035.
- Total jobs, which is the sum of the direct and indirect jobs, are set to increase from 12 465 in 2016 to 14 666 by the end of the construction period. They increase to 136 791 in 2022. They increase annually after that reaching approximately 164 000 by 2030.

Significance Ratings

All five cases that were assessed have major positive significance ratings.

The one necessary mitigation measure is for the negative impact of incomes on tourism operators as a result of the adverse impact on tourist attractions:

- The initial mitigation that was tested was to lower the water storage in the dam during the dry season. This made hardly any difference to the impact on the income of tourist operators.
- A more effective mitigation measure would be direct financial compensation to affected operators.
- Financial compensation would be economically efficient provided the compensation remains in the countries.

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1 Introduction

ERM Southern Africa is currently conducting an Environmental and Social Impact Assessment (ESIA) of the proposed Batoka Gorge Dam and Hydroelectric Scheme for the Zambezi River Authority (ZRA). The hydroelectric scheme is situated upstream of the existing Kariba Dam scheme on the Zambezi River and approximately 50km downstream of the Victoria Falls, a world heritage site. A number of specialist studies have already been completed, including a specialist economic assessment by Anchor Environmental Consultants that focuses on the localised microeconomic impact on the affected tourism related firms in the gorge. The ZRA has requested an economic cost benefit analysis to weigh the potential negative localised economic impact and the environmental impact of the hydroelectric scheme against the positive regional impacts. This report performs the cost benefit analysis and the macroeconomic analysis.

This report focuses only on the economic costs and has not attempted to quantify the environmental costs. These need to be weighed against each other by the relevant decision making authorities.

1.1 Note of Clarification

This economic report is not a full Economic Specialist report as required by an ESIA. An economic specialist report should be coached within the equity, efficiency and sustainability parameters. The focus of this report is on the economic efficiency of the project and the distribution of the costs and benefits through the economies of Zambia and Zimbabwe.

The report does not assess:

- Alternative electricity generation plants;
- Fit with legislative, regulatory and policy framework of the two countries;
- Economic equity or sustainability and the associated risks.

1.2 Declaration of Independence

This is to confirm that Barry Standish and Antony Boting of Stratecon are independent and have no vested or financial interests in the approval or disapproval of the proposed project.

1.3 Objectives

The objectives of this study are to determine the economic efficiency of the proposed hydroelectric scheme. This is done by investigating the efficiency of the hydroelectric scheme for a number of different cases. These are:

- Case 1: Base case. The scheme as presented in the Options Assessment Report with an FSL of 762m, producing 10 215 GWh of annual electricity.
- Case 2. Variations in final supply levels. These are 757m, 740m and 730m in the FSL;
- Case 3. Variations in electricity demand.
- Case 4. Lower water storage during the dry season.
- Case 5. The base case with peak load electricity exported to the SAPP at peak power prices.

A macroeconomic analysis was done on the base case.

1.4 Report Structure

The report has eight further sections:

- Section 2 gives a description of the project and overall study approach;
- Section 3 provides a baseline assessment of the project;
- Section 4 presents the limitations faced by the study;
- Section 5 describes the economic analysis and how to interpret the results;
- Section 6 lists costs, benefits and derivation;
- Section 7 presents the results of the cost benefit macroeconomic analyses;
- Section 8 reports the assessed significance ratings;
- Section 9 concludes the report.

2 Project Description and Study Approach

This section gives a brief description of the proposed project and approach.

2.1 Project Description

A full description of the project is given in Chapter 2 of the Environmental Impact Assessment Report.

The proposed Batoka Hydroelectric Scheme is located in the central portion of the Zambezi River Basin and would extend across the international boundary between Zambia and Zimbabwe. It would be situated upstream of the existing Kariba Dam hydroelectric scheme on the Zambezi River and approximately 50 km downstream of the Victoria Falls. The Victoria Falls (or Mosi-oa-Tunya Falls) was listed as a World Heritage Site in 1989 (UNESCO, 2016).

In Zimbabwe the proposed Batoka Gorge is situated within the province of Matabeleland North and in the Hwange Rural District, while in Zambia the main area of direct impact falls under the Southern Province in the Kazungula District. Electricity generated by the scheme would serve both countries.

Figure 1: Physical Location of the Proposed Batoka Gorge Hydroelectric Scheme

The key components of the proposed scheme are:

- Dam wall, impoundment and spillway: the proposed high gravity arch dam wall would be 181m in height. The full supply level (FSL) of the reservoir would be 762m above mean sea level. After impoundment to the full supply level, the reservoir surface area would cover approximately 23.0 km². The FSL of 762m has been selected to ensure the backwaters from the resulting impoundment do not reach the base of the Victoria Falls or flood the outlets of the existing Victoria Falls Power Station, located in the region of Silent Pool.
- Power houses: In a 1993 feasibility study it was planned that two powerhouses, each with an installed capacity of 800 MW, would be constructed on each river bank. However, a later feasibility study suggested that the optimum installed capacity of 2 400 MW (1 200 MW on each river bank). This is shown in Table 1 where the ratio of annual energy to total costs (last row of the table) derived from table 8.9 and figure 8.10 of the options assessment report (Studio Pietrangeli, 2015, p. 165) indicates that the scheme with 2 410 MW and generating 10 215 GWh has the highest ratio.

Table 1: Installed Power, Costs and Annual Energy Produced

Installed Power - MW	1 620	1 950	2 410	2 920	3 720
Total Costs ($ millions)	**2 300**	**2 433**	**2 625**	**2 848**	**3 155**
Annual Energy (ave) - GWh	8 565	9 322	10 215	11 011	11 890
Annual Energy : Total Costs	3.72	3.83	3.89	3.87	3.77

- Transmission lines in Zambia and Zimbabwe: in Zimbabwe the transmission lines would comprise 2 x 70 km 330 kV lines, running in parallel to the existing Hwange 330 kV substation. In Zambia, two 330 kV transmission line routes are proposed, each comprising two outgoing lines. The first routing is from Batoka, terminating at a proposed new 330 kV ZESCO substation to be constructed in Livingstone; this route would be 21 km long. The second line would run in parallel to the existing 220 kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km.
- Access roads in Zambia and Zimbabwe: the upgrading of existing roads and construction of new roads to access each bank from the main roads linking Livingstone to Lusaka (Zambia) and Victoria Falls to Bulawayo (Zimbabwe) would be required.
- Permanent villages and other ancillary infrastructure (such as quarries, spoils area, construction camps and batching areas): permanent villages would be located on each side of the river. Construction camps would house approximately 3 000 staff

(including security and support staff). It is proposed that the construction camps would be converted into permanent villages, once operational, for staff and support services personnel (customs, police etc.).

The project has no underground works. Due to the small storage capacity of the proposed reservoir, the proposed scheme would be operated as a run-of-river project with storage only sufficient to allow daily and weekly peaking but not for monthly or seasonal flow regulation.

2.2 Study Approach

In light of the note of clarification in the introduction, this section describes the approach to the economic analysis of the project and the cases that were analyzed.

This study comprised a desktop study. The underlying assumption is that Zambia and Zimbabwe currently have insufficient electricity (refer to Section 3 for supporting discussion). The electricity would be used to address current power outages and future growth. Any surplus would be exported to the Southern African Power Pool (SAPP).

3 Baseline Assessment

The purpose of this section is to acknowledge that a baseline assessment is necessary for a study of this nature.

In the best of all worlds the following aspects would be included in a baseline assessment.

- A description of the relevant demographic profiles of Zambia and Zimbabwe.
- Levels of employment and income.
- The current electricity supply, demand and capacity situation.
- Description of the degree to which there are power outages and the number of firms and households that are affected by these outages.
- Potential economic growth and development trends. The impact of these trends on the demand for electricity.
- Alternative power generation options.

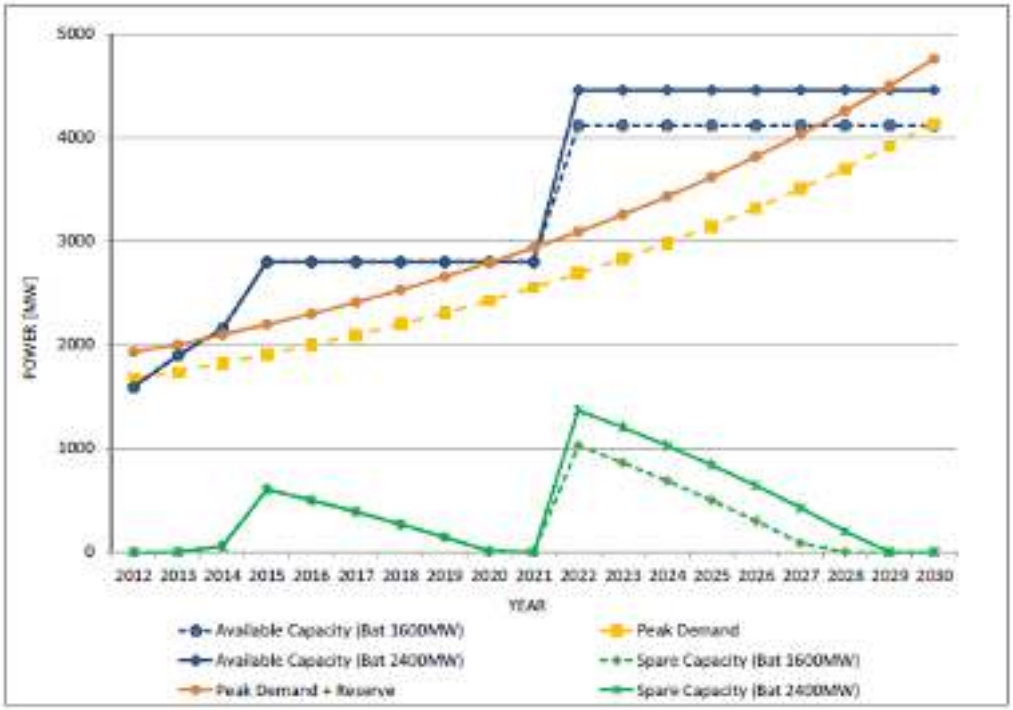
The major time constraints and terms of reference under which this study was undertaken prevented a detailed assessment. The most critical part of this assessment is, arguably, the current electricity supply, demand and capacity situation. It is this situation that provides some context for the need for the proposed Batoka Gorge Hydroelectric Scheme.

The data and projections on which the current and expected electricity supply, demand and capacity is based are drawn from the options assessment report. This, in turn, is based on the business plans of the relevant authorities in each country.

The current and expected electricity capacity, demand and surplus capacity for Zambia is given in Figure 2. As can be seen power shortages are expected in 2012 – 2014 and 2020 to 2021.

A number of new generation options are currently being either planned or commissioned. It was expected that a number of smaller power stations (maximum installed power of 300 MW) would begin generating electricity in 2014 and 2015, while two larger power plants, Batoka Gorge (800MW or 1 200 MW) and Kafue Gorge Lower (750 MW) would begin generating electricity in 2022 (Studio Pietrangeli, 2015, p. 123). It is expected that when the proposed Batoka Gorge hydroelectric scheme starts operating in 2022 there would be an estimated unserved demand of 227 MW in Zambia.

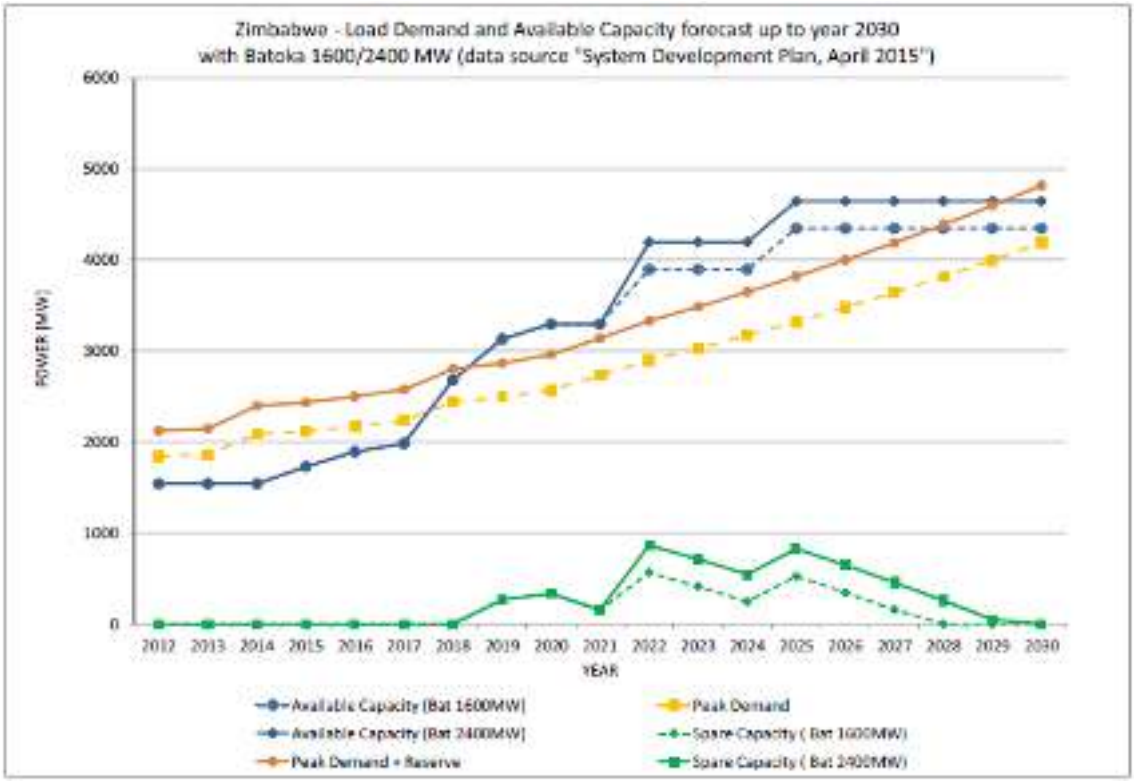
Figure 2: Available Capacity, Demand and Spare Capacity for Zambia



The current and expected electricity capacity, demand and surplus capacity for Zimbabwe is given in Figure 3. At the time that Batoka Gorge commences operations in 2022 there would be an estimated unserved demand of 444 MW in Zimbabwe.

A number of power stations, the majority of which are coal fired, are expected to be commissioned between 2016 and 2020 (Studio Pietrangeli, 2015, p. 121). Some of the larger ones, such as CASECO (600 MW) and Hwange 7 & 8 (600 MW) are coal fired power stations.

Figure 3: Available Capacity, Demand and Spare Capacity for Zimbabwe



The electricity that is expected from Batoka Gorge needs to be put into the context of the total power generation and demand of the two countries. This is done in order to show the size of the proposed Batoka Gorge scheme in relation to the total electricity supply of the country. Table 2 below shows the estimated demand and supply forecasts for Zambia, Zimbabwe and the Southern Africa Power Pool.

Table 2: Peak Electricity Demand and Generation Forecast

	2012	2013	2014	2015	2020	2025	2030	2035	2040	2045
Peak Demand Forecast (MW)										
Zambia	1 681	1 740	1 824	1 911	2 428	3 146	4 138	5 508	7 400	10 015
Zimbabwe	2 029	2 425	2 471	2 534	2 865	3 255	3 738	4 340	5 101	6 071
Generation Forecast (GWhr)										
Zambia	11 781	12 195	12 781	13 390	17 017	22 049	29 000	38 602	51 866	70 188
Zimbabwe	11 025	13 177	13 428	13 766	15 568	17 688	20 310	23 583	27 715	32 987
SAPP Total				327 791	369 675	418 733	479 123	554 207	648 541	768 335

The generation capacity of Batoka Gorge needs to be seen in the context of the total power generation and demand of the two countries. Under the base case the:

- Installed Power (MW) of Batoka Gorge would cover:

  - 38% of the peak demand for Zambia in 2025 and 29% in 2030.
  - 37% of the total peak demand for Zimbabwe in 2025 and 32% in 2030.
- The generation in GWh would generate sufficient electricity to supply:
  - 23% of the generation forecast in Zambia in 2025 and 18% in 2030.
  - 29% of the generation forecast of Zimbabwe in 2025 and 25% in 2030.

The motivation for the proposed Batoka Gorge Hydroelectric Scheme is that it would provide electricity at a cost that would be considerably lower than most of the reasonable alternatives:

- In Zambia Batoka Gorge:
- is expected to generate the fourth cheapest electricity of the seventeen planned power plants in Zambia (Studio Pietrangeli, 2015, p. 130);
- It is only slightly more expensive than the cheaper options;
- It is the largest planned power generation plant estimated to produce electricity less than half the price of electricity produced by Kafue Gorge Lower, the other large planned power station.
- In Zimbabwe:
- None of the power stations in Zimbabwe are expected to generate electricity at a lower cost than Batoka Gorge;
- The cost of electricity generation from large coal fired power stations (such as CASECO and Hwange) would be up to four times higher than Batoka Gorge.

It would be recognized that many factors could affect the electricity projections outlined. For example, the current drought has resulted in electricity shortages when surpluses were expected. In addition, delays in approval might affect the timing of some of the planned power plants. Changes in commodity prices might render some plants unfeasible. The consequence is that a number of variations to the base case demand amounts described above are investigated. A range in the unserved demand of both countries that is supplied by Batoka is investigated. These results are discussed and presented in section 7.1.3.

4 Limitations

- The project has been contextualised within the current and proposed electricity generation mix. However, no precise information on electricity generation has been provided for alternative power plants.
- Annual average electricity, taking changes in river flow, have been used.
- A number of assumptions were made because of the time constraints. These assumptions are described in the costs and benefits section. Some are varied in a sensitivity analysis.
- This report looks only at quantifiable impacts. Some impacts, such as the non-use value described in the Economic Specialist Report (Anchor Environmental Consultants, 2015, p. 48) or the value in the loss of habitat have not been included. These effects would need to be weighed by decision makers in when evaluating the merits of the proposed scheme.

5 Understanding the Economic Analysis

There are a variety of different types of economic analysis, some of which can be quantified and some of which cannot. The analyses that can be quantified include cost benefit analysis, microeconomic costs and benefits, and macroeconomic analysis. Cost benefit and macroeconomic analysis were used to analyse the proposed Batoka Gorge Hydroelectric Scheme. The purpose of this section is to describe these types of analysis and explain how to interpret the results.

5.1 Direct Benefits and Cost Benefit Analysis

An economic cost benefit analysis (CBA) was used to assess the economic efficiency of the proposed Batoka Gorge Dam and Hydroelectric Scheme. CBA treats the national economy, or in this case the two economies of Zambia and Zimbabwe, as entities in and of themselves. It assumes, with some important caveats, that what is demonstrably good for the two economies as a whole is a reasonable approximation of what would be good for the majority of the people living and working in the countries.

When interventions like new electricity generation plants are contemplated, decision makers need to know what impact the intervention would have on the economy as a whole and hence how much benefit can be assumed to accrue.

The outcome of the analysis is the reporting of a net present value (NPV), a benefit cost ratio (BCR) and an internal rate of return (IRR) for those cases where the project is compared to a business as usual alternative. A NPV shows the total value of future costs and benefits reduced to a present day value. This is done by using a social discount rate of 10% as specified by international best practice and as used in the options assessment report (Studio Pietrangeli, 2015, pp. 155, 176, 210 & 286). The BCR measures the changes in benefits and costs that would result from an investment. BCRs are typically used when there are many competing alternatives and projects need to be funded from a limited set of resources. Finally, the IRR is the discount rate that returns a NPV of zero and shows the likely economic returns to society of a project in relation to other investment opportunities.

If the evaluated benefits of a project are indeed greater than the overall project costs, then the BCR would be greater than one. A BCR greater than one indicates that the completed project would constitute an economic asset; a BCR less than one implies that the project would be an economic liability. The higher the BCR the less risk there is that the proposed investment could turn out to be less than viable economically. Low BCR's, even if greater

than one, provide a warning that a project could be risky and may turn out to be an economic liability.

A high BCR is usually a good indicator that it would be possible to raise finance to implement a project. In the case of a private sector investment the high BCR would be part of the business case to funders. A high BCR should give confidence that it is worth funding the project directly from its Treasury if it is a public infrastructure project. Alternatively, provision can be made with suitable institutional arrangements for the involvement of the private sector in project funding.

An economic analysis includes all costs to society. This is done by adjusting for shadow prices and wages and removing the distortions caused by taxes and subsidies.

The cost benefit analysis focuses purely on direct costs and benefits and does not take any indirect costs and benefits into account. Indirect costs and benefits would include those costs and benefits obtained through multiplier effects. For example, the construction of a building would have spin off effects for the construction industry and the building materials supply industries. These, in turn, would have backward linkages with other commodity suppliers and retail industries.

5.1.1 Negative Costs and Benefits

In certain cases, the analysis may use negative costs and benefits. Albeit confusing, this does follow international best practice. According to (Snell, 2011, p. 52) there may be instances, for example, where there is a reduction in user costs. This is then used as a negative cost in the analysis rather than a positive benefit. This does not change the IRR or the NPV of the project. It does impact on the BCR. However, it cannot make an efficient project inefficient.

5.2 Secondary Benefits and Macroeconomic Analysis

Cost benefit analysis takes into account first order costs and benefits. Macroeconomic analysis takes into account second order benefits as well.

The size of a national or regional economy is measured in terms of the total of all economic activities taking place within the area concerned, both in the public and private sectors. For countries like Zambia and Zimbabwe this includes measures of informal sector activity. The name given to the measure of the size of the economy is Gross Domestic Product (GDP).

The unit of measurement is the US dollar. Zimbabwean income is reported in US dollars. Zambian outputs are also reported in US dollars for comparative purposes.

Underlying the measurement of GDP is the understanding that all economic activity is dependent on the physical and institutional support systems that enable an economy to operate effectively. These include the various levels of governmental structure, the legal system, and the administrative, financial and educational infrastructure in the country. In terms of physical infrastructure, all economic activity depends on water supply, telecommunication, and transport infrastructure. The economy could not operate without all of these systems being in place.

While there are a number of different types of macroeconomic effects, the two most important are contribution to gross domestic product (GDP) and creation of jobs. The importance of job creation is obvious. Increases in GDP are synonymous with increases in peoples' economic standards of living. Increased GDP – i.e. increased production – is experienced in the form of more jobs, higher wages and reduced economic hardship. It is clearly an important measure.

The effects of any infrastructure project on the size of the GDP arise as a result of the myriad ways in which firms, public service providers and ordinary people find their normal daily activities affected, hopefully for the better, by the changes brought about by the new project.

The actual task of calculating the macroeconomic impact of the proposed project demands a detailed and multifaceted approach not least because of the so-called multiplier effects. It is well recognised that the simple act of spending – constructing a dam, for example - leads to other economic effects. Demand for steel and cement can lead to increased production in those industries. Increased demand for steel and cement, in turn, leads to increased demand for mining output which uses wood, water, electricity and so on. These are the so-called multiplier effects. While this process unfolds, each industry employs people and pays wages. Employees, in turn, spend their wages and cause further multiplier effects through the economy. Measuring this is further complicated by the fact that different industries demand different types of skills. This leads to different wage structures across the various industries. People earning different wages have different spending patterns. Thus, the change in overall spending patterns is dependent on which industries are affected.

On a technical note, industry multipliers can be calculated either for economies that are 'open or closed' with respect to households. Closed multipliers are smaller than 'open'

multipliers. The World Travel & Tourism Council publications, for example, uses 'closed' multipliers. In contrast Stratecon is of the opinion that households should be included and 'open' multipliers used. This is the case because some industry expenditure goes to households in the form of wages and dividends. People use this for expenditure on other goods and services, further stimulating the economy. As a result, 'open' economy multipliers are used in this analysis.

Five steps were required to measure the overall macroeconomic contribution of the proposed project:

- First, to identify appropriate expense items for each category of costs.
- Second, to determine the relative proportions of profit, labour, plant and material for each expense item.
- Third, to assign each item of material and plant to the appropriate SAM economic sector code.
- Fourth, the potential impact on tourism was included as a 'negative' benefit. This reduces macroeconomic benefits.
- Finally, all the items in the SAM coded list of costs for each country are brought together. The total multiplier effect is calculated as the aggregate product SAM coded spending on plant and material, as well as SAM coded spending by workers multiplied through the national multipliers.

The results are reported separately for the two countries.

5.3 Cost and Benefit Differences in the Two Approaches

One area of confusion that needs to be addressed is that there can be differences between costs in the cost benefit and macroeconomic analysis. This is the case, for example, with imports:

- Imports have only a marginal impact on the cost benefit analysis when compared to locally procured goods and services. The reason for this is that they are costs to society irrespective of the source of the inputs.
- On the other hand, expenditure on locally procured goods and services, although a cost to the project, are a macroeconomic benefit (because they accrue locally and have an economic "trickle-down" effect). As a result, the greater the import component the less the local macroeconomic benefits.

The macroeconomic effect of some costs and benefits are treated as follows:

- Saved production would have a positive macroeconomic effect. The general multiplier is used for the savings to firms because the distribution of these savings is not known.
- Connection costs area cost to the project. These do however have a positive macroeconomic effect because money is spent in the local economies on connections.
- Increased household income and any income generated from electricity exports are allocated to the general macroeconomic multiplier for each country.

6 Costs and Benefits

This section presents the costs and benefits that are used in the economic cost benefit analysis.

6.1 Costs

This section summarises the costs that would occur for the proposed Batoka Gorge Hydroelectric Scheme. There are four general categories of costs which have been treated as negative benefits. This methodological approach has been explained in Section 5.1.1:

- Those that are the direct result of the building and running of the proposed Scheme. These are divided into construction (capital), running (operation and maintenance) and financing costs.
- Those for households which, faced with being able to use newly supplied electricity, need to spend on both connection costs and electrical appliances in order to benefit from electricity.
- Firms which have three types of costs:
- Connections cost
- Generator fuel; and
- Lost productivity.
- Potential negative impact on tourism in the area around the proposed scheme.

6.1.1 Project

6.1.1.1 Construction

Initial construction (capital) costs are divided into fixed and variable[1] costs. Table 3 gives the capital costs from table 8.9 of the options assessment report (Studio Pietrangeli, 2015, p. 165) for different installed power options. It is understood that construction would start in 2016 and generation in 2022.

[1] *These are called 'varying and unvarying' cost in the Options Assessment Report*

Table 3: Capital Costs for Various Installed Power Options

Installed Power - MW	1 620	1 950	2 410	2 920	3 720
Costs - $ millions					
Fixed Costs	1 387	1 387	1 387	1 387	1 387
Varying Costs	913	1 046	1 238	1 461	1 768
Power House Civil Works	120	146	183	224	288
Electrical & Mechanical Equipment	387	446	525	607	731
Waterways	187	219	264	315	393
Ancillary Items	106	122	145	170	211
Transmission Lines	113	113	121	145	145
Total Costs ($ millions)	**2 300**	**2 433**	**2 625**	**2 848**	**3 155**

Construction costs vary for different levels of installed power while fixed costs are unchanged at $1 387m. Variable costs range between $913m and $1 768m and total costs therefore range between $2 300m and $3 155m. The most cost effective generation option is for installed power of 2 410MW[2]. This has a total cost of $2 625 million.

One of the important issues, from an economic perspective, is the proportion of imports to total costs. No information was available. It was assumed that imports would make up:

- 75% of fixed costs;
- 75% of power house civil works;
- All electrical and mechanical equipment;
- 75% of waterways and ancillary equipment;
- 90% of transmission lines.

Professional fees are assumed to be 15% of construction and annual running costs.

Table 4: Installed Power, Power Generated and Change in Costs for Varying Final Supply Levels

Reservoir Height - m a.s.l.	730	740	742	747	752	757	762
Change in height	32	22	20	15	10	5	0
Installed Power - MW	2 073	2 175	2 200	2 250	2 300	2 350	2 400
Change in Installed Power - MW	327	225	200	150	100	50	0
Change in IP per m height		10.2	10.0	10.0	10.0	10.0	
Power Generated - GWh/yr	7 380	8 266	8 923	9 253	9 565	9 890	10 215
Change in power - GWh/yr	2 835	1949	1292	962	650	325	0
Loss in power per m height		88.6	64.6	64.1	65.0	65.0	
RCC and E&M Costs - $m	581.3	629	639	661	684	708	734
Reduction in costs - $m	152.7	105	95	73	50	26	0
Reduction in costs per m height		4.8	4.8	4.9	5.0	5.2	

[2] *A discussion of efficient generation options is given in Section 2.1*

The efficiency of the project for varying final supply levels is given in Table 4. This is sourced from tables 10.4, 10.5 and 10.6 of the options assessment report (Studio Pietrangeli, 2015). In these tables the installed power, power generated and change in costs is given for a range of final supply levels. The calculated values for a 730m final supply level are shown in the second column of the table.

6.1.1.2 Operations and Maintenance

There would be running (operating and maintenance) costs. There is no detailed estimate for these costs. As a result, a cost of 0.36c/kWh has been used. This is the cost given in figure 6.15 and table 6.14 the Options Assessment Report (Studio Pietrangeli, 2015, p. 130 & 133). This would result in an annual running cost of $36.8m for an electricity generation of 10 215 Gwh – the most cost effective level of installed capacity.

6.1.1.3 Financing

There is no information available about how the project would be financed. There are three potential options. It can be financed by:

- Local capital markets in Zimbabwe and Zambia;
- International capital markets;
- The World Bank.

The interest component is treated differently between domestic and international borrowing in an economic cost benefit analysis. The interest component of a domestic loan is a transfer payment and excluded from the analysis. The interest component of an international loan is a cost to the project because it is a cost to the country.

There is also a difference between loans from the international bond market and loans from the World Bank. Bond market loans would be charged according to country risk. World Bank loans typically are concessionary loans with interest rates that are lower than commercial rates.

The latest information from the World Bank is that Zambia has been paying about 7% for sovereign loans. In their Zambia Economic Brief, the World Bank indicates how the sovereign spread of Zambia's (and other African) bonds have been decreasing relative to 10-year US Treasuries. The average spread for Zambian Government Bonds over US Treasuries Bills in 2014 was approximately 500 basis points. The average spread in November 2014 was 422 basis points (World Bank Group, 2014, p. 2). According to Trading Economics the current yield on 10 year US Government Treasuries is 2.006% (Trading

Economics, 2016). This means that the yield on 10 year Zambian Government bonds would be 7%.

In the light of the above discussion the following assumptions have been made:

- The loan would be financed by the international bond market.
- Revenues are in US dollars. This offsets foreign exchange rate risks on the capital loans.
- It would be a ten-year loan.
- The real interest rate is 7%.
- Financing costs are only for the initial capital costs.

These assumptions are subjected to a sensitivity analysis in Section 7.1.5.

6.1.2 Firms

There is a need to make a distinction between the costs and benefits firms face as a result of improved and/or new electricity connections. The key issue is to decide which costs to include:

- Costs which are common to before and after new/improved electrification are excluded. The most obvious of these is the current payment for electricity.
- Current costs that are the result of a lack of or a reliable supply of electricity. An example of this is the savings on fuel for backup generators. Electrification would reduce these costs. These are treated as a benefit (reduced cost) in the analysis.
- Payment for new electricity. This cost is accounted for in the running of the proposed scheme. Including it as a cost for both firms and the proposed scheme would constitute double counting.
- The cost to newly electrified firms for connection to the grid. This has been assumed to be $5 000 for each new connection. This cost is a consequence of the project and is therefore treated as a negative benefit in the analysis. This assumption is varied in a sensitivity analysis.

6.1.3 Households

People in households are likely to face two types of costs if they wish to benefit from electricity. These are the connection and appliance costs. Benefits from electricity come from the use of appliances. An obvious example of this is electric lighting. These costs are a

consequence of electrification and are treated as a negative benefit, in the net household income described in section 6.2.2.2.

6.1.3.1 Connection Costs

It has been assumed that a new connection cost would be $2 000. This is based on discussion with industry experts and previous experience in Namibia and Zimbabwe.

It is recognized that this is both a large sum of money for poorer households and probably unaffordable. Some mitigation is required on the part of government to ensure that households are connected and can benefit from the new opportunities.

6.1.3.2 Costs of Appliances

The cost of appliances has been based on the lowest retail prices for each appliance. This proportionate purchase of appliances and the cost of the relevant appliances are used to determine the expected average appliance spending for households in each of the electricity usage bands.

6.1.4 Tourism

There is the potential for negative impacts on white water rafting and other tourism offerings. It is felt that this would impact on these firms that are dependent on tourism in the gorge.

The specialist report on the localised economic impact has estimated that there would be losses in tourism revenue worth $7.94m because of the proposed scheme (Anchor Environmental Consultants, 2015, p. 47). The estimates are made for a final supply level of 757m. The value of lost tourism revenue at this supply level is shown in the second column of Table 5.

ERM Southern Africa have made some estimates of the degree to which this impact would vary at different supply levels. These are also reported in the table. The annual lost tourism business is estimated to be $6.69m for a final supply level of 730m, $7.93m for 740m and $7.94m for 762m[3].

[3] *These costs all exclude the non-use value of the environment, as discussed in the Economic Specialist Report by Anchor Environmental Consultants*

Table 5: Local Tourism Affected by Batoka Gorge for Varying Final Supply Levels

1	2	3	4	5	6
Description of Activity	**Estimated Value ($) at fsl 757m**	**Variation Compared to fsl 757m**			
		Final Supply Level (m)			
		730	**740**	**757**	**762**
Accommodation	1 492 704	100%	100%	100%	100%
White water rafting	3 490 000	65%	100%	100%	100%
Birding and hiking	82 279	100%	100%	100%	100%
Angling	158 300	80%	90%	100%	100%
Jet Extreme	963 600	100%	100%	100%	100%
Scenic Flights	1 350 000	100%	100%	100%	100%
Park Fees	406 900	100%	100%	100%	100%
Total Lost Business ($)	**7 943 783**	**6 690 623**	**7 927 953**	**7 943 783**	**7 943 783**

Excludes non-use value

Source:

Data in columns 1 and 2 from Batoka HES Economic Specialist Report, table 22, pg 48

Percentage in columns 3, 4, 5 & 6 estimated by ERM Southern Africa

Two further assumptions have been made:

- The impact would start at the same time as construction.
- Tourism would have grown at the future expected average economic growth for the two countries.

6.2 Benefits

There are many benefits that would occur either as a result of new electrical connections or more reliable electricity generation. These accrue to both households, firms and the electricity utility. The latter occurs, from an economic perspective, as a result of electricity exports. Consequently, these benefits accrue to society as a whole.

6.2.1 Firms

There are three types of firms that would benefit from an increased supply of electricity. These are firms that:

- Currently have power outages without backup generators;
- Currently have power outages with backup generators;
- Are expected to starte as a result of economic growth.

The following assumptions have been made:

- In the absence of Batoka Gorge, total unserved demand by 2022 in:
- Zambia is estimated at 962 GWhrs and expected to increase annually. By 2028 estimated power outages in Zambia would be 5 108 GWhrs (the capacity of Batoka Gorge to supply electricity to either country).
- Zimbabwe is estimated to be 1 882 GWhrs. By 2030 this would exceed 5 108 GWhrs. This is the total supply of electricity from Batoka Gorge to Zimbabwe.
- There would be no power outages during 2022 and 2028 in Zambia and between 2022 and 2030 in Zimbabwe because of the proposed Batoka Gorge scheme. Further power outages can only be avoided with additional generation plants.
- In Zambia 38.2% of firms have backup generators[4] and 11.2%[5] in Zimbabwe.
- New firms would increase by 5.6% in Zambia and 3.4% in Zimbabwe [6]. It has been assumed that the proportion of firms with and without generators and associated costs would be unchanged.

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[4] *(Steinbuks & Foster, 2010, p. 512)*

[5] *This percentage was sourced from a survey of firms in Zimbabwe*

[6] *The rate of economic growth is not varied with and without an increase in electricity generation.*

6.2.1.1 Generator Use during Outages

Some firms have invested in backup generators. There are other, limited, backup options. Typically, the cost of own generation is higher than the cost of grid electricity (Oseni & Pollitt, 2013, p. 24). In addition, there can be other costs like the diminished capacity to finance other types of investments, equipment damage from electrical surges and wider societal costs like the use of dirty fuel. These latter costs have been excluded from the analysis.

Two cost estimates have been made for Zambia:

- Oseni & Pollitt (2013, p. 25) estimate the cost of own generation is $0.58/kWh measured over an eight-hour outage. This is made up of a fixed cost of $0.18/kWh and a variable cost of $0.40/kWh;
- Steinbuks and Foster (2010, p 509) estimate the cost is $0.45/kWh. This is made up of a fixed cost of also $0.18/kWh and a variable cost of $0.27/kWh.

These costs have been used to estimate the 2015 generator costs from outages to firms in Zimbabwe and Zambia:

- The power outage costs for firms with generators is $0.38/kWh in generation costs and $0.39/kWh in lost production;
- The drop in the oil price between 2013 and 2015 price reduces the variable cost to $0.20/kWh;
- Adjusting for taxies and levies (as has to be done in a cost benefit analysis) reduces this cost to $0.14/kWh;
- Fixed costs have been included in the analysis[7];
- In the absence of any other data the same costs have been used for Zimbabwe.

6.2.1.2 Lost Production During Power Outages

It has been assumed that the lost production cost of power outages to firms without generators is 1.5 times that of firms with generators[8].

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[7] *This is debatable because some commentators would argue that fixed costs are sunk costs and should be omitted. In this case Stratecon is of the opinion that they need to be included because doing this takes account of any future generator capacity that may be added.*

[8] *The literature indicates far higher losses. Using a lower value makes the approach more conservative because the benefits would be lower.*

6.2.2 Households

Households would have two benefits from electrification:

- Saving from other forms of fuel currently used for cooking, lighting and during outages.
- Income benefits as a result of time savings, increases in productivity and health benefits. Health benefits are the result of less smoke inhalation, burns and fatalities from fires and the use of refrigeration for food and medicines.

6.2.2.1 Savings in Alternative Fuels

Many households would less time collection and less money buying alternative fuels. These fuels include firewood (purchased or collected), candles, paraffin, LPG, etc.

The following assumptions were made:

- Households spend $12 monthly on other types of fuel. This is based on a recent survey of rural households in Zimbabwe[9].
- The number of affected households is calculated by dividing total household unserved demand by a monthly amount of 100kWh. This is estimated based on the income of low income households.
- The electricity shortage has been divided equally between households and firms.

6.2.2.2 Income Benefits

The positive impacts of electricity on income are well documented. Table 6 gives the results of three recent publications which estimated the impact of electricity and electrification on household income. Electrification increased household income in:

- Bangladesh by between 9% and 30%. (Khandker, Barnes, & Samad 2009).
- India by between 16% and 46% (Khandker, Samad, Ali, & Barnes 2012).
- Vietnam by between 25% and 36% (Khandker S. R., Barnes, Samad, & Huu Minh 2008).

The 16% was used in the analysis. This was chosen as a conservative assumption.

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[9] *This is part of the Zimbabwe Rural Electrification Master Plan which is currently being developed.*

Table 6: Increase in Household Income Attributed to Electricity

Country	Lower Band	Mid Band	Upper Band	Source
Bangladesh	9%	12%	30%	(Khandker, Barnes, & Samad, 2009)
India	16%	39%	46%	(Khandker, Samad, Ali, & Barnes, 2012)
Vietnam	25%	31%	36%	(Khandker S. R., Barnes, Samad, & Huu Minh, 2008)

6.2.3 Exports

It is likely that any excess electricity that is not purchased in Zimbabwe or Zambia would be exported to the SAPP. The following assumptions have been made:

- A price of $0.05/kWh for base load;
- A price of $0.15/kWh for peak load;
- The benefits also have a trickle-down effect as the export revenue is used in the country. Hence in the macroeconomic analysis the multiplier impact is assumed to be the average for each country.

7 Results

This section presents the results of the economic analysis:

The cost benefit results are relatively more important as they measure the economic efficiency of a project. They are the results on which the decision to proceed should be taken. In contrast the macroeconomic analysis shows the distribution of the benefits across the economy.

The cost benefit analysis has been tested for different cases. The macroeconomic analysis is only reported for the base case.

7.1 Cost Benefit Analysis Results

This section presents the results to the cost benefit analysis. These are reported as the:

- Present value (PV) of costs and benefits;
- Net present value (NPV) of the differences between the costs and benefits;
- Benefit cost ratio (BCR) which gives the $ benefit per $ of cost; and
- Internal rate of return (IRR). This is the discount rate that returns a NPV of zero.

The following cases were analyzed:

- Case 1 - base case: a dam with a final supply level of 762m. This is the proposal in the options analysis report.
- Case 2: different dam heights
- Case 3: variations in demand.
- Case 4: reduced water storage in dry season.
- Case 5: exports of peak load generation. Two cases are reported here:
- Peak case 2, in which release rates were peak over a three-hour period every morning and a three-hour period every evening with reservoir volume balanced over a 24-hour period to achieve this outcome;
- Peak case 3, in which outflows peak over a three-hour period every morning and a three-hour period every evening during weekdays with reservoir storage balanced over the weekly period to achieve this result.

In addition, a sensitivity analysis was done on the key assumptions of the base case.

7.1.1 Case 1: Base Case – Dam Height and FSL of 762m

The results of the analysis for the proposal in the options assessment report are presented in Table 7.

- It was found that the costs have a present value (PV) of $3 133m. The initial capital costs contribute the most to the overall cost, with a PV of $1 889m. Financing costs contribute $607m, followed by professional fees ($300m) and running costs ($203m). A reduction in tourism business adds $135m to the overall cost.

Table 7: Cost Benefit – Base Case

All Monetary Values in $ millions	**PV**
Costs	
Initial Capital Cost	1 889
Financing Costs of ICW	607
Opertions & Maintenance	203
Professional Fees	300
Tourism Impacts	135
Total Cost	**3 133**
Benefits - Zambia	
Firms	
Generator Savings	1 366
Saving from Outages (with Generators)	1 659
Saving from Outages (without Generators)	4 033
Connection Costs	-131
Households with Existing Connections	
Alternative Fuel Savings	187
Households with New Connections	
Increased Income and Net Benefits	0
Exports	610
Total Benefits - Zambia	**7 724**
Benefits - Zimbabwe	
Firms	
Generator Savings	361
Saving from Outages (with Generators)	444
Saving from Outages (without Generators)	5 300
Connection Costs	-77
Households with Existing Connections	
Alternative Fuel Savings	171
Households with New Connections	
Increased Income and Net Benefits	353
Exports	481
Total Benefits - Zimbabwe	**7 035**
Total Benefits - Zambia & Zimbabwe	**14 758**
NPV	11 625
BCR	4.71
IRR	28%

- Benefits in the base case have a PV of $14 758m; $7 724m to Zambia and $7 035m to Zimbabwe.
- For Zambia:
    - Savings from reduced outages of $5 692m is the largest benefit. This is $4 033m for firms without and $1 659m with generators.
    - Savings on generators and alternative fuels are $1 366m for firms and $187m for households.
    - There are $131m grid connection costs for firms (negative benefit).
    - Exports would be worth $610m.
- For Zimbabwe:
- Total savings from outages by firms of $5 744m is the largest benefit. This is made up of $5 300m for firms without and $444m for firms with generators.
- Savings from expenditure on generators and alternative fuels are $361m for firms and $171m for households.
- There are $77m grid connection costs for firms (expressed as a negative benefit in the table).
- Exports would be worth $481m.
- The NPV is R11 625m. This is positive. The base case would be economically efficient and benefits both Zambia and Zimbabwe.
- The BCR is 4.71. This means that for every $1.00 spent on the project there are benefits of by $4.71. This is a robust result.
- The IRR is 28%.

7.1.2 Case 2: Different Dam Heights

The impact of different heights in the dam wall and, as a result, final supply levels is shown in Table 8. The results are given for FSLs of 730m, 740m, 757m and 762m.

Table 8: Cost Benefit – Different Final Supply Levels

Final Supply Level	**metres**	**730**	**740**	**757**	**762**
Installed Capacity	MW	2 083	2 185	2 360	2 410
Power Generated	GWh/yr	7 380	8 266	9 890	10 215
Total Costs	$m	2 887	2 978	3 098	3 133
Total Benefits	$m	10 893	12 148	14 335	14 758
NPV	$m	8 007	9 170	11 236	11 625
BCR	ratio	3.77	4.08	4.63	4.71
IRR	%	25%	26%	28%	28%

There are lower costs and benefits with a lower dam wall. Benefits reduce more proportionately than costs. The BCR and IRR for an FSL of:

- 762m (base case) are 4.71 and 28%;
- 757m are 4.63 and 28%;
- 740m are 4.08 and 26%;
- 730m are 3.77 and 25%.

The efficiency of the proposed scheme remains positive with lower dam heights.

7.1.3 Case 3: Variations in Electricity Demand

The results of changing electricity demand assumptions in the base case are given in Table 9. These assumptions are varied between very low and very high demand cases.

Table 9: Cost Benefit Analysis for Variation in Electricity Demand for 762m FSL

Variable	Very Low Demand	Low Demand	Base Case	High Demand	Very High Demand
Unserved Demand: Zambia (MW)	0	200	227	600	1 000
Unserved Demand: Zimbabwe (MW)	0	200	444	600	1 000
Annual Growth in Demand: Zambia	0.5%	3.0%	5.6%	6.0%	8.0%
Annual Growth in Demand: Zimbabwe	0.5%	2.0%	3.4%	4.0%	6.0%
Benefit Cost Ratio (BCR)	**2.35**	**4.15**	**4.71**	**5.18**	**5.59**

The results show that the proposed scheme remains economically efficient even with substantial changes in demand assumptions.

7.1.4 Case 4: Lower Water Storage in Dry Season

It is understood from ERM Southern African that a FSL of 762m would compromise white water rafting and other tourism services. It therefore reduces incomes to people working in this industry. It is further understood that white river rafting could continue to take place if water levels were lower in the dry season.

The impact on the economic results of reducing the dry season water levels from 762m to 740m are given in Table 10.

Table 10: Results of Scheme Operated at Lower Levels During Dry Season

Low Season Supply Level	**metres**	**762**	**740**
Installed Capacity	**MW**	2 410	2 322
Power Generated	**GWh/yr**	10 215	9 842
Total Costs	**$m**	3 133	3 124
Initial Capital Cost and Financing	***$m***	*2 496*	*2 496*
Operations & Maintenance	***$m***	*203*	*196*
Professional Fees	***$m***	*300*	*299*
Tourism Impacts	***$m***	*135*	*134*
Total Benefits	**$m**	14 758	12 421
NPV	**$m**	11 625	9 296
BCR	**ratio**	4.71	3.98
IRR	**%**	28%	26%

The differences between the two water heights are:

- Costs reduce from $3 133m to $3 124m (0.3%);
- Revenue to tourism firms would be $1m higher;
- Overall benefits would drop from $14 758m to $12 421m (16%);
- The NPV would drop from $11 625m to $9 296m;
- The BCR reduces from 4.71 to 3.98 and the IRR from 28% to 26%.

These changes result in a drop in economic efficiency. They do bring about a marginal increase in tourism revenues.

7.1.5 Case 5: Exporting Peak Load Power

The consequence of generating peak load electricity and exporting it to the SAPP at a premium rate of 15c/kWh is shown in Table 11. The results are given for the base case and two peak load cases. All of the information for the differences between the three different cases in this section were sourced from the options assessment report. The differences between three instances are in

- The base case all power generated is for base load. Costs are $3 133m and benefits $14 758m.
- Peak case 2 where 6 561GWh/yr are produced for base load and 3 583GWh/yr for peak load. Costs are lower and benefits are higher. The latter because of higher revenues.
- Peak case 3 where 6 837GWh/yr are produced for base load and 3 132GWh/yr are produced for peak load. Costs remain the same as peak case 2 and benefits are lower.

Table 11: Cost Benefit – Exporting Peak Load Electricity

Peak Load Scenario		Base Case	Peak Case 2	Peak Case 3
Base Power Generated	GWh/yr	10,215	6,561	6,837
Peak Power Generated	GWh/yr	0	3,584	3,329
Total Power Generated	GWh/yr	10,215	10,145	10,166
Total Costs	$m	3,133	3,132	3,132
Total Benefits	$m	14,758	16,248	16,201
NPV	$m	11,625	13,116	13,069
BCR	ratio	4.71	5.19	5.17
IRR	%	28%	32%	32%

There are only minor costs changes. The benefits increase because the peak load power could be exported at a premium. The BCR and IRR for peak case:

- 2 increase to 5.19 and 32%;
- 3 increase to 5.17 and 32%.

The efficiency of the proposed scheme increases if the peak load could be generated and exported at a premium to the SAPP.

7.1.6 Base Case Sensitivity Analysis

A sensitivity analysis was conducted on a number of assumptions. These were changes in:

- Unserved demand in Zambia and Zimbabwe in 2022;
- The distribution of unserved demand between households and firms;
- The cost of lost production to firms without generators;
- Average monthly electricity usage of new firms;
- Firm connection costs;
- Exports of base peak load;
- Running costs;
- Reduced electricity demand;
- Financing costs.

Only some of the assumptions affected the results. These are the only results that are reported below. Combinations of some of these assumptions were also tested and the results reported in section 7.1.3.

The results for the base case are highlighted in bold in the tables in section. The BCR is reported twice. First for a dam with a FSL of 762m and operated at that level. Second for a dam with a FSL of 762m operated at 740m during the dry season.

7.1.6.1 Unserved Demand

The base case assumed 227MW of unserved demand in Zambia and 444MW in Zimbabwe in 2022. This sensitivity analysis varies unserved demand. The results are reported in Table 12 for Zambia and Table 13 for Zimbabwe.

Table 12: Unserved Demand in Zambia

Unserved Demand Zambia	fsl 762m	Low season fsl 740m
0 MW	4.54	3.79
227 MW	**4.71**	**3.98**
900 MW	5.09	4.36
1,205 MW	5.12	4.40

For Zambia:

- With no unserved demand in 2022 the BCR for a:
  - FSL of 762m would reduce from 4.71 to 4.54;
  - FSL of 740m would drop from 3.98 to 3.79;
  - This drop is the result of more exports to the SAPP.
- The BCRs are higher with more unserved demand in 2022. Benefits are higher when electricity is consumed locally.

Table 13: Sensitivity Analysis of Unserved Demand in Zimbabwe

Unserved Demand Zimbabwe	fsl 762m	Low season fsl 740m
0 MW	4.27	3.45
444 MW	**4.71**	**3.98**
900 MW	5.06	4.45
1,205 MW	5.13	4.49

For Zimbabwe:

- With no unserved demand in 2022 the BCR for a:
  - FSL of 762m would reduce from 4.71 to 4.27;
  - low season FSL of 740m would drop from 3.98 to 3.45;
  - This drop is the result of more exports to the SAPP.
- The BCRs are higher with more unserved demand in 2022. Benefits are higher when electricity is consumed locally.

The results are mildly sensitive to changes in unserved demand in 2022. This is because any differences in demand are exported. This generates revenues which offset the lower local benefits.

7.1.6.2 Distribution of Unserved Demand

Unserved demand is distributed equally between households and firms in the base case. The results of variations are shown in Table 14.

Table 14: Households and Firm Distribution of Unserved Demand

Households : Firms Unserved Demand Split	fsl 762m	Low season fsl 740m
25% Households & 75% Businesses	6.72	5.80
50% Households & 50% Businesses	**4.71**	**3.98**
75% Households & 25% Businesses	2.70	2.15

It was found that the higher the proportionate share of unserved energy for firms the greater the economic efficiency. For example, with firms having 75% of unserved energy demands the BCR increases to 6.72 for a FSL of 762m and 5.80 for 740m Conversely, the BCR would be 2.70 and 2.15 respectively with a 25% share.

The results are sensitive to changes in the distribution of unserved demand.

7.1.6.3 Cost of Lost Production for Firms without Generators

It was assumed in section 6.2.1.2 that firms without generators would have losses 1.5 times greater than firms with generators. Variations in this assumption show that:

With the FSL 762m scheme the BCR would:

- Reduce to 3.72 with losses equal to those of firms with backup generators;
- Reduce to 2.72 with losses equal to half those of firms with backup generators;
- Increase to 16.23 for losses equal to 7.3 times[10] those of firms with backup generators.

With a dry season FSL of 740m the BCR would:

- Reduce to 3.01 with losses equal to those of firms with backup generators;
- Reduce to 2.04 with losses equal to half those of firms with backup generators;

[10] *This is the value in the findings of (Steinbuks & Foster, 2010, p. 509).*

- Increase to 15.21 for losses equal to 7.3 times those of firms with backup generators.

Table 15: Sensitivity Analysis of Cost of Lost Production

Cost of Lost Production for Firms without Generators	fsl 762m	Low season fsl 740m
0.5 x businesses with generators	2.72	2.04
1.0 x businesses with generators	3.72	3.01
1.5 x businesses with generators	**4.71**	**3.98**
2.0 x businesses with generators	5.70	4.94
5.0 x businesses with generators	11.66	10.75
7.3 x businesses with generators	16.23	15.21

The results are very sensitive to relative changes in the losses of firms without generators.

7.1.6.4 Annual Growth in Demand for Electricity in Zambia and Zimbabwe

The base case estimates that annual electricity demand is expected to increase by 5.6% in Zambia and 3.4% in Zimbabwe between 2012 and 2045.

Table 16: Annual Growth in Demand for Electricity in Zambia

Annual Growth in Demand - Zambia	fsl 762m	Low season fsl 740m	Peak Power
0.0%	3.55	2.78	4.49
3.0%	4.52	3.79	5.14
5.6%	**4.71**	**3.98**	**5.21**

In Zambia an annual change in demand for electricity of:

- 0% reduces the BCR to:
- 3.55 for a FSL of 762m;
- 2.78 for FSL of 740m.
- 3% reduces the BCR to:
- 4.52 for a FSL of 762m;
- 3.79 for FSL of 740m.

Table 17: Sensitivity Analysis of Growth in Demand for Electricity in Zimbabwe

Annual Growth in Demand - Zimbabwe	fsl 762m	Low season fsl 740m	Peak Power
0.0%	4.11	3.23	4.92
2.0%	4.63	3.90	5.17
3.4%	**4.71**	**3.98**	**5.21**

In Zimbabwe a change in demand for electricity of:

- 0% reduces the BCR to:
- 4.11 for a FSL of 762m;
- 3.23 for a FSL of 740m.
- 2% reduces the BCR to:
- 4.63 for a FSL of 762m;
- 3.90 for a FSL of 740m.

The results are largely insensitive to changes in the growth of demand for electricity. This rather unexpected result is because any excess electricity would be exported. The export revenues would offset lower domestic benefits.

7.1.6.5 Financing Costs

The impact on the BCR of changed financing costs are shown in Table 18.

Table 18: Changes in Real Rate Cost of Borrowing

International Loans	fsl 762m	Low season fsl 740m
5% Real Interest Rate	5.00	4.22
7% Real Interest Rate	**4.71**	**3.98**
10% Real Interest Rate	4.32	3.64
15% Real Interest Rate	3.76	3.17

The results are only moderately sensitive to changes in real interest rates. The project remains economically efficient for the range tested.

7.1.7 Conclusion to the Cost Benefit Analysis

The following conclusions are made:

- Operating the dam at its highest level is economically the most efficient.
- Variations in demand for electricity would not change the economic efficiency so long as surplus electricity could be exported to the SAPP.
- Operating at less than capacity during the dry season reduces the economic efficiency. It also would make hardly any difference to the impact on income of tourist operators. Mitigation would be improved by financial compensation to these operators. This would not affect economic efficiency provided the compensation is not relocated to other countries.
- Exporting peak load electricity to the SAPP would improve the efficiency of the project.

7.2 Macroeconomic Results

The macroeconomic contribution of the base case is reported[11]. The results are reported annually between 2016 and 2025 and in 5 year increments until 2035. The only variable that changes after 2036 is lost tourism revenue.

The reported macroeconomic indicators are the contribution to Gross Domestic Product and direct and indirect jobs in Zambia and Zimbabwe. These are disaggregated into construction, operations and maintenance, professional fees, reduced tourism revenues, savings from reduced outages and exports.

7.2.1 Gross Domestic Product

Gross Domestic Product is the total value of all final goods and services produced in a country. It is clearly fundamental to the economic quality of life of people in Zambia and Zimbabwe. It is also the most important and all-encompassing measure of the macroeconomic effect of the proposed Batoka Gorge Hydroelectric Scheme. The contribution to GDP is presented in Table 19 and Figure 4.

Table 19: Contribution to GDP

Contribution to GDP - US$m, 2015 Prices	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035
Zambia												
Initial Construction Costs	103	103	103	103	103	103						
Operations & Maintenance							29	29	29	29	29	29
Professional Fees	14	14	14	14	14	14	6	6	6	6	6	6
Reduced Tourism Revenues	-10	-10	-11	-11	-12	-12	-13	-13	-14	-14	-18	-22
Savings from Outages							207	401	552	702	1 100	1 100
Exported Electricity							477	396	316	235	0	0
Total Contribution to Zambian GDP	**107**	**106**	**106**	**105**	**105**	**105**	**706**	**819**	**888**	**958**	**1 117**	**1 113**
Zimbabwe												
Initial Construction Costs	128	128	128	128	128	128						
Operations & Maintenance							47	47	47	47	47	47
Professional Fees	26	26	26	26	26	26	11	11	11	11	11	11
Reduced Tourism Revenues	-16	-16	-17	-18	-18	-19	-20	-21	-22	-23	-28	-34
Savings from Outages							1 281	1 464	1 647	1 830	2 071	2 071
Exported Electricity							601	505	408	311	0	0
Total Contribution to Zimbabwean GDP	**139**	**138**	**138**	**137**	**136**	**135**	**1 920**	**2 006**	**2 091**	**2 176**	**2 101**	**2 095**
Total Contribution to Regional GDP	246	245	244	243	241	240	2 627	2 824	2 979	3 134	3 218	3 208
Cumulative Contribution to Regional GDP	246	491	734	977	1 218	1 458	4 085	6 909	9 889	13 023	29 609	45 670

In Zambia the total contribution to GDP:

- Is largely constant during construction - between $107m and $105m.

[11] *It will be recalled that the results to the other cases are reported only for the cost benefit analysis because those results should typically carry more weight in policy decisions. This has been outlined in Section 5. In a nutshell the cost benefit results report the economic efficiency of a project. Ideally it is these results that determine whether or not the project should go ahead. The macroeconomic analysis show how the benefits are distributed through the economy.*

- Increases to $706m by 2022 in the first year of operation and continues to increase until 2030 as a result of savings from reduced outages.
- By 2030 contribution to GDP is $1 117m.
- This drops slightly to $1 113m by 2035 because of falling tourism revenues.

In Zimbabwe the total contribution to GDP:

- Is largely constant during construction - between $139m and $135m.
- Increases to $1 920m by 2022 in the first year of operation and continues to increase until 2030 as a result of savings from reduced outages.
- By 2030 contribution to GDP is $2 101m.
- This drops slightly to $2 095m by 2035 because of falling tourism revenues.

In total, contribution to GDP:

- Is largely constant during construction - about $240m.
- Increases to $2 627m by 2022.
- This is $3 208m by 2035.

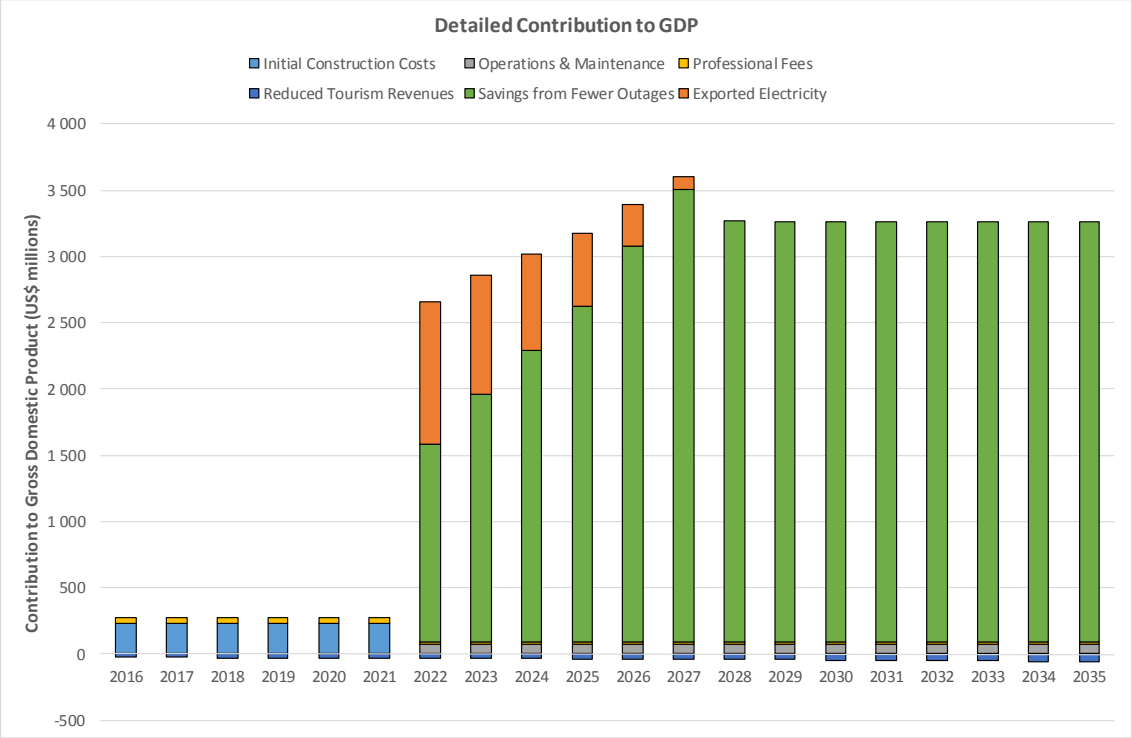
In aggregate the proposed Batoka Gorge hydroelectric scheme would have added a cumulative $1 458m to the GDPs of the two countries at the end of construction. By 2035 this cumulative contribution is estimated to be $45 670m.

The disaggregated contribution is:

- Construction costs have been divided evenly over six years. Most of the materials are imported and therefore do not make a macroeconomic contribution. Local procurement increases Zambian GDP annually by $103m and by $128m in Zimbabwe.
- Running expenses would contribute $29m to Zambian GDP and $47m to Zimbabwean GDP.
- Professional fees would contribute a further $14m a year to Zambian GDP and $26m to Zimbabwean GDP during construction. This operational contribution is expected to be $6m annually in Zambia and $11m in Zimbabwe.
- Reduced tourism revenues are expected to cost Zambia $10m in 2016 increasing to $22m by 2035. This would be $16m and $34m for Zimbabwe.

- The contribution of electricity to savings from fewer outages in Zambia is expected to increase GDP by $207m in 2022 and increasing $1 100m from 2030. In Zimbabwe this is expected to increase from $1 281m to $2 071m over the same period.
- Income from exports is estimated to contribute $477m to the Zambian economy in 2022. This reduces annually and no exports are expected by 2030. Exports would contribute $601m to Zimbabwe in 2022, also dropping off by 2030.

Figure 4: Detailed Contribution to Gross Domestic Product



The detailed contribution to GDP is shown in Figure 4:

- The difference in contribution to GDP between construction and operating is clearly apparent. Most of the construction expenses are imports.
- Exports decline and local production increases until 2027 when local demand uses all the generation capacity of the proposed Batoka Gorge scheme.
- The slight drop between 2027 and 2028 is because there are no further electricity connections.
- The negative impact from lower tourism revenue is also shown, as is the relative size of this impact.

7.2.2 Direct and Indirect Jobs

The proposed Batoka Gorge hydroelectric scheme would result in changes to two types of jobs. The first are the direct jobs that would be created. These are jobs directly on building and running the scheme. Included are the structural changes to the economy as a result of improved productivity. The second are the so-called indirect jobs that result from the multiplier effects of the capital and operational costs, the lost tourism business, the improved productivity and exports.

Table 20 reports on the direct jobs, Table 21 on the indirect jobs in the two countries and Table 22 is a sum of the direct and indirect job creation for both countries. Figure 5 illustrates the total direct and indirect job creation in the two countries as well as contribution to their GDPs.

Table 20: Direct Jobs

Contribution to Direct Jobs	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035
Zambia												
Initial Construction Costs	250	250	1 500	1 500	1 500	1 500						
Operations & Maintenance							837	837	837	837	837	837
Professional Fees	243	243	243	243	243	243	106	106	106	106	106	106
Reduced Tourism Revenues	-174	-181	-189	-197	-206	-214	-223	-233	-243	-253	-312	-385
Savings from Outages							3 662	6 574	9 238	11 902	19 440	19 440
Exported Electricity							8 428	7 005	5 582	4 159	0	0
Contribution to Zambian Direct Jobs	**319**	**312**	**1 554**	**1 546**	**1 538**	**1 529**	**12 809**	**14 288**	**15 519**	**16 750**	**20 070**	**19 998**
Zimbabwe												
Initial Construction Costs	250	250	1 500	1 500	1 500	1 500						
Operations & Maintenance							966	966	966	966	966	966
Professional Fees	257	257	257	257	257	257	112	112	112	112	112	112
Reduced Tourism Revenues	-258	-269	-280	-292	-305	-318	-331	-345	-360	-375	-463	-570
Savings from Outages							19 030	22 029	25 029	28 029	34 157	34 157
Exported Electricity							9 992	8 383	6 773	5 164	0	0
Contribution to Zimbabwean Direct Jobs	**250**	**239**	**1 477**	**1 465**	**1 453**	**1 440**	**29 768**	**31 145**	**32 520**	**33 895**	**34 772**	**34 665**
Contribution to Regional Direct Jobs	569	550	3 031	3 011	2 990	2 969	42 577	45 433	48 040	50 645	54 842	54 662

During the construction period between 2016 and 2021:

- The options assessment report expects that 500 people would be employed during the first two years of construction, increasing to around 3 000 people for the rest of the construction period. These direct jobs, in the absence of other information, have been divided equally between the two countries.
- It is estimated that professional fees would generate 243 jobs in Zambia and 257 in Zimbabwe.
- There would be job losses because of lower tourism revenues. In Zambia it is estimated that these job losses would increase from 174 in 2016 to 214 in 2021 while in Zimbabwe it is estimated that the job losses would increase from 258 to 318 over the same time period.

When operations commence in 2022:

- It is estimated that 837 direct jobs would be created in Zambia and 966 in Zimbabwe from operations and maintenance.
- Professional fees could generate 106 direct jobs in Zambia and 112 in Zimbabwe.
- There would be a loss of 223 direct jobs in tourism in Zambia and 331 in Zimbabwe in 2022. This would increase to 385 and 570 respectively by 2035.
- Savings from fewer outages is expected to generate 19 440 direct jobs from 2030 in Zambia and 34 157 in Zimbabwe.
- Exports contribute to job creation in the early years of operation. In Zambia as many as 8 428 jobs could be created from export revenue in 2022 while in Zimbabwe it is estimated that 9 992 direct jobs could be created.

Total direct jobs in the two countries are estimated to exceed 1 500 from the third year of construction. The number of direct jobs then increases until stabilising at approximately 54 000 in 2030.

Table 21: Indirect Jobs

Contribution to Indirect Jobs	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035
Zambia												
Initial Construction Costs	4 674	4 674	4 674	4 674	4 674	4 674						
Operations & Maintenance							1 397	1 397	1 397	1 397	1 397	1 397
Professional Fees	266	266	266	266	266	266	116	116	116	116	116	116
Reduced Tourism Revenues	-350	-365	-380	-396	-413	-431	-449	-468	-488	-509	-627	-773
Savings from Outages							7 363	15 232	20 588	25 944	39 083	39 083
Exported Electricity							16 944	14 083	11 222	8 361	0	0
Contribution to Zambian Indirect Jobs	**4 590**	**4 575**	**4 560**	**4 543**	**4 526**	**4 509**	**25 370**	**30 359**	**32 834**	**35 308**	**39 969**	**39 823**
Zimbabwe												
Initial Construction Costs	7 429	7 429	7 429	7 429	7 429	7 429						
Operations & Maintenance							2 491	2 491	2 491	2 491	2 491	2 491
Professional Fees	383	383	383	383	383	383	167	167	167	167	167	167
Reduced Tourism Revenues	-506	-528	-550	-574	-598	-624	-650	-678	-707	-737	-909	-1 120
Savings from Outages							47 213	53 282	59 351	65 419	68 144	68 144
Exported Electricity							19 622	16 462	13 301	10 141	0	0
Contribution to Zimbabwean Indirect Jobs	**7 306**	**7 285**	**7 262**	**7 239**	**7 214**	**7 189**	**68 843**	**71 723**	**74 603**	**77 481**	**69 894**	**69 683**
Contribution to Regional Indirect Jobs	11 896	11 860	11 822	11 782	11 741	11 698	94 213	102 083	107 437	112 789	109 862	109 505

Indirect jobs are shown in Table 21. Total indirect jobs in the two countries are set to increase from around 11 900 in 2016 to approximately 94 000 in 2022. As business productivity increases so too do the indirect jobs, until they total almost 110 000 by 2030 and 2035.

Table 22: Total Direct and Indirect Jobs

Contribution to Direct and Indirect Jobs	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035
Zambia												
Initial Construction Costs	4 924	4 924	6 174	6 174	6 174	6 174						
Operations & Maintenance							2 234	2 234	2 234	2 234	2 234	2 234
Professional Fees	509	509	509	509	509	509	222	222	222	222	222	222
Reduced Tourism Revenues	-523	-546	-569	-593	-619	-645	-673	-701	-731	-762	-939	-1 158
Savings from Outages							11 025	21 806	29 826	37 846	58 523	58 523
Exported Electricity							25 372	21 088	16 803	12 519	0	0
Contribution to Total Zambian Jobs	**4 909**	**4 887**	**6 114**	**6 089**	**6 064**	**6 038**	**38 179**	**44 647**	**48 353**	**52 058**	**60 039**	**59 820**
Zimbabwe												
Initial Construction Costs	7 679	7 679	8 929	8 929	8 929	8 929						
Operations & Maintenance							3 457	3 457	3 457	3 457	3 457	3 457
Professional Fees	641	641	641	641	641	641	279	279	279	279	279	279
Reduced Tourism Revenues	-764	-797	-831	-866	-903	-941	-982	-1 024	-1 067	-1 113	-1 371	-1 690
Savings from Outages							66 243	75 311	84 380	93 448	102 301	102 301
Exported Electricity							29 614	24 844	20 074	15 305	0	0
Contribution to Total Zimbabwean Jobs	**7 556**	**7 523**	**8 739**	**8 704**	**8 667**	**8 629**	**98 611**	**102 868**	**107 123**	**111 376**	**104 666**	**104 347**
Contribution to Total Regional Jobs	12 465	12 410	14 853	14 793	14 731	14 666	136 791	147 515	155 476	163 434	164 704	164 168

Total jobs, the sum of the direct and indirect jobs discussed above, are shown in Table 22. Total jobs are set to increase from 12 465 in 2016 to 14 666 by the end of the construction period. They increase to 136 791 in 2022. They increase annually after that reaching approximately 164 000 by 2030.

Figure 5: Contribution to Direct and Indirect Jobs and Gross Domestic Product

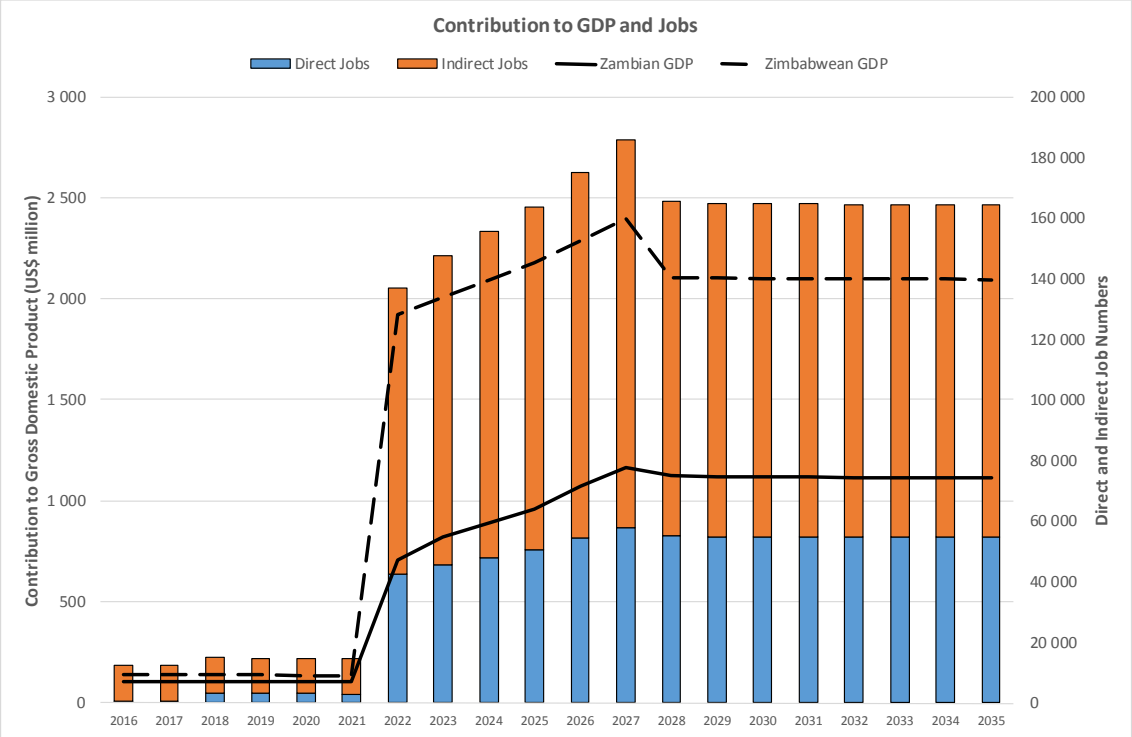


Figure 5 shows the contribution to direct and indirect jobs (the blue and orange columns respectively) and to the Zambian and Zimbabwean economies respectively (the two black lines). A number of patterns are apparent:

- The contribution of the scheme to jobs and to the economies of the two counties increases significantly during the operating period (from 2022 onwards).
- For every one direct job there are approximately two indirect jobs.
- There is a higher economic contribution to Zimbabwe than Zambia.

8 Overall Assessment and Significance Rating of Impacts

This section assesses the five cases analysed in Section 7.1.

8.1 Economic Feasibility: Case 1: Base Case – Dam Height and FSL of 762m

8.1.1 Description of Effect

Determine whether the construction and operation of the proposed Batoka Gorge Hydroelectric Scheme, operating at an FSL of 762m, is economically efficient.

8.1.2 Assessment

The overall conclusion from the cost benefit analysis is that the base case is economically efficient. Realistic assumption changes did not result in economic inefficiency.

Table 23: Significance Rating of the Proposed Batoka Gorge Hydroelectric Scheme at FSL 762m

Criteria	**Rating**
Extent	Regional and International
Duration	Permanent
Scale	Large (National and International)
Frequency	Constant
Likelihood	Likely
Magnitude	Positive
Sensitivity / Vulnerability / Importance of Resource / Receptor	High
Impact Significance	**Major**

The project has a major positive impact significance, as shown in Table 23. Although the project overall is beneficial from the national perspective of the two countries there is a localised negative economic impact on the tourism facilities affected by the scheme (Anchor Environmental Consultants, 2015).

Mitigation measures could include:

- Operating the dam at a lower level during the dry season.
- Financial payments from the ZRA to the tourist companies affected by the scheme. This transfer would not affect the economic efficiency of the project if the transfers remain in the countries.

8.2 Economic Feasibility: Case 2: Different Dam Heights

8.2.1 Description of Effect

Determine whether the construction and operation of the proposed Batoka Gorge Hydroelectric Scheme, with an FSL of less than 762m, is economically efficient from a combined national perspective for Zambia and Zimbabwe.

8.2.2 Assessment

The overall conclusion from the cost benefit analysis is that case 2 is economically efficient. The economic efficiency is lower than the base case.

Table 24: Significance Rating of the Proposed Batoka Gorge Hydroelectric Scheme with FSLs less than 762m

Criteria	**Rating**
Extent	Regional and International
Duration	Permanent
Scale	Large (National and International)
Frequency	Constant
Likelihood	Likely
Magnitude	Positive
Sensitivity / Vulnerability / Importance of Resource / Receptor	High
Impact Significance	**Major**

The project has a major positive impact significance, as shown in Table 24. Although the project overall is beneficial from the national perspective of the two countries there is a localised negative economic impact on the tourism facilities affected by the scheme (Anchor Environmental Consultants, 2015).

Mitigation measures could include:

- Operating the dam at a lower level during the dry season.

- Financial payments from the ZRA to the tourist companies affected by the scheme. This transfer would not affect the economic efficiency of the project if the transfers remain in the two countries.

8.3 Economic Feasibility: Case 3: Variations in Electricity Demand

8.3.1 Description of Effect

Determine whether the construction and operation of the proposed Batoka Gorge Hydroelectric Scheme, with an FSL of 762m, is economically efficient with electricity demands different to those of the base case.

8.3.2 Assessment

The overall conclusion from the cost benefit analysis is that the base case is economically efficient. The outcome remains economically efficient with variations in electricity demand. The efficiency of the project reduces as demand for electricity reduces. However, the project remains efficient under the range tested.

Table 25: Significance Rating of the Proposed Batoka Gorge Hydroelectric Scheme at FSL 762m and Variations in Demand

Criteria	**Rating**
Extent	Regional and International
Duration	Permanent
Scale	Large (National and International)
Frequency	Constant
Likelihood	Likely
Magnitude	Positive
Sensitivity / Vulnerability / Importance of Resource / Receptor	High
Impact Significance	**Major**

The project has a major positive impact significance, as shown in Table 25. Although the project overall is beneficial from the national perspective of the two countries there is a localised negative economic impact on the tourism facilities affected by the scheme (Anchor Environmental Consultants, 2015).

Mitigation measures could include:

- Operating the dam at a lower level during the dry season.

- Financial payments from the ZRA to the tourist companies affected by the scheme. This transfer would not affect the economic efficiency of the project if the transfers remain in the countries.

8.4 Economic Feasibility: Case 4 -Lower Water Storage in Dry Season

8.4.1 Description of Effect

Determine whether the construction and operation of the proposed Batoka Gorge Hydroelectric Scheme, constructed at an FSL of 762m and operated at an FSL of 740m during the dry season is economically efficient from a combined national perspective for Zambia and Zimbabwe.

8.4.2 Assessment

The overall conclusion from the cost benefit analysis is that this case is still economically efficient when operated at a lower level during the dry season. However, the economic efficiency has reduced. Realistic changes in the assumptions did not change the efficiency of the project.

Table 26: Significance Rating of the Proposed Batoka Gorge Hydroelectric Scheme Operated at FSL 740m during the Dry Season

Criteria	**Rating**
Extent	Regional and International
Duration	Permanent
Scale	Large (National and International)
Frequency	Constant
Likelihood	Likely
Magnitude	Positive
Sensitivity / Vulnerability / Importance of Resource / Receptor	High
Impact Significance	**Major**

The project has a major positive impact significance, as shown in Table 26. Although the efficiency has reduced from the previous case it is still an economically efficient project. Although the project overall is beneficial from the national perspective of the two countries there is a localised negative economic impact on the tourism facilities affected by the scheme (Anchor Environmental Consultants, 2015).

The purpose of this particular case it to determine the impact on tourism revenues that result from a lower FSL during the dry season. The result is insignificant. Lost tourism revenues change from $135m with a FSL of 762m to $134m with a FSL of 740m.

As a consequence, the only mitigation measure that would have any meaningful affect would be financial compensation by the ZRA to the tourist companies affected by the proposed scheme.

8.5 Economic Feasibility: Case 5: Exporting Peak Load Electricity

8.5.1 Description of Effect

Determine whether the construction and operation of the proposed Batoka Gorge Hydroelectric Scheme, with an FSL of 762m, is economically efficient from a combined national perspective for Zambia and Zimbabwe when peak load electricity is exported to the SAPP.

8.5.2 Assessment

The overall conclusion from the cost benefit analysis is that case 5 is economically efficient. The economic efficiency is higher than the base case.

Table 27: Significance Rating of the Proposed Batoka Gorge Hydroelectric Scheme at FSL 762m and Exporting Peak Load Electricity

Criteria	**Rating**
Extent	Regional and International
Duration	Permanent
Scale	Large (National and International)
Frequency	Constant
Likelihood	Likely
Magnitude	Positive
Sensitivity / Vulnerability / Importance of Resource / Receptor	High
Impact Significance	**Major**

The project has a major positive impact significance, as shown in Table 27. Although the project is beneficial overall from the national perspective of the two countries there is a localised negative economic impact on the tourism facilities affected by the scheme (Anchor Environmental Consultants, 2015).

Mitigation measures could include:

- Operating the dam at a lower level during the dry season.

- Financial payments from the ZRA to the tourist companies affected by the scheme. This transfer would not affect the economic efficiency of the project if the transfers remain in the two countries.

9 Conclusion

This report set out to determine the economic efficiency of the proposed Batoka Gorge Hydroelectric Scheme and the distribution of the costs and benefits through the economies of Zambia and Zimbabwe. It did this by performing an economic cost benefit analysils and a macroeconomic analysis.

Cost Benefit Analysis Results

The following results are reported:

- Case 1, the base case, with an FSL of 762m:
  - The NPV is R11 625m. This is economically efficient and would benefit countries.
  - The BCR is 4.71. This means that for every $1.00 spent on the project would bring benefits of $4.71. This is a robust result.
  - The IRR is 28%.
- Case 2: Different Dam Heights: There are lower costs and benefits with a lower dam wall. Benefits reduce more proportionately than costs. The BCR and IRR for an FSL of:
  - 762m (base case) are 4.71 and 28%;
  - 757m are 4.63 and 28%;
  - 740m are 4.08 and 26%;
  - 730m are 3.77 and 25%.
- Case 3: Variations in Electricity Demand: The proposed scheme remains economically efficient even with substantial changes to the underlying assumptions of electricity demand of the base case.
- Case 4: Lower Water Storage in the Dry Season:
  - The NPV would drop from $11 625m to $9 296m;
  - The BCR reduces from 4.71 to 3.98 and the IRR from 28% to 26%.
- Case 5: Exporting Peak Load Power: The efficiency of the proposed scheme increases if the peak load could be generated and exported at a premium to the SAPP. The BCR and IRR for:
  - Peak case 2 increase to 5.19 and 32%;
  - Peak case 3 increase to 5.17 and 32%

The following conclusions are made:

- Operating the dam at its highest level is economically the most efficient.
- Variations in demand for electricity would not change the economic efficiency provided surplus electricity could be exported to the SAPP.
- Operating at less than capacity during the dry season reduces the economic efficiency. It also would make hardly any difference to the impact on income of tourist operators. Mitigation would be improved by financial compensation to these operators. This would remain efficient so long as the compensation is not relocated to other countries.
- Exporting peak load electricity to the SAPP would improve the efficiency of the project.

A sensitivity analysis was conducted on a number of assumptions for the base case (FSL of 762m) and case 4 (lower water storage in the dry season). The results were only affected by changes to some of the assumptions. The results were most sensitive to changes in the distribution of unserved demand (between households and firms) and the cost of lost production for firms without generators. However, the results remained economically efficient for the entire range tested.

Macroeconomic Results

The macroeconomic contribution of the base case is reported[12].

In Zambia the total contribution to GDP:

- Is largely constant over construction - between $107m and $105m.
- Increases to $706m by 2022 in the first year of operation and continues to increase until 2030 as a result of savings from less outages.
- By 2030 contribution to GDP is $1 117m.
- This drops slightly to $1 113m by 2035 because of falling tourism revenues.

In Zimbabwe the total contribution to GDP:

- Is largely constant over construction - between $139m and $135m.

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[12] *It will be recalled that the results to the other cases are reported only for the cost benefit analysis because those results should typically carry more weight in policy decisions.*

- Increases to $1 920m by 2022 in the first year of operation and continues to increase until 2030 as a result of savings from less outages.
- By 2030 contribution to GDP is $2 101m.
- This drops slightly to $2 095m by 2035 because of falling tourism revenues.

In total, contribution to GDP:

- Is largely constant over construction - about $240m.
- Increases to $2 627m by 2022.
- This is $3 208m by 2035.

In aggregate the proposed Batoka Gorge hydroelectric scheme would have added a cumulative $1 458m to the GDPs of the two countries at the end of construction. By 2035 this cumulative contribution is estimated at $45 670m.

The contribution of the proposed Batoka Gorge Hydroelectric scheme to job creation:

- Total direct jobs in the two countries are estimated to exceed 1 500 from the third year of construction. The number of direct jobs then increases until stabilising at approximately 54 000 in 2030.
- Total indirect jobs in the two countries are set to increase from around 11 900 in 2016 to approximately 94 000 in 2022. As business productivity increases so too do the indirect jobs, until they total almost 110 000 by 2030 and 2035.
- Total jobs, which is the sum of the direct and indirect jobs, are set to increase from 12 465 in 2016 to 14 666 by the end of the construction period. They increase to 136 791 in 2022. They increase annually after that reaching approximately 164 000 by 2030.

Significance Ratings

All five cases assessed have major positive significance ratings.

There would be negative impacts on local firms that supply tourism services. This may warrant mitigation:

- Operating the scheme at a lower level during the dry season makes hardly any difference to tourism revenues.
- The alternative is a direct financial compensation from the ZRA to affected firms.

10 Bibliography

(CSIR), T. C. (2004). *The estimation of unit costs of road traffic accidents in South Africa.*

Anchor Environmental Consultants. (2015). *Batoka Gorge Hydro-Electric Scheme Environmental and Social Impact Assessment: Economic Assessment.* Cape Town.

Barnes, D. F., Khandker, S. R., & Samad, H. A. (2010). *Energy Access, Efficiency, and Poverty: How Many Households Are Energy Poor in Bangladesh?*

De Vita, G., Endresen, K., & Hunt, L. C. (2006). An empirical analysis of energy demand in Namibia. *Energy Policy*, 3447-3463.

Dinkelman, T. (2008). *The Effects of Rural Electrification on Employment: New Evidence from South Africa.*

Federal Motor Carrier Safety Administration (FMCSA). (2008). Current FCMSA Crash Cost Figures.

IEG. (2008). *The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benifits.* World Bank, Independent Evaluation Group. Washington: World Bank InfoShop.

Inglesi, R. (2010). Aggregate electricity demand in South Africa: Conditional forecasts to 2030. *Applied Energy*, 197-204.

Inglesi-Lotz, R. (2011). The evolution of price elasticity of electricity demand in South Africa: A Kalman filter application. *Energy Policy*, 3690-3696.

Inglesi-Lotz, R., & Blignaut, J. N. (2011). ESTIMATING THE PRICE ELASTICITY OF DEMAND FOR ELECTRICITY BY SECTOR IN SOUTH AFRICA. *SAJEMS NS*, 449-465.

Jacobson, A. (2007). Connective Power: Solar Electrification and Social Change in Kenya. *World Development, 35*(1), 144-162.

Khandker, S. R., Barnes, D. F., & Samad, H. A. (2009). *Welfare Impacts of Rural Electrification: A Case Study from Bangladesh.* World Bank.

Khandker, S. R., Barnes, D. F., Samad, H., & Huu Minh, N. (2008). *Welfare Impacts of Rural Electrification: Evidence from Vietnam.* World Bank.

Khandker, S. R., Samad, H. A., Ali, R., & Barnes, D. F. (2012). *Who Benefits Most from Rural Electrification? Evidence in India.* World Bank.

Kirubi, C., Jacobson, A., Kammen, D. M., & Mills, A. (2009). Community-Based Electric Micro-Grids Can Contribute to Rural Development: Evidence from Kenya. *Elsevier, 37*(7), 1208-1221.

Kopp, A. (2010). *How to use rural electricity in a productive way.* NADEL MAS-cycle 2008 - 2010.

Lindberg, G. (2001). External Accident Cost of Heavy Goods Vehicles. Swedish National Road and Transport Research Institute (VTI).

Lloyd, P., & Cowan, B. (2005). *IMPROVING ACCESS TO ELECTRICITY: LESSONS FROM KHAYELITSHA.* Energy Research Centre, University of Cape Town, South Africa.

Mathee, A., & de Wet, T. (2001). Rural Electrification in South Africa- Implications for the Health and Quality of Life of Women. *ENERGIA News*, pp. 20-22.

Namibia Statistics Agency. (2011). *Namibia 2011 Population & Housing Census Main Report.* Namibia Statistics Agency.

Namibia Statistics Agency. (2012). *Namibia Household Income & Expenditure Survey (NHIES) 2009/10.* Namibia Statistics Agency.

Oseni, M. O., & Pollitt, M. G. (2013). *The Economic Costs of Unsupplied Electricity: Evidence from Backup Generatoin among African Firms.* University of Cambridge: Energy Policy Research Group.

Pereira, M. G., Sena, J. A., Freitas, M. A., & da Silva, N. F. (2011). Evaluation of the impact of access to electricity: A comparative analysis of South Africa, China, India and Brazil. *Renewable and Sustainable Energy Reviews*, 1427-1441.

Prasad, G., & Dieden, S. (2007). *Does Access to Electricity Enable the Uptake of Small and Medium Enterprises in South Africa.* Cape Town: Energy Research Centre, University of Cape Town.

Prasad, G., & Ranninger, H. (2003). THE SOCIAL IMPACT OF THE BASIC ELECTRICITY SUPPORT TARIFF (BEST). *Domestic Use of Energy Conference* (pp. 17-22). Energy and Development Research Centre (EDRC).

Prasad, G., & Visagie, E. (2006). *Impact of energy reforms on the poor in South Africa.* ENERGY RESEARCH CENTRE, University of Cape Town.

PRODUSE. (2013). *The Impact of Electricity Access on Economic Development.* Eschborn.

Snell, M. (2011). *Cost-benefit analysis, a practical guide (second edition).* London: Thomas Telford.

Spalding-Fecher, R. (2005, 05). Health benefits of electrification in developing countries: a quantitative assessment in South Africa. *Energy for Sustainable Development*, pp. 53-62.

Spalding-Fecher, R., & Matibe, D. K. (2003). Electricity and externalities in South Africa. *Energy Policy*, 721-734.

Steinbuks, J., & Foster, V. (2010). When do firms generate? Evidence on in-house electricity supply in Africa. *Energy Economics*, 505-514.

Studio Pietrangeli. (2015). *Batoka Gorge Hydo-Electric Scheme Phase II Layout, Option Assessment Report.*

The Economist. (2016, January 9th - 15th). Electricity in Africa: Power Hungry. *The Economist*, p. 34.

The Freight Transport Association (U.K.). (2012). HGV Accident Research: Lading Factors and other KPI.

Trading Economics. (2016, January 26). *Government Bond 10y - Countries*. Retrieved from Trading Economics: www.tradingeconomics.com/bonds

UNESCO. (2016, January 29). *Mosi-oa-Tunya / Victoria Falls*. Retrieved from UNESCO World Heritage List: http://whc.unesco.org/en/list/509

Viscusi, W. K. (2005, June). The Value of Life. HARVARD, JOHN M. OLIN CENTER FOR LAW, ECONOMICS, AND BUSINESS.

World Bank Group. (2014). *Zambia Economic Brief.* Washington DC: The World Bank.

ZESCO. (2016, January 15). *Customer Care*. Retrieved from Load Shedding Schedules: http://www.zesco.co.zm/customerCare/loadSheddingSchedule

ZESCO. (2016, 01 18). *Generation Projects*. Retrieved from Projects: www.zesco.co.zm/projects/generation

Updated Cost Benefit Analysis Specialist Study (2019)

Stratecon

Applied Economic Research

Economic Cost Benefit Analysis

Batoka Gorge Hydro-Electric Scheme: Dam FSL 757m

Prepared for ERM Southern Africa

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Economic Cost Benefit Analysis

Proposed Batoka Gorge Hydro-Electric Scheme: Dam FSL 757m

Prepared by:

Barry Standish
Antony Boting
John White

12 September 2019

Executive Summary

This report is an update of the 2016 economic cost benefit analysis of the proposed Batoka Gorge Hydro-Electric Scheme (BGHES or Project). It has been undertaken within the context of the ERM Southern Africa Environmental and Social Impact Assessment (ESIA) of this Project. This update focuses on a single option of a scheme with a final reservoir level of 757m. This economic report is not a full Economic Specialist report as required by an ESIA and only focusses on the economic cost benefit analysis of the Project.

Four sets of analyses were done. These are:

- Base Case: an evaluation of the BGHES within committed electricity generation options and excluding emergency generators. This Base Case was extended to assess the impact of a severe drought on the economic efficiency of the BGHES.
- Alternative 1: an evaluation of the BGHES within committed and identified electricity generation options. This alternative includes the operation of emergency generators.
- Alternative 2: renewable and new coal generation options as substitutes for the BGHES.
- Sensitivity analyses on the key assumptions.

The following findings were made:

The Base Case is economically efficient. It would have a Net Present Value (NPV) of $10 643m and benefit both countries. The Benefit Cost Ratio (BCR) is 4.44, meaning that every $1.00 of project expenditure would return $4.44 in societal benefits to the two countries. The economic internal rate of return (IRR) is 28%.

It was found that the Base Case would need a drought that would result in the scheme standing idle for seventeen years (starting immediately after completion) to make the Project economically inefficient. There is no record of such drought over the last century. Alternatively, reduced flows resulting in generation capacity of 16% over the full lifespan of the Project are required to make the Project economically inefficient. Once again, there is no record of such drought over the last century.

Alternative 1 includes the operation of emergency generators which substitute for some of the BGHES output. The excess output is sold to other countries. In this situation the BCR drops from 4.44 to 3.75, which is still an efficient result. The NPV falls from $10 643m to $8 526m and the IRR from 28% to 24%.

Alternative 2 assessed whether other renewable energy and new coal generation options would be more efficient than the BGHES. Renewable energy options would need storage capacity to fulfil the same role as the BGHES. It was found that BGHES is the most efficient option. The only economically efficient baseload alternative is Concentrated Solar Power (CSP), but this is less efficient than the BGHES.

The overall conclusion is that the Project is economically efficient. It remains efficient even with a prolonged drought. It also remains efficient even if surplus energy, because of planned alternative generators or demand variations, is exported. The BGHES is a more efficient baseload option than coal, CSP, wind and solar PV.

The sensitivity analyses found that the results were most sensitive to changes in the growth in demand for electricity in both countries, the distribution of unserved demand (between households and firms), the cost of lost production for firms without generators and the initial construction costs. The results remained economically efficient for the entire range tested. A combination of assumptions found that the Project remains economically efficient with the least favourable combination.

The overall conclusion from the cost benefit analysis is that the base case is economically efficient. Realistic assumption changes did not result in economic inefficiency. The assessed alternative has a major positive significance rating considering that its extent is regional and international, it is permanent, of large scale, constant frequency and likely to be implemented. There would be negative impacts on local firms that supply tourism services in the gorge. This may warrant mitigation of direct financial compensation to affected firms.

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Abbreviations

BCR	Benefit Cost Ratio
BGHES	Batoka Gorge Hydro-Electric Scheme
CBA	Cost Benefit Analysis
CSP	Concentrated Solar Power
ESIA	Environmental and Social Impact Assessment
FSL	Final Supply Level
GDP	Gross Domestic Product
GWh	Gigawatt hour
HES	Hydroelectric Scheme
IRR	Internal Rate of Return
LCOE	Levelized Cost of Electricity
MW	Megawatt
NPV	Net Present Value
PEH	Peak Equivalent Hours
PV	Present Value
REA	Rural Electrification Agency [Zimbabwe]
REMP	Rural Electrification Masterplan [Zimbabwe]
SADC	Southern African Development Community
SAM	Social Accounting Matrix
SAPP	Southern African Power Pool
Solar PV	Solar Photovoltaic
ZESA	Zimbabwe Electricity Supply Authority
ZESCO	Zambia Electricity Supply Corporation
ZRA	Zambezi River Authority

Introduction

ERM Southern Africa is conducting an Environmental and Social Impact Assessment (ESIA) of the proposed Batoka Gorge Hydro-Electric Scheme (BGHES or Project) for the Zambezi River Authority (ZRA). The BGHES is situated upstream of the existing Kariba Dam on the Zambezi River and approximately 50km downstream of the Victoria Falls, a world heritage site. Several specialist studies were completed, including a specialist economic assessment by Anchor Environmental Consultants (2015) that focused on the localised microeconomic impact on the affected tourism related firms in the gorge. The ZRA subsequently requested an economic cost benefit analysis to assess the potential negative localised economic and environmental impact of the BGHES relative to the positive regional impacts. This was done by StratEcon in 2016. The ZRA has now requested an update to that economic cost benefit analysis focussing on one single option, which is the scheme with a final reservoir level of 757m.

The report has seven sections:

- Section 1 is a short contractual clarification;
- Section 2 describes the proposed project;
- Section 3 outlines the approach and methodology;
- Section 4 presents the results of the cost benefit analysis;
- Section 5 reports the assessed significance ratings;
- Section 6 concludes the report;
- An appendix is included that gives the expected macroeconomic contribution of the proposed project.

1 Contractual Details

This was a desktop study. It used information supplied by the project engineers (Studio Pietrangeli, 2018) (Studio Pietrangeli, 2019d) and no field work was done.

1.1 Declaration of Independence

This is to confirm that Barry Standish, Antony Boting and John White of StratEcon are independent and have no vested or financial interests in the approval or otherwise of the Project.

1.2 Not Full Specialist Report

This economic report is not a full Economic Specialist report that would be needed for an Environmental and Social Impact Assessment (ESIA). The focus of this report is on the economic efficiency of the Project. The distribution of the costs and benefits through the economies of Zambia and Zimbabwe are described in an appendix. An ESIA economic specialist report should be done within the framework of equity, efficiency and sustainability parameters.

The report does not assess:

- Fit with legislative, regulatory and policy framework of the two countries;
- Economic equity or sustainability and the associated risks. This would include the ability of the countries to pay off the loans required to service the costs;
- Environmental costs.

2 Context

This chapter gives the Project context by describing the BGHES, the current power generation situation in Zambia and Zimbabwe, future supply and demand and the proposed role of the Batoka Gorge Hydroelectric Scheme.

2.1 Project Description[1]

The BGHES is in the central portion of the Zambezi River Basin and would extend across the international boundary between Zambia and Zimbabwe. It would be situated upstream of the existing Kariba Dam hydroelectric scheme on the Zambezi River and approximately 50 km downstream of the Victoria Falls. The Victoria Falls (or Mosi-oa-Tunya Falls) was listed as a World Heritage Site in 1989 (UNESCO, 2016).

In Zimbabwe the Batoka Gorge is in the province of Matabeleland North and in the Hwange Rural District, while in Zambia the main area of direct impact falls under the Southern Province in the Kazungula District. Electricity generated by the scheme would serve both countries.

Figure 1: Location

[1] *This is a project summary of the full description in Chapter 2 of the Environmental Impact Assessment Report.*

The key components of the proposed scheme are:

- Dam wall, impoundment and spillway: the proposed high gravity arch dam wall would be 175m in height. The full supply level (FSL) of the reservoir would be 757m above mean sea level. After impoundment to the full supply level, the reservoir surface area would cover approximately 23.0 km². The FSL of 757m has been selected to ensure the backwaters from the resulting impoundment do not reach the base of the Victoria Falls or flood the outlets of the existing Victoria Falls Power Station, located in the region of Silent Pool.
- Power houses: In a 1993 feasibility study it was planned that two powerhouses, each with an installed capacity of 800 MW, would be constructed on each riverbank. However, a later feasibility study suggested an optimum installed capacity of 2 400 MW (1 200 MW on each riverbank).
- Transmission lines connecting the Project to the grid in Zambia and Zimbabwe:
    - In Zimbabwe the transmission lines would comprise 2 x 67 km 400 kV lines, running in parallel to the existing Hwange substation.
    - In Zambia, two 330 kV transmission line routes are proposed. The first routing, consisting of two lines, is 22km long from Batoka and terminating at a proposed new ZESCO substation to be constructed in Livingstone. The second line is a single line running in parallel to the existing 220 kV line, terminating at the Muzuma substation in Choma, approximately 152 km long.
    - The Batoka North and Batoka South Interconnector consists of two 330kV lines 10km in length.
- Access roads in Zambia and Zimbabwe: the upgrading of existing roads and construction of new roads to access each bank from the main roads linking Livingstone to Lusaka (Zambia) and Victoria Falls to Bulawayo (Zimbabwe) would be required.
- Permanent townships and other ancillary infrastructure (such as quarries, spoils area, construction camps and batching areas): permanent townships would be located on each side of the river. Construction camps would house approximately 1 500 staff each (including security and support staff) (Studio Pietrangeli, 2018, p. 251). It is proposed that the construction camps would be converted into permanent townships, once operational, for staff and support services personnel (customs, police etc.).
- The BGHES would be operated as a run-of-river project with storage only enough to allow daily and weekly peaking but not for monthly or seasonal flow regulation. This is because of the low storage capacity of the proposed reservoir.

2.2 Power Supply and Demand

This section describes the current and future power generation and demand in the region and discusses the need for the BGHES. This description includes:

- The current electricity supply, demand and capacity situation in each country.
- The impact of potential economic growth trends on the demand for electricity.
- An assessment of alternative power generation options.

Information on current and expected electricity supply, demand and capacity is from the options assessment report and chapter 3 of the Environmental Impact Assessment Report. Updated official reports cited in the Options Assessment and the Environmental Impact Assessment reports have been accessed where possible.

It would be recognized that many factors could affect the electricity projections. For example, the current drought has resulted in electricity shortages when surpluses were expected. In addition, delays in approval might affect the timing of some of the planned power plants. Changes in commodity prices might render some plants unfeasible. Expensive generation costs might lead to some plants only being operated in periods of high demand. The consequence is that variations to the base case demand and supply amounts described above are investigated. These results are discussed and presented in section 4.

2.2.1 Zambia

The expected electricity demand and surplus capacity for Zambia is given in Figure 2 (Studio Pietrangeli, 2018, p. 126). The Energy Regulation Board of Zambia has stated that their national installed capacity in 2017 was 2 897MW (Energy Sector Report 2017, 2018, p. 30). This corresponds with the amount illustrated for 2017 in Figure 2.

While there was a deficit of 526 MW as a result of the 2016 drought, the deficit had been eliminated by 2017 (2018, p. 44). This was due to the improved hydro power generation from better rains and the expansion in generation capacity by IPPs (most notably the 300 MW Maamba coal-fired thermal power plant and the 120 MW Ithezi tezhi hydro power plant) (Environmental Resources Management Southern Africa (Pty) Ltd, 2019, pp. 3-2). This corroborates Figure 2, which shows that power shortages are only expected after 2020 without the BGHES. It is worth noting, that Zambia was again a net importer of 353 GWh of electricity in 2017/18 (Southern African Power Pool, 2019, p. 39).

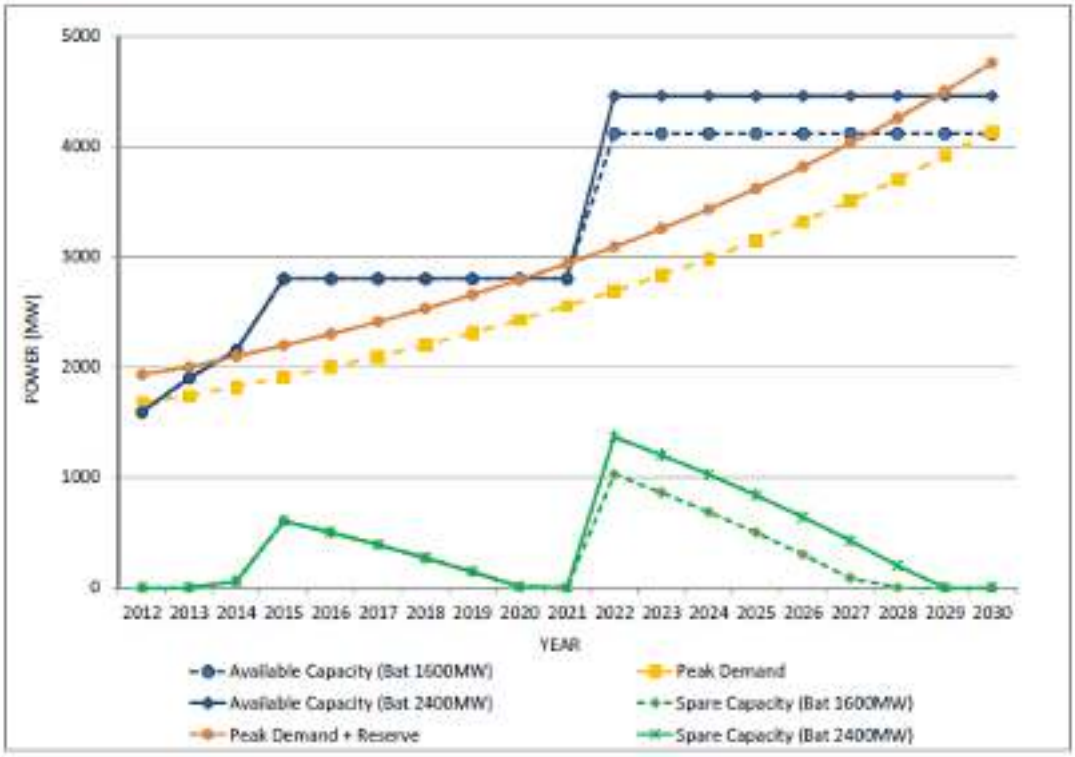

Figure 2: Zambia: Capacity and Demand - 2012 to 2030

Source: (Studio Pietrangeli, 2018, p. 126)

The available capacity shown in Figure 2 is based on the planned BGHES commencing operations in 2022. This planned opening is now delayed to 2028. The demand curves (yellow and orange curves in the figure) are based on annual demand growth in excess of 5%. The ESIA estimates updated annual growth rates in electricity demand of closer to 3% (2019, pp. 3-3). The Energy Regulation Board (2018, p. 44) expects supply and demand to have been balanced in 2017. This means that by 2028 Zambia would require a further 1 113 MW of generating capacity at 3.0% growth in electricity demand and 2 127 MW at the growth rate of 5.1% used in Figure 2. These updated growth paths for demand are shown in Figure 3.

Several new hydropower generation options are planned. There are three large hydroelectric power plants. These are Kafue Gorge Lower with 750 MW installed capacity and currently under construction; BGHES with 1 200 MW of installed capacity for Zambia; and Luapula River Hydro with 1 200 MW of installed capacity (of which 600MW would be supplied to Zambia and 600MW exported to the Democratic Republic of the Congo). Three small hydropower plants (maximum capacity of 88 MW and combined capacity of 118 MW) are in implementation phase or under procurement (Energy Regulation Board, 2017: Energy Sector Report for 2016, as cited in the ESIA (2019, pp. 3-9)).

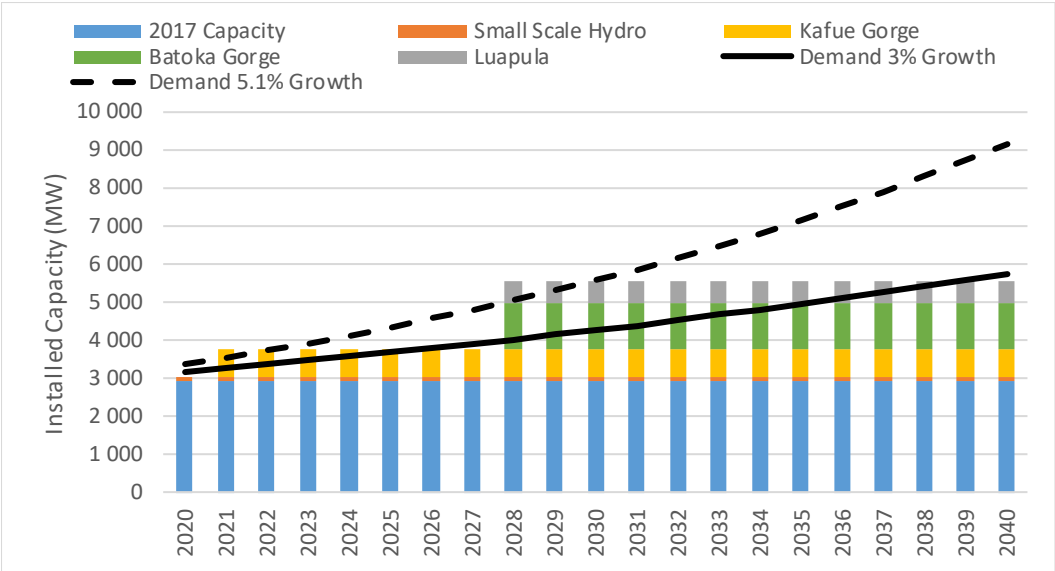

Figure 3: Zambia Installed Capacity and Demand – 2020 to 2040

Source: Consultant Own Calculations

The Kafue Gorge Lower and BGHES are in either feasibility or implementation phases. It is reported in the media that a main contractor has been appointed for the build, operate and transfer of the BGHES[2] and that construction is nearing completion on the Kafue Gorge Lower project[3]. The feasibility studies for the Luapula River scheme are about to be commissioned. This would mean that the BGHES and Kafue Gorge Lower schemes would be implemented and completed before Luapula. With a combined capacity of 1 950 MW, the BGHES and Kafue Gorge Lower schemes would have enough capacity to meet demand in 2028 for a 3% economic growth but not for 5.1%. At 3.0% the two schemes would have enough capacity to meet demand until 2035 (assuming all existing plants operate at current capacity or are not decommissioned). The Luapula River scheme would then be needed to begin operating by 2028 with a 5.1% growth.

The Final Options Assessment Report (Studio Pietrangeli, 2018, p. 130) indicates that BGHES has the fourth lowest unit generation cost at 3.71US$c/kWh. This is only marginally more expensive than the cheapest options. Ithezi tezhi, which has already been developed, is the cheapest at 3.08c/kWh. The second and third cheapest options have estimated generation costs of 3.58c/kWh and would each produce less than half the capacity of BGHES. The Kafue

[2] *www.businesslive.co.za/bd/world/africa/2019-06-21-ge-to-build-hydro-power-plant-between-zimbabwe-and-zambia/,*
www.moneyweb.co.za/news-fast-news/ge-powerchina-set-to-build-4bn-zambia-zimbabwe-hydropower-plant/

[3] *constructionreviewonline.com/2019/01/us-2bn-kafue-gorge-lower-hydropower-station-nears-completion/*

Gorge Lower scheme is estimated to produce electricity at 8.06c/kWh, more than double that of BGHES.

The conclusion for Zambia is that there will be electricity shortages without the BGHES. Even with the planned Kafue Gorge Lower scheme (which would produce electricity at more than double the cost of the BGHES) and the Luapula River Hydro project the country still requires the generation capacity of BGHES.

2.2.2 Zimbabwe

The expected electricity demand and surplus capacity for Zimbabwe is presented in Figure 4 (Studio Pietrangeli, 2018, p. 129). The 2017 installed capacity was 2 270 MW but available capacity, because of aging power stations, was only 1 850 MW (ZPC cited in the ESIA (Environmental Resources Management Southern Africa (Pty) Ltd, 2019, pp. 3-11)). In Figure 3 the 2017 installed capacity would be above and available capacity below the blue line.

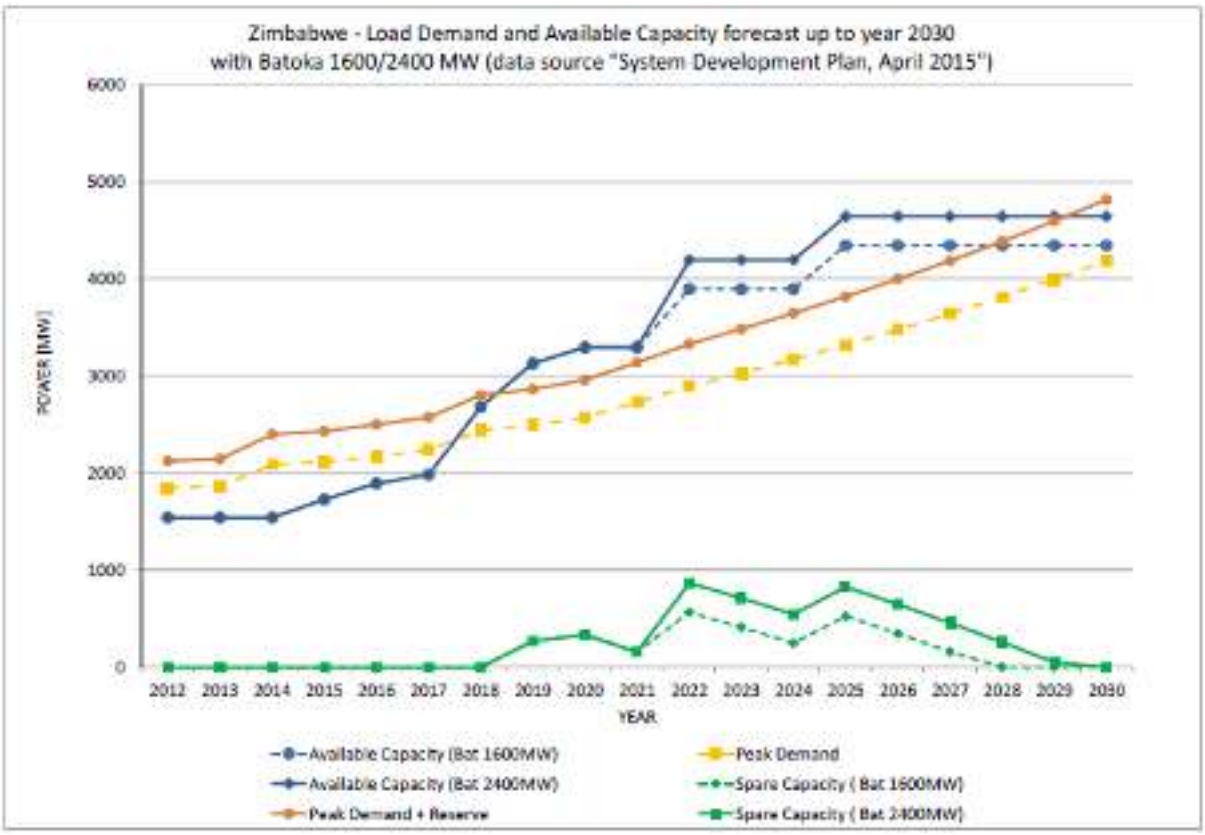

Figure 4: Zimbabwe: Capacity and Demand – 2012 to 2030

There is currently insufficient supply to meet demand in Zimbabwe. The Zimbabwe Electricity Supply Authority (ZESA) reports severe rolling blackouts[4]. According to the ESIA, demand for electricity in 2012 was 2 200 MW (2019, pp. 3-9), while available capacity was less than 1 850 MW.

The available capacity shown in Figure 4 is based on the planned BGHES commencing operations in 2022. This planned opening is now delayed to 2028. The demand curves (yellow and orange curves in the figure) are based on annual demand growth of approximately 5%. The SAPP Generation forecast suggests a slightly lower 3.4% (Studio Pietrangeli, 2018, p. 120). The lower SAPP forecast of 3.4% will be adopted for this analysis, as advised by the ZRA[5].

Several power stations, a mixture of coal fired, hydroelectric and solar, are expected to be commissioned between 2018 and 2022 (ZPC cited in the ESIA (pp. 3-13)).

- Repowering of existing coal plants, the Kariba south extension and the Gwanda solar PV project are expected to add 580MW by 2020.
- The completion of an emergency generation plant to produce 120 MW by 2019. This emergency plant and the projects listed above to be completed by 2020 are all required to meet the demand for electricity by the country.
- The Hwange coal generation plant expansion is expected to add 600 MW by 2021 and small-scale solar PV and hydroelectric plants are expected to add a further 230 MW by 2022.

This would bring the additional capacity by 2022 to 1 530MW. These new generation options, as well as Batoka Gorge and the demand for electricity are shown in Figure 5. Many of these options and particularly the coal fired plants are expected to generate electricity at three to four times the price of the Batoka Gorge Hydroelectric Plant (Studio Pietrangeli, 2018, p. 133) and are not yet committed.

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[4] *www.zesa.co.za, accessed on 22 July 2019*

[5] *Pers. Comm, e-mail dated 10 September 2019*

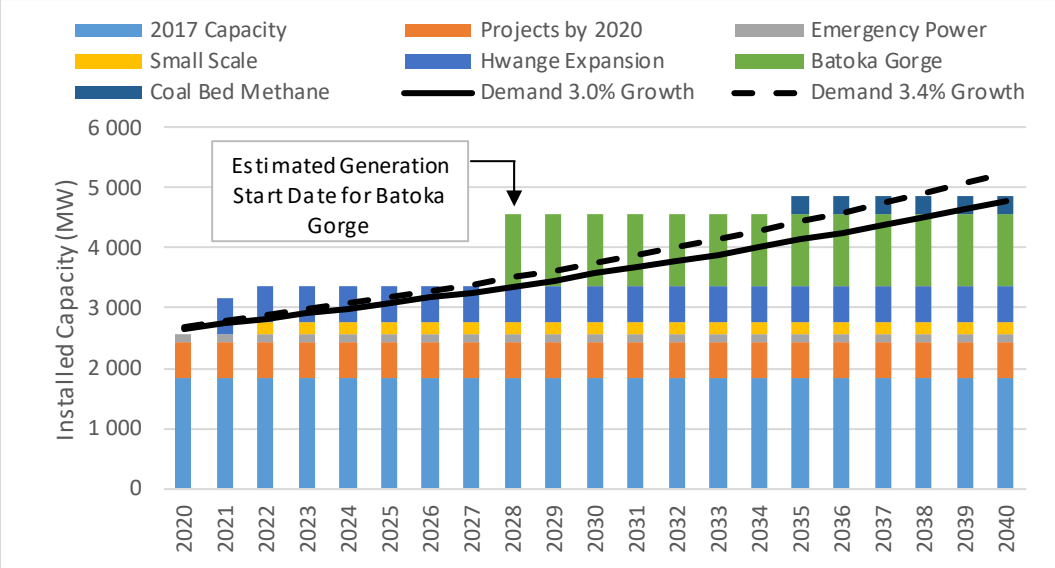

Figure 5: Zimbabwe: Installed Capacity and Demand – 2020 to 2040

Source: Consultant Own Calculations

The following can be concluded from Figure 5:

- Zimbabwe would have electricity shortages by 2028 with a 3% annual increase in electricity demand. This is when the BGHES is expected to start.
- All the electricity generated by BGHES would be absorbed by 2039 at a 3.0% annual growth rate and by 2036 at 3.4%.
- BGHES would obviate the need to run the expensive generators at Hwange Expansion and the Emergency Power between 2028 and 2036/38.
- The electricity generated by the more expensive plants could be sold as peak power to the SAPP.
- Demand for electricity could also be higher than estimated because of the extensive rolling blackouts experienced by the country. Firms and households have adapted to these blackouts and many have generators (refer to the discussion in section 3.2.2.1). Firms and households may revert to using cheaper forms of energy once there is a more reliable supply.

The conclusion for Zimbabwe is that the BGHES is needed to meet growing energy demands. Even with the planned thermal and emergency electricity plants (which would produce electricity at three to four times the cost of the BGHES) the country still requires the generation capacity of BGHES in later years.

2.2.3 Southern African Power Pool

The Southern African Power Pool (SAPP) operates an electricity power pool in the Southern African Development Community (SADC). The SAPP provides a forum for regional solutions to electric energy problems (Southern African Power Pool, 2019, p. 3). In 2004 it started the development of a competitive electricity market for the SADC region. In 2018 a total of 2 124 GWh of electrical energy was traded on the SAPP competitive market (2019, p. 6).

The electricity that is expected from BGHES needs to be put into the context of the total power generation and demand of the two countries. This is done in order to show the size of the BGHES in relation to the total electricity supply of the country. Table 1 below shows the estimated demand and supply forecasts for Zambia, Zimbabwe and the Southern Africa Power Pool (Studio Pietrangeli, 2018, pp. 119, 120). The peak demand forecast for 2020 is estimated at 57.3 GW. The actual demand for 2018 was 57.7 GW (Southern African Power Pool, 2019, pp. 6, 11), which at two years earlier already exceeds the forecast. The peak demand forecasts shown in Table 1 relate to a growth in demand for electricity of 5.6% in Zambia and 3.4% for Zimbabwe.

Table 1: Peak Electricity Demand and Generation Forecast

	2012	2013	2014	2015	2020	2025	2030	2035	2040	2045
Peak Demand Forecast (MW)										
Zambia	1 681	1 740	1 824	1 911	2 428	3 146	4 138	5 508	7 400	10 015
Zimbabwe	2 029	2 425	2 471	2 534	2 865	3 255	3 738	4 340	5 101	6 071
SAPP Total	45 124	48 502	49 427	50 672	57 302	65 108	74 756	86 806	102 015	121 421
Generation Forecast (GWhr)										
Zambia	11 781	12 195	12 781	13 390	17 017	22 049	29 000	38 602	51 866	70 188
Zimbabwe	11 025	13 177	13 428	13 766	15 568	17 688	20 310	23 583	27 715	32 987
SAPP Total				327 791	369 675	418 733	479 123	554 207	648 541	768 335

Source: (Studio Pietrangeli, 2018, pp. 119, 120)

The generation capacity of BGHES needs to be seen in the context of the total power generation and demand of the two countries. The:

- Installed Power (MW) of BGHES would cover:
  - 29% of the peak demand for Zambia in 2030.
  - 32% of the total peak demand for Zimbabwe in 2030.
- Generation in GWh would generate enough electricity to supply:
  - 18% of the generation forecast in Zambia in 2030.
  - 25% of the generation forecast of Zimbabwe in 2030.

2.2.4 Need for Batoka Gorge Hydro-Electric Scheme

The motivation for the BGHES is that it would provide electricity at a cost considerably lower than most alternatives:

- In Zambia, BGHES:
  - is expected to generate the fourth cheapest electricity of the seventeen planned power plants in Zambia (Studio Pietrangeli, 2018, p. 130);
  - it is only slightly more expensive than the lower cost options;
  - it is the largest planned power generation plant estimated to produce electricity at less than half the price of electricity produced by Kafue Gorge Lower, the other large planned power station.
- In Zimbabwe:
  - All the planned power stations are expected to generate electricity at a cost higher than BGHES;
  - The cost of electricity generation from large coal fired power stations (such as the Hwange expansion) would be up to four times higher than BGHES.

3 Approach and Methodology

The objective of this analysis was to assess the economic efficiency of the BGHES using economic cost benefit analysis. The analysis takes its starting point from Section 2.2 which demonstrated that both Zambia and Zimbabwe would have insufficient electricity generation capacity within the near future.

Four sets of analyses were completed:

- Base Case: an evaluation of BGHES within committed electricity generation options and excluding emergency generators. This Base Case was extended to assess the impact of a severe drought on the economic efficiency of BGHES.
- Alternative 1: an evaluation of BGHES within committed and identified electricity generation options. This alternative includes the operation of emergency generators.
- Alternative 2: renewable and new coal generation options as substitutes for BGHES.
- Sensitivity analyses on the key assumptions.

This section starts by introducing the concept of economic cost benefit analysis and how to interpret the results. It continues by listing the relevant project costs and benefits. This is followed by a description of how alternative forms of electricity generation were valued. Finally, two limitations are listed.

3.1 Economic Cost Benefit Analysis

An economic cost benefit analysis (CBA) was used to assess the economic efficiency of the BGHES. CBA treats the national economy, or in this case the two economies of Zambia and Zimbabwe, as entities in and of themselves. It assumes, with some important caveats, that what is demonstrably good for the two economies combined is a reasonable approximation of what would be good for most of the people living and working in the countries.

When interventions like new electricity generation plants are contemplated, decision makers need to know what impact the intervention would have on the economy as a whole and hence how much benefit can be assumed to accrue.

The outcome of the analysis is the reporting of a net present value (NPV), a benefit cost ratio (BCR) and an internal rate of return (IRR) for those cases where the project is compared to a business as usual alternative. An NPV shows the total value of future costs and benefits reduced to a present-day value. This is done by using a social discount rate of 10% as specified by international best practice and as used in the options assessment report (Studio

Pietrangeli, 2018, pp. 155, 176, 210 & 285). The BCR measures the changes in benefits and costs that would result from an investment. BCRs are typically used when there are many competing alternatives and projects need to be funded from a limited set of resources. Finally, the IRR is the discount rate that returns an NPV of zero and shows the likely economic returns to society of a project in relation to other investment opportunities.

If the evaluated benefits of a Project are indeed greater than the overall project costs, then the BCR would be greater than one and the NPV positive. A BCR greater than one (or a positive NPV) indicates that the completed project would constitute an economic asset; a BCR less than one implies that the project would be an economic liability. The higher the BCR the less risk there is that the proposed investment could turn out to be less than viable economically. Low BCR's, even if greater than one, provide a warning that a project could be risky and may turn out to be an economic liability.

A high BCR is usually a good indicator that it would be possible to raise finance to implement a project. In the case of a private sector investment the high BCR would be part of the business case to funders. A high BCR should give confidence that it is worth funding the project directly from its Treasury if it is a public infrastructure project. Alternatively, provision can be made with suitable institutional arrangements for the involvement of the private sector in project funding.

An economic analysis includes all costs to society. This is done by adjusting for shadow prices and wages and removing the distortions caused by taxes and subsidies.

The cost benefit analysis focuses purely on direct costs and benefits and does not take any indirect costs and benefits into account. Indirect costs and benefits would include those costs and benefits obtained through multiplier effects. For example, the construction of a building would have spin off effects for the construction industry and the building materials supply industries. These, in turn, would have backward linkages with other commodity suppliers and retail industries.

3.2 Establishing Costs and Benefits: BGHES

The process used to establish individual costs and benefits is described here.

3.2.1 Costs

There are four general categories of costs:

- Those that are the direct result of the building and running of the BGHES. These are divided into construction (capital), running (operation and maintenance) and financing costs. This also includes the opportunity cost of land.
- Those for households which, faced with being able to use newly supplied electricity, need to spend on both connection costs and electrical appliances in order to benefit from electricity.
- Firms which have connection costs.
- Potential negative impacts on tourism in the area around the BGHES.

The analysis only included quantifiable costs. Some costs, such as the non-use value described in the Economic Specialist Report (Anchor Environmental Consultants, 2019, p. 53) or loss of habitat costs have not been included. These effects would need to be weighed by decision makers when evaluating the merits of the BGHES.

3.2.1.1 Project Costs

3.2.1.1.1 Construction

Initial construction (capital) costs were provided by the design engineers. Table 2 lists the capital costs (Studio Pietrangeli, 2019d, pp. 245, 247). It is understood that construction would start in 2021 and last for seven years, with generation commencing in 2028. The largest components are the construction costs of the dam itself ($644m) and the electro-mechanical equipment ($329m and $265m).

Table 2: Capital Costs

		Month	
Cost Item	**US$m**	**Start**	**End**
Roads	$42.6	0	36
Camps and Facilities	$91.0	0	36
Stationary Plant	$69.2	0	36
River Diversion	$182.0	22	84
Dam	$644.1	22	84
Spillway	$133.4	22	84
Plunge Pool	$17.0	22	84
Power Waterways	$194.7	24	66
Power Houses	$188.3	24	84
Hydraulic Steel Structures	$226.8	25	82
Mechanical Turbines	$329.3	25	84
Electrical Supply	$264.7	25	84
Transmission Lines & Substations	$265.1	6	54
Environmental Monitoring	$30.6	0	84
Total Construction Cost	**$2 678.8**		

One of the important issues, from an economic perspective, is the proportion of imports to total costs. No information was available. It was assumed that imports would make up:

- 75% of civil works;
- 90% of electrical and mechanical equipment;
- 75% of waterways and ancillary equipment;
- 90% of transmission lines;
- Half of the environmental monitoring costs.

Professional fees are assumed to be 15% of construction and annual running costs.

3.2.1.1.2 Operations and Maintenance

There would be running (operating and maintenance) costs. There is no detailed estimate for these costs. However, an overall operating cost of 0.50c/kWh was provided by the Project engineers[6]. This would result in an annual running cost of $51.1m for electricity generation of 10 215 GWh.

3.2.1.1.3 Financing

The cost and source of financing is important because economic cost benefit analysis deals differently with interest on domestic compared to international borrowing. Interest on a domestic loan is a transfer payment within a country or region and excluded from the analysis. Interest on an international loan is a cost to the country and included.

There are three potential financing options. These are from local capital markets in Zimbabwe and Zambia; international capital markets; or concessional financing from the World Bank. A report by the World Bank on investment options for the project states that 54% of the funding would be concessional funding and lists the following terms for the various loans (World Bank, 2018, p. 23):

- Concessional financing: 2.5% interest rate, 10 years' grace and a 40-year repayment period;
- Market-based lending: 8% interest rate, 0 years' grace and a 20-year repayment period;
- Domestic lending: 6% interest rate and a 10-year repayment period.

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[6] *Pers. Comm. – email from Studio Pietrangeli, dated 8 July 2019*

It has been assumed that the balance of 46% is funded through international market-based lending (8% interest and 20-year repayment period).

3.2.1.2 Firms

The costs to firms are the grid connection costs which are assumed to be $4 000 per connection. This assumption is varied in a sensitivity analysis.

Payment for new electricity is a cost but has already been included in the cost of the Project. It is not included here because it would be double counting.

3.2.1.3 Households

Households will have two costs - connection and appliance costs. Benefits from electricity come from the use of appliances. An obvious example of this is electric lighting. Based on discussion with industry experts in Namibia and Zimbabwe, it has been assumed that a new connection cost would be $2 000. The lowest retail price has been used for appliance costs.

3.2.1.4 Tourism

There is the potential for negative impacts on tourism firms using the gorge. The specialist report on the localised economic impact has estimated that there would be losses in tourism revenue worth $6.86m because of the BGHES (Anchor Environmental Consultants, 2019, p. 52)[7]. The value of lost tourism revenue at the supply level of 757m is shown in Table 3.

Table 3: Local Tourism Impacts

Description of Activity	Total
Accommodation	1 407 805
White water rafting	3 340 000
Birding and hiking	82 279
Angling	158 300
Scenic Flights	1 350 000
Canyoneering	16 000
Park Fees	506 600
Total Lost Business ($)	**6 860 984**

Excludes non-use value

It has been assumed that the impact on tourism would start during construction and the tourism growth would be dependent on international economic growth rates. According to the

[7] *The 2015 Anchor Environmental Consultants report has the loss in tourism revenue slightly higher, at $7.94m. The updated value of $6.86m provided in the 2019 report has been used in this analysis.*

World Bank Global Markets Outlook, global growth is set to gradually rise from 2.6% in 2019 to 2.8% in 2021[8]. An annual long-term growth rate of 3.0% is assumed in the analysis.

3.2.1.5 Land Opportunity Cost

The land for the generation plant and associated facilities has alternative uses which means that an economic analysis must include the opportunity cost.

The different land parcels are:

- The lake reservoir has an expected surface area of 23 km². This is 2 300ha[9]. The opportunity cost of the lake reservoir is included in the displaced tourism business discussed in the preceding section. No further opportunity cost is considered for the lake reservoir.
- The townships would initially house the construction teams and then be converted into accommodation for operating personnel. The areas required are 491ha in Zambia (ERM, 2019a) and 706ha in Zimbabwe (ERM, 2019b). The total area is 1 197ha in a rural setting. The opportunity cost of this land is that it could be used for farming purposes.
- New access roads to the site. Although the majority of the access roads would be situated on existing roads, approximately 1.2km of new road of 10m width would be built in Zambia (Studio Pietrangeli, 2019d, p. 45). A further 5m is allowed for the road reserve on either side, bringing the area required for new roads to 2.4ha. The opportunity cost of this land is that it could be used for farming purposes.
- Corridors for transmission lines. According to the feasibility report on the transmission system design, it is forbidden to live inside the corridor of the transmission line (Studio Pietrangeli, 2019c, p. 25). This is to allow access for maintenance on the system. The way leave width is given as 110m for two parallel 400 kV lines (68km long), 50m for single 330 kV lines (10km and 152km lengths) and 85m for two parallel 330 kV lines (22km length). The total area for the transmission corridor is 1 745ha, which would predominantly be in rural land. Although living within the transmission corridors is forbidden, farming activity would be allowed in both countries. It is assumed for the purposes of this analysis that because farming activity is allowed there is no opportunity cost for the transmission corridor land.

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[8] *https://www.worldbank.org/en/publication/global-economic-prospects*

[9] *Pers. Comm. – email from ERM Southern Africa, dated 2019 08 27*

Total land to be acquired for the Project, excluding the surface area of the reservoir in the gorge and the transmission corridors, is 1 199.4ha. The opportunity cost of this land needs to be calculated. The market value of productive rural land is used as an indicator of the productive use of this land:

- Sales of rural land in the affected areas of Zimbabwe and Zambia were investigated.
- The average value of rural land in Zimbabwe[10] is $35 500/ha, with a minimum value of $480/ha and a maximum value of $83 000/ha. When outliers are removed the average value of land increases to $58 000/ha.
- The average value of land in Zambia is $47 000/ha, with a minimum value of $2 400/ha and a maximum value of $274 000/ha.
- The analysis uses $50 000/ha. The area of land required for the facilities (but excluding the surface area of the reservoir) has an opportunity cost of $60.0m based on this rate. This is approximately 2% of the initial capital costs of the Project.

3.2.2 Benefits

There are many benefits for households and firms from new electrical connections and/or more reliable electricity generation. Any electricity exports are revenue to the country even though they are initially paid to the electricity utility company. These are all societal benefits.

3.2.2.1 Firms

There are benefits to three types of firms. There are those firms that currently experience power outages without backup generators; those that currently experience power outages with backup generators; and those that would be established as a result of economic growth.

The following assumptions have been made to determine the number of firms:

- Total unserved demand by 2028 in Zambia is estimated at 1 043 GWh and in Zimbabwe at 435 GWh (refer to description in sections 2.2.1 and 2.2.2).
- When BGHES becomes operational in 2028 there would be enough supply to meet demand (5 108 GWh for each country) until 2036 for Zambia and 2038 for Zimbabwe. Thereafter additional generation plants would be needed to meet growing demand.

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[10] *www.property.co.zw/agricultural-land-farms-for-sale/matabeleland-north, www.pamgolding.co.za/property-search/vacant-land-properties-for-sale-multiple-locations/dd191c78-4dfa-447c-8a2e-243402f12b47, , www.pamgolding.co.za/property-details/41-hectares-vacant-land-for-sale-glen-forest-zimbabwe/3zb1423045*

- Half the demand for BGHES electricity in each country is due to firms and the other half from households (this assumption is tested in a sensitivity analysis).
- All the new demand by firms in 2028 would be from existing firms, whereas the annual increase in demand thereafter would be from new firms. This assumption distinguishes the GWh demand by existing and new firms.
- In their article on in-house electricity generation in Africa, Steinbuks & Foster estimate that 38.2% of firms have backup generators Zambia (2010, p. 512). A later survey by the World Bank on in-house electricity generation put this percentage at 27.2% for Zambia and at 64.1% for Zimbabwe. This distinguishes the GWh demand by existing firms with and without generators. In section 3.2.2.1.1 and 3.2.2.1.2 the value of lost production per kWh of unserved demand will be allocated to existing firms with and without generators.
- New firms would increase by 3.0% in both Zambia and Zimbabwe[11]. It has been assumed that the proportion of firms with and without generators and associated costs would be unchanged.

3.2.2.1.1 Standby Generator Use during Outages

Some firms have invested in standby generators. There are other, limited, backup options. Typically, the cost of own generation is higher than the cost of grid electricity (Oseni & Pollitt, 2013, p. 24). In addition, there can be other costs like the diminished capacity to finance other types of investments, equipment damage from electrical surges and wider societal costs like the use of dirty fuel. These latter costs have been excluded from the analysis.

Two cost estimates have been made for Zambia:

- Oseni & Pollitt (2013, p. 25) estimate the cost of own generation is $0.58/kWh measured over an eight-hour outage. This is made up of a fixed cost of $0.18/kWh and a variable cost of $0.40/kWh;
- Steinbuks and Foster (2010, p 509) estimate the cost is $0.45/kWh. This is made up of a fixed cost of also $0.18/kWh and a variable cost of $0.27/kWh.

[11] *The rate of annual increase in electricity demand is similar to the economic growth forecast for both countries by Trading Economics (www.tradingeconomics.com). This rate is not varied with and without an increase in electricity generation.*

These costs have been used to estimate the 2019 generator costs from outages to firms in Zimbabwe and Zambia:

- The power outage costs for firms with standby generators is $0.58/kWh in generation costs and $0.39/kWh in lost production;
- The drop in the oil price between 2013 and 2019 price reduces the variable cost to $0.24/kWh;
- Adjusting for taxes and levies (as must be done in an economic cost benefit analysis) reduces this cost to $0.16/kWh for Zambia and $0.15/kWh for Zimbabwe;
- Fixed costs have been included in the analysis[12].

3.2.2.1.2 Lost Production during Power Outages

It has been assumed that the lost production cost of power outages to firms without generators is 1.5 times that of firms with generators[13].

3.2.2.2 Households

Households would have two benefits from electrification:

- Savings from other forms of fuel currently used for cooking, lighting and during outages.
- Income benefits as a result of time savings, increases in productivity and health benefits. Health benefits are the result of less smoke inhalation, burns and fatalities from fires and the use of refrigeration for food and medicines.

3.2.2.2.1 Savings on Alternative Fuels

Many households would spend time collecting and money buying alternative fuels. These fuels include firewood (purchased or collected), candles, paraffin, LPG, etc.

The following assumptions were made:

- Households spend $12 monthly on other types of fuel. This is based on a recent survey of rural households in Zimbabwe[14].

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[12] *This is debatable because some commentators would argue that fixed costs are sunk costs and should be omitted. In this case StratEcon is of the opinion that they need to be included because doing this takes account of any future generator capacity that may be added.*

[13] *The literature indicates far higher losses. Using a lower value makes the approach more conservative because the benefits would be lower.*

[14] *This is part of the Zimbabwe Rural Electrification Master Plan*

- The number of affected households is calculated by dividing total household unserved demand by a monthly amount of 100kWh. This is estimated based on the income of low-income households.

3.2.2.2.2 Income Benefits

The positive impacts of reliable electricity on income are well documented. Table 4 gives the results of three publications which estimated the impact of electricity and electrification on household income. Electrification increased household income in:

- Bangladesh by between 9% and 30%. (Khandker, Barnes, & Samad 2009).
- India by between 16% and 46% (Khandker, Samad, Ali, & Barnes 2012).
- Vietnam by between 25% and 36% (Khandker S. R., Barnes, Samad, & Huu Minh 2008).

Table 4: Electricity Contribution to Household Income

Country	Lower Band	Mid Band	Upper Band	Source
Bangladesh	9%	12%	30%	(Khandker, Barnes, & Samad, 2009)
India	16%	39%	46%	(Khandker, Samad, Ali, & Barnes, 2012)
Vietnam	25%	31%	36%	(Khandker S. R., Barnes, Samad, & Huu Minh, 2008)

16% was used in the analysis and it has been assumed that this would take place over nine years (Khandker, Barnes, & Samad, 2009). This percentage is applied to the Zambian and Zimbabwean economic contexts.

3.2.2.3 Exports

It was assumed that any excess electricity that is not purchased in Zimbabwe or Zambia would be exported to the SAPP at $0.05/kWh for base load (Energy Regulation Board, 2018, p. 52).

3.3 Establishing Costs and Benefits: Alternative Electricity Generation

It is appropriate to compare BGHES to other generation options, even though these are not in the current planning mix. This inclusion makes the BGHES analysis more even-handed. The included alternatives are coal, concentrated solar power (CSP), solar photovoltaic (solar PV) and wind. The analysis relied on existing information to compare BGHES and these alternatives. The workability of these options was not investigated, for example, whether there are appropriate sites for wind farms.

The approach was to use a levelized cost of electricity (LCOE) which includes all important costs for an identical electricity output. This calculation includes construction and operating costs; construction duration; necessary land area; and external costs.

3.3.1 Construction and Operating Costs

It is necessary to compare plants with a similar output as BGHES when developing comparable LCOEs. The LCOEs have therefore been used as a function of the annual BGHES electricity production which gives the difference in capacity factor for each technology.

These costs are construction, operation, maintenance and fuel costs amortized over the plant lifetime. South African LCOEs were used and the results presented in Table 5.

Table 5: South Africa Levelized Cost - Alternative Electricity Generation

Plant $c/kWh	O&M LCOE	Capex LCOE	Capex and O&M LCOE (Excl Storage)	Storage Cost	Capex and O&M LCOE (Inc Storage)
Batoka Gorge			3.69		3.69
Kusile (units 5&6)	3.58	10.06	13.64		13.64
SA IPP Wind	1.43	3.93	5.36	17.05	22.41
SA IPP CSP	1.64	11.22	12.86		12.86
SA IPP Solar PV	2.01	4.49	6.50	12.79	19.29

Sources: Kusile (Meridian Economics, 2017)*, SA IPP Wind, CSP & PV* (GreenCape, 2019)

Wind and solar PV are intermittent sources of electricity. They are low cost with the cost of energy storage excluded. BGHES is a base load generator so a true comparison means that energy storage costs must be included. This would increase the costs of these technologies substantially. Accounting for storage requirements:

- Renewable energy providing less than 20 to 30% of a country's energy demand could be accommodated in networks without the need for storage (Sharpley, 2015);
- An equivalent solar or wind power plan would need to have storage to be comparable to BGHES, which would be supplying in the region of 30% of the electricity in both Zambia and Zimbabwe,
- Storage equivalent to 75% of the daily generating capacity of solar PV would be required to produce baseload power.
- Calculating the storage requirements for wind is far more complex, because wind is stochastic and the pattern varies from day to day (Rycroft, 2016). Consequently, it is assumed that 100% storage requirement for daily wind power is required.

Table 5 concludes that the BGHES produces the lowest cost electricity. Coal is 370% and CSP 350% more expensive. Wind and Solar PV must be assessed with storage costs to make them comparable to BGHES as a base load generator. This makes them six and five times more expensive when assessed on construction and operating LCOEs.

3.3.2 Construction Period

Construction time determines how long it takes before electricity is generated. This influences when the benefits start and, therefore, the BCR. BGHES construction is expected to be seven years. Typical construction times for the other options are eight years for coal (Kusile Power Station, 2019); two years for a wind plant of 140 MW (Stats and Facts SAWEA, 2018); two and a half years for 100 MW CSP (Kathu Solar Park, 2019); and one and a half years for a 50 to 75 MW solar PV plant (Engineering News, 2013).

Wind, CSP and solar PV would consist of several plants to generate the same electricity as BGHES. According to the South African Independent Power Producers, 1 362 MW of wind plants and 838 MW of solar PV plants were rolled out in two years. It has been assumed that numerous wind, solar PV and CSP plants could be rolled out at multiple locations around the countries at the same time, so that wind and solar PV would commence generating full electricity after two years and CSP after three years.

3.3.3 Land Area

Land is important because of its opportunity cost. The land cost is based on the following rates per GWh:

- 0.92 for coal (US Department of Energy, 2019);
- 0.13 for wind (Denholm, Hand, Jackson, & Ong, 2009);
- 1.41 for CSP (Ong, Campbell, Denholm, Margolis, & Heath, 2013);
- 1.37 for solar PV (Ong, Campbell, Denholm, Margolis, & Heath, 2013).

The total opportunity cost of land is determined by multiplying the rates per GWh above with the annual production of 10 215 GWh and the value of rural land at $50 000 per hectare, as discussed in section 3.2.1.5.

3.3.4 External Costs

External costs are sourced from ExternE (Externalities of Energy. A Research Project of the European Commission, 2006). These include human health – mortality and morbidity; building

material degradation; crops; global warming; amenity loss; ecosystems; and land use changes. External costs for electricity production using different technologies are shown in Table 6.

Table 6: Electricity Generation - External Costs

	External Costs (US$ per kWh)		
Generation Type	**Low**	**Central**	**High**
Coal	0.027	0.113	0.199
Oil	0.040	0.093	0.146
Diesel	0.040	0.093	0.146
Gas	0.013	0.033	0.053
Hydro	0.001	0.007	0.013
Wind	0.001	0.002	0.003
Solar	0.008	0.008	0.008
Biomass	0.003	0.021	0.040

A comparison of the 'central' values in the table shows that wind has the lowest external cost (0.2c/kWh), followed by hydro (0.7c/kWh) and solar (0.8c/kWh). Coal has the highest external costs at 11.3c/kWh, followed by oil and diesel (9.3c/kWh). Coal has external costs that are sixteen time higher than hydro, while oil and diesel are thirteen times higher. Wind has between a quarter and a third of the external costs of hydro.

3.3.5 Cost Summary

Table 7 summarises the final LCOE costs. It is found that BGHES generates the lowest cost electricity. This is followed by CSP. The inclusion of storage costs needed for a base load makes coal the third lowest cost. Wind and solar PV with storage costs are the most expensive.

Table 7: Alternative Generation Options - Total LCOE

Plant $c/kWh	Capex and O&M LCOE (Excl Storage)	Storage Cost	Capex and O&M LCOE (Inc Storage)	Land Cost	External Cost	Total LCOE
Batoka Gorge	3.69		3.69	0.06	0.0001	3.75
Coal	13.64		13.64	0.46	0.0011	14.11
Wind	5.36	17.05	22.41	0.07	0.0000	22.47
CSP	12.86		12.86	0.71	0.0001	13.57
Solar PV	6.50	12.79	19.29	0.69	0.0001	19.98

3.4 Limitations and Critical Assumptions

This analysis faced the following limitations and made some critical assumptions:

- The Project has been contextualised within the current and proposed electricity generation mix. No precise information on electricity generation has been provided for specific alternative power plants in the two countries. Generalised costs were based on international sources.
- It is not known how BGHES fits into sequencing of the planned generation options. It has therefore been assumed that sequencing will be in line with the LCOE of the various options.
- It is expected that the BGHES will be operated in conjunction with the Kariba Complex. The planning would ensure the absence of countervailing negative impacts. It is expected that the filling of the Batoka Gorge reservoir would be done in such a manner as not to impact on the operation of the Lake Kariba hydroelectric plant. It is also expected that the water flow from the BGHES would be properly controlled to minimise any downstream impacts on economic activities.

4 Analytical Results

This section presents the results of the cost benefit analysis. Four sets of analyses were completed:

- Base Case: an evaluation of BGHES within committed electricity generation options and excluding emergency generators. This Base Case was extended to assess the impact of a severe drought on the economic efficiency of BGHES.
- Alternative 1: an evaluation of BGHES within committed and identified electricity generation options. This alternative includes the operation of emergency generators.
- Alternative 2: renewable and new coal generation options as substitutes for BGHES.
- Sensitivity analyses on the key assumptions.

4.1 Base Case

This base case is BGHES within committed electricity generation options and excluding emergency generators. This analysis is extended to consider the impact of a severe drought and possible climate change impacts.

4.1.1 Base Case without Water Shortages

The results of the Base Case without a water shortage are presented in Table 8.

- It was found that the costs have a present value (PV) of $3 095m. The initial capital costs contribute the most to the overall cost, with a PV of $1 749m. Financing costs contribute $688m, followed by professional fees ($262m) and running costs ($247m). A reduction in tourism income adds a further $94m to costs and land opportunity cost $55m.

Table 8: Results: Base Case without Water Shortages

All Monetary Values in $ millions	PV
Costs	
Initial Capital Cost	1 749
Financing Costs of ICW	688
Opportunity Cost of Land	55
Operations & Maintenance	247
Professional Fees	262
Tourism Impacts	94
Total Costs	**3 095**
Benefits - Zambia	
Firms	
Generator Savings	771
Saving from Outages (with Generators)	863
Saving from Outages (without Generators)	3 464
Connection Costs	-91
Households with Existing Connections	
Alternative Fuel Savings	1 017
Households with New Connections	
Increased Income and Net Benefits	74
Exports	558
Total Benefits - Zambia	**6 656**
Benefits - Zimbabwe	
Firms	
Generator Savings	1 797
Saving from Outages (with Generators)	2 025
Saving from Outages (without Generators)	1 701
Connection Costs	-90
Households with Existing Connections	
Alternative Fuel Savings	1 012
Households with New Connections	
Increased Income and Net Benefits	85
Exports	551
Total Benefits - Zimbabwe	**7 082**
Total Benefits - Zambia & Zimbabwe	**13 738**
NPV	10 643
BCR	4.44
IRR	28%

- Benefits in the base case have a PV of $13 738m; $6 656m to Zambia and $7 082m to Zimbabwe.
- For Zambia:
  - Savings from reduced outages of $4 327m is the largest benefit. This is $3 464m for firms without and $863m with generators.
  - Savings on generators and alternative fuels are $771m for firms and $1 017m for households.
  - There are $91m grid connection costs for firms.
  - Exports would be worth $558m.

- For Zimbabwe:
  - Total savings from outages by firms of $3 726m is the largest benefit. This is made up of $1 701m for firms without and $2 025m for firms with generators.
  - Savings from expenditure on generators and alternative fuels are $1 797m for firms and $1 012m for households.
  - There are $90m grid connection costs for firms.
  - Exports would be worth $551m.
- The Project NPV is $10 643m. This is positive. The base case would be economically efficient and benefits both Zambia and Zimbabwe.
- The BCR is 4.44. This means that for every $1.00 spent on the Project there are benefits of $4.44. This is a robust result.
- The IRR is 28%.

4.1.2 Base Case with Drought and Climate Change

This section assesses the impact of droughts and climate change on the economic efficiency of the Project. The worst drought since 1978 occurred in 1996 and lasted nearly five years (Studio Pietrangeli, 2019a, p. 69). The relevance of climate change, in this instance, would mean a lower water flow. This means that the effects of climate change and a drought can be investigated simultaneously.

The effect of a drought was assessed in two ways. These are by having no flow or a reduced flow.

4.1.2.1 Drought – No Flow

This approach assessed the time needed for a drought with no water flow to make the Project inefficient. It was modelled with the drought starting immediately after construction and preventing any electricity generation. It was done by determining the time needed to make the PVs of benefits and costs equal.

It was found that it would need a drought of seventeen years to make the Project economically inefficient. There has been no drought of this length in living memory.

4.1.2.2 Drought – Reduced Flow

This approach assessed how much lower the water flow would need to be, over the entire Project life, to make the Project economically inefficient. It was modelled by assessing the reduction in electricity generated, as a result of reduced flows, to make the PVs of benefits

and costs equal. These reduced flows were then compared to the dry year modelled by the project engineers.

The Project engineers modelled a dry year with a generation capacity between approximately 80 MW and 600 MW for each country (Studio Pietrangeli, 2019a, pp. 71, 82). This would give an average energy generation of 500MW for both countries, which is approximately 21% of the design capacity. This in turn is a 79% output reduction. It was found that generation capacity would need to reduce by 84% (to 400 MW) for the Project to become economically inefficient. The project would therefore remain economically efficient, although marginally so, at the reduced flow rate.

There is no record of any prolonged period of reduced flow. An analysis of monthly inflow rates into Lake Kariba shows that there were only two periods of low flows over consecutive years between 1962 and 2014 (Studio Pietrangeli, 2019b, p. Annex C) (Studio Pietrangeli, 2019d, p. 13). The first was between 1982 and 1984 when three years of very low flows were recorded. The second was between 1992 and 1996 when four out of five years recorded very low flows.

4.1.2.3 Climate Change

This approach assessed the possible reduction in electricity generation as a result of climate change on the Project efficiency.

The effect of climate change on energy production of the Project was investigated by the Project engineers (Studio Pietrangeli, 2019d, pp. 18, 19). Several different situations relating to different types of global emissions were modelled, using a Global Circulation Model. The results showed that the most extreme global emissions could reduce energy production at BGHES by 25% but that under the likely path of global emissions, energy production would reduce by between 1% and 20%.

At a 20% reduction in output the BCR would reduce to 3.79 and at a 25% reduction to 3.63. The Project therefore remains economically efficient under either climate change reduction amount.

4.1.2.4 Conclusion to Droughts and Climate Change

The conclusion to the investigation into droughts and climate change shows that they are unlikely to render the Project economically inefficient.

- A complete drought of seventeen years with no flow through the gorge would need to occur from the day of first operations.
- Alternatively, all future years would need to be as bad as the worst inflows in the gorge in recorded history. Records show that this is unlikely to happen.
- As another alternative, energy production would need to reduce by about 84% from the first day of operations to render the Project inefficient, when studies have shown that climate change would reduce production by at most 25% by 2044 (sixteen years after production starts).

The efficiency of the BGHES remains positive even with conservative estimates of drought and climate change.

4.2 Alternatives

As stated above two alternatives to the base case were analysed. Alternative 1 is BGHES within committed and identified options. Emergency generation is in operation in this alternative. Alternative 2 considers renewable energy and new coal as BGHES substitutes.

4.2.1 Alternative 1: BGHES within Committed and Identified Options

This alternative considers the case where BGHES is built and run within committed and identified options. The difference to the base case is that all future identified options and, most importantly, emergency generators are operated even though the latter are more expensive to run than BGHES. The consequence is that there would be a period where some of the electricity from BGHES would be surplus to national requirements and would be sold into the Southern African Power Pool.

The results are shown in Table 9 and compared to the Base Case.

Table 9: Cost Benefit Results – Alternative 1 Relative to Base Case

All Monetary Values in $ millions	Base Case	Alternative 1
Costs		
Total Costs	**3 095**	**3 095**
Benefits - Zambia		
Firms		
Generator Savings	771	506
Saving from Outages (with Generators)	863	558
Saving from Outages (without Generators)	3 464	2 241
Connection Costs	-91	-82
Households with Existing Connections		
Alternative Fuel Savings	1 017	658
Households with New Connections		
Increased Income and Net Benefits	74	101
Exports	558	1 114
Total Benefits - Zambia	**6 656**	**5 096**
Benefits - Zimbabwe		
Firms		
Generator Savings	1 797	1 598
Saving from Outages (with Generators)	2 025	1 791
Saving from Outages (without Generators)	1 701	1 505
Connection Costs	-90	-93
Households with Existing Connections		
Alternative Fuel Savings	1 012	895
Households with New Connections		
Increased Income and Net Benefits	85	109
Exports	551	720
Total Benefits - Zimbabwe	**7 082**	**6 526**
Total Benefits - Zambia & Zimbabwe	**13 738**	**11 621**
NPV	10 643	8 526
BCR	4.44	3.75
IRR	28%	24%

- BGHES costs remain the same, with a PV of $3 095m.
- The total benefits reduce from $13 738m to $11 621m because the exported excess electricity has a lower benefit.
- The Project NPV reduces from $10 643m to $8 526m, which is positive, and the Project remains economically efficient.
- The BCR reduces from 4.44 to 3.75. This means that for every $1.00 cost of the Project, both countries benefit by $3.75.
- The IRR reduces from 28% to 24%.

4.2.2 Alternative 2: Renewable and New Coal as BGHES substitutes

A comparison was done between the electricity generated by the BGHES and the equivalent alternative renewable energy technologies of wind, CSP and solar PV and the option of new coal.

In the interest of a balanced analysis the construction of BGHES and these alternatives was started at the same time. Most of the alternatives would be completed before the BGHES and therefore start producing electricity earlier. BGHES would start producing eight years after the start of construction. It was assumed that this would be two years for wind with storage; three years for CSP, two years for solar PV with storage and nine years for coal.

Table 10: Cost Benefit Results - Alternative 2: Renewables and New Coal

	BGHES	Coal	CSP	Wind Without Storage	Solar PV Without Storage	Wind With Storage	Solar PV With Storage
Costs PV ($m)	3 095	14 044	13 507	5 398	7 158	22 370	19 888
Benefits PV ($m)	13 738	12 489	20 114	22 125	22 125	22 125	22 125
NPV ($m)	10 643	-1 555	6 607	16 727	14 967	-245	2 238
BCR	4.44	0.89	1.49	4.10	3.09	0.99	1.11

The results are shown in Table 10 with wind and solar PV with and without storage costs.

- BGHES has the lowest costs. Wind and solar PV, including storage, are the most expensive options. CSP and coal have lower costs than wind and solar PV with storage.
- Wind and solar PV have the highest benefits because of their modular approach and shorter lead time.
- Coal has lower benefits than BGHES for three reasons. First, coal has a longer lead time than BGHES. Second, coal needs more land (1.1ha compared to 0.25ha per GWh) with higher opportunity costs. Third, coal power externality costs are substantially higher than hydropower.

The economic efficiency and ranking where wind and solar PV are analysed with storage costs:

- BGHES has the highest BCR and NPV.
- Wind with storage is economically inefficient with a BCR of 0.99. It has the second lowest BCR and NPV of all options.
- Solar PV with storage costs is marginally efficient with a BCR of 1.11.

- Coal and CSP have lower BCRs and NPVs than BGHES. Coal is inefficient with a BCR of less than one and a negative NPV and is the most inefficient of all alternatives. CSP is economically efficient, with a BCR of more than one and a positive NPV.

The conclusion is that BGHES as baseload hydro power is the most efficient option. The only other viable baseload option within the current context is CSP.

4.3 Sensitivity Analyses

Two categories of sensitivity tests were run. First were single tests on the main assumptions. Second were simultaneous tests on several assumptions.

4.3.1 Single Sensitivities

Sensitivity tests were run individually on seven of the main assumptions. These were for:

- Electricity demand growth in both countries;
- The distribution of unserved demand between households and firms;
- The cost of lost production to firms without generators;
- Variations in the initial construction costs;
- Average monthly electricity usage of new firms;
- Firm connection costs;
- Exports of base load.

Only the first four of these tests had any major effects on the results and these are reported below.

4.3.1.1 Electricity Demand Growth - Zambia and Zimbabwe

The base case estimates that annual electricity demand is expected to increase by 3.0% in both countries. This sensitivity analysis varies unserved demand. The results are reported in Table 11 for Zambia and Table 12 for Zimbabwe.

Table 11: Sensitivity: Zambia - Electricity Demand Growth

Annual Growth in Demand - Zambia	BCR
1.0%	3.12
3.0%	**4.44**
5.6%	5.00

In the sensitivity analysis the assumed annual growth rate in Zambia is varied between a low of 1.0% and a high of 5.6%. The high value of 5.6% is the increase in demand presented in the Options Assessment Report (Studio Pietrangeli, 2018, pp. 120, 126). The results are sensitive to varying the growth in demand for electricity in Zambia. The BCR reduces to 3.12 if demand were to only increase by 1% a year, whereas it would increase to 5.00 if demand were to increase by 5.6%. The results are more sensitive to a reduction in demand than an increase. This is due to the capacity of the scheme being exceeded earlier with the higher demand and no further benefit that can be generated.

Table 12: Sensitivity: Zimbabwe - Electricity Demand Growth

Annual Growth in Demand - Zimbabwe	BCR
1.0%	2.93
3.4%	**4.44**
5.0%	4.96

In the sensitivity analysis for Zimbabwe the annual growth rate is varied between a low of 1.0% and a high of 5.0%. The high value of 5.0% is the increase in demand presented in the Options Assessment Report (Studio Pietrangeli, 2018, pp. 120, 129). The results are sensitive to varying the growth in demand for electricity in Zimbabwe, but the project remains economically efficient for the full range tested.

The above sensitivities are done individually for each country because of the characteristics of supply and demand in each one. When they are combined and no growth in demand for electricity in both countries is assumed then the BCR reduces to 1.41. This is still an economically efficient result and indicates that the Project is economically desirable based on current demand and with most future planned generation plants still being implemented.

The conclusion to this sensitivity analysis is that the results are sensitive to changes in the growth of demand for electricity. The Project, however, remains economically efficient even for low increases in demand.

4.3.1.2 Distribution of Unserved Demand

Unserved demand is distributed equally between households and firms in the base case. The results of variations are shown in Table 13.

Table 13: Sensitivity - Unserved Demand Distribution

Households : Firms Unserved Demand Split	BCR
25% Households & 75% Businesses	5.80
50% Households & 50% Businesses	**4.44**
75% Households & 25% Businesses	3.08

It was found that the higher the proportionate share of unserved energy for firms the greater the economic efficiency. For example, with firms having 75% of unserved energy demands the BCR increases to almost 6. Conversely, the BCR would be 3.08 with a 25% share.

The results are sensitive to changes in the distribution of unserved demand, but the Project remains economically efficient for the range tested.

4.3.1.3 Cost of Lost Production for Firms without Standby Generators

It was assumed in section 3.2.2.1.2 that firms without standby generators would have losses 1.5 times greater than firms with generators. Variations in this assumption show that:

The BCR would:

- Reduce to 3.88 with losses equal to those of firms with standby generators;
- Reduce to 3.33 with losses equal to half those of firms with standby generators;
- Increase to over 10 for losses equal to 7.3 times[15] those of firms with standby generators.

Table 14: Sensitivity: Lost Production Cost

Cost of Lost Production for Firms without Generators	BCR
0.5 x businesses with generators	3.33
1.0 x businesses with generators	3.88
1.5 x businesses with generators	**4.44**
2.0 x businesses with generators	4.99
5.0 x businesses with generators	8.33
7.3 x businesses with generators	10.89

The results are very sensitive to relative changes in the losses of firms without generators, but the Project remains economically efficient for the full range tested.

[15] *This is the value in the findings of (Steinbuks & Foster, 2010, p. 509).*

4.3.1.4 Initial Construction Costs

The largest cost of the Project is the initial construction cost. This sensitivity analysis investigates variation in these costs and presents the results in Table 15.

Table 15: Sensitivity – Variation in Initial Construction Costs

Initial Construction Costs	BCR
20% Less ($2 143m)	5.36
As Provided ($2 679m)	**4.44**
20% More ($3 215m)	3.79

The Project becomes less efficient with an increase in the initial construction costs and more efficient with a decrease, as would be expected. The Project, however, remains economically efficient for the full range tested. The initial capital costs would need to increase to five times their value for the Project to no longer be efficient.

4.3.2 Simultaneous Sensitivities

The results of the previous analysis were combined to assess the consequence of changes in multiple assumptions. These combinations and results are shown in Table 16.

Table 16: Assessing Combined Assumptions

Variable	Least Favourable	Primary Assumptions	Most Favourable
Annual Growth in Demand: Zambia	1.0%	3.0%	5.6%
Annual Growth in Demand: Zimbabwe	1.0%	3.4%	5.0%
Households : Firms Split	75%	50%	25%
Lost Production without Generators	1.0 times	1.5 times	5.0 times
Construction Costs	20% Higher	As Provided	20% Lower
SAPP Base Load Exports ($c/kWh)	4.0 c/kWh	5.0 c/kWh	6.0 c/kWh
Benefit Cost Ratio (BCR)	**1.06**	**4.44**	**18.52**

- The Project remains economically efficient under the least favourable combination of assumptions, although only marginally so. This combination represents very little increase in demand for electricity in both countries, very little uptake by firms (most of the new demand would therefore be from households, which do not generate as much economic value), a 20% increase in the initial construction costs and prices of exports to the SAPP are lower than historically.

- The efficiency of the Project increases substantially with a combination of favourable assumptions. This combination is more representative of an increase in demand for

electricity as shown in the Options Assessment Report (Studio Pietrangeli, 2018, pp. 119, 126, 129), has a bigger uptake by firms rather than households, a value of lost production by firms closer to that indicated in the literature (Steinbuks & Foster, 2010, p. 509), a 20% reduction in the estimated construction costs and a slight premium on exports to the SAPP.

Although the Project is just above breakeven for the least favourable combination of assumptions, it is still efficient. The efficiency improves substantially when looking at the most favourable combination and on the balance of probability this project would generate substantial benefits for both countries.

5 Assessment and Significance Rating

This section assesses the economic efficiency of the Project.

5.1 Description of Effect

Determine whether the construction and operation of the BGHES, operating at an FSL of 757m, is economically efficient.

5.2 Assessment

The overall conclusion from the cost benefit analysis is that the base case is economically efficient. Realistic assumption changes did not result in economic inefficiency.

Table 17: Significance Rating of the Proposed BGHES

Criteria	**Rating**
Extent	Regional and International
Duration	Permanent
Scale	Large (National and International)
Frequency	Constant
Likelihood	Likely
Magnitude	Positive
Sensitivity / Vulnerability / Importance of Resource / Receptor	High
Impact Significance	**Major**

The Project has a major positive impact significance, as shown in Table 17. Although the Project overall is beneficial from the national perspective of the two countries there is a localised negative economic impact on the tourism facilities affected by the scheme (Anchor Environmental Consultants, 2019).

Mitigation measures could include financial payments from the ZRA to the tourist companies affected by the scheme. This transfer would not affect the economic efficiency of the Project if the transfers are not remitted abroad.

6 Conclusion

This report set out to determine the economic efficiency of the BGHES using an economic cost benefit analysis.

The conclusion is that the Project is robust from an economic efficiency point of view. The Project would remain efficient even with a prolonged drought or reduced flow because of climate change. The Project remains efficient even if surplus energy, because of planned alternative generators or demand variations, is exported. BGHES is a more efficient baseload option than coal, CSP, wind and solar PV.

Sensitivity analyses found the results most sensitive to changes in the growth in demand for electricity in both countries, the distribution of unserved demand (between households and firms), the cost of lost production for firms without generators and the initial construction costs. The results remained economically efficient for the entire range tested. A combination of assumptions found that the Project remains economically efficient with the least favourable combination.

The overall conclusion from the cost benefit analysis is that the base case is economically efficient. Realistic assumption changes did not result in economic inefficiency. The Project is assessed to have a major positive significance rating considering that its extent is regional and international, it is permanent, of large scale, constant frequency and likely to be implemented. There would be negative impacts on local firms that supply tourism services in the gorge. This may warrant mitigation of direct financial compensation to affected firms.

7 Bibliography

(2017, 11 15). Retrieved from Meridian Economics: http://meridianeconomics.co.za/wp-content/uploads/2017/11/CoalGen-Report_FinalDoc_ForUpload-1.pdf

(2019). Retrieved from GreenCape: https://www.green-cape.co.za/assets/Uploads/RENEWABLE-ENERGY-MARKET-INTELLIGENCE-REPORT-FINAL-WEB.pdf

Anchor Environmental Consultants. (2015). *Batoka Gorge Hydro-Electric Scheme Environmental and Social Impact Assessment: Economic Assessment.*

Anchor Environmental Consultants. (2019). *Batoka Gorge Hydro-Electric Scheme Environmental and Social Impact Assessment: Economic Assessment (Amended).* Cape Town.

Central Statistics Office. (2018). *2017 Labour Force Survey Report.* Lusaka: Ministry of Labour and Social Security.

Denholm, P., Hand, M., Jackson, M., & Ong, S. (2009). *Land-Use Requirements of Modern Wind Power Plants in the United States.* National Renewable Energy Laboratory. Retrieved from https://www.nrel.gov/docs/fy09osti/45834.pdf

Energy Regulation Board. (2018). *Energy Sector Report 2017.*

Engineering News. (2013, 06 04). Retrieved from https://www.engineeringnews.co.za/article/50-mw-de-aar-solar-project-at-peak-construction-stage-2013-06-04

Environmental Resources Management Southern Africa (Pty) Ltd. (2019). *Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River: Environmental and Social Impact Assessment (ESIA) for the Project Area of Inundation, Staff Villages and Quarries (V3.0).*

ERM. (2019a). *Resettlement Policy Framework (RPF) – Zambia: Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River.*

ERM. (2019b). *Resettlement Policy Framework (RPF) – Zimbabwe: Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River.*

ExternE. (2006). *Externalities of Energy. A Research Project of the European Commission*. Retrieved from ExternE: http://www.externe.info/externe_2006/

Kathu Solar Park. (2019, 07 16). Retrieved from Kathu Solar Park: https://www.kathusolarpark.co.za/

Khandker, S. R., Barnes, D. F., & Samad, H. A. (2009). *Welfare Impacts of Rural Electrification: A Case Study from Bangladesh.* World Bank.

Kusile Power Station. (2019, 07 16). Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Kusile_Power_Station

Ong, S., Campbell, C., Denholm, P., Margolis, R., & Heath, G. (2013). *Land-Use Requirements for Solar Power Plants in the United States.* National Renewable Energy Laboratory. Retrieved from https://www.nrel.gov/docs/fy13osti/56290.pdf

Oseni, M. O., & Pollitt, M. G. (2013). *The Economic Costs of Unsupplied Electricity: Evidence from Backup Generatoin among African Firms.* University of Cambridge: Energy Policy Research Group.

Rycroft, M. (2016, 04 25). *Energy storage and baseload generation.* Retrieved from eePublishers: https://www.ee.co.za/article/energy-storage-baseload-generation.html

Sharpley, N. (2015, 10 23). *Unlocking the potential of wind power with energy storage.* Retrieved from Windpower Engineering and Development: https://www.windpowerengineering.com/design/unlocking-potential-wind-power-energy-storage/

Southern African Power Pool. (2019). *Annual Report.*

Stats and Facts SAWEA. (2018, 11 13). Retrieved from The South African Wind Energy Association: https://sawea.org.za/stats-and-facts-sawea-2/

Steinbuks, J., & Foster, V. (2010). When do firms generate? Evidence on in-house electricity supply in Africa. *Energy Economics*, 505-514.

Studio Pietrangeli. (2018). *Batoka Gorge Hydo-Electric Scheme Phase II Layout, Option Assessment Report.*

Studio Pietrangeli. (2019a). *Batoka Gorge Hydro-Electric Scheme Phase III - Feasibility, Vol. 10 - 375 Gen R SP 001 - Reservoir Operation and Energy Production Studies.* Rome: Zambezi River Authority.

Studio Pietrangeli. (2019b). *Batoka Gorge Hydro-Electric Scheme Phase III - Feasibility, Vol. 10 - Reservoir Operatoin and Energy Production Report, Annexes.* Rome: Zambezi River Authority.

Studio Pietrangeli. (2019c). *Batoka Gorge Hydro-Electric Scheme, Phase III - Feasbility Design, Transmission System Design Vol. XII.* Rome: Zambezi River Authority.

Studio Pietrangeli. (2019d). *Batoka Gorge Hydro-Electric Scheme, Phase III - Feasibility, Vol.1 - Main Report - Draft.* Zambezi River Authority.

UNESCO. (2016, January 29). *Mosi-oa-Tunya / Victoria Falls*. Retrieved from UNESCO World Heritage List: http://whc.unesco.org/en/list/509

US Department of Energy. (2019, 07 16). Retrieved from https://www.energy.gov/eere/geothermal/geothermal-power-plants-minimizing-land-use-and-impact

World Bank. (2018). *Batoka Gorge Hydroelectric Scheme: A Macroeconomic Assessment of Public Investment Options (MAPIO).* Washington: World Bank.

Zimbabwe National Statistics Agency. (2019). *Quarterly Digest of Statistics Fourth Quarter 2018.* Harare: ZimStat.

Appendix: Macroeconomic Analysis

This appendix describes the results of a macroeconomic analysis. It is included in the appendix because it was not part of the terms of reference. This section commences with a description of the methodological approach before presenting the results.

Macroeconomic Analysis Methodology

While a cost benefit analysis considers first order costs and benefits a macroeconomic analysis considers second order benefits as well.

The size of a national or regional economy is measured in terms of the total of all economic activities taking place within the area concerned, both in the public and private sectors. For countries like Zambia and Zimbabwe this includes measures of informal sector activity. The name given to the measure of the size of the economy is Gross Domestic Product (GDP). The unit of measurement is the US dollar. Zimbabwean income is reported in US dollars. Zambian outputs are also reported in US dollars for comparative purposes.

Underlying the measurement of GDP is the understanding that all economic activity is dependent on the physical and institutional support systems that enable an economy to operate effectively. These include the various levels of governmental structure, the legal system, and the administrative, financial and educational infrastructure in the country. In terms of physical infrastructure, all economic activity depends on water supply, telecommunication, and transport infrastructure. The economy could not operate without all these systems being in place.

While there are many different types of macroeconomic effects, the two most important are contribution to gross domestic product (GDP) and creation of jobs. The importance of job creation is obvious. Increases in GDP are synonymous with increases in peoples' economic standards of living. Increased GDP – i.e. increased production – is experienced in the form of more jobs, higher wages and reduced economic hardship. It is clearly an important measure.

The effects of any infrastructure project on the size of the GDP arise as a result of the myriad ways in which firms, public service providers and ordinary people find their normal daily activities affected, hopefully for the better, by the changes brought about by the new project.

The actual task of calculating the macroeconomic impact of the BGHES demands a detailed and multifaceted approach not least because of the so-called multiplier effects. It is well recognised that the simple act of spending – constructing a dam, for example - leads to other

economic effects. Demand for locally produced steel and cement can lead to increased production in those industries. Increased demand for steel and cement, in turn, leads to increased demand for mining output which uses wood, water, electricity and so on. These are the so-called multiplier effects. While this process unfolds, each industry employs people and pays wages. Employees, in turn, spend their wages and cause further multiplier effects through the economy. Measuring this is further complicated by the fact that different industries demand different types of skills. This leads to different wage structures across the various industries. People earning different wages have different spending patterns. Thus, the change in overall spending patterns is dependent on which industries are affected.

Five steps were required to measure the overall macroeconomic contribution of the proposed project:

- First, to identify appropriate expense items for each category of costs.
- Second, to determine the relative proportions of local profit, labour, plant and material for each expense item. Imports are excluded from the macroeconomic analysis.
- Third, to assign each item of material and plant to the appropriate SAM economic sector code.
- Fourth, the potential negative impact on tourism, which would reduce the macroeconomic benefits.
- Finally, all the items in the SAM coded list of costs for each country are brought together. The total multiplier effect is calculated as the aggregate product SAM coded spending on plant and material, as well as SAM coded spending by workers multiplied through the national multipliers.

In any macroeconomic assessment, there is a need to report the potential contribution to direct, indirect and induced jobs. The difference between the different job types is as follows:

- Direct jobs are created on site with the construction of the hydroelectric scheme as well as with the on-going operations once completed.
- Indirect jobs are created in the supply chain. They occur because of the backward and forward linkages of firms within the economy. If, for example, a construction company procures specialist materials for the dam then the indirect jobs would be those based at the specialist product factory.
- Induced jobs are those jobs that arise because of the expenditure of salaries and wages by direct and indirect employees. For example, the retail industry would benefit from induced jobs when construction workers spend their salaries.

Direct jobs are calculated as follows:

- The increased expenditure due to the various components of the project (such as the construction of the BGHES and its operation) needs to be determined. These costs are provided as inputs into the economic analysis by the technical experts.
- Each activity needs to be aligned with the sectors in the Social Accounting Matrices (SAMs) for Zambia and Zimbabwe. A SAM is a mathematical representation of the economies of each country. It is a matrix that indicates the revenue and expenditure of each of the economic sectors. The proportion of turnover of each sector that is spent directly on salaries and wages is provided by the SAM. This proportion varies for different economic sectors. Therefore, if the total change in turnover, or demand, of a sector is known then the value of salaries and wages can be calculated. For example, if it is estimated that $1m is spent on building the dam wall and the proportion of salaries and wages for the construction industry is 30% then the $1m dam wall expenditure would have increased salaries and wages in construction by $300 000. Once again, this example is only true for the locally constructed portion and excludes imports.
- Direct jobs are calculated by dividing the increase in salaries and wages calculated above by the average monthly earnings (converted to annual earnings) for the appropriate sector. For Zimbabwe the average earnings are sourced from the June 2018 Quarterly Digest of Statistics (Zimbabwe National Statistics Agency, 2019) and for Zambia from the 2017 Labour Force Survey (Central Statistics Office, 2018).
- Where actual information on direct employment is known, these numbers are used rather than the calculation described above. To illustrate, the ESIA Report estimates 2 000 people involved in the construction in the first two years of the Project, increasing to 8 000 for the remaining five (Environmental Resources Management Southern Africa (Pty) Ltd, 2019). This number is split equally between both countries and reported, rather than that calculated as described above.

The results are reported separately for the two countries.

Results of Macroeconomic Analysis

The macroeconomic contribution of the Project is reported annually between 2021 and 2030 and in 5-year increments until 2040. The only variable that changes after 2040 is lost tourism revenue.

The reported macroeconomic indicators are the contribution to Gross Domestic Product and direct and indirect jobs in Zambia and Zimbabwe. These are disaggregated into construction,

operations and maintenance, professional fees, reduced tourism revenues, savings from reduced outages and exports.

Gross Domestic Product

Gross Domestic Product is the total value of all final goods and services produced in a country. It is clearly fundamental to the economic quality of life of people in Zambia and Zimbabwe. It is also the most important and all-encompassing measure of the macroeconomic effect of the proposed Batoka Gorge Hydroelectric Scheme. The contribution to GDP is presented in Table 18 and Figure 6.

Table 18: Contribution to GDP

Contribution to GDP - US$m, 2019 Prices	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Zambia												
Initial Construction Costs	13	15	68	58	56	50	46					
Operations & Maintenance								31	31	31	31	31
Professional Fees	2	2	10	8	8	7	7	4	4	4	4	4
Reduced Tourism Revenues	-4	-4	-4	-5	-5	-5	-5	-5	-5	-5	-6	-7
Savings from Outages								175	287	359	718	703
Exported Electricity								264	229	193	0	0
Total Contribution to Zambian GDP	**11**	**13**	**74**	**61**	**59**	**52**	**47**	**470**	**546**	**581**	**747**	**731**
Zimbabwe												
Initial Construction Costs	19	21	95	80	78	70	64					
Operations & Maintenance								46	46	46	46	46
Professional Fees	3	4	16	13	13	12	11	7	7	7	7	7
Reduced Tourism Revenues	-6	-6	-6	-7	-7	-7	-7	-7	-8	-8	-9	-11
Savings from Outages								226	358	447	879	876
Exported Electricity								311	270	227	0	0
Total Contribution to Zimbabwean GDP	**16**	**19**	**105**	**87**	**84**	**75**	**67**	**583**	**672**	**719**	**923**	**918**
Total Contribution to Regional GDP	28	31	178	148	144	127	115	1 052	1 218	1 300	1 670	1 649
Cumulative Contribution to Regional GDP	28	59	237	386	530	657	771	1 824	3 042	4 342	12 131	20 237

In Zambia the total contribution to GDP:

- varies between $11m and $74m during construction;
- increases to $470m by 2028 in the first year of operation and continues to increase until a peak of $747m in 2035 as a result of savings from reduced outages;
- is $731m by 2040.

In Zimbabwe the total contribution to GDP:

- varies between $16m and $105m during construction;
- increases to $583m by 2028 in the first year of operation and continues to increase until a peak of $923m in 2035 as a result of savings from reduced outages;
- is $918m by 2040.

In total for both countries, contribution to GDP:

- varies between $28m and $178m during construction;

- increases to $1 052m by 2028;
- peaks at $1 670m in 2035
- is $1 649m by 2040.

In aggregate the BGHES would have added a cumulative $771m to the GDPs of the two countries at the end of construction. By 2040 this cumulative contribution is estimated to be $20 237m.

The disaggregated contribution:

- Construction costs have been spread over seven years. Most of the materials are imported and therefore do not make a macroeconomic contribution. Local procurement increases Zambian GDP by a maximum of $68m and by $95m in Zimbabwe.
- Running expenses would contribute $31m to Zambian GDP and $46m to Zimbabwean GDP.
- Professional fees would contribute up to $10m to Zambian GDP and $16m to Zimbabwean GDP during construction. This operational contribution is expected to be $4m annually in Zambia and $7m in Zimbabwe.
- Reduced tourism revenues are expected to cost Zambia $4m in 2021 increasing to $7m by 2040. This would be $6m and $11m for Zimbabwe.
- The contribution of electricity to savings from fewer outages in Zambia is expected to increase GDP by $175m in 2028 and increasing to $703m in 2040, with a peak of $718m in 2035. In Zimbabwe this is expected to increase from $226m to $876m over the same period, with a peak of $879m in 2035.
- Income from exports is estimated to contribute $264m to the Zambian economy in 2028. This reduces annually and no exports are expected by 2035 because all the electricity would be consumed locally. Exports would contribute $311m to Zimbabwe in 2028, dropping off to zero by 2035.

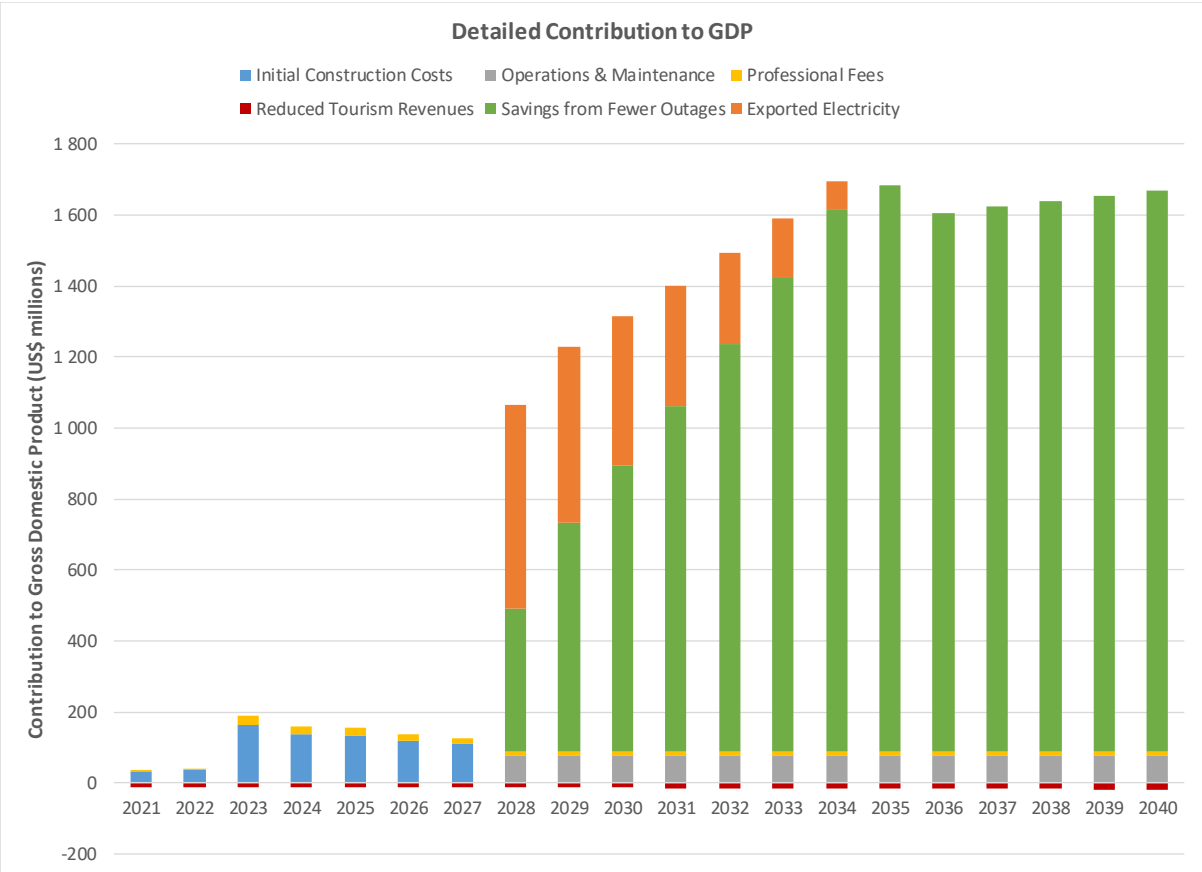

Figure 6: Contribution to Gross Domestic Product

The details of the contribution to GDP are presented in Figure 6:

- The difference in contribution to GDP between construction and operating is clearly apparent. Most of the construction expenses are imports.
- Electricity exports decline and local production increases until 2035 when local demand uses all the generation capacity of the BGHES.
- The drop between 2035 and 2036 is because there are no further electricity connections in either country (all the electricity produced is used by that year and no further households or business can connect).
- The negative impact from lower tourism revenue is also shown, as is the relative size of this impact.

Direct and Indirect Jobs

The BGHES would result in changes to two types of jobs. The first are the direct jobs that would be created. These are jobs directly on building and running the BGHES. Included are the structural changes to the economy as a result of improved productivity. The second are

the so-called indirect jobs that result from the multiplier effects of the capital and operational costs, the lost tourism business, the improved productivity and exports.

Table 19 reports on the direct jobs, Table 20 on the indirect jobs in the two countries and Table 21 is a sum of the direct and indirect job creation for both countries. Figure 7 illustrates the total direct and indirect job creation in the two countries as well as contribution to their respective GDPs.

Table 19: Direct Jobs

Contribution to Direct Jobs	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Zambia												
Initial Construction Costs	1 000	1 000	4 000	4 000	4 000	4 000	4 000					
Operations & Maintenance								750	750	750	750	750
Professional Fees	64	74	327	279	269	240	220	146	146	146	146	146
Reduced Tourism Revenues	-140	-144	-149	-153	-158	-162	-167	-172	-177	-183	-212	-245
Savings from Outages								5 969	9 781	12 200	24 270	23 712
Exported Electricity								8 894	7 714	6 500	0	0
Contribution to Zambian Direct Jobs	**924**	**929**	**4 178**	**4 126**	**4 112**	**4 077**	**4 053**	**15 587**	**18 213**	**19 414**	**24 955**	**24 363**
Zimbabwe												
Initial Construction Costs	1 000	1 000	4 000	4 000	4 000	4 000	4 000					
Operations & Maintenance								750	750	750	750	750
Professional Fees	26	30	133	113	110	98	89	59	59	59	59	59
Reduced Tourism Revenues	-63	-65	-67	-69	-71	-73	-75	-78	-80	-82	-96	-111
Savings from Outages								2 057	3 165	4 089	8 915	9 154
Exported Electricity								3 268	2 831	2 380	0	0
Contribution to Zimbabwean Direct Jobs	**963**	**965**	**4 066**	**4 044**	**4 038**	**4 024**	**4 014**	**6 057**	**6 726**	**7 196**	**9 629**	**9 853**
Contribution to Regional Direct Jobs	1 887	1 894	8 244	8 170	8 150	8 102	8 067	21 644	24 939	26 610	34 584	34 216

During the construction period between 2021 and 2027:

- The ESIA report expects that 2 000 people would be employed during the first two years of construction, increasing to around 8 000 people for the rest of the construction period (Environmental Resources Management Southern Africa (Pty) Ltd, 2019). These direct jobs, in the absence of other information, have been divided equally between the two countries.
- It is estimated that professional fees would generate up to 327 jobs in Zambia and 133 in Zimbabwe.
- There would be job losses because of lower tourism revenues. In Zambia it is estimated that these job losses would increase from 140 in 2021 to 167 in 2027 while in Zimbabwe it is estimated that the job losses would increase from 63 to 75 over the same time period.

When operations commence in 2028:

- It is estimated that 750 direct jobs would be created in each of Zambia and Zimbabwe from operations and maintenance.
- Professional fees could generate 146 direct jobs in Zambia and 59 in Zimbabwe.

- There would be a loss of 172 direct jobs in tourism in Zambia and 78 in Zimbabwe in 2028. This would increase to losses of 245 and 111 respectively by 2040.
- Savings from fewer outages is expected to generate 24 000 direct jobs in Zambia and 9 000 in Zimbabwe from 2035 onwards.
    - It is noted that there is a large disparity between the job numbers in Zambia and Zimbabwe, when it would be expected that they would be similar. This has to do with differences in the average compensation of employees in both countries.
    - According to the Quarterly Digest of Statistics for Zimbabwe the total compensation of 843 000 non-agricultural employees in June 2018 was US$1 456.3m (Zimbabwe National Statistics Agency, 2019, p. 13). This implies an average monthly salary of $1 728 (an annual $20 727).
    - The Zambian Labour Force Survey indicates that average monthly earnings in the non-agriculture sectors in 2017 was K3 493 (Central Statistics Office, 2018, p. 86). In mid-2017 the Zambian Kwacha was trading at approximately K9.00 to the US Dollar, implying that the average non-agriculture sector salary was $388 (an annual $4 657). It is also noted that formal sector salaries are 28% higher than the average in Zambia (2018, p. 85).
    - Average salaries in Zimbabwe are thus about three and a half times those in Zambia.
    - Job numbers are calculated by dividing increases in salaries (which in turn are derived from increases in turnover – refer to the description in the previous section on how direct jobs are calculated) by the average salaries in a sector. Based on the relative sizes of the average salaries and allowing for variation amongst the different sectors, Zambia would generate about three times as many jobs for the same increase in salaries.
    - This is the phenomenon that is being seen when comparing job numbers between the two countries.
- Exports contribute to job creation in the early years of operation. In Zambia as many as 8 894 jobs could be created from export revenue in 2028 while in Zimbabwe it is estimated that 3 268 direct jobs could be created.

Total direct jobs in the two countries are estimated to exceed 8 000 from the third year of construction. The number of direct jobs then increases until stabilising at approximately 34 000 in 2035.

Table 20: Indirect Jobs

Contribution to Indirect Jobs	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Zambia												
Initial Construction Costs	679	756	3 440	2 907	2 829	2 533	2 313					
Operations & Maintenance								2 166	2 166	2 166	2 166	2 166
Professional Fees	105	120	535	456	440	392	360	239	239	239	239	239
Reduced Tourism Revenues	-229	-236	-243	-251	-258	-266	-274	-282	-291	-299	-347	-402
Savings from Outages								9 636	15 727	19 685	39 577	38 836
Exported Electricity								14 573	12 640	10 651	0	0
Contribution to Zambian Indirect Jobs	**554**	**640**	**3 731**	**3 112**	**3 012**	**2 659**	**2 399**	**26 332**	**30 481**	**32 441**	**41 635**	**40 839**
Zimbabwe												
Initial Construction Costs	210	231	1 036	871	850	761	693					
Operations & Maintenance								509	509	509	509	509
Professional Fees	42	48	212	181	175	156	143	95	95	95	95	95
Reduced Tourism Revenues	-76	-78	-80	-83	-85	-88	-90	-93	-96	-99	-115	-133
Savings from Outages								2 691	4 212	5 330	10 904	10 996
Exported Electricity								3 916	3 392	2 851	0	0
Contribution to Zimbabwean Indirect Jobs	**176**	**201**	**1 168**	**969**	**939**	**829**	**745**	**7 117**	**8 111**	**8 685**	**11 393**	**11 467**
Contribution to Regional Indirect Jobs	730	841	4 900	4 081	3 951	3 488	3 145	33 450	38 593	41 127	53 028	52 306

Indirect jobs are shown in Table 20. Total indirect jobs in the two countries are set to increase from around 700 in 2021 to approximately 3 000 in 2027, with a peak of 4 900 in 2023. As business productivity increases so too do the indirect jobs, until they exceed 50 000 by 2035.

Table 21: Total Direct and Indirect Jobs

Contribution to Direct and Indirect Jobs	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Zambia												
Initial Construction Costs	1 679	1 756	7 440	6 907	6 829	6 533	6 313					
Operations & Maintenance								2 916	2 916	2 916	2 916	2 916
Professional Fees	169	194	862	735	710	632	580	385	385	385	385	385
Reduced Tourism Revenues	-369	-380	-392	-404	-416	-428	-441	-454	-468	-482	-559	-648
Savings from Outages								15 605	25 508	31 885	63 847	62 548
Exported Electricity								23 467	20 354	17 151	0	0
Contribution to Total Zambian Jobs	**1 478**	**1 570**	**7 910**	**7 238**	**7 123**	**6 737**	**6 452**	**41 919**	**48 695**	**51 855**	**66 590**	**65 202**
Zimbabwe												
Initial Construction Costs	1 210	1 231	5 036	4 871	4 850	4 761	4 693					
Operations & Maintenance								1 259	1 259	1 259	1 259	1 259
Professional Fees	68	78	345	294	284	253	232	154	154	154	154	154
Reduced Tourism Revenues	-139	-143	-147	-152	-156	-161	-166	-171	-176	-181	-210	-244
Savings from Outages								4 748	7 377	9 419	19 819	20 151
Exported Electricity								7 184	6 223	5 231	0	0
Contribution to Total Zimbabwean Jobs	**1 139**	**1 166**	**5 234**	**5 013**	**4 978**	**4 853**	**4 759**	**13 174**	**14 837**	**15 881**	**21 022**	**21 320**
Contribution to Total Regional Jobs	2 617	2 735	13 144	12 251	12 101	11 590	11 211	55 093	63 532	67 737	87 612	86 522

Total jobs, the sum of the direct and indirect jobs discussed above, are shown in Table 21. Total jobs are set to increase from around 2 600 in 2021 to 11 200 by the end of the construction period, with a peak of 13 100 in 2023. Operations increase jobs to over 55 000 in 2028. They increase annually after that, exceeding 86 000 by 2040.

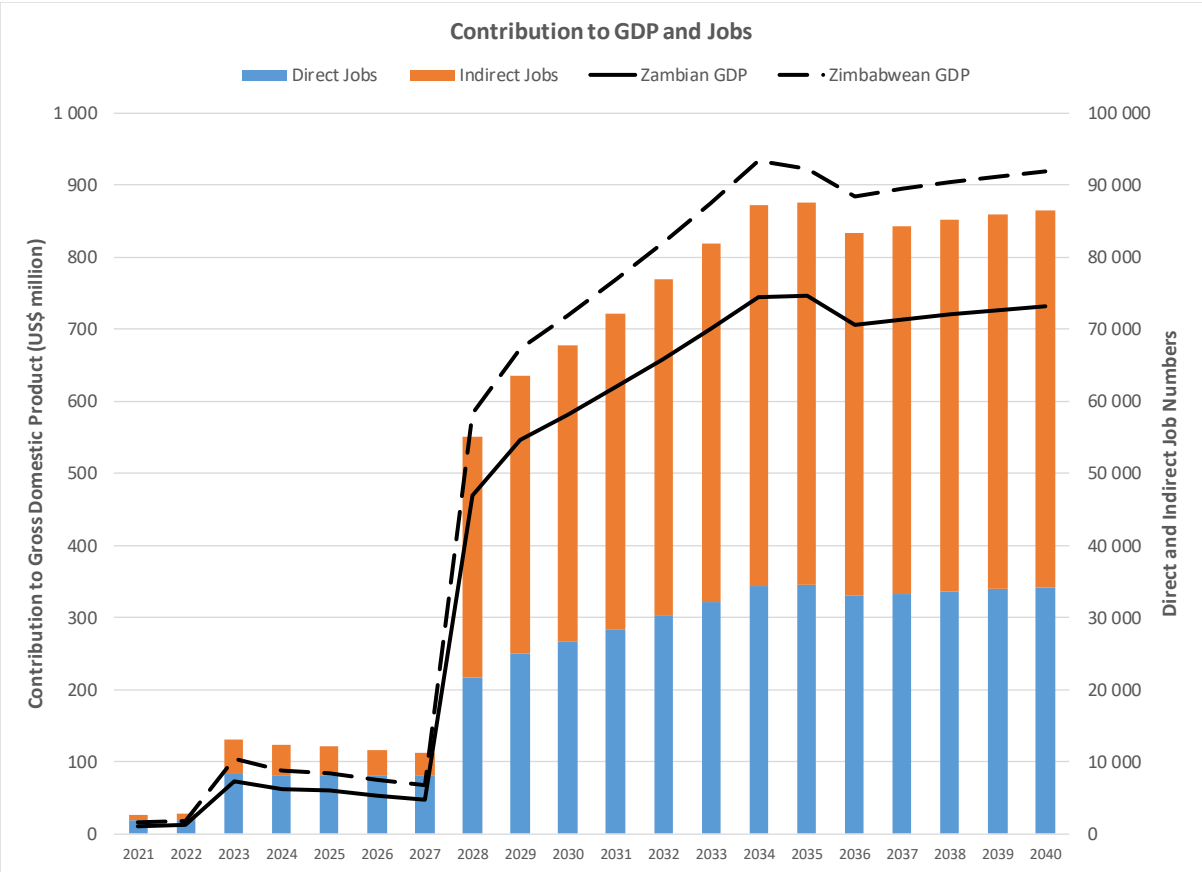

Figure 7: Jobs and Gross Domestic Product

Figure 7 shows the contribution to direct and indirect jobs (the blue and orange columns respectively) and to the Zambian and Zimbabwean economies (the two black lines). Three patterns are apparent:

- The contribution of the BGHES to jobs and to the economies of the two counties increases significantly during the operating period (from 2028 onwards).
- For every two direct jobs there are approximately three indirect jobs.
- There is a higher economic contribution to Zimbabwe than Zambia.

Annex L

Cultural Heritage Report Zimbabwe

L1 PROOF OF SUBMISSION OF CULTURAL HERITAGE REPORT TO THE NATIONAL MUSEUM AND MONUMNETS OF ZIMBABWE

National Museums and Monuments of Zimbabwe

Our ref: A60/CM/zm

11 March 2015

Eng. Munyaradzi C. Munodawafa
Chief Executive
Zambezi River Authority
Kariba House
32 Cha Cha Cha Road
Lusaka
ZAMBIA

Dear Sir,

re: **NATIONAL MUSEUMS AND MONUMENTS OF ZIMBABWE COMMENTS ON CULTURAL HERITAGE BASELINE REPORT FOR THE PROPOSED BATOKA GORGE HYDRO-ELETRIC SCHEME, ZIMBABWE.**

Further to our letter of even reference and dated 25 February 2015, we write to confirm that National Museums and Monuments of Zimbabwe has now reviewed the above cited baseline report.

National Museums and Monuments of Zimbabwe is satisfied with the report as it is comprehensive and thorough, clearly bringing out, as it does, major observations that our institution must address to ensure that cultural heritage resources protection is integral to both project planning and implementation.

In essence, the report has sufficient content to inform us and the developer on critical issues that require monitoring or intervention.

PENROSE HILL, 107 KOTTON ROW, HARARE

especially for us, given our mandate to conduct appropriate mitigation where heritage resources are under threat.

The assessment identified 91 archaeological sites. Of these sites the majority were assessed to be of negligible significance and "worthy of further investigations". The sites were deemed to have scientific value as they represent the full variety of the sites in the project area (p.152) and as such their mitigation will ensure a proper record of the cultural heritage of the Batoka project footprint before likely destruction.

The assessment also affirmed the major significance of Chemapato hill site as previously highlighted by earlier assessments. This is a living heritage site and will require appropriate mitigations measures.

Please note that mitigation can only be carried out by the National Museums and Monuments of Zimbabwe and our team will require to scope and cost the work upon which a budget will be produced and forwarded to yourselves.

Important to also note is that should other heritage occurrences of a significant nature that are not covered in the impact assessment report come to our attention, the developer will be expected to take all appropriate mitigation or such other necessary conservation interventions as prescribed by ourselves.

Your assistance and cooperation to save our heritage is greatly appreciated.

Sincerely

C. Mahachi (Dr.)
EXECUTIVE DIRECTOR

TANGIBLE CULTURAL HERITAGE REPORT – BATOKA GORGE HYDRO-ELECTRIC SCHEME, ZIMBABWE

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1.1 SUMMARY

A Cultural Heritage Assessment of the proposed Batoka Gorge Hydro-Electric Scheme (HES) project on the Zambezi River, including both archaeological and palaeontological investigations, was carried out on the Zimbabwean side from 15th to 24th August 2014. The objective was to both update earlier 1993 and 1998 heritage assessments to the standard now required by National Museums and Monuments of Zimbabwe, as well as investigating additional areas identified as part of the proposed development footprint where this has changed.

No sites of palaeontological interest were located. 91 Archaeological sites are recorded in this report - either sites recorded previously or 55 new ones located during the current field reconnaissance. Relevant mitigation procedures are proposed for those sites considering their importance to the Cultural Heritage in this part of Zimbabwe. This includes a reassessment of those sites documented previously. Most of the sites are ephemeral or disturbed: as such they have limited social and academic significance. Relevant mapping and excavation is suggested for several key sites providing a future reference point in our understanding of the Cultural Heritage of the Victoria Falls area. The importance of the Living Traditional site of Chemapato Hill is reaffirmed. Where additional work is required on the part of the Project Proponent this is outlined.

1.2 PROJECT DESCRIPTION

The Zambezi River Authority (ZRA) is considering developing the proposed Batoka Gorge Hydro-Electric Scheme (HES) on the Zambezi River. This bilateral project between Zambia and Zimbabwe includes the construction of a concrete gravity arch dam that will provide up to 800 MW of electrical power each for Zambia and Zimbabwe with a total capacity of 1600 MW. The proposed Scheme is located approximately 50km downstream of the Victoria Falls within the province of Matabeleland North and in the Hwange Rural District, *Figures 1 and 2*.

The following are the key components of the proposed Batoka HES Project:

- A 181m high dam wall and water impoundment upstream toward Victoria Falls World Heritage Site. The maximum height of the reservoir is tentatively set at 762m above mean sea level at which stage the reservoir surface area will cover approximately 25.6 km^2.

- Powerhouses shall be constructed on each riverbank below the proposed dam wall.

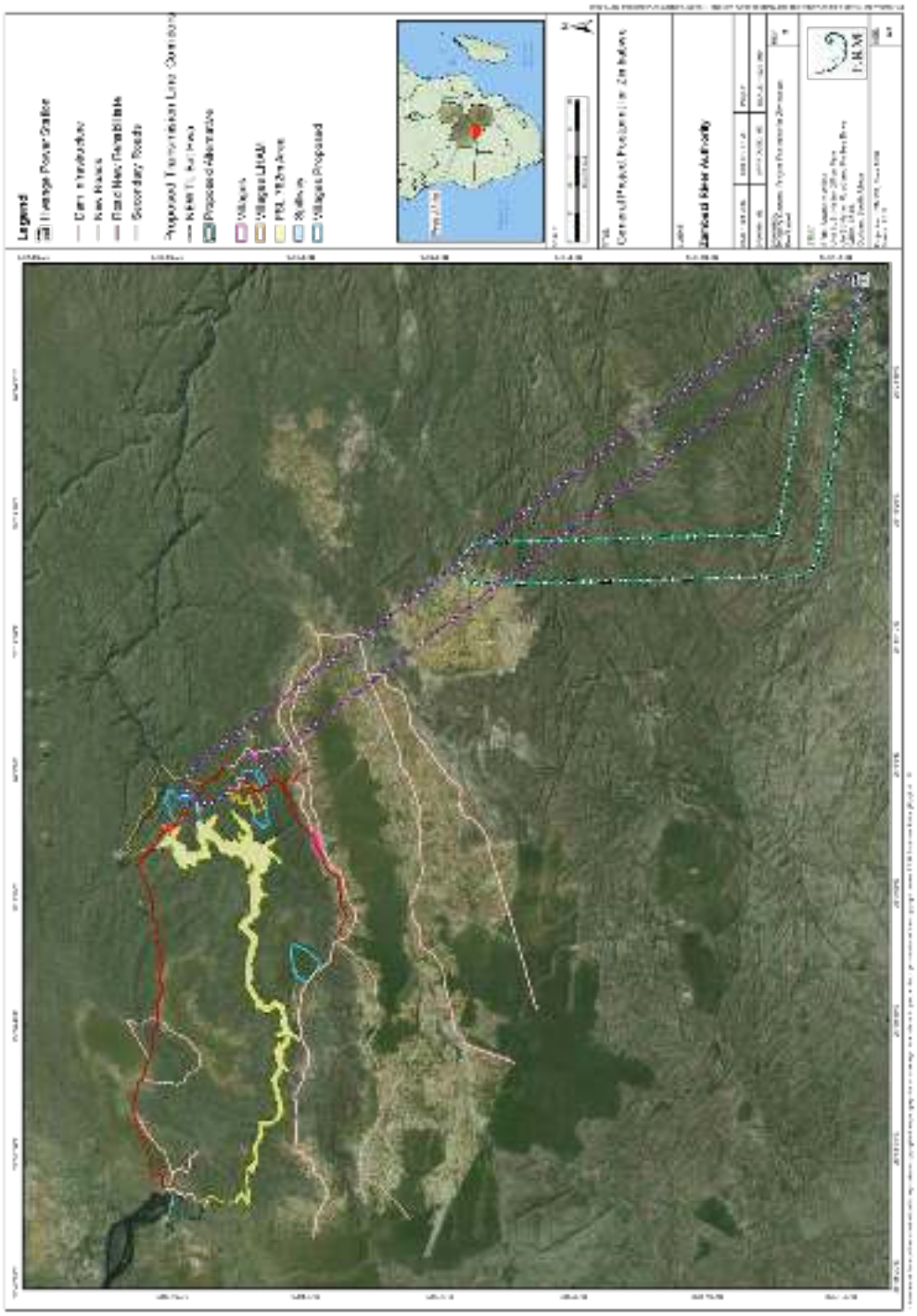
- In Zimbabwe the proposed transmission lines shall comprise 2 x 70km 330kV lines running in parallel and sharing a common right-of-way to the existing Zimbabwe Power Company (ZPC) Hwange 330 kV substation. An alternative, taking advantage of the existing A8 national road for the reasons of cheaper construction and future maintenance, deviates

approximately 30km from the starting point. It heads directly south towards the A8 motorway and thence to Hwange.

- Access roads shall be developed to access the site, either upgrading of existing roads and/or construction of new roads.

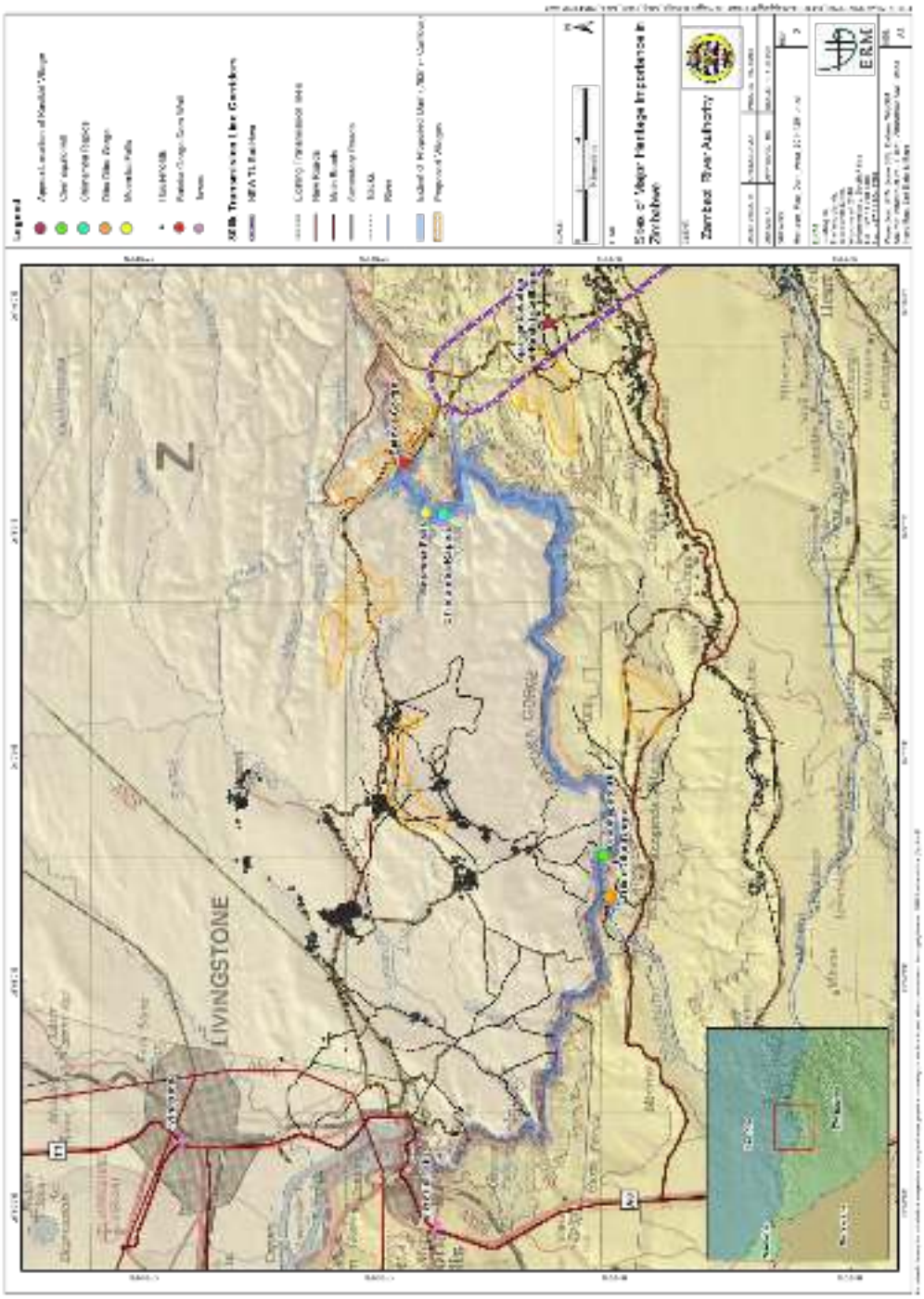
- Other ancillary infrastructure shall include quarries; a spoils/dumping area, construction and batching camps and a residential area consisting of permanent staff housing and associated facilities.

Figure 0.1 Key Components of Proposed Batoka HES Project in Zimbabwe



Source: ERM, 2014

Figure 0.2 More Detailed Map of Key Components of Proposed Batoka HES Project in Zimbabwe



Source: ERM, 2014

1.3 TERMS OF REFERENCE

The following Terms of Reference were issued on the 5th August 2014 and guided this study:

ARCHAEOLOGY (ROB BURRETT)

- *Field visit to confirm and adequately document sites previously recorded as well as potential new sites located during field visit*
- *Site visit to include baseline data collection for dam site and some ancillary infrastructure (ie, dam wall, power houses, spillway, inundation area, construction camp, permanent villages, switch yard and access roads). Footnote = Depending on the extent of the dam site and ancillary infrastructure areas, additional scope may be required. Any additional scope will be agreed between the Consultant and ERM and is subject to additional contractual arrangements.*
- *Desk top study level (preliminary assessment of the cultural heritage database and information from available studies) for the provisional transmission line routes*
- *Reporting and impact assessment*
- *Chance Find procedure*
- *Briefing of Zambian team (ie, discussions with Zambian Specialist) Footnote = Zambia data will be gathered by Zambian Specialist. No field time, site visits or data gathering trips to Zambia are included for the Consultant. No contingency has been included for documenting sites of intangible cultural significance following report back from sociological surveys.*
- *Review of terms of reference for Zambian team*
- *Review of Zambian report*

At this stage, the archaeological scope of work for the Transmission lines is omitted, although it is recognised that this scope will need to be added. This scope will be added once a more defined transmission line route can be provided by the feasibility study engineers and an archaeological assessment can be undertaken. It is recognised that any archaeological finds might result in further minor alignment adjustments to the proposed transmission line routes and hence desk top involvement will be sought initially. This additional scope will be agreed between the Consultant and ERM and is subject to additional contractual arrangements.

1.4 OBJECTIVES

The purpose of this investigation of the Cultural Heritage resources on the Zimbabwean side of the proposed Batoka HES was to comply with the legal requirements of the National Museums and Monuments of Zimbabwe (NMMZ) Act Chapter 25 (11), supported by various Statutory Instruments. The most recent additional legislation, Statutory Instrument 143 of 2011, must be read in conjunction with the institutional recommendations contained in a 1998 NMMZ publication entitled 'Archaeological Impact Assessments: Guidelines for Planning Authorities and Developers'[2].

This national legislation and related body of operational recommendations grant the NMMZ authority over all sites and structures of cultural, specified scientific, historical, archaeological and palaeontological significance. They set standards for reporting, evaluation and notification. This report seeks to comply with these requirements, as well as seeking NMMZ guidance on the

[2] NMMZ, 1998

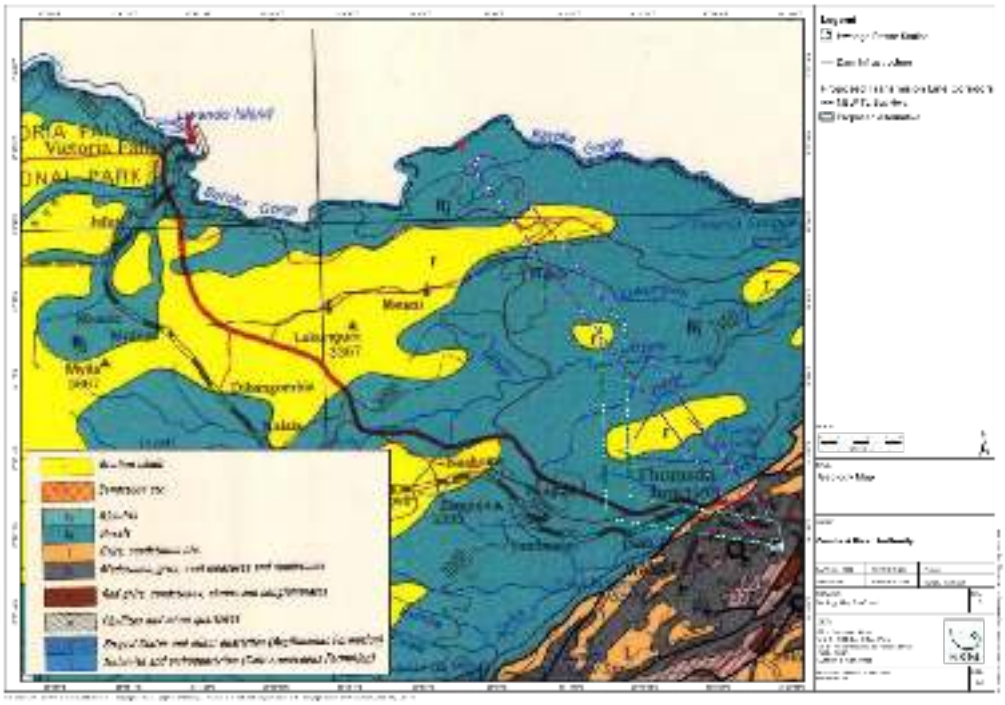
conclusions offered as well as the proposed mitigation procedures recommended.

1.5 HERITAGE CONTEXT

1.5.1 *Simplified Geology of the Dam Project Area*

To understand the Cultural and Palaeontological Heritage of the Project Area it is necessary to have a general knowledge of the basic geology of the general Victoria Falls landscape[3]. It is on this, and often directed by it, that the heritage signature exists, *Figure 3.*

Figure 0.3 Simplified Regional Geology of the Batoka HES Project, Zimbabwe



Source: ERM, 2014

The underlying Karroo Series Basalt dates to about 180 million years ago. It results from a repeated series of lava extrusions. Between these eruptions there were periods of sedimentation and it is in these lenses of sandstone that fossil remains may occur. Although not known locally, such remains have been found nearby in Lake Kariba Basin where the same geological sequence occurs[4]. The potential for finding these palaeontological sites has been raised in previous investigations, but as yet nothing has been found.

Being volcanic the basalt itself does not contain fossils, but it does include scattered amygdaloidal deposits of agate and quartz, *Figure 4.* From these as

[3] Clark, 1950 and 1952; Bond and Clark, 1954; Moore, 2013
[4] Bond, 1973; Darlington Munyikwa (Deputy Executive Director NMMZ) cited in 1993 and 1998 ESIA reports

well as secondary alluvial deposits derived from the same origin, Stone Age people would fashion lithic artefacts.

Figure 0.4 ***Typical Basalt found in the Batoka HES Project Area showing Internal Structure.***

Source: RSB, 2014

The basalt forms both sides of the Batoka Gorge as well as constituting the dominant landsurface of the Project Area. Generally soils are shallow or have been stripped bare by geomorphological surface processes – surface wash, soil and talus creep and fluvial incision. Away from the deeply incised Batoka Gorge, harder layers of basalt form ridges or plateaux. Where the rock is softer or brecciated, the basalt has decayed to form plains of deep deposits of granular rubble or finer dark soils, *Figure 5.* The process of seasonal alternate wetting and drying causes these soils to have a distinctive self-churning character. This process mixes the soil and is of considerable importance to sites of Cultural Heritage:

- Distinct cultural assemblages are often mixed instead of retaining their original stratigraphic sequence.

- The process causes larger stones/artefacts to move upward through the soil to accumulate at the surface, while at the same time winnowing smaller stones and artefacts downward. This disturbance of the original cultural assemblages distorts site integrity, destroying the spatial and temporal associations of artefacts so limiting their interpretative value.

Figure 0.5 Typical Basalt Soil found in the Batoka HES Project Area (Kasikiri village)

Source: RSB, 2014

Scattered linear intrusions of calcite are also present in the basalt, *Figure 6.* In some places these have weathered and given rise to secondary calcium carbonate deposits. These have in some instances formed thick calcrete deposits or have accumulated as significant travertine deposits around springs, along waterways and at waterfalls and rapids, *Figure 7.* While the current reconnaissance found nothing of interest in these deposits, their importance in containing fossil remains cannot be understated. Most often there are plant remains but animal bones may also become imbedded. The well-known South African Hominin[5] fossil site of Taung is of such origin.

Figure 0.6 Calcite Intrusion in Basalt near Batoka HES Proposed Dam Wall

Source: RSB, 2014

[5] Early human ancestors

Figure 0.7 Secondary Calcium Carbonate Deposit on tributary of Dibu Dibu Stream

Source: RSB, 2014

The Kalahari Sand Formation is comparatively recent in origin and overlies the basalt in many places. It is a relic of an extensive palaeo-lake and palaeo-dune system that were once a feature of this part of the world. The formation consists of more than sand:

- The basal Silicified Limestone is grey to yellowish-brown or mottled. In places this 'flint-like' rock has been subject to localised replacement of the carbonates by silica to form chalcedony, *Figure 8.* This material may contain fossil gastropods or fine filaments of the fossilized plant *Chara.* The chalcedony appears to have been a raw material of choice of the Middle Stone inhabitants of the region.

Figure 0.8 *Modified Basal Limestone (Chalcedony), Basal Kalahari Sand Formation*

Source: RSB, 2014

- Overlying this unit are the Pipe Sandstone beds. These varying from poor to highly silicified sandstone with a characteristic weathering pattern exhibiting numerous, interlocking, hollow tubes thought to result from secondary solution facilitated by microbial activity. The Pipe Sandstones often form distinct scarps on the lower margins of the palaeo-dunes, while it persists as a resistant rubble that caps many basalt ridges, *Figure 9.* Fossil plant remains and gastropods are reported, while there are many trace fossils – small linear tubes created by burrowing crustaceans at the time that these deposits were formed[6].

- The upper levels of the Pipe Sandstone give way to a poorly consolidated, iron-enriched rubble that grades into the overlying red sands. Described as Carstone, *Figure 10,* this ferruginous deposit was used by past inhabitants as a source of iron for smelting.

- Overlying this are the remains of the Kalahari palaeo-dunes. A thick deposit of red sand, these wind-lain deposits have been subject to extensive bioturbation that has destroyed any internal sedimentary structure. The

[6] Bond, 1973; Moore, 2013

sands can be many metres deep. It some places they have subsequently been reworked by both wind and or water resulting in white sand where the iron coating has been removed from the original sandgrains. The same processes have affected many of the natural gravels and stone tools present, polishing them to a glossy finish. *Figure 11* compares five polished artefacts with two fresh, unpolished ones of the same raw material.

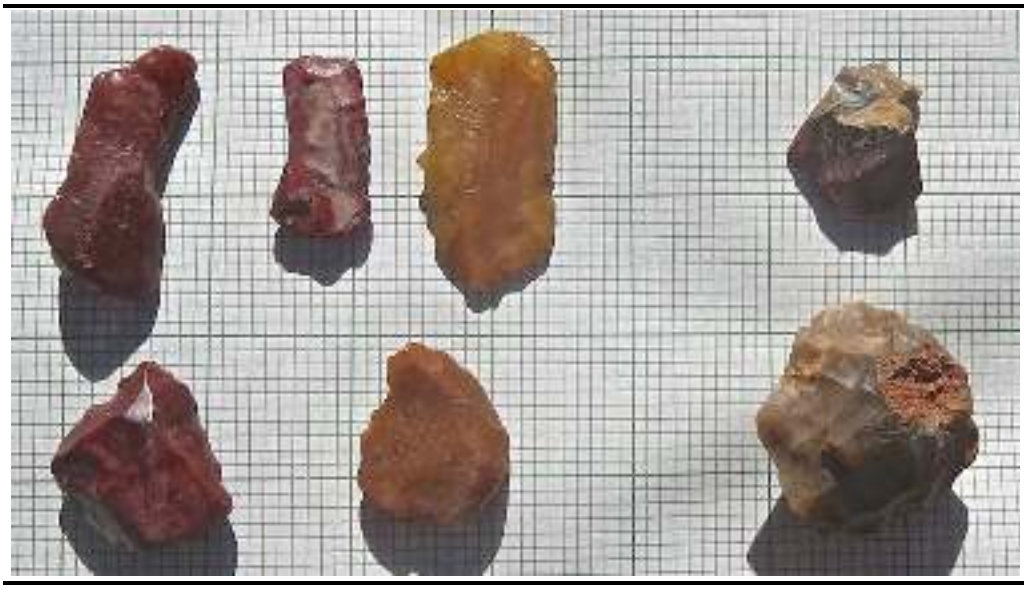
Figure 0.9 Typical Surface Exposure of Pipe Sandstone, Kalahari Sand Formation

Source: RSB, 2014

Figure 0.10 Carstone, Kalahari Sand Formation

Source: RSB, 2014

Figure 0.11 ***Polished Stone Artefacts (left) associated with the Reworking of the Kalahari Sand Formation, Site 16 Gorges Lodge***



Source: RSB, 2014

Alluvial deposits of waterworn pebbles occur along the Zambezi River and its major tributaries, *Figure 12.* In some cases these consist entirely of chalcedony pebbles, although basalt and agate also occur. The 'Old Gravels' occur at different heights above the Zambezi River and along the margins of the Batoka Gorge. They are witness to the previous position of the river before its incision to the current position. These gravels have attracting past human attention as a source of raw material for the manufacture of stone tools.

These 'older gravels' are largely restricted to the Zambian side reflecting the southward erosion of the Zambezi and subsequent greater deposition on the north bank. Early Stone Age lithics as well as occasional fossil animal bones have been recovered from them. The 'Younger Gravels' are found on both sides of the River but are not as extensive. They are mainly associated with the tributaries of the Zambezi and are associated with later Middle Stone lithics.

Figure 0.12 Typical Surface Exposure of 'Younger Gravels' perched above Zambezi River, Gorges Lodge

Source: RSB, 2014

The backward erosion of the Victoria Falls and the origin of the Batoka Gorge have been subject to considerable academic debate, although there is increasing consensus that it results from cyclical erosion cycles of the evolving Zambezi River increasing or loosing erosive capacity through river capture. While not in itself a prominent topographical feature, the Chimamba Rapids[7] just upstream of the proposed Batoka Gorge dam is considered an important knickpoint in the evolution of this unique river system[8].

1.5.2 Archaeological Heritage

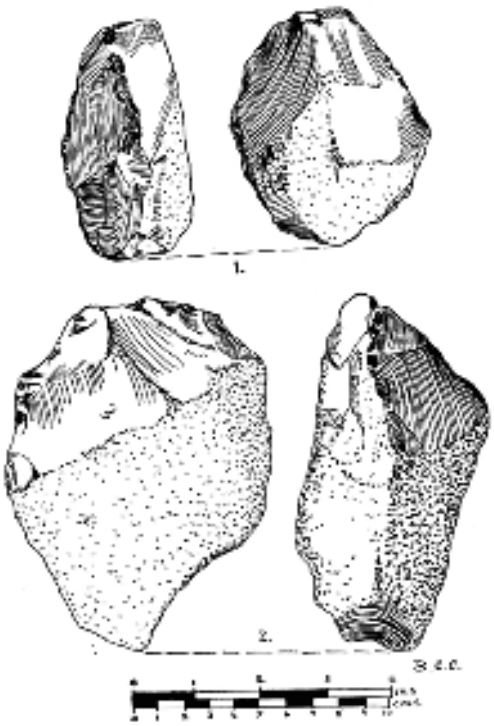
The Victoria Falls and Livingstone areas are well known in terms of their archaeological heritage. Most work has been conducted on the north bank of the Zambezi River out of the Livingstone Museum in Zambia. It is likely that the archaeological footprint on the south bank in Zimbabwe is similar. The following is a brief summary of the known archaeological history.

The Stone Age

The Victoria Falls was one of the first places in Central Africa where stone tools were identified in the opening years of the Twentieth Century[9]. The earliest tools are assigned to the Olduwan Tradition. They date to between 1.7 to 1.4 million years before present (BP). These simple, facetted cobblestones are found in secondary contexts in the older alluvial gravels of the Zambezi River, *Figure 13.*

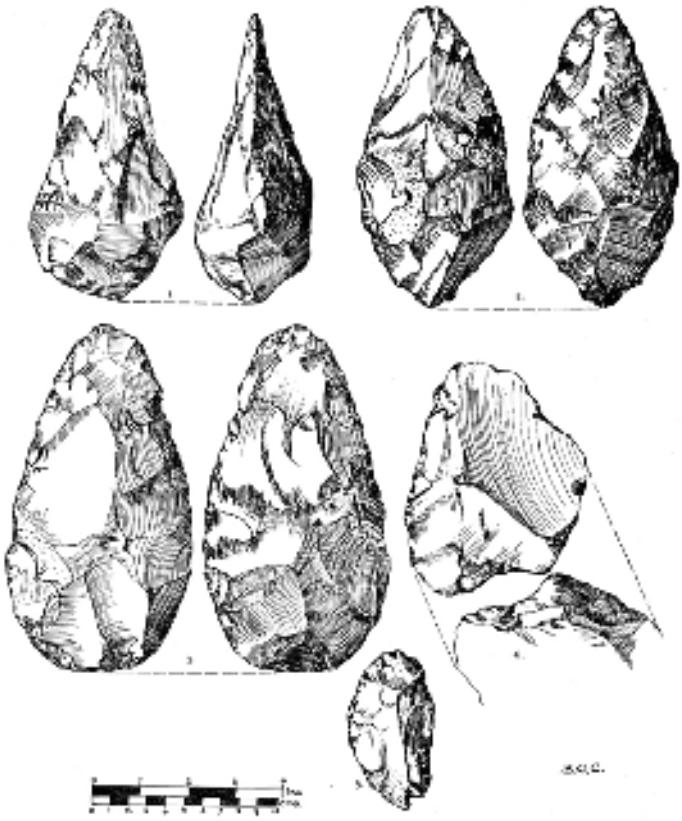
[7] The name derives from its local Tonga onomatopoeic name Chomoomba, the Ground Hornbill (Moore, 2103: 7).
[8] Lamplugh, 1907: 151; Clark, 1950: 124; Moore and Cottrill 2010; Moore, 2013: 7-8
[9] Molyneux, 1905; Lamplugh, 1906

Figure 0.13 Olduwan Tradition Artefacts, Older Gravels, Zambezi River



Source: Clark, 1950: 67

Figure 0.14 Acheulean Tradition Artefacts, Maramba River, Livingstone



Source: Clark, 1950:76

More common are the characteristic tools of the succeeding Acheulean Tradition of the Early Stone Age. Pear-shaped handaxes and straight-edged

cleavers are diagnostic tool forms, *Figure 14.* Dating to between 1.4 million to 300,000 years ago, these tools have been found both in secondary contexts in the alluvial gravels where they occur as isolated tools, as well as in localised concentrations of several hundred. The latter sites are probably the result of home-based or factory activities[10]. Most of the known Acheulean sites occur on the Zambian side of the River. This accords with the shifting geomorphological processes in the area. Those sites that may have existed on the Zimbabwean side have probably been destroyed, eroded away as the Zambezi River shifts southward. A particularly important Acheulean site was excavated as a tourist display near Songwe Point in Zambia[11].

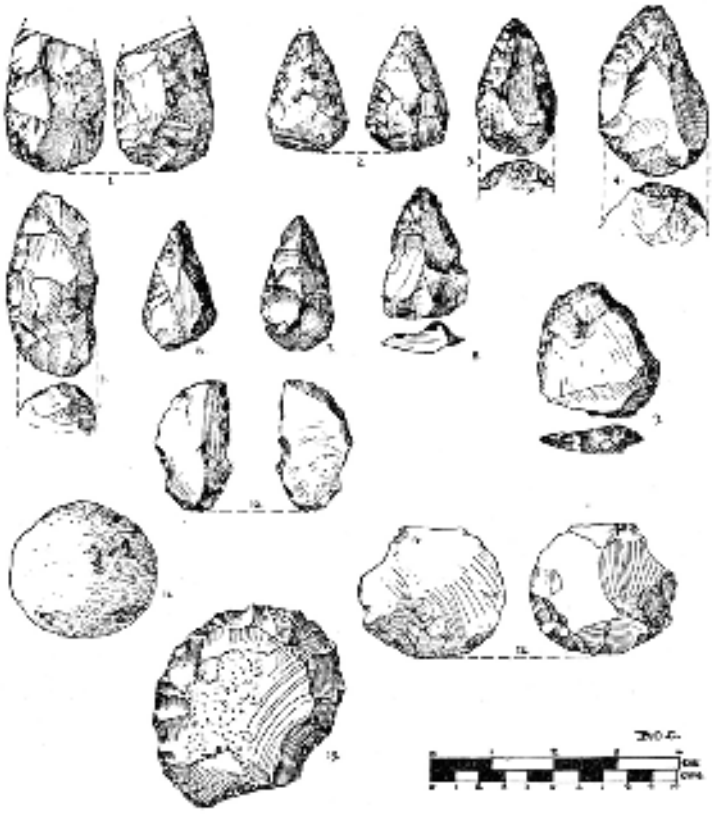
The Bembezi or Sangoan Tradition (300,000 to 200,000 years BP) represents a later refinement of the lithic tools to smaller, pointed handaxes with the adoption of a more skilled flaking technique. These tools and those of the following Middle Stone Age (dating to between 200,000 to 35,000 years BP) are common throughout the region. The earliest tools in the Charama Tradition are chunky and irregular, but they become more refined with time. There are several temporal and regional variations in the Middle Stone Age with the Bambata Tradition the most common in the Victoria Falls area.

It appears that these early hunter-gatherer communities favoured this part of the Zambezi Valley. Their use of the characteristic Levallois flaking technique, large pyramidal cores, flakes with multi-facetted striking platforms and several standard formal tool forms makes for easy identification of these lithic assemblages. Triangular points, large rectangular blades and chunky scrapers are diagnostic tool forms, *Figure 15.* These groups are likely to have consisted of roaming bands that followed the larger plains game during their season migrations, hunting being their principle economic sustenance. In Zimbabwe, their archaeological signature is found almost everywhere as diffuse, isolated pieces. Localised concentrations, where not the result of secondary geomorphological processes, reflect home-base or factory accumulations.

[10] Clark, 1950, 1952, 1955, 1975 and 1990; Mitchell, 2002

[11] This site is now again covered following the destruction of this community run resort by fire.

Figure 0.15 *Characteristic Middle Stone Age Artefacts from various locations in and around Livingstone, Zambia*



Source: Clark, 1950:100

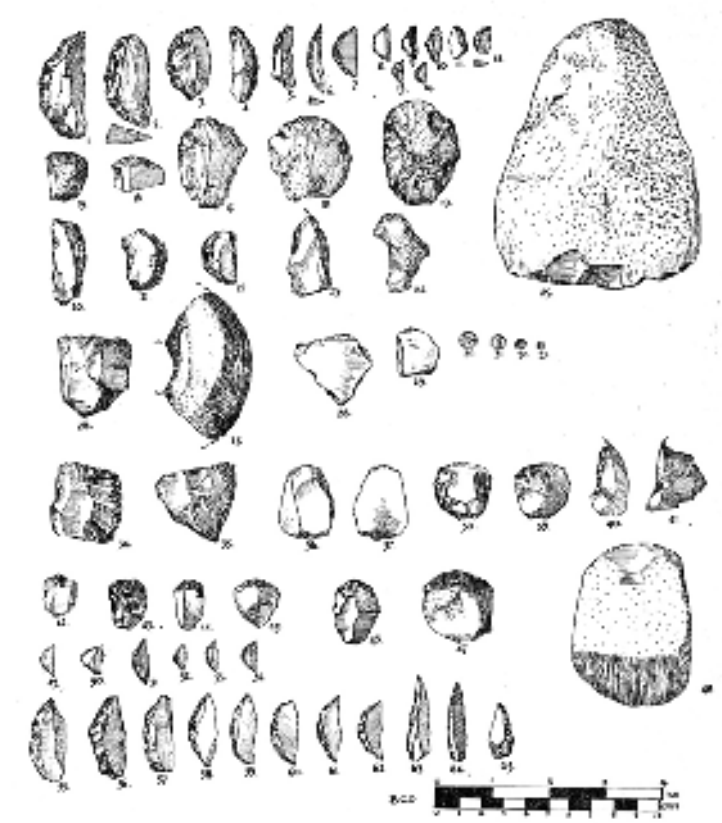
About 40,000 years ago a new lithic tradition emerged. These assemblages date from 35,000 to recent historic times, although most predate 1,000 AD. The Late or Later Stone Age is characterised by very small lithic artefacts. These microlithic tools were components in larger tools made from organic material, the latter rarely survives. Bladelets, small retouched tools and thumbnail scrapers are diagnostic tool forms, while cores show multiple parallel flaking or are smaller pyramidal forms, *Figure 16.* The earliest assemblages combine several characteristic Middle Stone Age tool forms. These Tshangula Tradition sites are poorly understood and it is possible that these assemblages are in fact mixed deposits rather than it being a discrete tradition. Later assemblages have been lumped into regional variations of the 'Wilton Techno-Industrial complex'. The local Zambezi Wilton requires further research in the light of research elsewhere in the country which shows significant change through time.

In space these sites may overlap with that of the earlier Middle Stone Age sites, but are more often they are found in locations closer to the margins of the Zambezi and on local high points, especially where there are small natural rock overhangs[12]. Their smaller extent reflects the more limited band structure of these communities. They were somewhat more sedentary, exploiting

[12] The main references for the Stone Age in this area are the work of Clark 1950, 1952,, 1955 and 1975. A revision of his interpretations, especially the dating of the sequence can be found in recent summaries of our current understanding of the Stone Age sequence in Zimbabwe in Walker and Thorp 1997; Burrett 1998; and Bandama, 2013

smaller territories and placing a greater value on plants and small game as principle foods[13].

Figure 0.16 *Late Stone Age Artefacts, Zambezi River Valley*



Source: Clark, 1950:110

Farming Community Sites

This archaeological entity was previously been termed the 'Iron Age' but this term has been dropped given incorrect associations being made with different communities and different times in the archaeological sequences in Europe and the Indian Subcontinent[14].

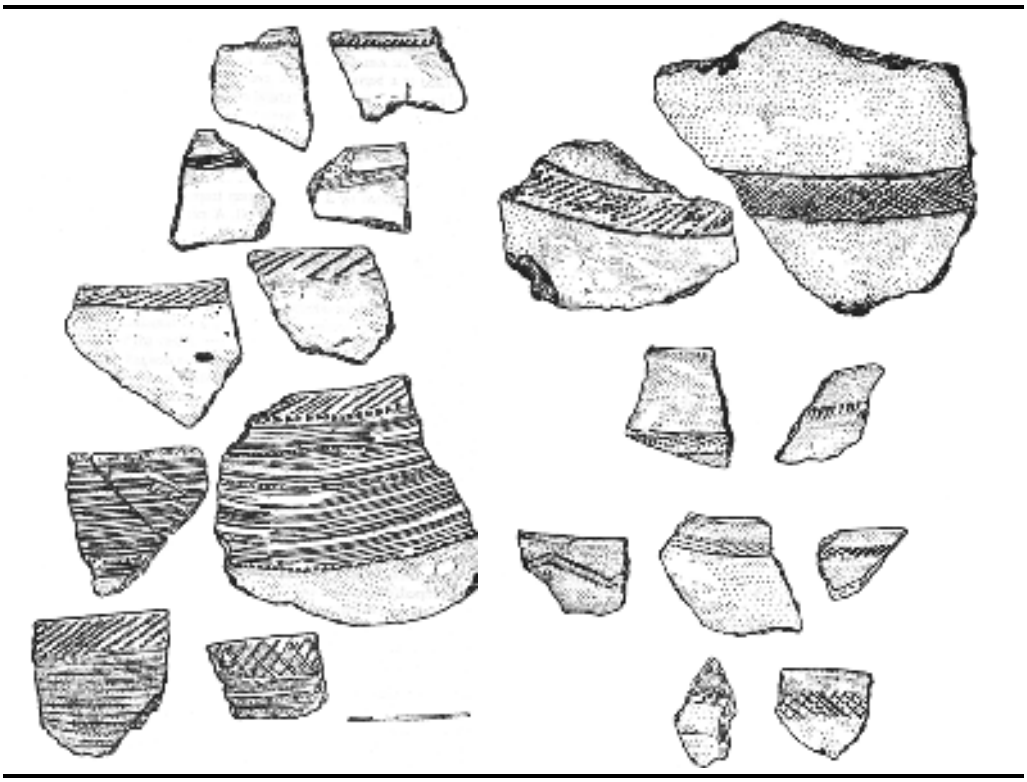
Research suggests that crop cultivation, the building of permanent village settlements and the working of iron and copper, appear as a cultural package in the opening years of the First Millennium AD. Studies of the remains of these settlements and the changing sequence of pottery decoration have been conducted along the Zambia side of the Zambezi River, *Figure 17*. A few isolated records suggest that similar sites exist to south of the River, although there has been little systematic investigation to date.

The earliest Farming Community villages date to 200 AD. Assigned to the Shongwe Tradition, the earliest groups were scattered pioneers who occupied large, centralised villages built away from the Zambezi and adjacent to large

[13] Bandama 2013; Burrett 1998; Mitchell 2002
[14] Pwiti, 1996

marshy areas (*dambos*) that lie between the palaeo-dunes[15]. These first groups were gradually replaced or more likely evolved into the current Tonga-speaking communities who traditionally occupied this area. The archaeological record in Zambia suggests that the Toka-Leya have been present in this area since at least the Sixteenth Century AD.

Figure 0.17 The Farming Community Pottery Sequence for Southern Province, Zambia. (Early Farming Community- left; Later Farming Community – right)



Source: Vogel 1971a: 18, 22

1.6 METHODOLOGY

The preparation of the Cultural Heritage report comprised three components. The Project Baseline Determination consisted of an initial desktop review of earlier Cultural Heritage assessments as well as literature review. This was followed by a ten-day field visit to the Batoka HES Project Area located in Zimbabwe. A subsequent desktop review of the proposed transmission lines was undertaken using Google Earth.

1.6.1 General Desktop Review of Project Study Area

Based on a generalised plan of the project proposals the records of the Archaeological Survey of Zimbabwe were checked. These are housed in the Zimbabwe Museum of Human Sciences, Harare. This was to understand if there were any known archaeological sites, as well as to get a general

[15] The most important work is that of Vogel, 1971a, 1971b, 1975a, 1975b). Phillipson 1975 provides as useful simplified discussion for the general public

understanding of the regional Cultural Heritage Baseline. *Table 1* records this information.

Table 0.1 ***Archaeological Sites Already Appearing in the Database of the Archaeological Survey of Zimbabwe, Museum of Human Sciences, Harare***

Map	Museum Number	Grid Reference	Site Name	Cultural Association
1725 D4	**Victoria Falls**			
	1725:DD:01	LL-77-13	Masvi River	Stone Age
	1725:DD:02	LL-77-14	Victoria Falls National Park	Stone Age
	1725:DD:03	LL-77-16	Victoria Falls National Park	Middle Stone Age
	1725:DD:04	LL-77-17?	Victoria Falls	Stone Age
	1725:DD:05	LL-77-18	Victoria Falls	Stone Age
	1725:DD:06	LL-78-13	Masvi River	Middle Stone Age
	1725:DD:07	LL-78-16	Victoria Falls	Stone Age
	1725:DD:08	LL-75-14	Victoria Falls National Park	Stone Age
	1725:DD:09	LL-76-14	Victoria Falls National Park	Stone Age
	1725:DD:10	LL-79-13	Masue Confluence	Stone Age
	1725:DD:11	LL-79-16	Victoria Falls Area	Stone Age
	1725:DD:12	LL-78-19	Victoria Falls	Stone Age
	1725:DD:13	LL-739-104	Cummings Farm	Stone Age
	1725:DD:14	LL-83-10	Victoria Falls National Park	Stone Age
	1725:DD:15	LL-78-13	Masue River	Early Farming Community
	1725:DD:16	LL-80-20	Victoria Falls	Late Farming Community
	1725:DD:17	LL-77-15	Victoria Falls National Park	Early Farming Community
	1725:DD:18	LL-774-194	Big Tree	Middle Stone Age/Early Farming Community
	1725:DD:19	LL-7702-1869	Victoria Falls	Late Farming Community
	1725:DD:20	LL-78-15	Victoria Falls	Late Farming Community
	1725:DD:21	LL-76-19	Dales Kopje	Stone Age
1726 C3	**Batoka Gorge**			
	NIL			
1825 B2	**Vic Falls Airport**			
	1825:BB:01	LL-70-08	Victoria Falls	Early Stone Age
	1825:BB:02	LL-82-09	Shara	Farming Community
1826 A1	**Lukunguni**			

	1826:AA:01	MK-08-82	Lobangwe	Middle Stone Age
	1826:AA:02	LK-99-83?	Matetsi River	Middle Stone Age
1826 A2	**Ombi River**			
	NIL			

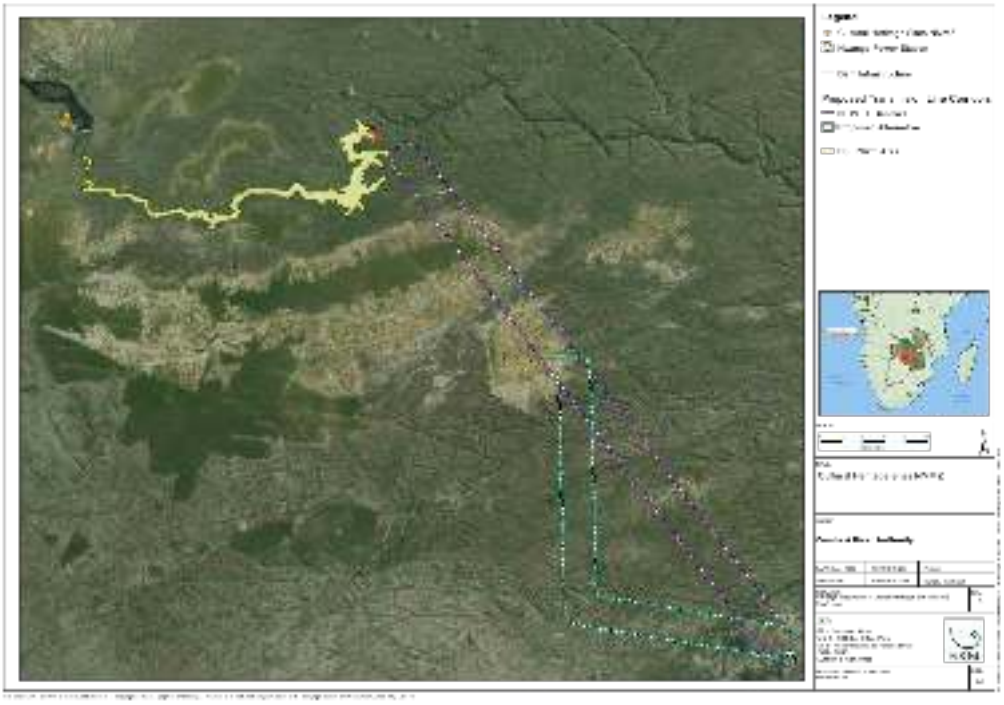
In comparison to other areas of Zimbabwe only a small number of sites were confirmed. The known Cultural Baseline reflecting limited archaeological research on the ground rather than being a true indicator of past human endeavour. '*An examination of the current state of our archaeological knowledge of northwestern Zimbabwe reveals that little is known because most of the region is archaeologically unexplored'* [16].

The sites mentioned in the NMMZ records are largely in and around Victoria Falls town. Most were recorded as simple 4-figure grid references, that provide approximations of position rather than actual site locations. In the 1940s when most were recorded, detailed national 1:50,000 topographical maps were not yet available. *Figure 18* maps only those sites in the NMMZ records for which we have more accurate 6-figure grid references. It does not include sites recorded in earlier field studies covering the Batoka HES. Most of the sites recorded are described as undiagnostic Stone Age remains. This reflects the lithic interests of early archaeologists then based at Livingstone Museum. A variety of additional published sources were also consulted in an effort to understand the Cultural Heritage Baseline[17].

[16] Ncube, 2004: 2

[17] This includes the seminal works of J. Desmond Clark (1950, 1952, 1955, 1975) on the Stone Age sites of this area and a variety of other authors on the subsequent Farming Community sites of the last 2,000 years. Formally known as the Iron Age, the latter archaeological phase includes baseline works by Fagan, Phillipson and Daniels (1969); Phillipson (1975); and Vogel (1971a, 1971b, 1977a, 1975b); and Huffman (1989). The summary of Zimbabwean Palaeontology by Geoffrey Bond (1973) was also consulted, as were the historical accounts of Mubitana (1975) and Ncube (2004) and recent geological interpretations by Moore and Cottrill (2010), Moore (2013). A number of additional, shorter articles were consulted as shown in the reference Section 1.11 to this report

Figure 0.18 ***Previous Confirmed Cultural Heritage Sites, Archaeological Survey of Zimbabwe, Museum of Human Sciences, Harare (Yellow Dots)***



Source: ERM, 2014

The previous Environmental and Social Impact Assessment (ESIA) reports, listed below, were then reviewed. They cover to some extent the Cultural Heritage resources of part of the Project Area and show increasing recognition of the importance of Heritage research and a greater thoroughness in field assessment and reporting. In reviewing these reports several gaps in the Cultural Heritage Baseline were identified.

The 1982 Preliminary Assessment

In 1981, the Zimbabwean Natural Resources Board commissioned a 'Preliminary Assessment of the Environmental Implications of the Batoka Gorge and Mupata Gorge sites'[18]. This report, the first of its kind in Zimbabwe, predated local legislation and was restricted, in the case of the Batoka Scheme, to the area to be inundated by the proposed water reservoir.

The author, R.F. Du Toit, based his Cultural Heritage assessment on secondary sources and provided generalised statements on the regional occurrence of stone tools in the alluvial gravels of the Zambezi River[19]. No specific heritage sites were cited and he concluded that there would be negligible heritage impact as the archaeology lies above the proposed waterline. There is no mention of palaeontology.

Arising from this report an IUCN workshop was held in Victoria Falls in 1992. While accepting Du Toit's findings as valid, '*well done within the limits of its*

[18] Du Toit, 1982
[19] Du Toit, 1982: 180-1

preliminary nature'[20], the participants called for additional field-based assessment. A heritage specialist from the Zimbabwean government was not represented at the workshop. However, Dr N.M. Katanekwa from the Zambia National Heritage Conservation Commission did offer relevant comments on behalf of the discipline.

The IUCN Workshop called for actual field reconnaissance and the integration of the heritage information into the technical planning process. The participants identified a very real gap in Zimbabwean record. They also raised concerns about possible palaeontological remains and sites of sacred and intangible cultural importance. Possible conflict with the recently declared World Heritage Site of Victoria Falls and its Gorges and the UNESCO World Heritage Site Convention was raised, although this was not interrogated to any degree.

The 1993 Intermediate Assessment

In 1992 ZRA commissioned the Batoka Joint Venture Consultants to carry out a technical and general environmental study of the Batoka Gorge HES. It was recognised that this was '*an intermediate stage*' appraisal and that it was not a full ESIA.[21] It was intended to expand on Du Toit's baseline study, although its scope and area of coverage was limited and no mitigation procedures were recommended. In concluding its authors called for '*a more comprehensive EIA* (to) *include further studies which will compensate for this lack of data*'[22].

The Cultural Heritage consultant/s are unknown, but in line with their TOR their report is brief and spatially restricted[23]. The archaeological history of the region is summarised, although with errors. Most of the sites mentioned were captured from the Archaeological Survey of Zimbabwe, as unconfirmed sites appearing on the Zimbabwe Surveyor General's 1:50,000 map (Victoria Falls 1725 D4), or come from what appear to be limited areas established through interviewing local people rather than extensive personal observation, *Figure 19.* Of the eleven sites located in the field many are outside of the actual Batoka Project Footprint. No precise grid references for these sites are given in the 1993 report, although these were later established in the 1998 investigation. This suggests that at least some of the investigating team were the same.

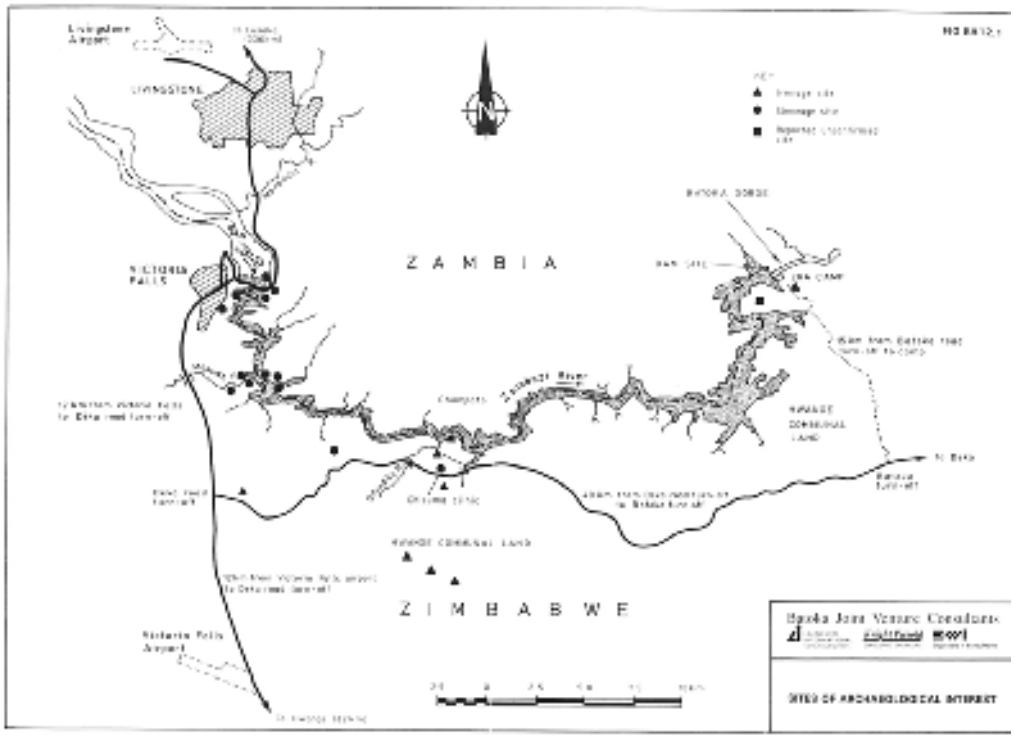
While mention is made of palaeontological resources, it is unclear if this discipline was investigated in the field. The comments may reflect office-based enquiry rather than fieldwork.

The spatial coverage of the 1993 report was inadequate and its discussion was based largely on secondary, unconfirmed data. However, one site was justifiably given prominence. Chemapato Hill is an isolated hillock on the Zimbabwean side of the Batoka Gorge. It has important Living Heritage

[20] IUNC, 1992: point 1.0
[21] ZRA, 1993, Section 7.1
[22] ZRA, 1993, Section 7.1
[23] ZRA, 1993, Vol. 4. Section EA12

associations. Although no grid reference was given, the site was correctly mapped and a brief description of the cultural remains provided. The sacred nature of the hill, its associated artefacts and their importance to the nearby residents was highlighted.

Figure 0.19 Cultural Heritage Sites reported in 1993 ESIA



Source: ZRA, 1993

While limited in extent, the 1993 Cultural Heritage report was always intended as *'a preliminary archaeological survey of the Batoka Gorge'*[24]. The consultants called for a more comprehensive reconnaissance, pointing out that not only the dam wall and area of inundation require investigation, but also all auxiliary infrastructural and township developments.

The 1998 ESIA

Following the recommendations of the 1993 Intermediate Assessment, further environmental and social assessments were undertaken, beginning September 1997. These *'additional or further studies'*[25] included archaeology and palaeontology.

The consultancy team was drawn from the Archaeology section of the History Department, University of Zimbabwe (Harare) and from NMMZ[26]. Dr D. Munyikwa of NMMZ compiled the palaeontology component. Extensive field reconnaissance and community engagement were carried out, adding 31 new sites to the Zimbabwean archaeological record, as shown in *Table 2* and *Figure 20*. The team reaffirmed four sites cited in the 1993 report, providing the

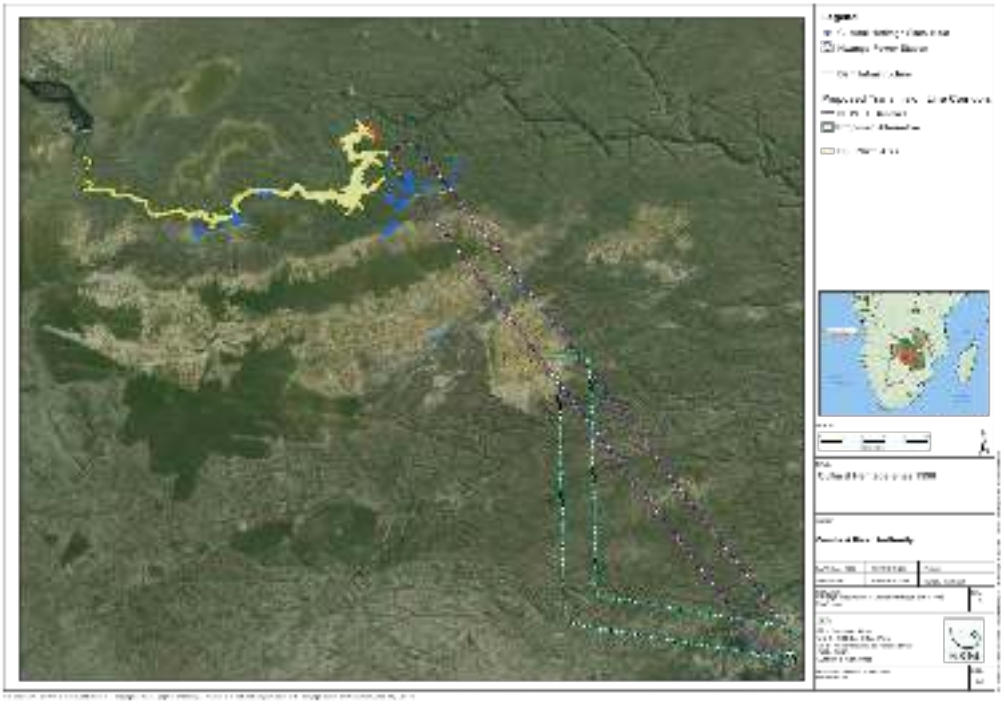
[24] ZRA, 1993 Vol. 4. Section EA12, point EA12.2
[25] ZRA, 1998 Vol. 4a. Background and Summary, Point 1
[26] Email from Dr G. Mahachi, Executive Director, NMMZ, dated 13th May 2014

necessary grid references. They reaffirmed earlier observations that most heritage sites lie above the intended level of water inundation and were thus not threatened by the construction of the Batoka HES. Their investigations of the proposed auxiliary developments on the other hand revealed many new sites and a set of proposed mitigation procedures appears in their report. These proposals have not as yet been implemented by the Project Proponent.

Table 0.2 Cultural Heritage Sites Recorded in the 1998 ESIA Report

Map	UTM reading	Cultural Association	Site name
1993 Survey			
	897-102	Farming Community	Chemapato
	895-083	Middle Stone Age	Chisuma I
	894-086	Middle or Late Stone Age	Chisuma II
	898-088	Middle Stone Age	Chisuma III
1998 Survey			
	089-114	Late Farming Community	
	074-114	Middle Stone Age	
	075-115	Middle Stone Age	
	075-119	Middle & Late Stone Age	
	086-112	Middle & Late Stone Age	
	107-126	Multi-component site	
	106-125	Late Farming Community	
	094-124	Multi-component site	
	093-128	Multi-component site	
	087-127	Late Stone Age	
	076-130	Middle Stone Age	
	092-134	Middle Stone Age	
	074-067	Multi-component site	Ncube Muuyu
	070-085	Farming Community site	Mpinami
	074-087	Late Farming Community	
	076-088	Late Farming Community	Mpinami
	138-148	Middle & Late Stone Age	
	137-149	Middle Stone Age	
	129-135	Middle Stone Age	
	885-101	Middle Stone Age	Gorges Lodge
	092-139	Middle Stone Age	
	108-129	Multi-component site	
	082-107	Middle Stone Age	
	078-092	Late Stone Age	Mpinami
	921-091	Late Stone Age	Ayelukwa
	992-093	Middle Stone Age	Ayelukwa
	930-098	Middle & Late Stone Age	Shearwater
	939-098	Late Stone Age	
	122-987	Middle Stone Age	
	962-121	Late Farming Community	
	954-121	Late Stone Age	

Figure 0.20 Cultural Heritage Sites located and confirmed in the 1998 ESIA (indicated as Blue Dots)



Source: ERM, 2014

Although the 1998 report was comprehensive and several areas were investigated, there is still a need to update the 1998 assessment with photographic records and full location references taken by GPS. These are standards now required by NMMZ. New auxiliary development is now being proposed and it was necessary to re-evaluate the statements of significance and mitigation recommendations.

The palaeontological investigation, while finding nothing of significance, required reaffirmation.

1.6.2 *Field Reconnaissance*

Following the review of relevant literature and the previous Cultural Heritage studies, additional field reconnaissance was conducted, accompanied by the local project ecologist[27]. The purpose of this new work was to:

- Where possible to revisit the sites already recorded to provide precise GPS readings and to collect additional information on context and content of the sites. It was necessary to update the existing reports with digital images of site setting and the material present to conform to NMMZ standards.

[27] It must be noted that this field reconnaissance covered only the survey and verification process. There were no collections of artefacts or excavations. These lie outside of current permissible investigation. They are additional mitigation procedures that can be considered only once feedback is received from NMMZ. The Project Proponent is obliged to fund this additional work if NMMZ deem it necessary. The Project Proponent is however free to choose either private consultants or work with NMMZ employees

- To investigate spatial gaps in the Project Footprint including areas west of the Gorges Lodge, east of Kasikiri village, and in the vicinity of the actual dam wall and its associate works.

- To investigate and make comments on the newly identified locations for project auxiliary infrastructure and its alternatives. As per the ESIA process, this provides preliminary comment to assist the project engineers in evaluating the alternative options.

- To understand the likely impact of the proposed transmission lines to Hwange and its alternative route. Knowing the local geology, topography, ecology and social conditions through initial field reconnaissance, would enable the consultant to use Google Earth to make relevant remote sensing observations.

- To review the 1998 mitigation recommendations. It was deemed important to understand if the procedures and costs suggested were still relevant in light of the integrity and significance of the sites concerned.

- To collect material for the compilation of a Chance Finds Management Plan (CFMP) for the Project Proponent and its subcontractors.

Before commencing, general maps of the envisaged Project Footprint were obtained and all known sites were overlaid. This allowed the area to be evaluated as to likely sensitivity of having, or equally important not having, sites of Cultural Heritage. Given the general absence of reported sites, the decisions were based largely on the consultant's past experience of ecological and topographical combinations suited to human habitation. Broadly speaking the following areas identified were categorised as follows:

Areas of likely HIGH Cultural Sensitivity

- Areas along the major tributaries of the Zambezi River with access to surface water and fertile soils.
- Chemapato Hill and adjacent land.
- The Chimamba Rapids and Moemba Falls.

Areas of likely MEDIUM Cultural Sensitivity

- The plateau surfaces adjacent to the southern edge of Batoka Gorge.

- Along the minor tributaries of the Zambezi River.
- The margins of the Kalahari Sand palaeo-dunes, often associated with water seepage and cultivatable soils.

Areas of likely LOW Cultural Sensitivity

- The broken country north of the Kasikiri community.
- The broken country southeast of Jambezi Business Centre toward Hwange town.
- The steep, near vertical slopes of the Batoka Gorge.
- The crests of the Kalahari Sand palaeo-dunes.

The proposed infrastructure of the Batoka HES was superimposed onto these areas. This includes the dam wall, spillway, roads and residential settlement alternatives; and the proposed transmission line to Hwange Power Station. Several areas of high and medium sensitivity were highlighted for priority investigation.

The field reconnaissance was undertaken from 15th to 24th August 2014. It involved pedestrian transects and snap samples taken at various points pre-identified on the relevant maps and Google Earth images, as well as additional points noted while driving between these points. Efforts were also made to revisit previously recorded sites. As the work progressed initial plans were modified as it became difficult to locate many of the sites reported due to limited access and the time available.

All sites located were recorded on a handheld GPS using the Zimbabwean standard, ie UTM based on the global positioning system ARC 1950 Clarke 1880. These readings provide for accurate mapping on the Zimbabwean Surveyor-General's 1:50,000 topographical maps[28]. Photographs were taken of select artefacts and the site setting. No material was collected in line with NMMZ regulations[29].

Site significance is not always easy to evaluate in the field and in an effort to quantify the procedure and remove idiosyncratic bias, the consultant based his evaluations on a quantitative scheme shown in *Box 1.*

[28] These maps are the basis of the system used in the Archaeological Survey of Zimbabwe. It must be emphasised that the ARC 1950 and WGS84 references are not identical and cannot be juxtaposed.

[29] It must be noted that while permissible in other country's Zimbabwean heritage legislation does not permit any tampering with sites and artefacts without written approval from NMMZ. This means that surface collections and "shovel tests" are not permitted and were not part of the reconnaissance.

Box 0.1 Criteria Used for Field Evaluation

Measuring site significance.

Criteria

Score one point for each of the following if true, zero if not. No half marks.

1. Integrity of site – is it intact, are materials essentially in situ?

2. Are there a variety of different features present?

3. Is there a good depth of deposit and/or amount of archaeological material present?

4. Is it unique or are there many examples of this type of site?

5. Does it have a meaningful contribution to future research?

6. Has it any social associations?

7. Has it potential ecotourism?

Significance

Add up the above scores and measure the significance of the site against the following:

0-1 = no significance. This category generally applied to isolates, i.e. scatters of <5 artefacts.

2 = low significance. Suggest surface collection during Phase 2 Mitigation.

3 = medium significance. Requires subsequent excavation in Phase 2 Mitigation.

4-5 = high significance. Site needs thorough documentation – Phase 3 Research.

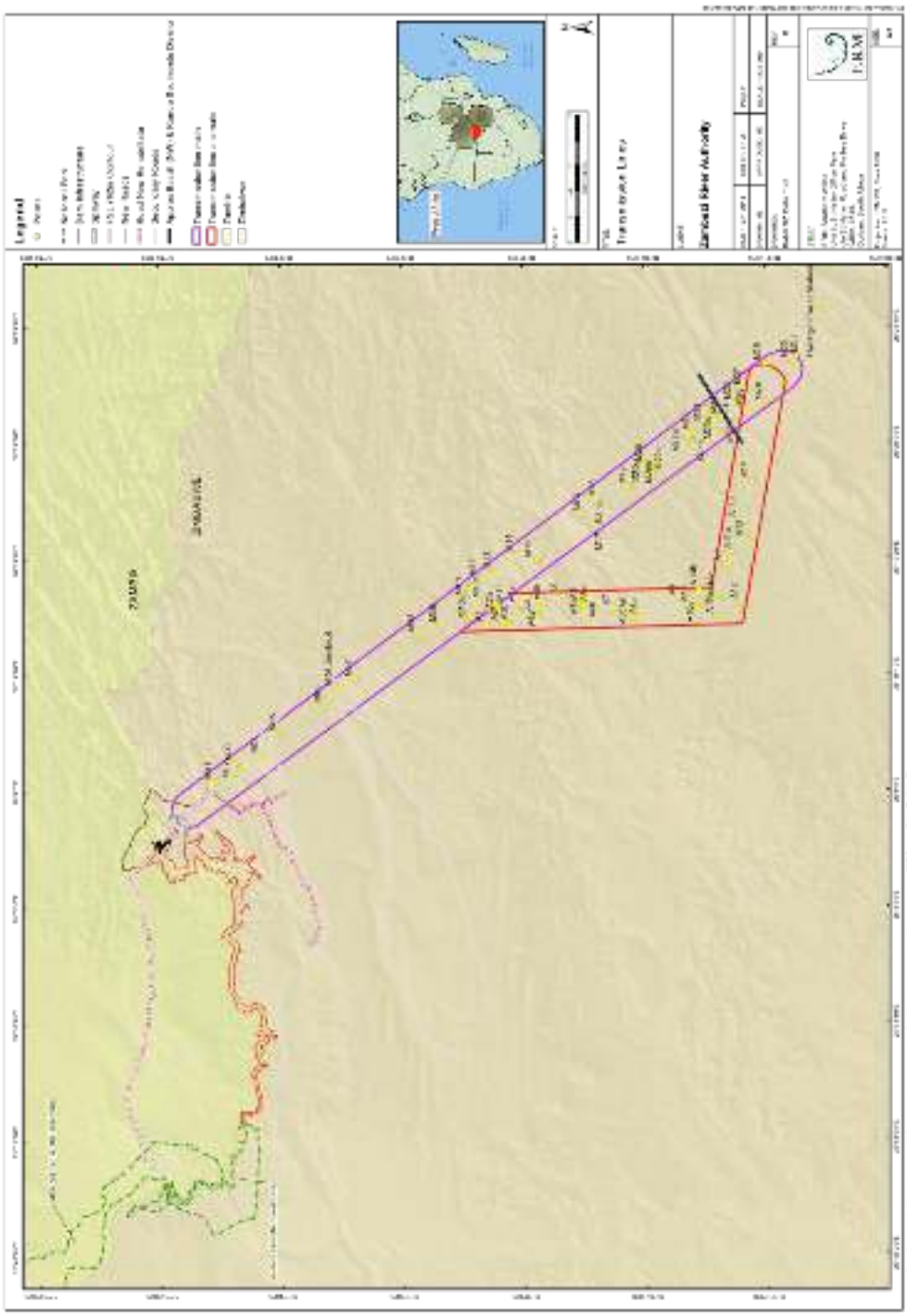
6-7 = very high significance. Site should not be developed. Preserve.

1.6.3 Desktop Review of Transmission Lines

It is necessary to review the likelihood of possible Cultural Heritage resources along the two proposed electricity transmission lines linking the Batoka HES to the Hwange Power Station, *Figure 21.* A desktop review was carried out in order to provide an overview and assist the project engineers in assessing the transmission lines route options. A comprehensive Cultural Heritage Impact Assessment of the two proposed transmission line routes has not been undertaken. Given the proposed power rating of the transmission lines, the final route chosen must be assessed in accordance with EMA requirements. This requires additional on the ground reconnaissance and a separate Cultural

Heritage report will need to be compiled and submitted to NMMZ and EMA for approval.

Figure 0.21 ***Points of Possible Cultural Heritage Interest along the Proposed Transmission Lines as Identified on Google Earth (indicated as Red and Yellow Dots)***



Source: ERM, 2014

The desktop review involved checking along the overlay of the proposed transmission line routes on Google Earth to locate points of possible heritage significance, both tangible and intangible. This identification of possible hotspots was based on personal experience; prior field reconnaissance observations; and looking closely at all areas near rivers, alluvial soil, existing

populated areas, plateaux features and local seeps. Access to surface water in this dry area is particularly important, both historically and now. Where noted, these points were highlighted as places of possible heritage significance, *see Appendix 1.* The red dots are places of particular concern.

Potential archaeological sites were highlighted. This is based on the premise that previous habitation often alters local soil conditions and vegetation cover, this makes them visible from above, although the actual artefacts may not be seen[30]. Possible intangible sites were also noted. The spiritual importance of local waterfalls, rapids and pools of water to the local Nambya and Tonga communities was taken into consideration. There are several such sites that function as ritual centres elsewhere in the Hwange District. While they have no physical cultural attributes, their intangible value is immense.

All possible heritage sites were marked on the Google Earth image as places to be best avoided. The project engineers were advised to take a route with the least possible impact.

Although not obvious at this scale of remote sensing, it was stressed that isolated trees, such as baobabs, often have local ritual importance. In addition small, centralised community cemeteries would also not appear on the Google Earth imagery. These sites will only be identified during actual field reconnaissance once the actual route has been chosen.

Other ESIA work recently undertaken by the consultant indicates that NMMZ will require a fully independent assessment of the route of these transmission lines. An in-house assessment by the Zimbabwe Power Corporation (ZPC) or any of its affiliates would not be sufficient. This point must be reaffirmed by ZRA in any future correspondence with NMMZ.

1.6.4 Assumptions and limitations

The emphasis in this research has been on tangible Cultural Heritage. This includes[31]:

- archaeology;
- palaeontology; and
- historical sites.

Sites of Intangible Heritage as defined in the International Finance Corporation (IFC) Performance Standard 8 where not investigated. This aspect is being covered by the social consultants in the ESIA team. Only in the case of the site of Chemapato Hill, a known site of Living Cultural Heritage, were local stakeholders engaged, see Section 1.7.4.

The current field reconnaissance was based on generalised maps of the proposed project development and alternative sites. These are not at the same scale as those of the Zimbabwe Surveyor-General. It was therefore not

[30] cf Denbow 1979
[31] ERM, Impact Assessment Standard v1.0, Annex B – 5. Cultural Heritage

possible to define the exact boundaries of the proposed developments on the ground. It is assumed that the areas investigated are close as possible to the proposed footprint.

The field reconnaissance took into consideration the current proposed Project Footprint. However, given that the design proposals are still being finalised and that alternatives are being considered in terms of construction and power generation, some areas may not have been covered in the current footprint investigated. Given the site-specific nature of tangible Cultural Heritage it is possible that additional sites may be destroyed without documentation and evaluation. As with the transmission lines, any further proposals must be subject to additional survey of these areas.

Despite the intention to revisit all of the sites previously recorded this proved difficult for reason of time restraints, a lack of clarity on the marked anti-personnel mine fields, and a problem with the previous readings. The sites in the 1998 report were given as 6-figure grid references. These proved too rough to allow for quick location. In addition it is unclear as to what global position system was originally used to map these sites. Many of those reported, where mapped on the relevant 1:50,000 maps or Google Earth fall in unlikely positions such as in the Zambezi River itself or on the Zambian north bank. After several abortive attempts it was decided that this objective be put aside. It was deemed better to locate and understand new sites, assessing the current proposed footprint that is more extensive than on previous occasions.

At the time of the field reconnaissance surface visibility was good as most areas were relatively free of moribund plant cover. The heritage remains were thus relatively easily to identify. However in some locations this was not the case. In several streambeds the previous season's grass cover remained thick, while uncultivated sections of the Kalahari Sand palaeo-dunes were often well vegetated and heritage sites were difficult to identify.

Given the time limitations not all areas could be visited. The southern margins of the gorge were covered in detail, as were the Kalahari Sand palaeo-dunes in areas of proposed roads and residential settlement. However, additional post-ESIA investigations of other areas is still required. These include:

Figure 0.22 Cave in the North Face of the Batoka Gorge near Tiata Lodge, Zambia

Source: RSB, 2014

- The **Batoka Gorge** itself is an area of particular concern. It was not fully explored, although investigated to a limited extent at the proposed site of the dam wall as well as near Gorges Lodge in Zimbabwe at the western end of the intended reservoir. In both cases the relief was steep and there was no sign of past human habitation. It is likely that these areas were simply too steep and lacking in resources to have supported past settlement.

  This absence may be real but there remains a strong possibility that heritage sites may have been missed along the greater length of the Gorge. The consultant is aware of scattered, shallow caves along the lower slopes in some areas of brecciated basalt. *Figure 22* shows one such example on the opposite Zambian bank. None of these potential sites were investigated during our reconnaissance. While they may have been scoured out during times of flood, it is possible that traces of heritage may still exist, including rock art, Stone Age deposits and sites of burial and intangible importance.

- Similar cave-like features occur in some of the tributary gorges. For instance in the Dibu Dibu Gorge a 'sacred leopard[32]' is said to take up residence periodically in such overhangs, see *Figure 2*. Unfortunately they could not be accessed. As they will be lost will inundation, they require further investigation.

[32] It is likely that there is a resident leopard that uses the gorge as part of its range, especially as a large troop of baboons has resident in the riparian fringe in the gorge

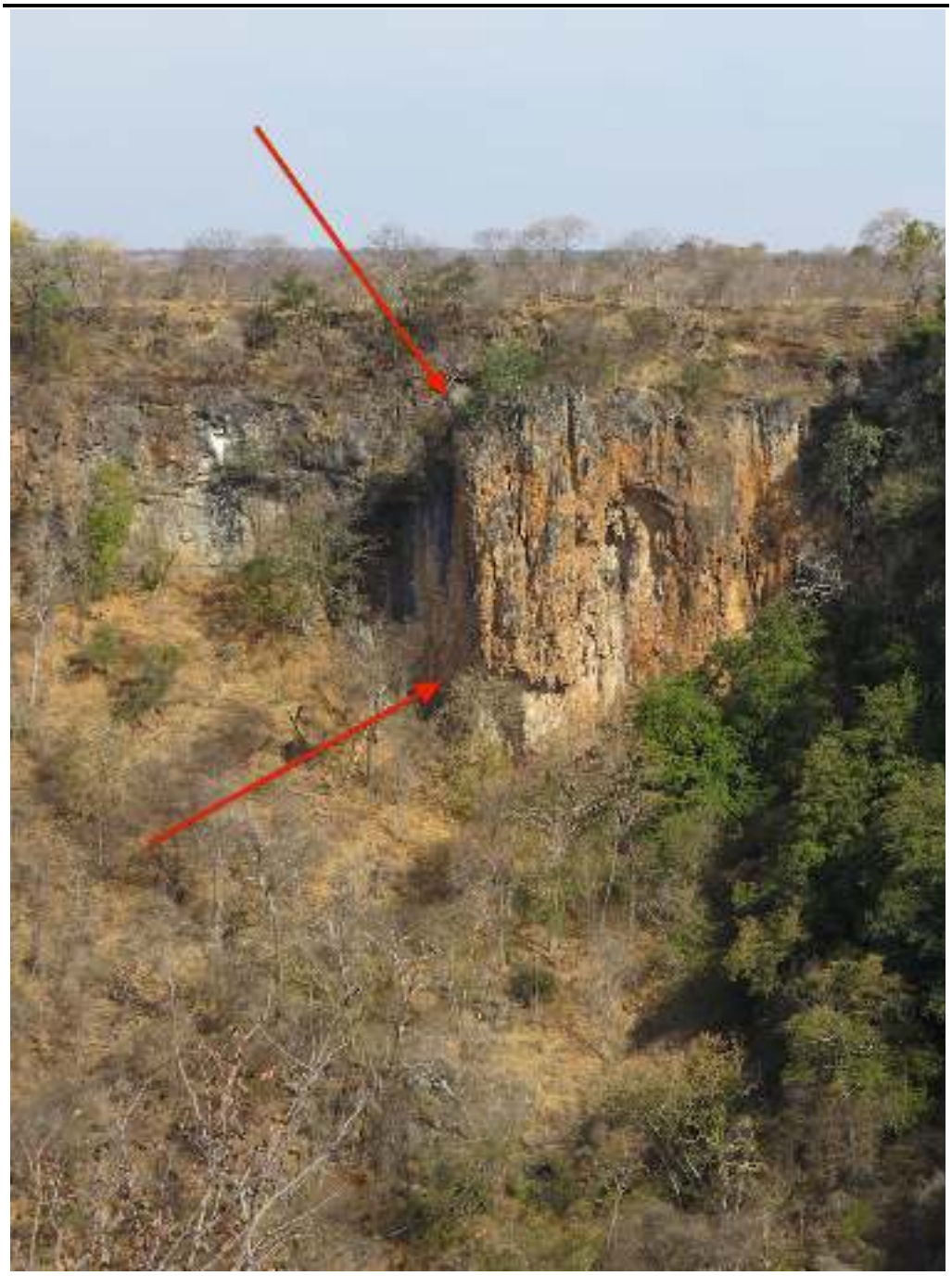
- In the same Dibu Dibu Gorge there is an extensive travertine deposit that may include fossils, *Figure 23*. Unfortunately the steep valley slopes and crumbly geology prevented investigation. Similar travertine deposits, although possibly not as extensive as that in the Dibu Dibu Gorge, were noted in other tributary gorges.

- As yet unrecorded heritage sites may exist beside the rapids of the Zambezi River, its many pools and on scattered islands. These may result from fishing activities or be associated with intangible values. It is known that the local Toka-Leya and Nambya communities believe such features to be spiritual places where the ancestors and spirits of nature are consulted or placated[33]. For this reason it was hoped to investigate the Moemba (Mwemba) Falls and Chimamba Rapids. This was not possible. The relief was too steep and such a visit would have severely limited time to investigate the general Project Footprint. To understand these and other features along and inside the Batoka Gorge, a water-based investigation is required.

- The remote area west of the village of Kasikiri is without tracks and is heavily dissected, see *Figure 2*. The many plateaux, natural seeps and islands in the Zambezi River (especially once it turns sharply northward) are places of potential heritage interest. The lack of access would have required additional days walking and camping on site. It must however be assessed prior to any development, subject to additional post-ESIA reports.

[33] Ncube 2004: 24-27

Figure 0.23 Particularly Extensive Travertine Deposit at the Head of Dibu Dibu Gorge



Source: RSB, 2014

Of particular concern, and an issue not resolved before the field reconnaissance, is the issue of anti-personnel landmines. These were laid north of what is now known as Kasikiri village during the Rhodesian Civil War. The Consultants were informed that there were three lines, all now unmarked and the mines remain a potential threat to humans and animals. While the Zimbabwe National Army (ZNA) has done some work removing them, it was uncertain if this has been completed. Indeed there is still a ZNA tented base camp nearby (at the time unoccupied) as well warning signs, *Figures 24 and 71.* Furthermore there were two types of mines: plastic and metal. The plastic ones, as opposed to the metal ones, are not easily identified and removed, many possibly still exist. In addition soil processes are known to move the mines from their original point of burial. More than seventy

mines were located by the ZNA in 2013, in an area on the outskirts of Victoria Falls town which is believed to have been cleared on three separate occasions.

Figure 0.24 Mine Field Danger Sign on roadside north of Kasikiri Village

Source: RSB, 2014

Feedback both before and during the field reconnaissance was not conclusive. No prior guarantees were obtained from ZNA at the time of the field reconnaissance and therefore it was deemed unsafe to proceed in this area. As a result, although there are plans to develop this area, it was not adequately investigated. The reconnaissance was restricted to along existing, well-worn paths used by the local people[34]. Once ZNA guarantees and assistance in the field are received, it is recommended that the entire area of the proposed residential settlement is investigated.

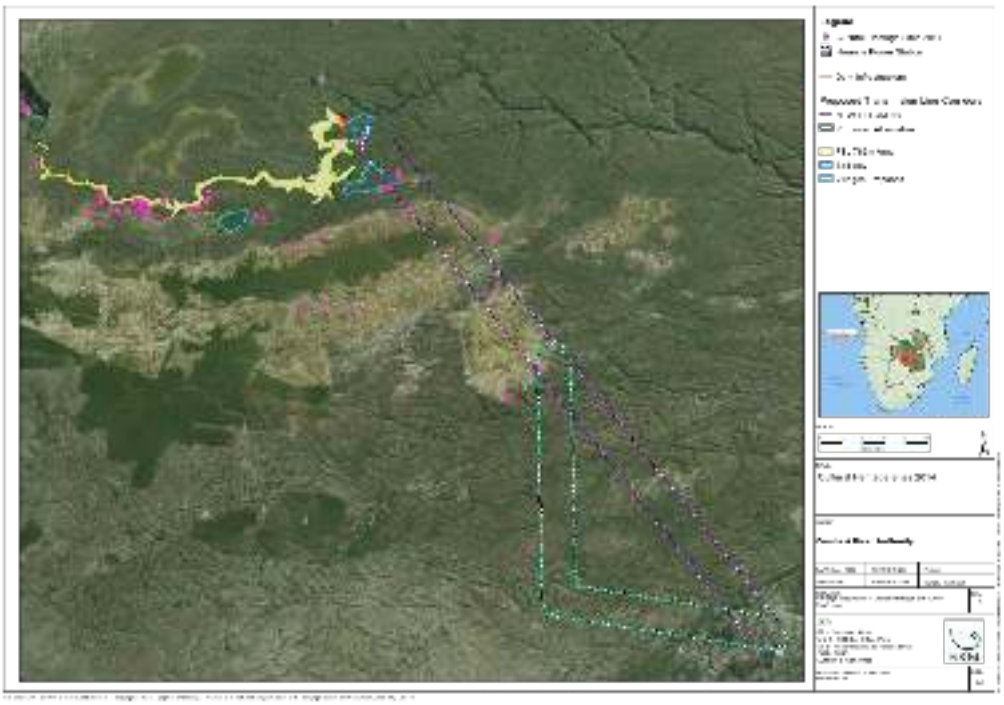
[34] It would seem that the 1998 team also traversed distinct lines in the minefield area. They may have had members of the ZNA accompanying them along similar pathways

1.7 CULTURAL HERITAGE BASELINE, ZIMBABWE

1.7.1 General Review of Project Study Area

The current investigation located 55 additional heritage sites, *Figure 25*. Most are on the slopes adjacent to the proposed dam, with others along the various roads for which the engineers required investigation before their deciding on the best routes to be redeveloped.

Figure 0.25 Cultural Heritage Sites Located in the Current Investigation (indicated as Pink Dots)

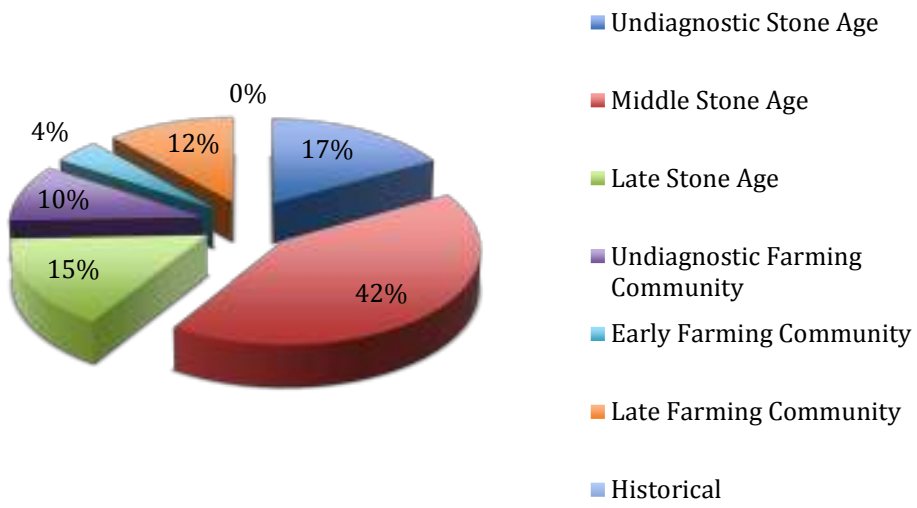


Source: ERM, 2014

Before describing the individual sites located, several comments can be made about the heritage signature of the proposed Batoka HES Project Area. These are generalised observations on the cultural landscape that allow some understanding of the potential impacts of the project:

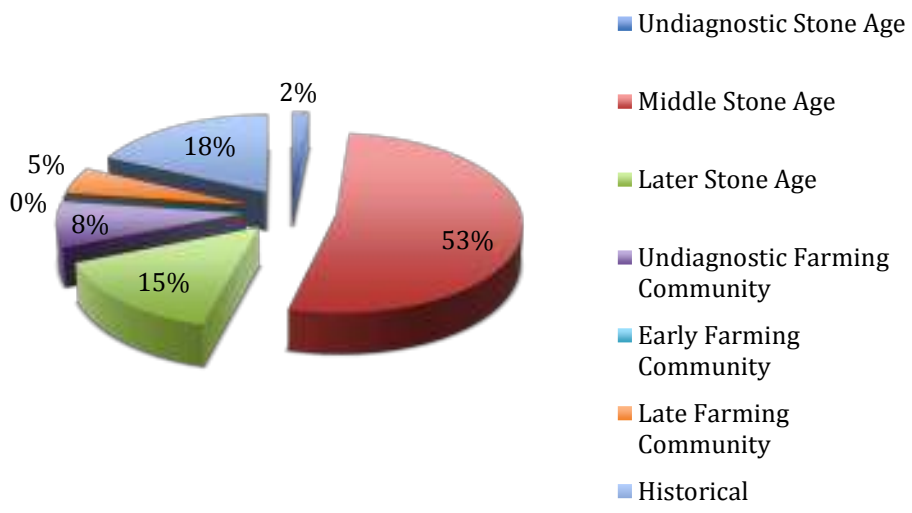
- The variety of sites recorded in the current reconnaissance is comparable to that previously known. *Figures 26-27* compare the current work with the combined records from NMMZ as well as earlier investigations. The same general pattern is evident. The differences result from the inclusion of 'historical' sites as an additional category in the current reconnaissance, and fewer undiagnostic Stone Age sites given a greater effort to identify their cultural association.

Figure 0.26 *Cultural Heritage Sites previously known by Cultural Category*



Source: RSB, 2014

Figure 0.27 *Cultural Heritage Sites located in the Current Investigation by Cultural Category*

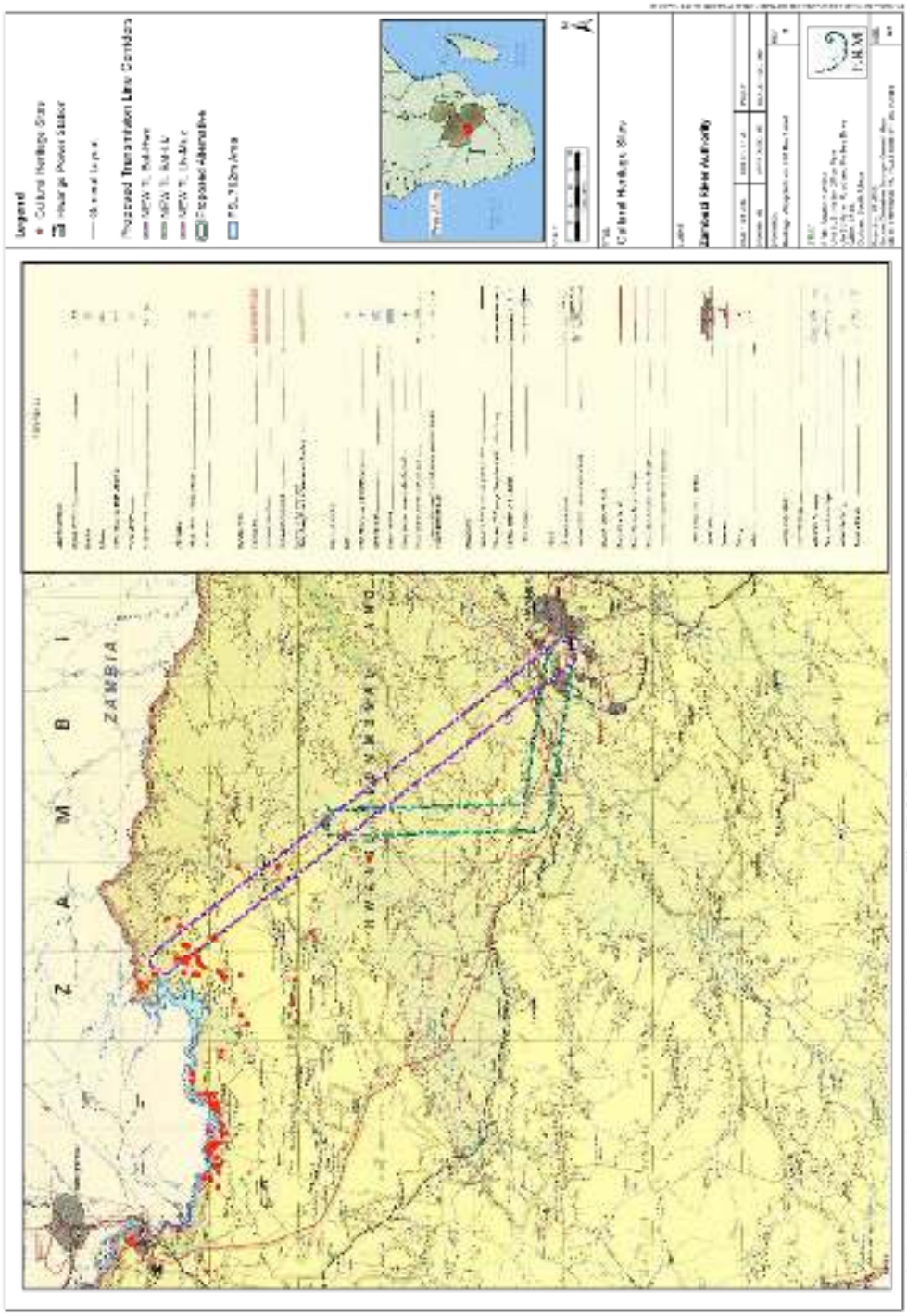


Source: RSB, 2014

- *Figure 28* shows the location of all the sites of the combined records, both the current reconnaissance and all earlier reports. Most of the sites identified have limited academic and cultural significance. The present communities have no direct link to the Stone Age communities and such sites would be of little interest to them. In addition, most of sites are no longer intact and their original contextual associations have been destroyed. Natural post-depositional geomorphological processes such as surface wash, soil creep and the self-churning nature of the local basalt soil

have disturbed many of them. More recent agricultural activities involving land clearance and tilling have also had a significant, destructive impact.

Figure 0.28 Combined Cultural Heritage Sites Located in the Batoka HES Investigations



Source: ERM, 2014

- Areas of steep and broken relief appear to have been avoided. This topography may have been deemed unsuitable for habitation while it has a limited ecological carrying-capacity. There is little chance, even in the past, that the broken areas near the proposed Batoka Gorge dam and southeast

of the village of Jambezi[35] would have supported a large enough wildlife biomass to attract regular hunter-gather/forager occupation[36]. They are also unsuited to grazing hence unattractive to subsequent Farming Communities. Today these areas are still sparsely occupied for the very same reasons. Other than isolated patches of alluvium along major streams and sites of spiritual significance, these areas have little in the way of Cultural Heritage resources.

- The vast majority of sites recorded date from the Stone Age, in particular Middle Stone Age (MSA).

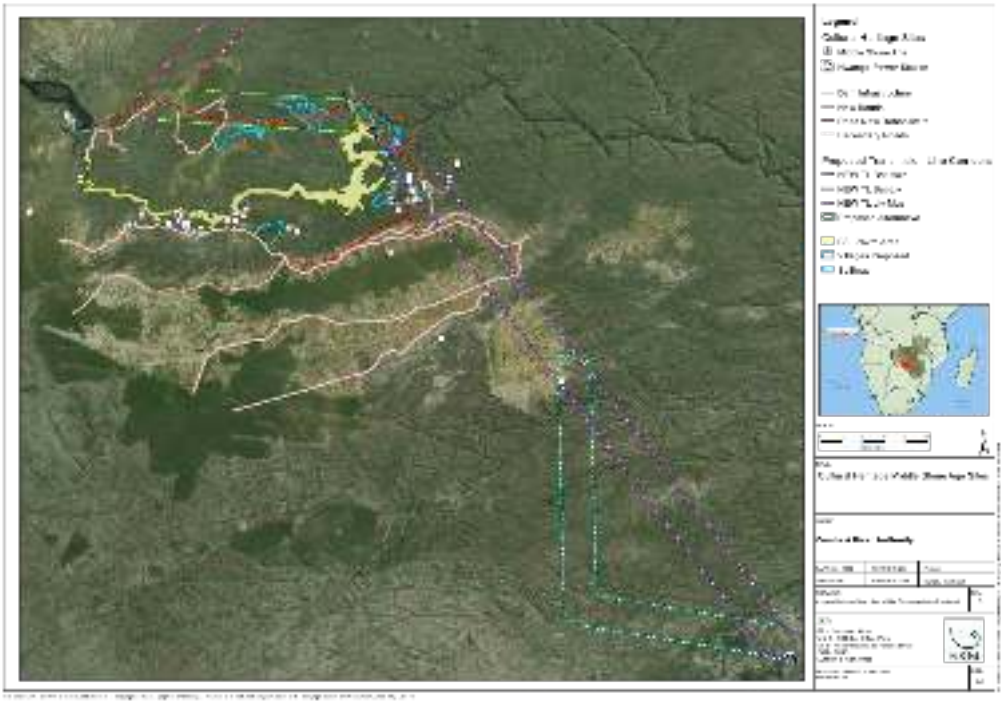
- Most of the Stone Age sites are located in the open basalt plains and low ridges towards Victoria Falls. The Waterfall, the River and its associated natural resources attracted these communities. The current reconnaissance reaffirms earlier observations first documented in the 1940s[37]. Stone Age sites are present, but with less frequently, in the more dissected country toward the proposed Batoka Gorge dam site and on the route to Hwange Power Station. They are found on the margins of the Kalahari Sand exposures, where most are scattered factory sites exploiting outcrops of the suitable raw material found in the lower strata of this Formation. Few sites occur on the Sands themselves. This may result from post-depositional bioturbation rather than an original absence of occupation – ie the material may have sunk deep into the sand and is therefore not longer visible[38].

- No diagnostic Early Stone Age (ESA) artefacts have been recorded on the Zimbabwe side although they are known in Zambia. This probably reflects the preferential accumulation of alluvial gravels on the north bank as the Zambezi River shifts slowly southward through lateral erosion. If such sites were once present to the south of the River they have probably been subsequently eroded.

- Middle Stone Age sites are widespread, found across a variety of landscapes, *Figure 29*. While they are found within the natural alluvial gravels, MSA material is also found elsewhere, unlike the ESA material. There is a greater incidence of MSA sites on the open basalt plains south of the Gorge and on northern slopes of the adjacent basalt ridges in Zimbabwe. This pattern may represent the repeated use of this specific environmental setting, but there is also a strong possibly that this is the result of post-depositional movement and reaccumulation.

[35] This village lies 19km southeast of the proposed Batoka HES dam wall along the likely transmission line route to Hwange.
[36] The historical observations of various Nineteenth and early Twentieth Century travellers and missionaries who passed through the area would testify that there was little in the way of wild animals and even fewer local inhabitants, cf Roberts 2009; Tabler 1960; Varian 1953
[37] Clark 1950, 1952, 1955, 1975; Bond and Clark 1954
[38] cf Brooks and Yellen 1987

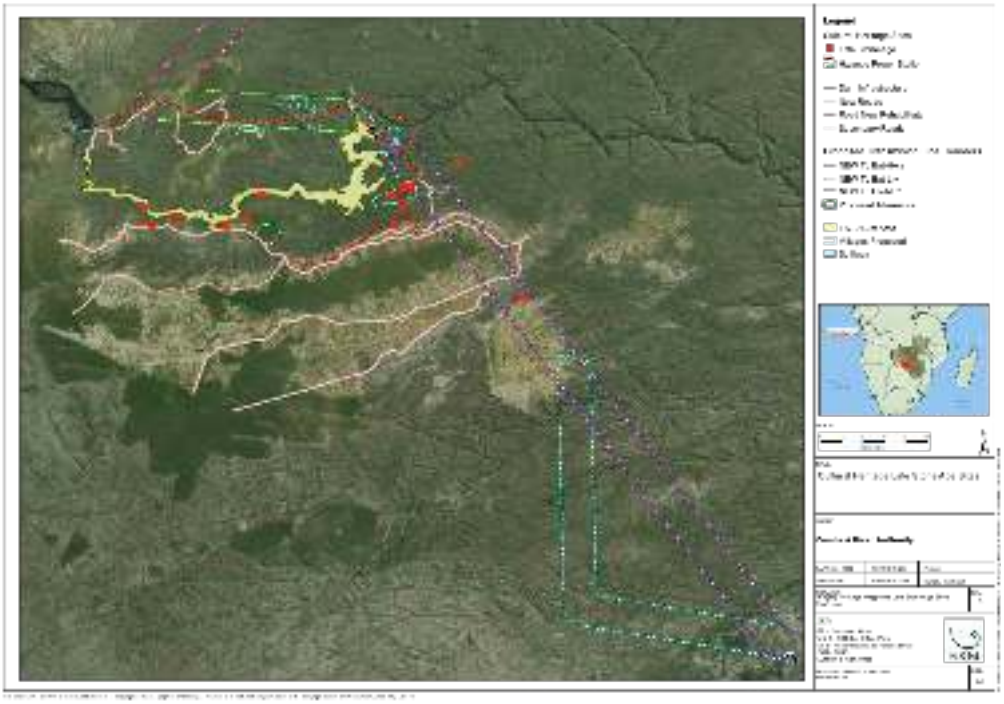
Figure 0.29 Middle Stone Age Cultural Heritage Sites Located in the Current Investigation (indicated as White Dots)



Source: ERM, 2014

- Late Stone Age (LSA) sites also occur, although fewer in number reflecting the shorter duration of this cultural phase. Their distribution overlaps that of the MSA, although several occur closer to tributary streams and the edge of the Batoka Gorge, *Figure 30*. This subtly different distribution may reflect a dissimilar site preference, although possibly it also reflects post-depositional processes. Smaller LSA artefacts are more easily displaced and lost. As such LSA sites in the deeper and better-developed basalt soils where the MSA appears to predominate may have been destroyed by surface erosion and soil movement. On the other hand, LSA material in the shallow soils on the margin of the Batoka Gorge would have had a better chance of survival.

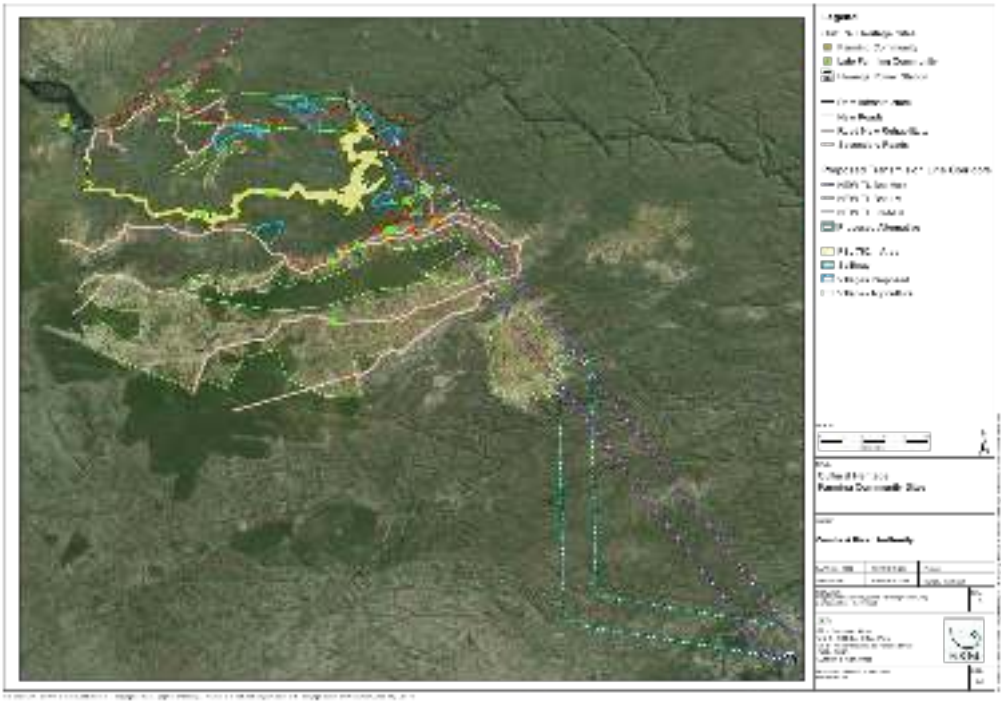
Figure 0.30 Late Stone Age Cultural Heritage Sites Located in the Current Investigation (indicated as Red Squares)



Source: ERM, 2014

- At several sites there are 'polished' Stone Age artefacts. This glossy surface sheen and loss of flake scar margins is the result of wind and water action, *Figure 11.* Known since the earliest archaeological reports, these glossy tools are likely to be largely secondary accumulations and are of limited cultural significance.

Figure 0.31 Farming Community Cultural Heritage Sites Located in the Current Investigation (indicated as Green and Brown Squares)



Source: ERM, 2014

- Farming Community sites are generally distributed away from the edge of the Batoka Gorge. They are mostly associated with the margins or crest of the palaeo-dunes of Kalahari Sand, *Figure 31.* This locational preference may reflect the choice of deeper, more easily tilled soils as well as the local presence of water that seeps from the margins of these palaeo-dunes. The exceptions discovered are an iron-smelting site and the ritual Chemapato Hill, both isolated on the edge of the Gorge. This is in line with Tonga traditions. Iron smelting with its social norms which symbolically link it to procreation, is conducted away from villages and eyes of women. The isolated site located would allow this[39].

- The pattern of Farming Community sites found along the dunes conforms to that already recorded in the literature - small, scattered villages dependent on a 'slash-and-burn economy' which has resulted in shallow, diffuse settlement debris[40].

- Efforts to relocate an Early Farming Community settlement near the 'Big Tree' in Victoria Falls were unsuccessful. It was hoped to understand this regional element of heritage footprint which is otherwise unrepresented in the current investigation. In contrast it is fairly common on the Zambian bank.

- In this District alluvial and colluvial gravels are often used for road preparation and repair resulting in many stone tools being displaced to

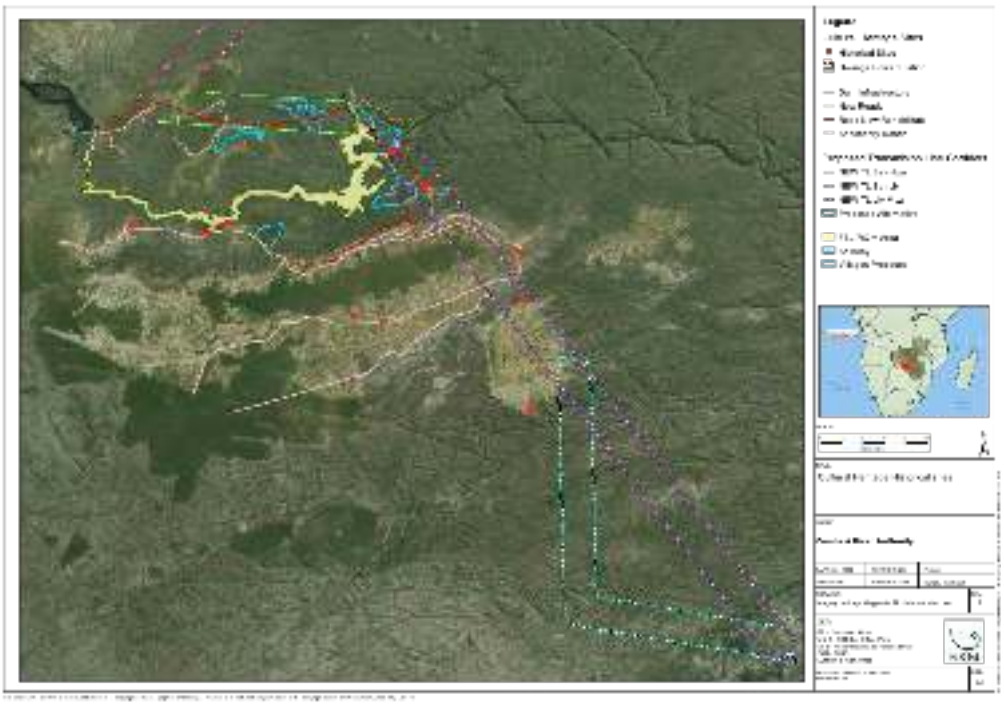
[39] While slag has been recorded in several of the village sites, this is probably the residue of secondary smithing rather than primary smelting (cf Huffman 1998)
[40] Vogel, 1971a, 1975b

secondary contexts in and along the margins of the roads. These artefacts were not recorded. However, the practice could result in future damage to the Cultural Heritage resources in the area. The appointed developers are likely to extract similar materials for the proposed widening of existing roads and the construction of new ones. All extraction must be subject to additional investigation and have an Environmental Management Plan in place.

- There appears to be an association of Farming Community sites and baobab trees. In the case of larger, older trees these may have been selected as sites for ritual activity. This is in line with known Toka-Leya and Nambya traditions[41]. Alternatively these trees, especially those medium-sized baobabs, may have become established later from seeds deposited during occupation. Whatever the association these trees are places best avoided in development.

- Historical sites, those sites located during fieldwork of the recent colonial and post-colonial period, are found across the proposed Project Area, reflecting the increased population and scattered landuse that has emerged with the advent of colonisation, *Figure 32.*

Figure 0.32 Historical Cultural Heritage Sites Located in the Current Investigation (indicated as Red Dots)



Source: ERM, 2014

- Chemapato Hill, contrary to the conclusions of the 1998 Report, is an important site with living and intangible heritage associations for the local Toka-Leya community, see Section 1.7.4.

[41] Ncube 2004:27-38

1.7.2 Review of Specific components of Project

The following areas are all located in Zimbabwe.

Dam wall - site, powerhouse, spillway, and access roads

This area of dissected basalt with steep sided valleys and razor-backed ridges was partially investigated and little of interest was found. It is rough country, and would have had in the past, as it does now, a low biomass productivity. There is likely to be minimal Cultural Heritage present.

No additional sites were found in this area. The single 'Late Stone Age flake' mentioned in the 1993 report is believed to be of no relevance. Found on the airstrip it is probably either an isolated occurrence or more probably in secondary context having being brought in as part of the surface gravel used for construction. The 'unconfirmed site' on the plateau west of the airstrip is outside of the Project Footprint and was not investigated[42]. The only site located was a recent historical one dating from the 1993 engineering survey. The cement beacon, together with nearby debris from a Landrover is of no further significance.

The vicinity of the proposed dam wall had nothing of significance. The rapids may once have been used as fishtraps through the addition of what are, possibly, rough stone walls built around the pools from natural alluvial cobbles, *Figure 33.* Similar fishtraps are known elsewhere on the Zambezi River and its major tributaries.

[42] The 1993 report cites local community representatives mentioning this heritage site but it was not visited. Time and funds again precluded investigation.

Figure 0.33 Possible Fishtraps in the Rapids at the Site of the Batoka HES Dam Wall

Source: RSB, 2014

Without water-based investigations on the River, access to the Chimamba Rapids and Moemba Falls was not possible these points were not checked. It appears that they are better accessed from the water or from the Zambian side. Further research from the Zambian side of the River, coming down one of the less steep tributaries may find sites of significance.

The area has limited palaeontological importance as no sandstone lenses were noted in the basalt. However, as stressed in earlier reports, these sedimentary deposits may be exposed during future building operations. They will be discussed in the separate CFMP booklet. Near the proposed spillway weathering of a calcite body has given rise to an extensive secondary 'limestone deposit' around a natural spring, *Figure 34*. While no fossils were seen in the dense calcrete-like deposit, this location is best avoided during future building operations (Grid Reference *ARC 1950 reading* = 35K 0407768 8016303).

Figure 0.34 Secondary Limestone/Travertine Deposit at Spring near the proposed Site of the Batoka HES Dam wall

Source: RSB, 2014

The area intended for development of the spillway was investigated and was found free of Cultural Heritage remains. The project engineering team has suggested that the rock extracted along this route and a small adjacent hill will provide ample building material for the actual dam wall. Given the extent of construction it is likely that additional areas will be quarried for the building aggregate. But, these sites have not as yet been identified and thus assessed. Any additional sites should be subject to further heritage surveys ahead of extraction. The same applies to all gravel extraction pits along the roads leading to the site, be they new sites to be opened or existing ones to be extended, as well as any sites used for dumping of spoil (waste rock and other debris) generated during the construction process. This report does not cover these sites.

The inundation area

Once built, the Batoka HES will flood the Gorge back toward the Victoria Falls. The water will be confined largely to inside the Gorge regardless of which of the final construction options is chosen. Although access to some areas of the Gorge was limited, the investigations that were possible found no sites of interest in the Gorge. The few isolated artefacts appear to have fallen from the crest where most of the known heritage sites are located. As such there will be limited impact. However as already indicated there are caves, islands and waterfalls that still require investigation. This is best achieved through a water-based investigation, ie suitable canoes or rafts launched below Victoria Falls and journeying downstream to the inundation area and to

the intended point of water discharge below the proposed dam wall. It is recommended that the Project Proponent undertake this additional assessment and submit relevant reports for approval to both EMA and NMMZ before construction commences.

With the filling of the reservoir rock movements on the slopes of the Gorge may expose sandstone lenses in the basalt. These could contain potential fossiliferous deposits. Where this happens it is desirable that the final appointed regulatory authority must advise NMMZ. The CFMP booklet will cover this eventuality.

Of particular concern are the travertine deposits that occur at points along the margins of the Batoka Gorge and its major tributaries. The deposit at the head of the larger arm of the Dibu Dibu Gorge is particularly well developed, *Figure 23.* These secondary deposits may include fossilised plant or animal debris. They are potentially important palaeontological sites and it is necessary that they are investigated further before inundation. Given their chemical and physical structure, with flooding they will deteriorate rapidly. This investigation will require proper mountaineering safety equipment and trained personnel[43]. Follow-up reports should be compiled and submitted to NMMZ for approval and comment.

The Proposed Residential Settlements

Of particular concern are the footprints of the residential settlements planned for the both the temporary construction staff of the Batoka HES and those permanently employed in its subsequent operations. These locations, more than previous proposals, will have an extensive Cultural Heritage impact as they will cover large areas suited to past human habitation.

The original 1993 Lahimaeier-Piesold-EMI plan identified a single location west of Kasikiri. New plans provided by the current engineers, Studio Pietrangeli, have expanded this area as well as adding two alternative sites. Field based observations suggest that the original location is still the best as it has fewer current and future challenges. Although neither of the alternatives have much in the way of Cultural Heritage, their ecological and safety impact render them less desirable.

Notwithstanding the limitations caused by the potential threat of anti-personnel mines in the area north of Kasikiri[44], several sites have been recorded within and around this settlement footprint, see Figure 2. Being an open, better-watered valley it attracts occupation, both in past as it does now. This point probably marks the historical northward limit of most human settlement in the region, the terrain beyond being too rough.

[43] There is no one in Zimbabwe with experience in late Quaternary fossil sites, although there are many specialists in South Africa where similar deposits are studied. It may be necessary for specialists to be engaged from a reputable institution such as the University of the Witwatersrand and the Tswane Museum.

[44] The current reconnaissance located only a few of these sites, as the consultant was not able to get clarity on the landmine threat in time for field research, the area was deemed unsafe for entry.

Most of the sites that fall in the proposed settlement near Kasikiri village were previously recorded in the 1998 survey. The current investigation added only a few. The majority of the sites in this area are small and disturbed. As such they have very limited heritage significance. Their destruction, if NMMZ should agree, would present no further difficulty as they have already been recorded. Those sites deemed more important and requiring additional investigation are discussed later, see Section 1.11.

It must be noted that the assessed site significance in this proposed settlement area near Kasikiri is based solely on the limited descriptions contained in the 1998 report. The accuracy of description and the current site integrity have not been verified. The 1998 report has some inconsistencies in the various tables that describe the sites Cultural associations and locations are sometimes confused. The mitigation procedures suggested in 1998 are assumed to remain relevant, despite the time lapse. Should this location be chosen as the project settlement site for Zimbabwe, the Project Proponent should require an additional, detailed investigation of this area to be undertaken. This requires precise details of the area to be developed, its access roads and all ancillary infrastructure including waste disposal areas, water and sewage works, and water extraction pipelines from the Zambezi River. Post-ESIA survey of this area should be submitted to both EMA and NMMZ for approval.

The Access Roads

The current engineers' proposals provide for the widening of several existing roads and tracks, as well as building two new sections of road. The field reconnaissance found several sites along these routes identified, although few of any of significance. Most sites are small and should NMMZ agree their destruction might be permitted.

The new roads include:

- A small section north of Kasikiri. This was not investigated as it was here that the Landmine warning sign was encountered.

- The much longer construction route east of the proposed dam site linking Zimbabwe to Zambia by way of a new bridge or crossing. Limits on field reconnaissance prevented investigation of this route, while precise details as to its position and nature were not provided prior to field reconnaissance. Inspection on Google Erath suggest that this road will require extensive grading given the nature of the terrain, while any bridge construction will result in localised disturbance and aggregate extraction is likely.

In both cases, these new roads require post-ESIA investigation and reporting.

'Borrow pits' or gravel extraction pits remain of particular concern. Aggregate will be required in road construction or rehabilitation. They already exist along the current track that has been built since the project was first initiated,

Figure 35. Additional pits will be required and existing pits may be extended. Their location is presently unknown and their impact cannot be assessed. Borrow pits and gravel and sand extraction are specified in Zimbabwe's EMA legislation and would be covered by the NMMZ Act. When the plans for the roads are finalised further investigation of these actual locations will be required as well as gaining approval from NMMZ.

Figure 0.35 Existing Borrow Pits on Road to the Dam Wall Site Illustrating the Damage Caused

Source: RSB, 2014

The Transmission Lines

As the route of these lines has not as yet been finalised a generalised, remote sensing overview of the proposals was compiled based on Google Earth. therefore, this 'assessment' is not an ESIA. The final route and its actual on the ground footprint must be investigated - subject of another, separate ESIA.

1.7.3 Results of Current Fieldwork

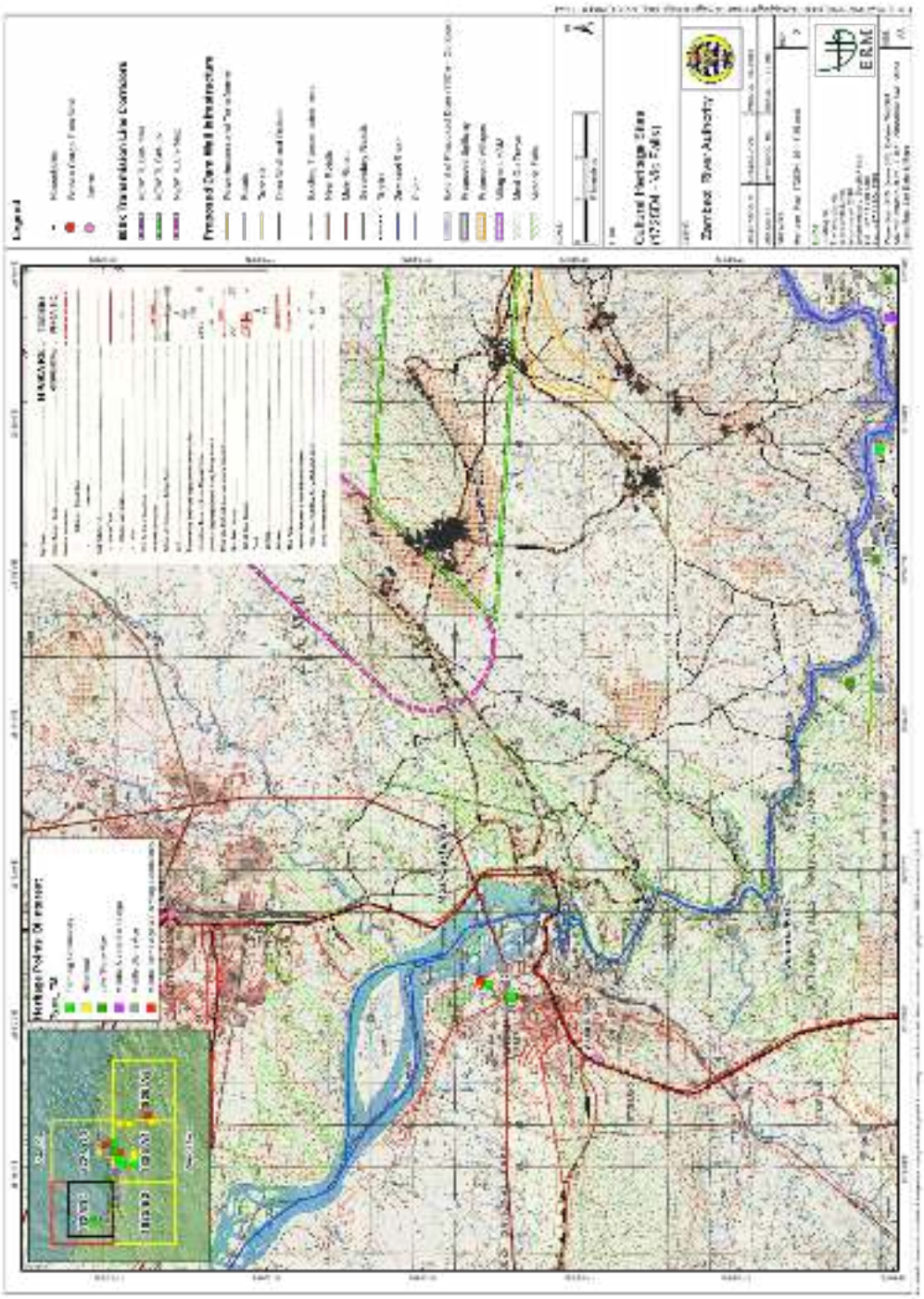
The following section lists the sites located during the current field reconnaissance. It provides a description of each location, its cultural assemblage, an assessment of site integrity and an evaluation its significance both from community and/or academic importance. Most sites are not individually named as they are archaeological occurrences with little prior interest to the local residents. Annotated versions of the relevant Surveyor-General topographical maps show the location of the sites.

The list that follows is laid out according to the relevant Topographical maps and is numbered sequentially. *Figures 36, 66, 78, 115, 143* show the number of sites located on each map and their cultural affinity.

1725 D4 Victoria Falls

Sixteen new sites were located on this map, Figure 36.

Figure 0.36 Cultural Heritage Sites Located on the Map 1725 D4 Victoria Falls



Source: ERM, 2014

1. 2014 Fieldwork Site Number = B22

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 37-38*
ARC 1950 GPS reading = 35K 0384299 8010004
Description = Concentration of MSA lithics on basalt valley floor near stream. Cores and flakes largely of chalcedony, but also a few items of white vein-quartz. One characteristic triangular flake of brown chalcedony and an end-side scraper of a similar material. A few tools show signs of secondary 'polish'. Wind and water erosion at the time of the reworking of the Kalahari Sands may also have impacted site integrity.
Site Integrity = Artefacts are in secondary contexts due to mixing by underlying basalt self-churning soils.
Field Assessed Site Significance = 1

Figure 0.37 Setting of Site 1 – Middle Stone Age

Source: RSB, 2014

Figure 0.38 Select Artefacts of Site 1 – Middle Stone Age, Bambata Tradition

Source: RSB, 2014

2. 2014 Fieldwork Site Number = B23

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 39-40.*

ARC 1950 reading = 35K 0384361 8010061

Description = Concentration of MSA lithics on basalt valley floor at base of low basalt ridge. Cores and flakes, mostly of chalcedony but with a few of white vein-quartz. Two side scrapers and a small but broken triangular MSA point. The last manufactured from yellow chalcedony. Some of the artefacts show signs of secondary 'polish'.

Site Integrity = There does, however seem to be some depth to the deposit, while the presence of smaller lithic pieces suggests that the assemblage has not been too distorted by the effects of the basalt self-churning soils. Wind and water erosion at the time of the reworking of the Kalahari Sands may have impacted site integrity to some extent.

Field Assessed Site Significance = 2

Figure 0.39 Setting of Site 2 – Middle Stone Age

Source: RSB, 2014

Figure 0.40 Select Artefacts of Site 2 – Middle Stone Age, Bambata Tradition

Source: RSB, 2014

3. 2014 Fieldwork Site Number = B24

Archaeological Isolate = Middle Stone Age (Unknown Tradition), *Figures 41-42*

ARC 1950 reading = 35K 0384379 8010690

Description = Diffuse scatter of MSA lithics amongst boulders of low basalt outcrop. Mainly flakes largely of chalcedony, with several showing signs of 'polish'.

Site Integrity = Isolated artefacts scattered by post-depositional geomorphological surface processes.

Field Assessed Site Significance = 0

Figure 0.41 ***Setting of Site 3 – Middle Stone Age***

Source: RSB, 2014

Figure 0.42 Select Artefacts of Site 3 – Middle Stone Age, Unknown Tradition

Source: RSB, 2014

4. 2014 Fieldwork Site Number = B25

Archaeological Site = Late Stone Age (Wilton Tradition), *Figures 43-44*

ARC 1950 reading = 35K 0384430 8010714

Description = Local concentration of LSA lithics in open area towards the edge of Batoka Gorge. Characteristic cores and flakes largely of chalcedony, but also of white vein-quartz and agate. Formal tools include thumbnail scarper and backed bladelets. One small piece of haematite.

Site Integrity = There is the potential for intact cultural deposit, although these artefacts are being scattered and winnowed by localised accelerated surface wash caused by the open, unvegetated surface. This may have reduced the integrity of the assemblage.

Field Assessed Site Significance = 2

Figure 0.43 *Setting of Site 4 – Late Stone Age*

Source: RSB, 2014

Figure 0.44 *Select Artefacts of Site 4 – Late Stone Age, Zambezi Variant of the Wilton Tradition*

Source: RSB, 2014

5. 2014 Fieldwork Site Number = B31

Archaeological Site = Middle Stone Age (Charama Tradition?), *Figures 45-46*

ARC 1950 reading = 35K 0393709 8010167

Description = Scatter of MSA lithics on talus-strewn slope of fragmented Pipe Sandstone spread over weathered basalt. Large number of cores with few flakes present suggesting it is a factory rather than occupational site. Artefacts largely of chalcedony, but also white vein-quartz and dolerite.

Site Integrity = Artefacts are in secondary contexts due to mixing by post-depositional geomorphological surface processes.

Field Assessed Site Significance = 0

Figure 0.45 Setting of Site 5 – Middle Stone Age

Source: RSB, 2014

Figure 0.46 Select Artefacts of Site 5 – Middle Stone Age, possibly Charama Tradition

Source: RSB, 2014

6. 2014 Fieldwork Site Number = B32

Archaeological Site = Middle Stone Age (Charama Tradition?), *Figures 47-48*

ARC 1950 reading = 35K 0393995 8010552

Description = MSA lithics on flat basalt exposure adjacent to a stream. Diffuse scatter of chalcedony cores and flakes.

Site Integrity = Artefacts have been impacted by post-depositional geomorphological surface processes and there is little cultural deposit remaining intact.

Field Assessed Site Significance = 1

Figure 0.47 Setting of Site 6 – Middle Stone Age

Source: RSB, 2014

Figure 0.48 Select Artefacts of Site 6 – Middle Stone Age, possibly Charama Tradition

Source: RSB, 2014

7. 2014 Fieldwork Site Number = B33

Archaeological Site = Middle Stone Age (Charama Tradition), *Figures 49-50*
ARC 1950 reading = 35K 0393918 8011239

Description = Thin rubble of natural pebbles overlying shallow basalt bedrock adjacent to stream. Most pebbles not rounded so must represent colluvial residue. Diffuse scatter of MSA lithics mixed with this natural deposit. These consist of chalcedony cores with only a few flakes. This may represent either secondary accumulation or a factory site. Many pieces, both natural and human artefacts, show signs of 'polish'.

Site Integrity = Artefacts have been impacted by post-depositional geomorphological surface processes and there is little deposit remaining intact.

Field Assessed Site Significance = 1

Figure 0.49 Setting of Site 7 – Middle Stone Age

Source: RSB, 2014

Figure 0.50 Select Artefacts of Site 7 – Middle Stone Age, Charama Tradition

Source: RSB, 2014

8. 2014 Fieldwork Site Number = B48

Archaeological Site = Middle Stone Age (Tradition unknown), *Figures 51-52*

ARC 1950 reading = 35K 0378619 8013478

Description = Scatter of MSA lithics associated with a natural perched alluvial gravel above the edge of the Batoka Gorge near the confluence of the Masue and Zambezi Rivers. It is adjacent to the Masue Waterfall. The basalt bedrock is shallow and there are numerous small and rounded basalt boulders combined with rounded chalcedony pebbles. This site has been previously described[45] and it appears in the Museum Survey records as 1725:DD:06. Lithics consist mainly of cores with only a few flakes. This suggests that it is either a manufacturing site or it has been impacted by post-depositional geomorphological surface processes that have removed most of the smaller flakes.

Site Integrity = Artefacts are probably in secondary contexts. The deposit is so shallow as render this site of limited academic interest.

Field Assessed Site Significance = 1

[45] Clark, 1950: 56-7

Figure 0.51 *Setting of Site 8 – Middle Stone Age*

Source: RSB, 2014

Figure 0.52 *Select Artefacts of Site 8 – Middle Stone Age, Unknown Tradition*

Source: RSB, 2014

9. 2014 Fieldwork Site Number = B49

Archaeological Site = Middle Stone Age (Tradition unknown), *Figures 53-54*

ARC 1950 reading = 35K 0378574 8013498

Description = Scatter of MSA lithics associated with a natural perched alluvial gravel above the edge of the Batoka Gorge near the confluence of the

Masue and Zambezi Rivers. It is adjacent to the Masue Waterfall. The basalt bedrock is shallow and there are numerous small and rounded basalt boulders combined with rounded chalcedony pebbles. This site has been previously described[46] and it appears in the Museum Survey records as 1725:DD:06. Lithics consist mainly of cores with only a few flakes. This suggests that it is either a manufacturing site or it has been impacted by post-depositional geomorphological surface processes that have removed most of the smaller flakes.

Site Integrity = Artefacts are probably in secondary contexts. The deposit is so shallow as render this site of limited academic interest.

Field Assessed Site Significance = 1

Figure 0.53 Setting of Site 9 – Middle Stone Age

Source: RSB, 2014

[46] Clark, 1950:56-7

Figure 0.54 Select Artefacts of Site 9 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

10. 2014 Fieldwork Site Number = B52

Archaeological Site = Late Stone Age (Possibly Tshangula Tradition), *Figures 55-56*

ARC 1950 reading = 35K 0387315 8010101

Description = Localised concentration of characteristic LSA lithics in open area set within well-established Mopane Woodland near the edge of the Dibu Dibu Gorge. In an area of shallow basalt soil there are several distinctive LSA cores and flakes made from a variety of raw materials including clear vein-quartz, agate, and to a lesser extent chalcedony which appears to be more common in MSA assemblages. No formal LSA tools noted and this description is based solely on manufacturing technique. This could imply an early date, possibly MSA-LSA transition that has been termed Tshangula lithics.

Site Integrity = Artefacts have been concentrated by surface wash but the site integrity is possibly still reasonably good and there may be some depth remaining to this deposit.

Field Assessed Site Significance = 2

Figure 0.55 *Setting of Site 10 – Late Stone Age*

Source: RSB, 2014

Figure 0.56 *Select Artefacts of Site 10 – Late Stone Age, Possibly Tshangula Tradition*

Source: RSB, 2014

11. 2014 Fieldwork Site Number = B54

Archaeological Isolate = Middle Stone Age (Bambata Tradition?), *Figures 57-58*

ARC 1950 reading = 35K 0387504 8010301

Description = Several MSA flakes of chalcedony on a flat area along side a low basalt ridge near the edge of the Batoka Gorge. All lithics show signs of 'polish'.

Site Integrity = These artefacts are in secondary contexts having been dispersed by post-depositional geomorphological surface processes.

Field Assessed Site Significance = 0

Figure 0.57 Setting of Site 11 – Middle Stone Age

Source: RSB, 2014

Figure 0.58 Select Artefacts of Site 11 – Middle Stone Age, possibly Bambata Tradition

Source: RSB, 2014

12. 2014 Fieldwork Site Number = B55

Archaeological Site = Later Farming Community Site of Chemapato Hill. For further discussion see Section 1.7.4.

ARC 1950 reading = 35K 0389915 8010002

Description = A very significant site with both tangible and intangible value. By definition a Living Heritage Site, this flat-topped hill lies on the edge of the Zimbabwean side of the Batoka Gorge. It was clearly once part of the same upper landsurface but has been separated by erosion along a

prominent fault line that has created the gap in between[47]. Access to the site is difficult as the slopes are steep and covered in loose basalt gravel. The use of ropes was required to get access, being accompanied by a member of the local community who had been asked to obtain clearance. This site is mentioned in both the 1993 and 1998 Cultural Heritage assessments. A large number of clay pottery vessels are on the site, as well many sherds of other broken vessels and grinding-stones. The 1998 report mentions an iron arrowhead near the northwestern end but this was not located.

Site Integrity = The site is intact, although it has recently been disturbed by animal digging, probably baboon, as well as unlawful wood cutting of hard wood species for curio carving. This matter has been raised with local authorities.

Field Assessed Site Significance = 6

13. 2014 Fieldwork Site Number = B56

Archaeological Site = Middle Stone Age (Tradition unknown), *Figures 59-60*

ARC 1950 reading = 35K 0377710 8018875

Description = Diffuse scatter of MSA lithics on the edge of a Kalahari Sand palaeo-dune near the banks of the Zambezi River above Victoria Falls. Variety of cores and flakes of chalcedony and white vein-quartz. No formal tools noted and this description is based only on manufacture technique.

Site Integrity = Artefacts are in disturbed secondary contexts. An old gravel track crosses the site at this point. The consultant believes that these artefacts may be associated with road gravel brought in rather than being an intact human signature.

Field Assessed Site Significance = 0

[47] This line of rock weakness can be seen on Google Earth

Figure 0.59 Setting of Site 13 – Middle Stone Age

Source: RSB, 2014

Figure 0.60 Select Artefacts of Site 13 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

14. 2014 Fieldwork Site Number = B58

Archaeological Site = Undiagnostic Farming Community, *Figures 61-62*

ARC 1950 reading = 35K 0377322 8019234

Description = On the Kalahari Sand palaeo-dune was a diffuse scatter of undiagnostic pottery sherds together with a number of pieces of slag, including some fairly large fragments. It is likely that an iron smelting

furnace was somewhere in the area, possibly associated with the nearby large baobab. NMMZ records indicate an Early Farming Community site in this area.

Site Integrity = Artefacts are in disturbed contexts due to animal action – burrowing and elephant tracks.

Field Assessed Site Significance = 0

Figure 0.61 Setting of Site 14 – Undiagnostic Farming Community Site

Source: RSB, 2014

Figure 0.62 Select Artefacts of Site 14 – Undiagnostic Farming Community Site

Source: RSB, 2014

15. 2014 Fieldwork Site Number = B62

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 63-64*

ARC 1950 reading = 35K 0387988 8010141

Description = Diffuse scatter of MSA lithics in flat area of soil and gravel over shallow basalt bedrock. The cores and flakes are largely of chalcedony, but one core of agate. No formal tools and description based on manufacturing technique. Several pieces have 'polish'.

Site Integrity = The artefacts have been scattered across wide area by post-depositional geomorphological surface processes and are in secondary contexts. There is little or no cultural deposit remaining.

Field Assessed Site Significance = 1

Figure 0.63 Setting of Site 15 – Middle Stone Age

Source: RSB, 2014

Figure 0.64 Select Artefacts of Site 15 – Middle Stone Age, Bambata Tradition

Source: RSB, 2014

16. 2014 Fieldwork Site Number = B63

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 11 and 65*

ARC 1950 reading = 35K 0388370 8009987

Description = Several MSA lithics have been exposed in roadway which has been graded into a perched alluvial gravel near the edge of Dibu Dibu Gorge. Besides natural rounded cobbles, there are numerous chalcedony cores and flakes, many of which show 'polish'. These natural gravels may

have attracted human interest as a source of raw material but the absence of small artefacts that these lithics are either part of the gravels or that the deposits have been winnowed by post-depositional geomorphological surface processes. This site was recorded in the 1998 report.

Site Integrity = The artefacts are probably in secondary contexts and have been further mixed by recent road making activity and other construction works at Gorges Lodge.

Field Assessed Site Significance = 1

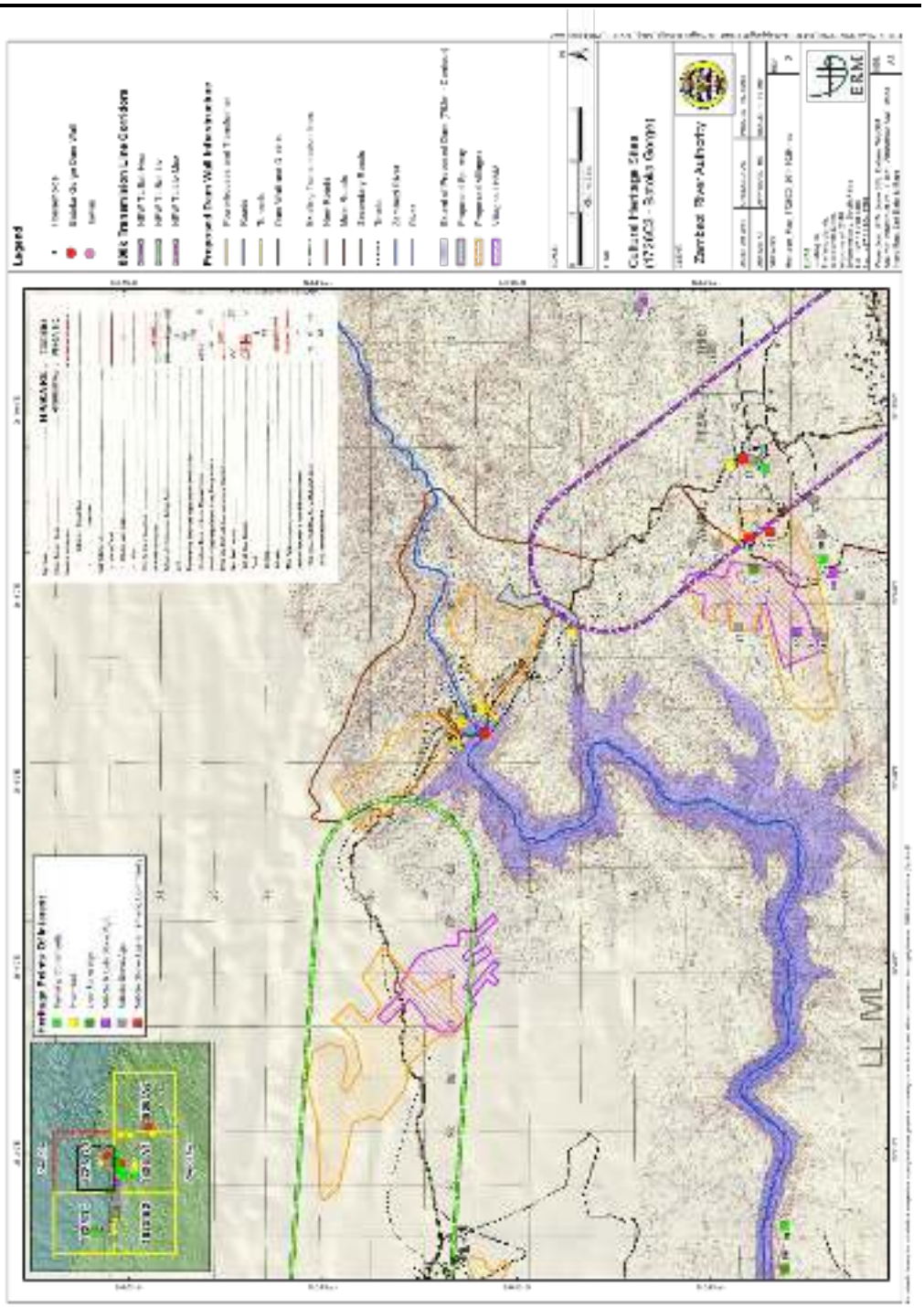
Figure 0.65 Setting of Site 16 – Middle Stone Age

Source: RSB, 2014

1726 C3 Batoka Gorge

Six new sites were located on this map, *Figure 66.*

Figure 0.66 Cultural Heritage Sites Located on the Map 1726 C3 Batoka Gorge



Source: ERM, 2014

17. 2014 Fieldwork Site Number = B10

Archaeological Isolate = Middle Stone Age (Tradition unknown), *Figures 67-68*
ARC 1950 reading = 35K 0410028 8011567
Description = Isolated chalcedony core on pathway through pass in weathered basalt ridge. Description based on manufacture technique.
Site Integrity = This artefact lay on the surface of a modern path and will have been disturbed by both natural and human activity.
Field Assessed Site Significance = 0

Figure 0.67 Setting of Site 17 – Middle Stone Age

Source: RSB, 2014

Figure 0.68 Select Artefacts of Site 17 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

18. 2014 Fieldwork Site Number = B12

Archaeological Isolate = Middle Stone Age (unknown Tradition), *Figures 69-70*

ARC 1950 reading = 35K 0409343 8011427

Description = Diffuse scatter weathered chalcedony cores and flakes over a wider area of undulating weathered basalt at the base of extensive east-

west trending basalt ridge. Descriptions based solely on manufacture technique and core form.

Site Integrity = The artefacts have been scattered in secondary contexts across wide area by post-depositional geomorphological surface processes. There is little or no cultural deposit.

Field Assessed Site Significance = 0

Figure 0.69 Setting of Site 18 – Middle Stone Age

Source: RSB, 2014

Figure 0.70 Select Artefacts of Site 18 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

19. 2014 Fieldwork Site Number = B41

Archaeological Site = Historical (1970s mine field), *Figures 24 and 71*

ARC 1950 reading = 35K 0410696 8013160

Description = This marks the anti-personnel mine field that dates from the 1970s. The point referenced is that of a sign at side of road indicating danger. This area consists of several low, parallel basalt ridges, now unoccupied and well vegetated which suggests that the mines remain a threat to local people and livestock. See also discussion in *Section 1.6.4.*

Figure 0.71 Setting of Site 19 – Historical, 1970s Anti-Personal Mine Field

Source: RSB, 2014

20. 2014 Fieldwork Site Number = B42

Archaeological Site = Historical (1993 Survey), *Figures 72-73*

ARC 1950 reading = 35K 0407484 8016173

Description = This point was marked with a 1993 Survey Peg No. 311. It is near the proposed dam wall and lies in a dissected area of steep relief which shows no other signs of past habitation. The peg is a numbered metal stake set in concrete. Nearby is a scatter of what appear to be rusty Land Rover parts that may date from this time.

Site Integrity = Site intact but of no significance.

Field Assessed Site Significance = 0

Figure 0.72 *Setting of Site 20 – Historical, 1993 Survey Beacon*

Source: RSB, 2014

Figure 0.73 *Select Features of Site 20 – Historical 1993 Survey Beacon and Debris*

Source: RSB, 2014

21. 2014 Fieldwork Site Number = B44

Archaeological Site = Historical (1970s homestead), *Figures 74-75*

ARC 1950 reading = 35K 0410690 8012795

Description = On flat crest of basalt ridge within the anti-personnel mine field are the remains of several homesteads. These were abandoned in the 1970s when the mines were laid, the residents being relocated elsewhere by the Rhodesian Authorities. That these villages have still not been reoccupied is clear testimony to the continuing threat of the anti-personnel mines. The remains consist of round and rectangular buildings of sun baked brick and pole and *dhaka*. Fragments of 'modern' glass and metal were also noted.

Site Integrity = Sites intact but of limited academic interest.

Field Assessed Site Significance = 1

Figure 0.74 Setting of Site 21 – Historical Homestead

Source: RSB, 2014

Figure 0.75 Select Features of Site 21 – Historical Homestead

Source: RSB, 2014

22. 2014 Fieldwork Site Number = B45

Archaeological Site = Middle Stone Age (Tradition unknown), *Figures 76-77*

ARC 1950 reading = 35K 0410731 8012745

Description = Diffuse scatter of MSA lithics on a low basalt ridge. The artefacts include cores and flakes of chalcedony and basalt. No formal tools were present and description is based on manufacture technique.

Site Integrity = The shallow soil of the site appears to have been disturbed by the former residents of the housing mentioned in the site recorded above. Some of the flakes may in fact be relatively modern. Site is now overgrown.

Field Assessed Site Significance = 0

Figure 0.76 Setting of Site 22 – Middle Stone Age

Source: RSB, 2014

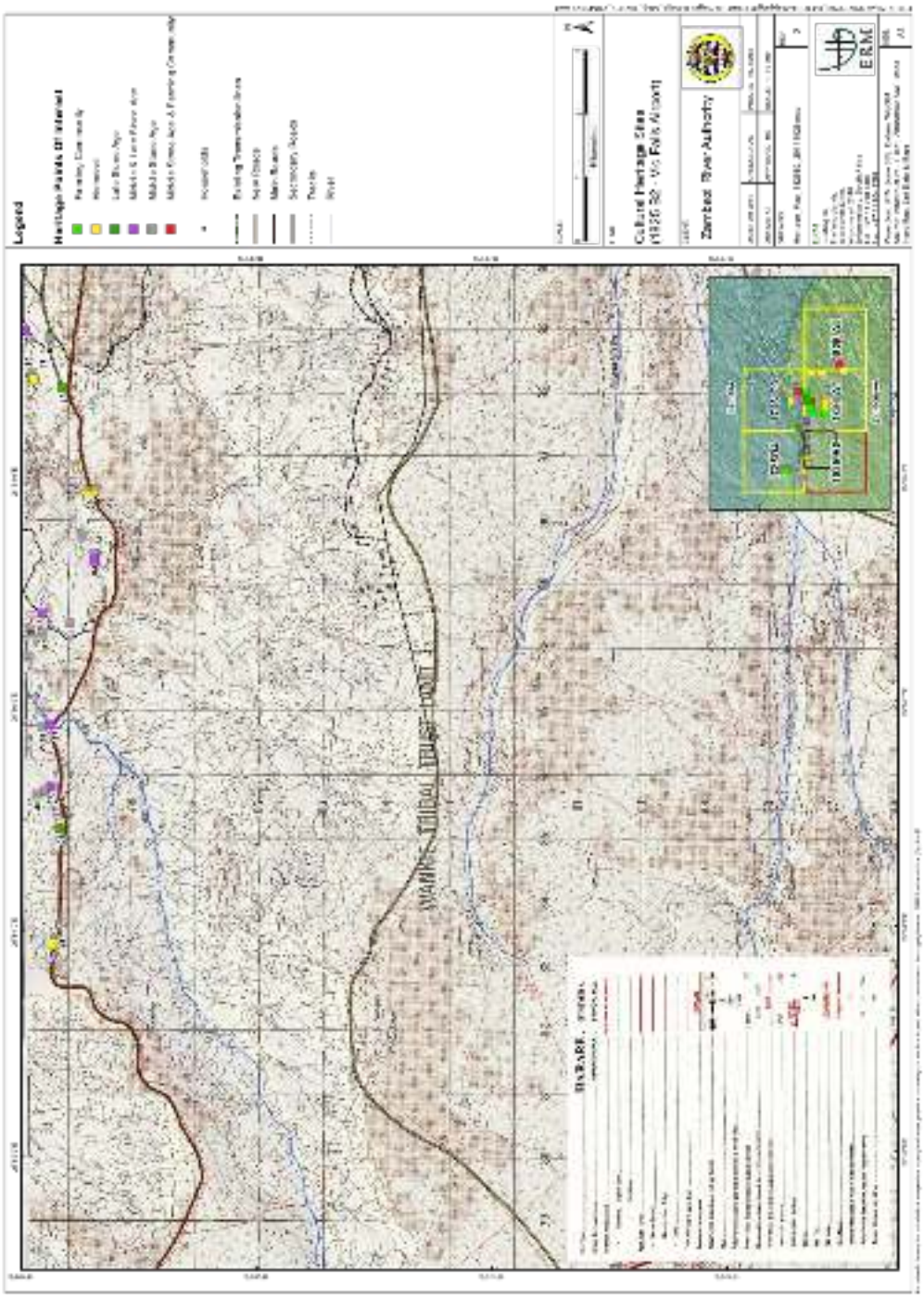
Figure 0.77 Select Artefacts of Site 22 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

1825 B2 Victoria Falls Airport

Eighteen new sites were located on this map, ***Figure 78***.

Figure 0.78 Cultural Heritage Sites Located on the Map 1825 B2 Victoria Falls Airport



Source: ERM, 2014

23. 2014 Fieldwork Site Number = B01

Archaeological Isolate = Undiagnostic Stone Age (possibly Middle Stone Age), *Figures 79-80*

ARC 1950 reading = 35K 0383479 8009182

Description = Undiagnostic Stone Age scatter consisting of chalcedony and quartz flakes within gravelly slope debris consisting of fragments of Pipe Sandstone and Carstone.

Site Integrity = Site has been impacted by post-depositional geomorphological surface processes and the artefacts are in secondary contexts.

Field Assessed Site Significance = 0

Figure 0.79 Setting of Site 23 – Undiagnostic Stone Age

Source: RSB, 2014

Figure 0.80 *Select Artefacts of Site 23 – Undiagnostic Stone Age, possibly Middle Stone Age*

Source: RSB, 2014

24. 2014 Fieldwork Site Number = B02

Archaeological Site = Middle Stone Age (Charama Tradition), *Figures 81-82*

ARC 1950 reading = 35K 0383422 8009221

Description = Scatter of MSA lithics on small plateau overlooking seasonal stream. The site is covered with fragments of chalcedony, natural exposure of the basal layers of the Kalahari Sands sequence. The numerous cores of chalcedony and the conspicuous absence of smaller artefacts suggest that this was a manufacturing site or it has been subject to severe post-depositional processes.

Site Integrity = the deposit is shallow and it is thought that the site has been impacted by post-depositional geomorphological surface processes leaving the artefacts in secondary contexts.

Significance evaluation = 1

Figure 0.81 Setting of Site 24 – Middle Stone Age

Source: RSB, 2014

Figure 0.82 Select Artefacts of Site 24 – Middle Stone Age, Charama Tradition

Source: RSB, 2014

25. 2014 Fieldwork Site Number = B03

Archaeological Site = Historical ('recent' homestead), *Figures 83-84*

ARC 1950 reading = 35K 0383376 8009256

Description = On small basalt plateau adjacent to seasonal stream were the remains of several rectangular buildings of an old homestead. Scattered glass and metal debris suggest a fairly recent abandonment.

Site Integrity = Site intact but of little academic interest.

Field Assessed Site Significance = 1

Figure 0.83 *Setting and features of Site 25 – Historical Homestead*

Source: RSB, 2014

Figure 0.84 *Select Artefacts of Site 25 –Historical Homestead*

Source: RSB, 2014

26. 2014 Fieldwork Site Number = B04

Archaeological Site = Late Stone Age (Tradition unknown), *Figures 85-86*

ARC 1950 reading = 35K 0385188 8009128

Description = Scatter of LSA lithics covering a wide area on top of a flat plateau of weathered basalt. The artefacts include both cores and flakes manufactured from white and clear quartz, agate and chalcedony. No formal tools noted and description is based only on manufacture technique.

Site Integrity = The site has been impacted by post-depositional geomorphological surface processes leaving the artefacts in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.85 Setting of Site 26 - Late Stone Age

Source: RSB, 2014

Figure 0.86 Select Artefacts of Site 26 – Late Stone Age, Tradition unknown

Source: RSB, 2014

27. 2014 Fieldwork Site Number = B05

Archaeological Site = Middle and Late Stone Age (possibly Tshangula Tradition), *Figures 87-88*

ARC 1950 reading = 35k 0386813 8009284

Description = Localised scatter of MSA and LSA lithics on a low terrace consisting of weathered basalt on the eastern bank of the Dibu Dibu River. Artefacts include chalcedony and quartz cores and flakes. Formal tool include LSA thumbnail scraper and a larger, more general side scraper that could be of MSA origin. This site may represent the transitional Tshangula Tradition between these two cultural phases. The association may however also result from post-depositional processes.

Site Integrity = A reasonable archaeological deposit appears to be present and excavation may be able to understand the origin of this assemblage.

Field Assessed Site Significance = 2

Figure 0.87 Setting of Site 27 – Middle and Late Stone Age

Source: RSB, 2014

Figure 0.88 Select Artefacts of Site 27 – Middle and Late Stone Age, possibly Tshangula Tradition

Source: RSB, 2014

28. 2014 Fieldwork Site Number = B06

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 89-90*
ARC 1950 reading = 35k 03866770 8009414
Description = Scatter of MSA lithics on a low terrace of basalt on the western bank of the Dibu Dibu River. The artefacts include chalcedony and quartz cores and flakes. One characteristic MSA side scraper.
Site Integrity = This site has been intensely cultivated in the past and most stones collected and piled as waste debris. Any cultural deposit will have been destroyed.
Field Assessed Site Significance = 1

Figure 0.89 Setting of Site 28 – Middle Stone Age

Source: RSB, 2014

Figure 0.90 Select Artefacts of Site 28 – Middle Stone Age, Bambata Tradition

Source: RSB, 2014

29. 2014 Fieldwork Site Number = B07

Archaeological Site = Historical (1970s homestead), *Figure 91*

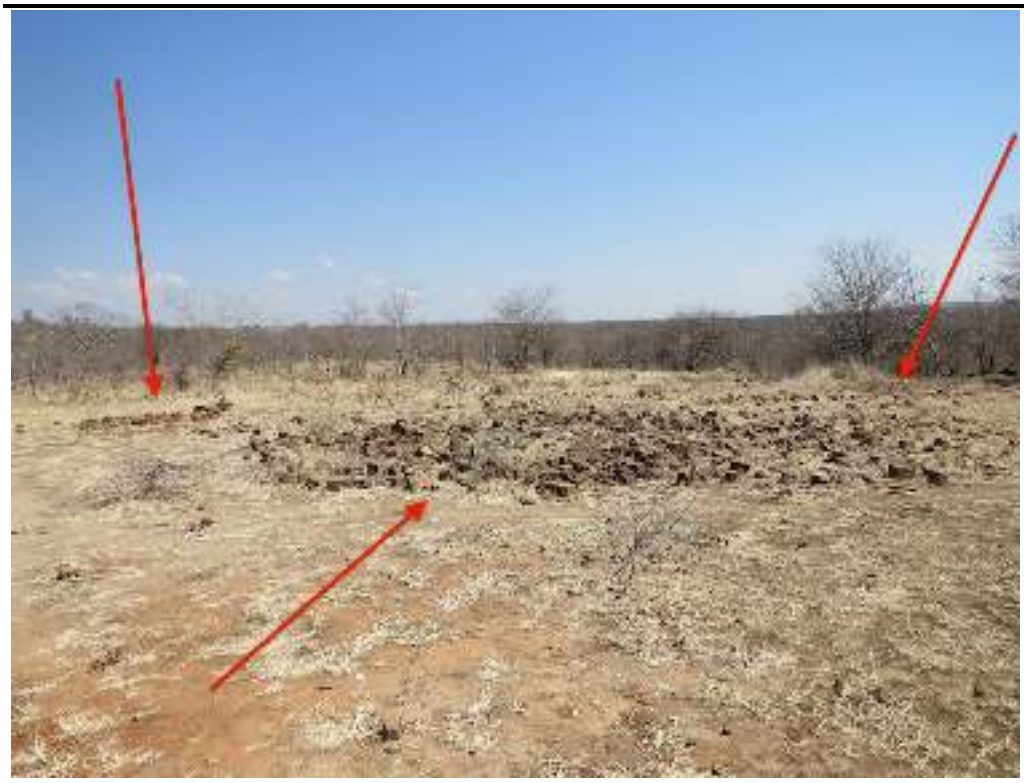
ARC 1950 reading = 35K 0390434 8008669

Description = On basalt plateau overlooking the edge of the Batoka Gorge are the remains of a homestead of rectangular and round houses of pole and *dhaka*, together with other 'modern' glass and metal debris. It was said that it was abandoned in the 1970s when the residents were forcibly relocated elsewhere by the Rhodesian Authorities.

Site Integrity = Site intact but of no further academic interest.

Field Assessed Site Significance = 1

Figure 0.91 Setting and Features of Site 29 – Middle Stone Age



Source: RSB, 2014

30. 2014 Fieldwork Site Number = B26

Archaeological Isolate = Mixed Middle Stone Age, *Figures 92-93*

ARC 1950 reading = 35K 0392341 8009581

Description = Fluvial concentration of typical MSA lithics in streambed.

Site Integrity = The artefacts are in secondary contexts having been eroded and accumulated by the stream. The site is of no real academic interest.

Field Assessed Site Significance = 0

Figure 0.92 Setting of Site 30 – Middle Stone Age

Source: RSB, 2014

Figure 0.93 Setting of Site 30 – Middle Stone Age, Fluvially Mixed Assemblage

Source: RSB, 2014

31. 2014 Fieldwork Site Number = B27

Archaeological Site = Middle Stone Age (Tradition unknown), *Figures 94-95*

ARC 1950 reading = 35K 0392248 8009546

Description = On small plateau overlooking the side of Batoka Gorge and associated with a perched alluvial gravel overlying shallow basalt bedrock. Within this there is a scatter of MSA lithics, both flakes and cores manufactured of chalcedony. Given that most of the peddles in the alluvium are of the same material, this may be a factory site with the MSA people taking advantage of the natural source of raw material. The absence of smaller artefacts suggests that it has been subject to severe post-depositional geomorphological surface processes leaving the artefacts in secondary contexts.

Site Integrity = There is no real cultural deposit and the lithics are probably in secondary contexts.

Field Assessed Site Significance = 0

Figure 0.94 Setting of Site 31 – Middle Stone Age

Source: RSB, 2014

Figure 0.95 Select Artefacts of Site 31 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

32. 2014 Fieldwork Site Number = B28

Archaeological Site = Historical (1970s homestead?), *Figure 96*

ARC 1950 reading = 35K 0392224 8009541

Description = On the edge of the Batoka Gorge in an open area are the remains of rectangular homestead. Site has no other cultural remains and it is difficult to interpret as it is possibly not a residential structure.

Site Integrity = The site is intact but of no further academic interest.

Field Assessed Site Significance = 1

Figure 0.96 Setting and features of Site 32 – Historical Homestead

Source: RSB, 2014

33. 2014 Fieldwork Site Number = B30

Archaeological Site = Middle and Late Stone Age (Bambata and Wilton or Tshangula Traditions), *Figures 97-100*

ARC 1950 reading = 35K 0393009 8009669

Description = This site is on the south side of low basalt ridge that is parallel to the edge of the Batoka Gorge and separated from it by this higher ground. In a local flat, open area is a concentration of lithic remains deriving from of both the MSA and LSA. Cores and flakes are present as well as several formal tools – backed bladelets and thumbnail scrapers of LSA origin and several chalcedony blades and larger scrapers that appear to be from the MSA. There are a variety of raw materials including white and clear vein-quartz, agate, and chalcedony. One large flaked artefact manufactured from thick green bottle glass, may be part of the LSA assemblage and suggests occupation closer to the historical period. These were the remaining San communities who were known to be in the region until just prior to colonisation.

Site Integrity = Although partially deflated and impacted from wash from the adjacent dirt track, there may exist cultural deposit worthy of further investigation.

Field Assessed Site Significance = 2

Figure 0.97 Setting of Site 33 – Middle and Late Stone Age

Source: RSB, 2014

Figure 0.98 Select Artefacts of Site 33 – Middle and Late Stone Age

Source: RSB, 2014

Figure 0.99 *Select Artefacts of Site 33 – Middle and Late Stone Age*

Source: RSB, 2014

Figure 0.100 *Select Artefacts of Site 33 – Late Stone Age Scraper made from Historical Bottle Glass. Important Late Precolonial Evidence.*

Source: RSB, 2014

34. 2014 Fieldwork Site Number = B35

Archaeological Isolate = Middle Stone Age (Tradition unknown), *Figures 101-102*

ARC 1950 reading = 35K 0388414 8008973

Description = In flat area of self-churning basalt soils is a scatter of lithic artefacts, mainly cores of chalcedony with flakes conspicuous in their absence. One large flaked piece may be ESA but as there are no other diagnostic remains of this earlier period one cannot be sure of this added cultural association.

Site Integrity = It is likely that all artefacts are in secondary contexts due to the geomorphological processes peculiar to these basalt soils and thus the site is of little academic interest.

Field Assessed Site Significance = 0

Figure 0.101 Setting of Site 34 – Middle Stone Age

Source: RSB, 2014

Figure 0.102 Select Artefacts of Site 34 – Middle Stone Age, Tradition unknown

Source: RSB, 2014

35. 2014 Fieldwork Site Number = B36

Archaeological Site = Middle and Late Stone Age (Bambata and Wilton Traditions), *Figures 103-104*

ARC 1950 reading = 35K 0388560 8009421

Description = Diffuse scatter of lithic remains on slight ridge/interfluve marking the edge of an extensive plain of self-churning basalt soils and the Dibu Dibu Gorge to the west. The artefacts comprise mainly of chalcedony MSA pieces, including one typical side scraper, but in addition there are a few LSA pieces manufactured from white vein-quartz. The later include a characteristic thumbnail scraper.

Site Integrity = This area has been partially deflated and the assemblages have been mixed by post-depositional geomorphological surface processes leaving the artefacts in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.103 Setting of Site 35 – Middle Stone Age

Source: RSB, 2014

Figure 0.104 Select Artefacts of Site 35 – Middle and Late Stone Age, Bambata and Wilton Traditions

Source: RSB, 2014

36. 2014 Fieldwork Site Number = B50

Archaeological Site = Middle Stone Age (Bambata and possibly Charama Traditions), *Figures 105-106*

ARC 1950 reading = 35K 0387894 8009625

Description = On the flat basalt surface adjacent to a stream are a number of chalcedony cores and flakes scattered across a wide area. There were no formal tools and description is based on manufacture technique only. Several of the artefacts show signs of 'polish'.

Site Integrity = The site has been impacted by post-depositional geomorphological surface processes leaving the artefacts in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.105 Setting of Site 36 – Middle Stone Age

Source: RSB, 2014

Figure 0.106 Select Artefacts of Site 36 – Middle Stone Age, Bambata and possibly Charama Traditions

Source: RSB, 2014

37. 2014 Fieldwork Site Number = B51

Archaeological Site = Middle Stone Age (possibly Charama Tradition), *Figures 107-108*

ARC 1950 reading = 35K 0388244 8009390

Description = Local flat area on top of a low basalt ridge near the head of the smaller Dibu Dibu Gorge are a number of MSA-type chalcedony cores and flakes. Only a few flakes are present but there appears to be cultural deposit and may be of further interest.

Site Integrity = Site is well vegetated and seem not to be subject to post-depositional geomorphological surface processes. The site may have research potential as there may be intact deposit.

Field Assessed Site Significance = 2

Figure 0.107 Setting of Site 37 – Middle Stone Age

Source: RSB, 2014

Figure 0.108 Select Artefacts of Site 37 – Middle Stone Age, Possibly Charama Tradition

Source: RSB, 2014

38. 2014 Fieldwork Site Number = B59

Archaeological Site = Middle and Late Stone Age (Bambata and Wilton Traditions), *Figures 109-110*

ARC 1950 reading = 35K 0385846 8009277

Description = Flat area on side of low basalt ridge with widespread scatter of lithic artefacts including cores, flakes and formal tools. The latter includes LSA thumbnail scrapers and retouched bladelets. The larger pieces are assumed to be MSA based merely on manufacture technique although no MSA tool forms were noted. A variety of raw materials were present including chalcedony, agate and grey vein-quartz.

Site Integrity = Although this site has been impacted by surface processes to some degree and by recent woodcutting activities, there appears to be intact cultural deposit that may have academic interest.

Field Assessed Site Significance = 2

Figure 0.109 Setting of Site 38 – Middle and Late Stone Age

Source: RSB, 2014

Figure 0.110 Select Artefacts of Site 38 – Middle and Late Stone Age, Wilton and possibly Bambata Traditions

Source: RSB, 2014

39. 2014 Fieldwork Site Number = B60

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 111-112*

ARC 1950 reading = 35K 0385793 8009378

Description = On the sloping northern edge of basalt ridge is a diffuse scatter of MSA lithics consisting of cores and flakes manufactured from chalcedony. Formal tools noted include a side scraper and a notched scraper. Several artefacts show signs of 'polish'.

Site Integrity = surface scatter impacted by surfaces processes and artefacts are in secondary contexts. No deposit.
Field Assessed Site Significance = 1

Figure 0.111 Setting of Site 39 – Middle Stone Age

Source: RSB, 2014

Figure 0.112 Select Artefacts of Site 39 – Middle Stone Age, Bambata Tradition

Source: RSB, 2014

40. 2014 Fieldwork Site Number = B61
Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 113-114*
ARC 1950 reading = 35K 0385720 8009503

Description = On flat crest of basalt ridge covered with weathered residue of Pipe Sandstone and basal chalcedony is a diffuse scatter of MSA cores and flakes made of chalcedony. Given the raw material present and the general absence of smaller flakes this may be factory rather than a occupational site.

Site Integrity = the site has been impacted to by post-depositional geomorphological surface processes and artefacts are in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.113 Setting of Site 40 – Middle Stone Age

Source: RSB, 2014

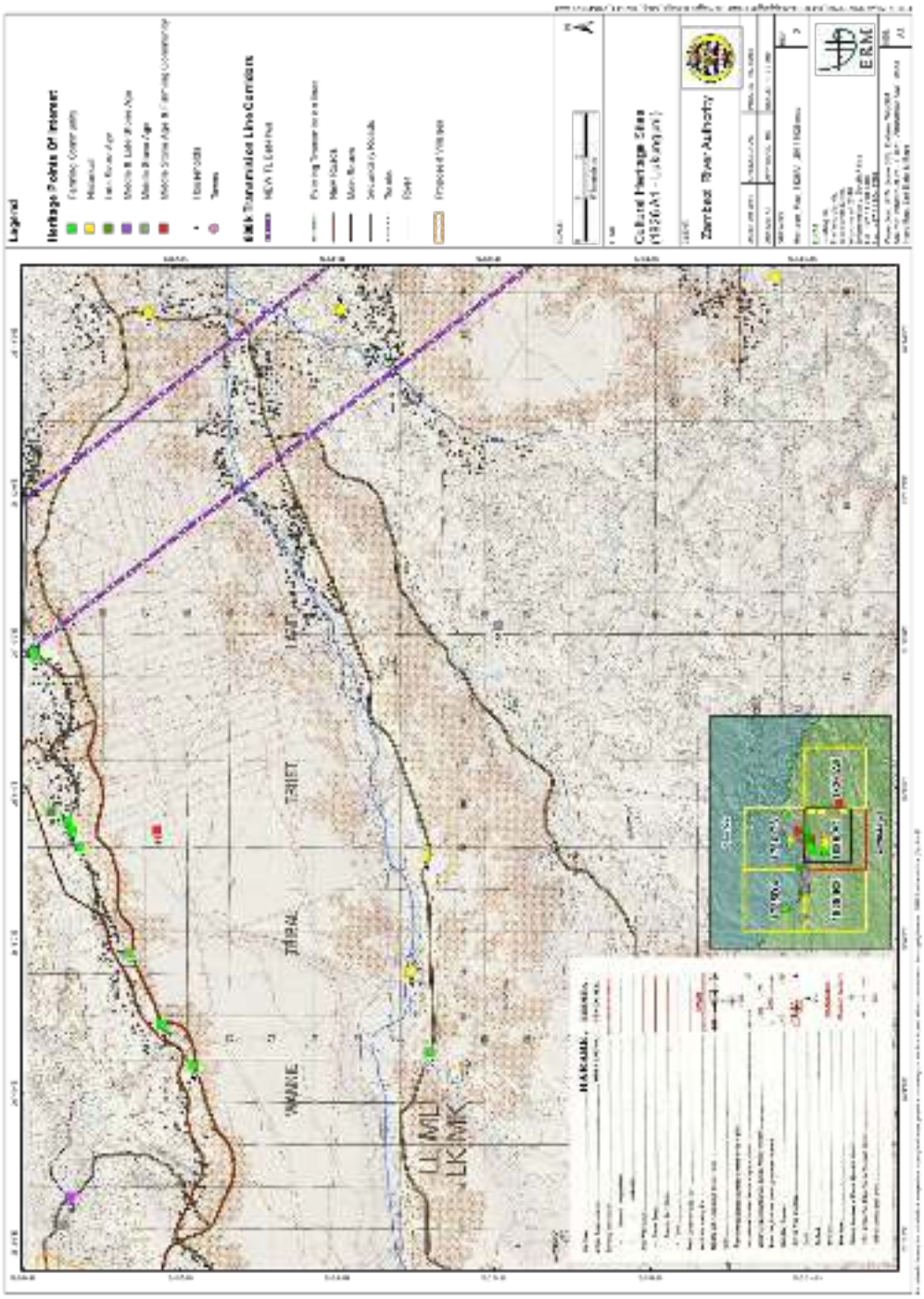
Figure 0.114 Select Artefacts of Site 40 – Middle Stone Age

Source: RSB, 2014

1826 A1 Lukunguni

Fourteen new sites were located on this map, *Figure 115.*

Figure 0.115 Cultural Heritage Sites Located on the Map 1826 A1 Lukunguni



Source: ERM, 2014

41. 2014 Fieldwork Site Number = B08

Archaeological Site = Late Farming Community (Village Site), Figures *116-118*

ARC 1950 reading = 35K 0401848 8005866

Description = This site lies on the northern edge of the crest of the Kalahari Sand palaeo-dune. It consists of a scatter of Late Farming Community debris including pottery fragments (some decorated), slag from iron smelting and pole-impressed *dhaka* from built structures. This old village site shows up as a blackened layer visible in the sides of several erosion gulleys that have cut back into the site from the northern side. It is possible

that these are old cattle tracks in which surface was has been concentrated hence the erosion.

Site Integrity = The whole area has been intensively cultivated and it is possible that most of the cultural remains have been disturbed. However as the deposit noted in the erosion gulleys seems fairly deep, the lower portions may be intact and worthy of further investigation.

Field Assessed Site Significance = 2

Figure 0.116 Setting of Site 41 – Farming Community Village Site

Source: RSB, 2014

Figure 0.117 Select Artefacts of Site 41 – Farming Community Village Site, Pottery Sherds

Source: RSB, 2014

Figure 0.118 ***Select Artefacts of Site 41 – Farming Community Village Site, Iron Working Debris***

Source: RSB, 2014

42. 2014 Fieldwork Site Number = B09

Archaeological Site = Undiagnostic Farming Community (Village site?), *Figures 119-120*

ARC 1950 reading = 35K 0411466 8009552

Description = On crest of the Kalahari Sand palaeo-dune and associated with baobab in an open cultivated field is a sparse scatter of Farming Community debris including undiagnostic pottery fragments and slag from iron smelting. This site may relate to the nearby one record as Site 53 (B46).

Site Integrity = The whole area has been intensively cultivated and it is likely that the cultural remains have been disturbed and are now in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.119 Setting of Site 42 – Farming Community, possibly Village Site

Source: RSB, 2014

Figure 0.120 Select Artefacts of Site 42 – Farming Community, possibly Village Site, Iron Slag and Pottery Sherds

Source: RSB, 2014

43. 2014 Fieldwork Site Number = B11

Archaeological Site = Late Farming Community (possibly village site), *Figures 121-122*

ARC 1950 reading = 35K 0402839 8006582

Description = Site lies on the crest of the Kalahari Sand palaeo-dune facing northward and is associated with several small baobabs in cultivated field. Consists of a diffuse scatter of Farming Community debris including pottery fragments (some decorated) and slag from iron smelting.

Site Integrity = The area has been intensively cultivated for a number of years, including we were told mechanical ploughing. The cultural remains have there probably been thoroughly disturbed and are now in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.121 Setting of Site 43 – Farming Community, possibly Village Site

Source: RSB, 2014

Figure 0.122 Select Artefacts of Site 43 – Farming Community, possibly Village Site, Iron Slag and Pottery Sherds

Source: RSB, 2014

44. 2014 Fieldwork Site Number = B13

Archaeological Site = Historical (1970s homestead?), *Figure 123*

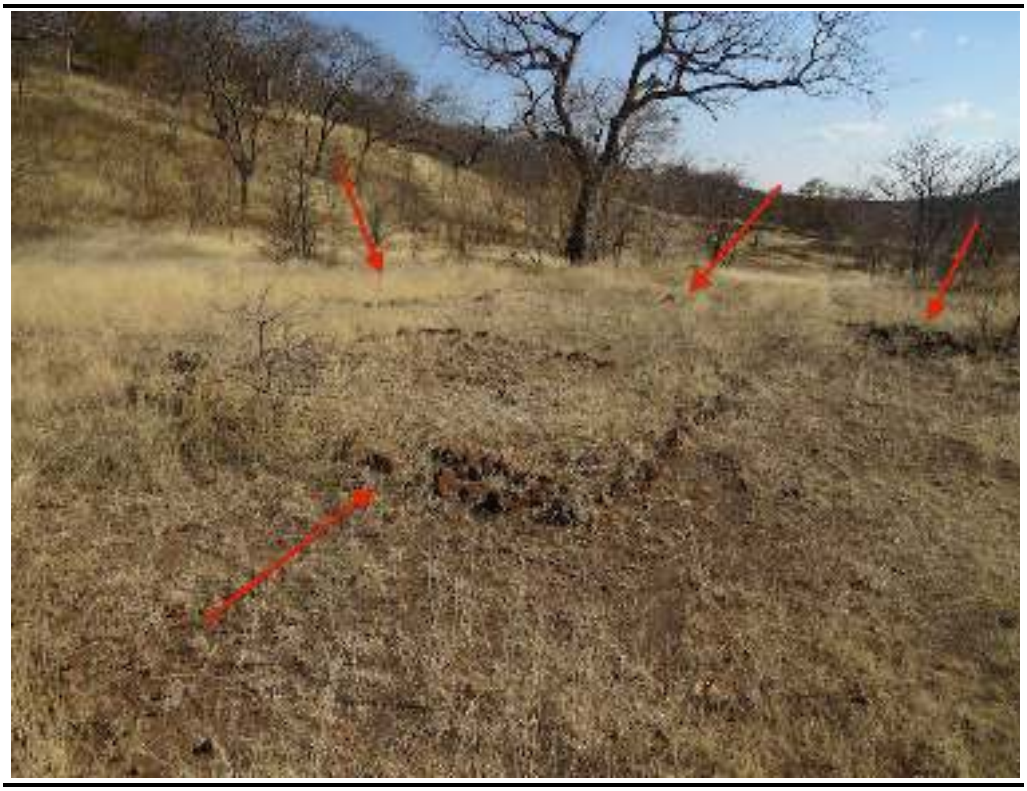
ARC 1950 reading = 35K 0419591 8006911

Description = At the foot of north–facing slope of basalt are the remains of an old homestead. Marked by several rectangular and round foundations, it is associated with 'modern' glass and metal fragments. It is possible that this is one of the many homesteads in this area abandoned in the 1970s during the Civil War.

Site Integrity = The site is intact but is of limited academic interest.

Field Assessed Site Significance = 1

Figure 0.123 Setting of Site 44 – Historical, Possibly 1970s Homestead



Source: RSB, 2014

45. 2014 Fieldwork Site Number = B15

Archaeological Site = Late Stone Age (Wilton Tradition), *Figures 124-125*

ARC 1950 reading = 35K 0419608 8002404

Description = On flat crest of basalt ridge adjacent to a stream are the remains of a LSA occupational site. The artefacts include typical cores, flakes and formal tools in chalcedony, agate and quartz. The formal tools include thumbnail scarpers, a segment and several backed bladelets.

Site Integrity = This site has a shallow deposit while it appears to have been disturbed by the more recent activities associated with the adjacent old homestead - see site 46 listed below.

Field Assessed Site Significance = 1

Figure 0.124 Setting of Site 45 – Late Stone Age

Source: RSB, 2014

Figure 0.125 Select Artefacts of Site 45 – Late Stone Age, Zambezi Variant of the Wilton Tradition

Source: RSB, 2014

46. 2014 Fieldwork Site Number = B16

Archaeological Site = Historical (old homestead), *Figure 126*

ARC 1950 reading = 35K 0419657 8002406

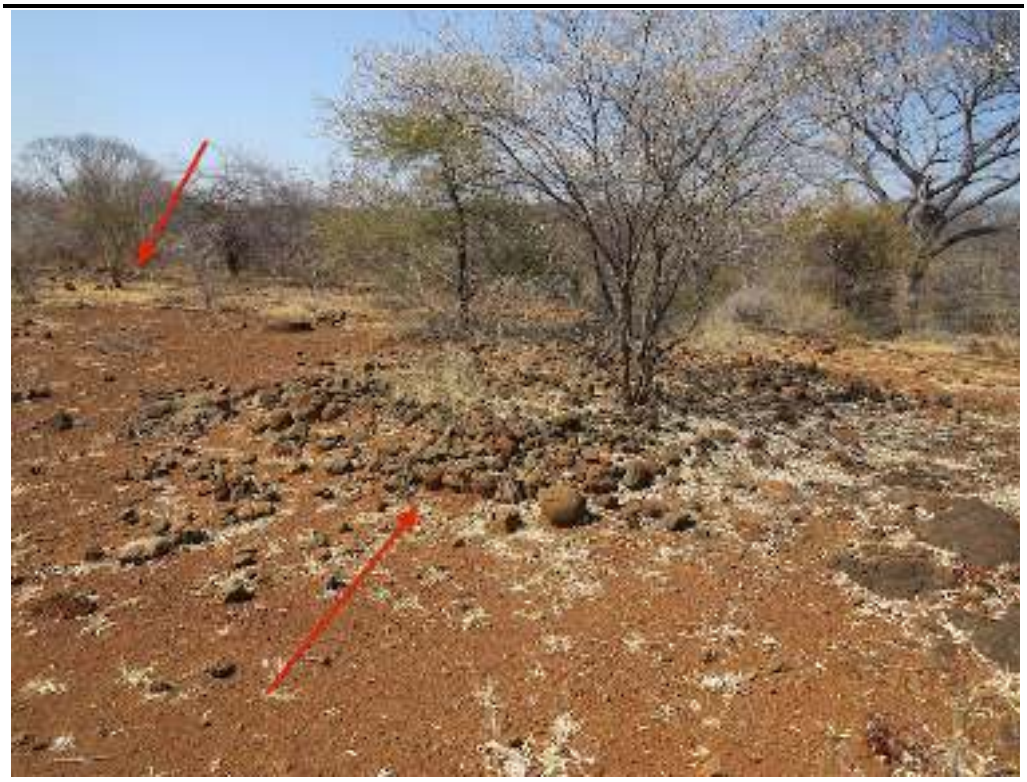
Description = On flat area on the crest of basalt ridge and adjacent to a seasonal stream are the remains of a more recent homestead. The rectangular and rounded structural foundations are marked by numerous basalt cobbles.

Recent metal and glass fragments suggest it was occupied in the not too distant past.

Site Integrity = The site is intact but is of limited academic interest.

Field Assessed Site Significance = 1

Figure 0.126 Setting of Site 46 – Historical Homestead



Source: RSB, 2014

47. 2014 Fieldwork Site Number = B18

Archaeological Site = Historical (old homestead), *Figure 127*

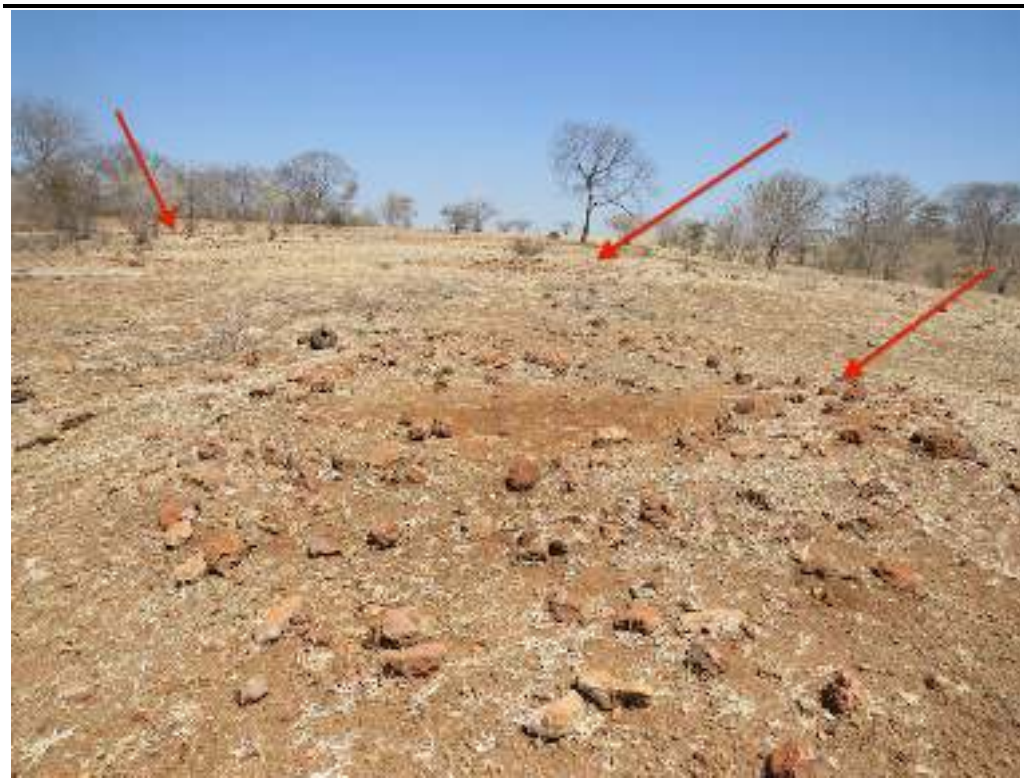
ARC 1950 reading = 35K 0420399 7992151

Description = Site lies on the crest of basalt ridge overlooking a formally important road leading south towards Hwange. It is the remains of a more recent homestead consisting of several rectangular and rounded foundations that are marked by numerous fragments of Pipe Sandstone and pieces of pole-impressed *dhaka*. The associated ashy middens contain recent metal and glass fragments while a coin that was located dates to 1986 suggesting the site is a modern but isolated homestead, abandoned fairly recently.

Site Integrity = This site is intact but is of limited academic interest.

Field Assessed Site Significance = 1

Figure 0.127 Setting of Site 47 – Historical Homestead



Source: RSB, 2014

48. 2014 Fieldwork Site Number = B19

Archaeological Site = Historical (recent cemetery), *Figures 128-129*

ARC 1950 reading = 35K 0406807 8000392

Description = On the northern side of Kalahari Sand palaeo-dune and in between modern occupied homesteads is an area of relatively intact Baikaea Woodland. This undisturbed patch is a local community cemetery which accounts for the area being left uncultivated and not exploited for firewood fuel. Eight grave mounds were noted, many of them associated with pierced vessels left for the deceased. One recent grave with earth still fresh, suggests that this cemetery is still functional. The photographs show difficult it is to see such features – there four graves shown.

Site Integrity = The site is intact and should not be disturbed in any manner as it will offend the community. This example shows the need for on-the-ground reconnaissance of all proposed developments that are associated with this project. It highlights the inability of remote sensing using Google Erath to identify sites of possible importance. This cemetery lies in the route of the proposed transmission lines but does not show up on the Google Image. Without thorough ground truthing the project engineers have incorrectly assumed that this is merely undeveloped land.

Field Assessed Site Significance = 5+

Figure 0.128 Setting of Site 48 – Historical Cemetery, two graves indicated

Source: RSB, 2014

Figure 0.129 Select Artefacts of Site 48 – Historical Cemetery, two graves indicated

Source: RSB, 2014

49. 2014 Fieldwork Site Number = B20

Archaeological Site = Historical (1970s cattle sales pens), *Figure 130*

ARC 1950 reading = 35K 0404065 8000755

Description = In valley between two palaeo-dunes of Kalahari Sand are the remains of a former government cattle sales pen. Consisting of steel poles and associated structural debris it is now abandoned.

Site Integrity = Site is intact but is of limited academic interest.

Field Assessed Site Significance = 1

Figure 0.130 Setting of Site 49 – Historical, Cattle Sales Pens

Source: RSB, 2014

50. 2014 Fieldwork Site Number = B21

Archaeological Site = Late Farming Community (possibly village site), *Figures 131-132*

ARC 1950 reading = 35K 0402172 8000325

Description = Occupying the flat crest of the Kalahari Sand palaeo-dune and associated with six small baobabs of the same age growing in cultivated fields is a diffuse scatter of Farming Community debris including pottery fragments (some decorated) and slag from iron smelting.

Site Integrity = The area has been intensively cultivated for a number of years and the cultural remains have been disturbed and are now in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.131 Setting of Site 50 – Farming Community, possibly Village Site

Source: RSB, 2014

Figure 0.132 Select Artefacts of Site 50 – Farming Community, possibly Village Site, Iron Slag and Pottery Sherds

Source: RSB, 2014

51. 2014 Fieldwork Site Number = B38

Archaeological Site = Middle Stone Age (Bambata Tradition), *Figures 133-136*

ARC 1950 reading = 35K 0398107 8008964

Description = On low basalt ridge on the margins of a Kalahari Sands palaeo-dune is a concentration of chalcedony rubble from the base of the Kalahari Sands sequence. These natural chunks appear to have attracted the attention of MSA people. This factory or manufacturing rather than

occupational site as can be seen from several, intact knapping locations where individuals in the past sat and worked the stone. Present are many cores, flakes and worked chunks of chalcedony. There are few formal tools but a classic MSA triangular point of yellow chalcedony was noted, as were several blades. These appear to be too large to be of LSA origin and are more typical of the MSA.

Site Integrity = despite erosion in places the cultural deposit of this site seems to be intact. It is an important site that certainly requires further investigation through excavation and mapping.

Field Assessed Site Significance = 5

Figure 0.133 Setting of Site 51 – Middle Stone Age

Source: RSB, 2014

Figure 0.134 Select Artefacts of Site 51 – Middle Stone Age, Bambata Tradition Factory Site

Source: RSB, 2014

Figure 0.135 Select Artefacts of Site 51 – Middle Stone Age, Bambata Tradition Factory Site. Note Characteristic Triangular Point

Source: RSB, 2014

Figure 0.136 Select Artefacts of Site 51 – Middle Stone Age, Bambata Tradition Factory Site

Source: RSB, 2014

52. 2014 Fieldwork Site Number = B39

Archaeological Site = Middle and Late Stone Age (possibly both Bambata and Wilton Traditions), *Figures 137-138*

ARC 1950 reading = 35K 0398760 8008751

Description = Extensive area of deflated sodic soils associated with stream. Across the exposed surface are the scattered of Stone Age material from several periods. Now mixed are MSA and LSA cores and flakes. Most are of chalcedony but there are some of white vein-quartz quartz and of agate.

Site Integrity = This area is subject to severe surface wash during the rains and in times of stream flow. This has eroded the overlying soil down to the white sodic subsoil/decayed and gleyed bedrock. The archaeological remains are now in secondary contexts having been derived from the overlying soil and nearby. They are now mixed and of little academic interest.

Field Assessed Site Significance = 1

Figure 0.137 Setting of Site 52 – Middle and Late Stone Age in Deflated Area of Sodic Soils

Source: RSB, 2014

Figure 0.138 Select Artefacts of Site 52 – Middle and Stone Late Age, Possibly both Bambata and Wilton Traditions in mixed contexts

Source: RSB, 2014

53. 2014 Fieldwork Site Number = B46

Archaeological Site = Undiagnostic Farming Community (village site), *Figures 139-140*

ARC 1950 reading = 35K 0411594 8009603

Description = On crest of the Kalahari Sand palaeo-dune and associated with a young baobab growing in a cultivated field is a scatter of Farming Community debris including undiagnostic pottery fragments, slag from iron smelting and pole impressed-dhaka. This site may be merely an extension of the diffuse scatter already described as Site 42 (B09).

Site Integrity = The entire area has been intensively cultivated and it appears that the cultural remains have been disturbed and are now in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.139 Setting of Site 53 – Farming Community Village Site

Source: RSB, 2014

Figure 0.140 Select Artefacts of Site 53 – Farming Community Village Site, Iron Slag, pottery sherds and Pole-Impressed Dhaka

Source: RSB, 2014

54. 2014 Fieldwork Site Number = B47

Archaeological Site = Late Farming Community (possibly village site), *Figures 141-142*

ARC 1950 reading = 35K 0404485 8007352

Description = On the northern edge of the Kalahari Sand palaeo-dune and in a cultivated field is a scatter of Late Farming Community debris including pottery fragments (some decorated) and slag from iron smelting.

Site Integrity = The whole area has been intensively cultivated and the cultural remains have been disturbed. They are now in secondary contexts and of little further academic interest.

Field Assessed Site Significance = 1

Figure 0.141 Setting of Site 54 – Farming Community, possibly Village Site

Source: RSB, 2014

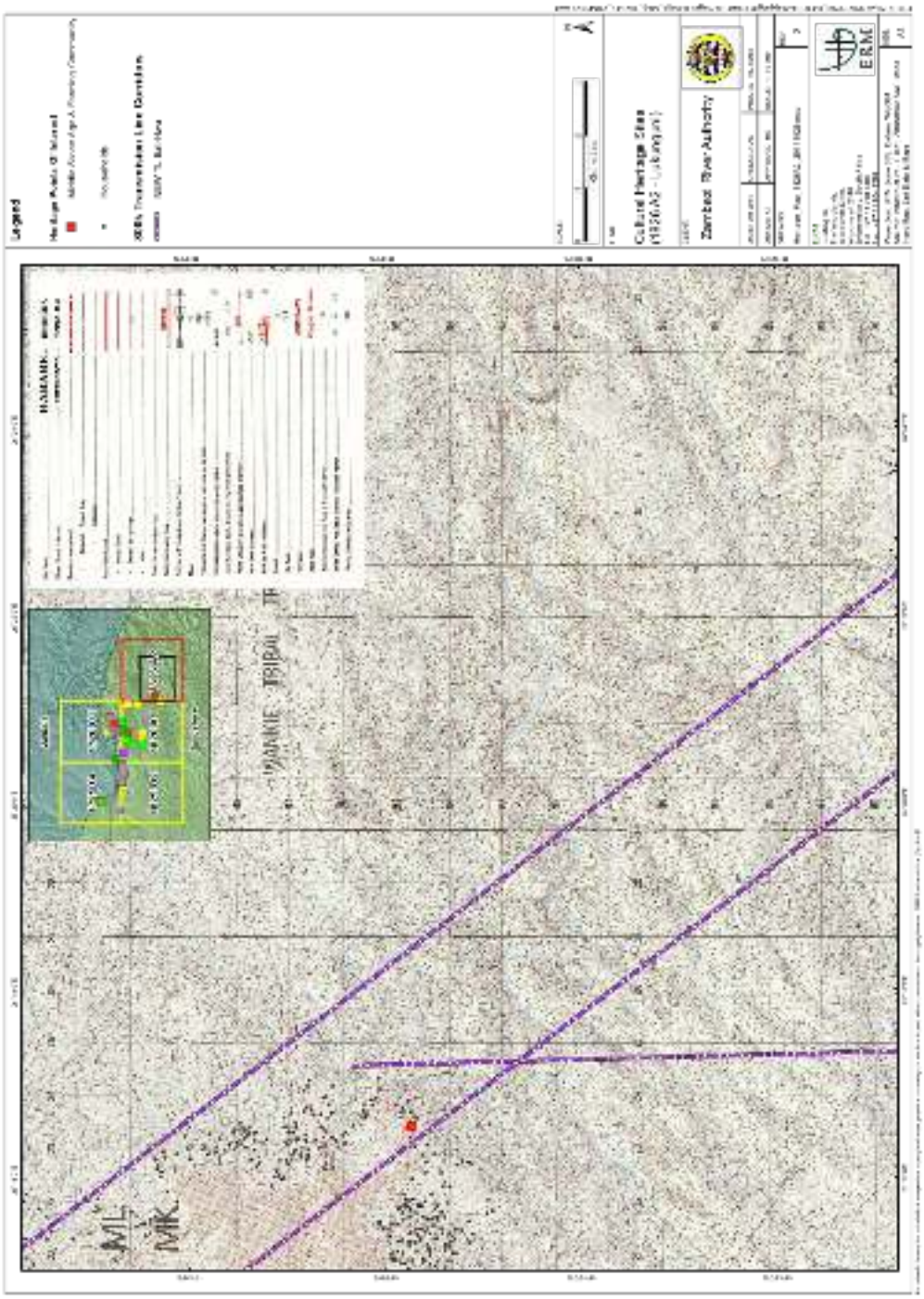
Figure 0.142 Select Artefacts of Site 54 – Farming Community, possibly Village Site, Iron Slag and pottery sherds

Source: RSB, 2014

1826 A2 Ombi River

One new site was located on this map, *Figure 143*.

Figure 0.143 Cultural Heritage Sites Located on the Map 1826 A2 Ombi River



Source: ERM, 2014

55. 2014 Fieldwork Site Number = B17

Archaeological Site = Middle Stone Age and Undiagnostic Farming Community, *Figures 144-145*

ARC 1950 reading = 35K 0423446 7994728

Description = On the edge of the Kalahari Sand palaeo-dune and associated with a large baobab in a cultivated field is a scatter of MSA flakes manufactured of chalcedony. Only one core was noted and most are flakes. Given the local absence of this raw material, this may represent a occupational site. There were also a number of fragments of iron smelting

slag that derive from a more recent, unassociated Farming Community period.

Site Integrity = The entire area has been intensively cultivated and the cultural remains have been disturbed and are now in secondary contexts.

Field Assessed Site Significance = 1

Figure 0.144 Setting of Site 55 – Middle Stone Age Site together with later Farming Community Debris

Source: RSB, 2014

Figure 0.145 Select Artefacts of Site 55 – Middle Stone Age Artefacts and Farming Community Village Iron Slag

Source: RSB, 2014

1.7.4 Chemapato Hill

The site of Chemapato Hill was discussed in some detail in both the 1993 and 1998 reports. It is described above as Site 12. It is a prominent flat-topped hill set off the edge of the Zimbabwean side of the Batoka Gorge and overlooking 'Rapid 21', *Figures 146-147*. Access is extremely difficult, being a scramble up a steep cleft on its southern face. The other edges are near vertical cliff faces. A further difficulty is the loose basalt scree over which one climbs which could be likened to walking on marbles. Security ropes were necessary to make the field assessment.

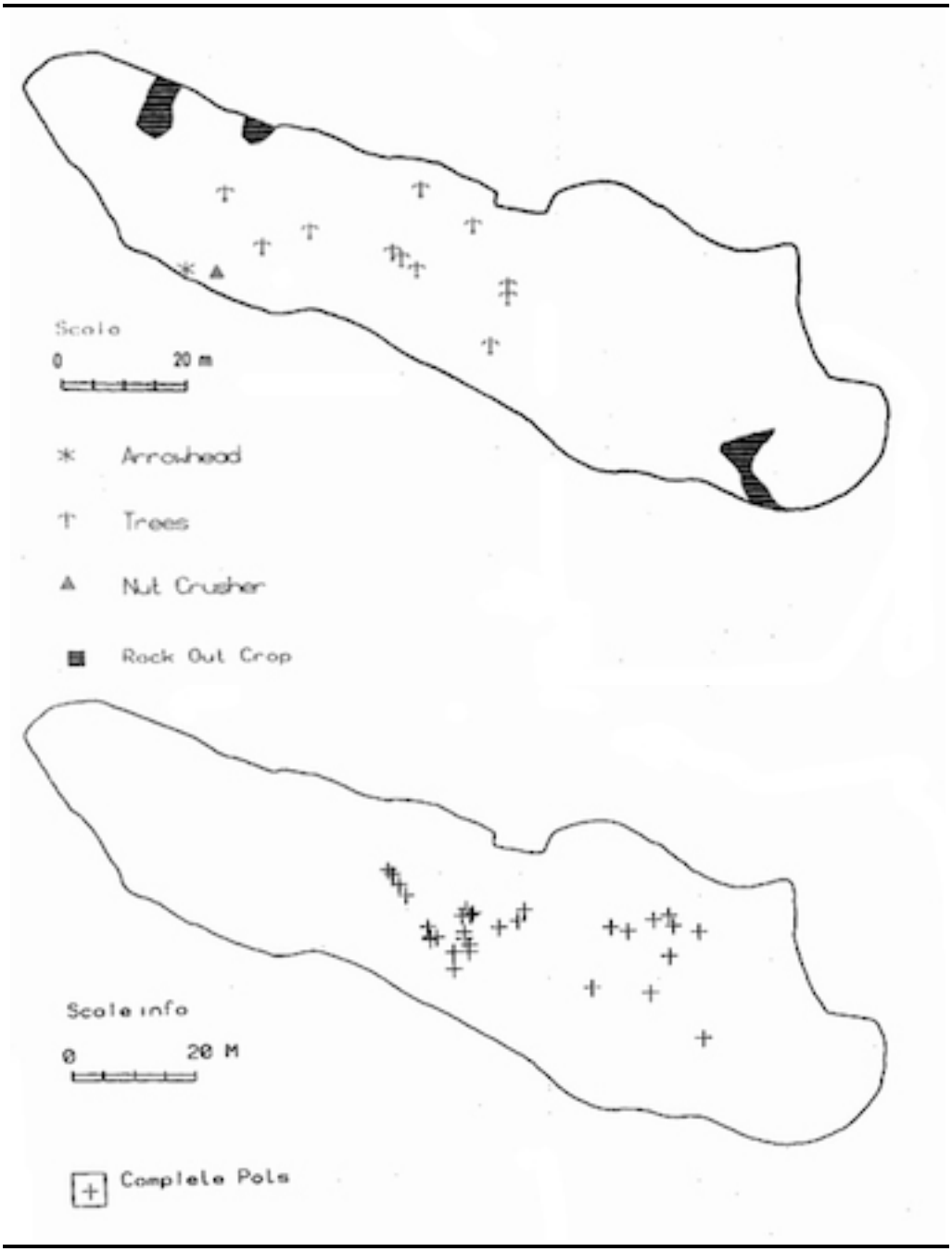
Figure 0.146 Site 12 - Chemapato Hill from the Zimbabwean edge of Batoka Gorge

Source: RSB, 2014

Figure 0.147 Site 12 - 'Rapid 21' in the Zambezi River below Chemapato Hill (on right side)

Source: RSB, 2014

Figure 0.148 1998 Maps of Cultural Material on Site 12 – Chemapato Hill



Source: ZRA,1998

The site was mapped during the 1998 investigation, *Figure 148*. It is flat topped with a thin soil cover. There are a number of large basalt boulders and evidence of the 'Younger Gravels' – fluvially derived pebble beds associated with the evolution of the palaeo-Zambezi River, *Figure 149*. In places of deeper soil there is a dense thicket of Grewia bushes with scattered trees. *Figures 150-151.* A surprisingly dense, moribund grass cover is a reflection of the site's inaccessibility to domestic livestock which have overgrazed much of the adjacent Zimbabwean bank.

Figure 0.149 *Site 12 - Chemapato Hill Soil Cover, Basalt Cobbles, 'Younger Gravels' and pottery sherds.*

Source: RSB, 2014

Figure 0.150 *Site 12 - Chemapato Hill, Natural Vegetation Cover on Eastern Side. Note pot in middle ground*

Source: RSB, 2014

Figure 0.151 Site 12 - Site 12 - Chemapato Hill, Natural Vegetation Cover at Centre of Hill

Source: RSB, 2014

Scattered across its flat top, most especially at the centre is a unique archaeological signature, *Figures 152-163.* There are many clay vessels of various sizes, but mostly large 'pots' of the type used traditionally to carry and store liquids. Most of the vessels are decorated with incised lines or blocks of graphite or red ochre colouring. This decoration is similar to that found in Zambia and is associated with Tonga-speaking communities[48]. Most have their bases broken. The consultant counted 52 whole or near whole vessels[49], together with many sherds from others. The decoration is mostly in the area of the neck and shoulder and consists of incision and comb stamping. Chevron bands of colour as well as pendant triangles and diamonds extend in some cases down on to the body of several vessels. An unusual circular pattern on the body of one vessel is divided into alternative segments of colour, *Figure 155*. As pointed out in the 1998 report, the absence of soot associated with domestic use and the high level of decoration all point to a specialist use of the site.

[48] Huffamn 1989.

[49] The 1998 team report 61 vessels.

Figure 0.152 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.153 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.154 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.155 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.156 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.157 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.158 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.159 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.160 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.161 Site 12 – Whole Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.162 Site 12 – Broken Pots on Chemapato Hill

Source: RSB, 2014

Figure 0.163 Site 12 – Broken Pots on Chemapato Hill

Source: RSB, 2014

The iron arrowhead described in the 1998 report and nearby 'nutcrusher' were not relocated, although several handheld upper grindstones were identified, *Figure 164a.* A number of flattened fragments of Pipe Sandstone, which are out of geological context, must have been brought in by human agency, *Figure 164b.* Some of the natural basalt boulders also show signs of wear through rubbing/grinding. These are not grindstones such as those used in the preparation of food or skins, but were probably for crushing and grinding indigenous nuts or tobacco.

Figure 0.164 Site 12 – Stone Artefacts on Chemapato Hill, Upper Grinding Stone of Basalt and Out of Contexts Fragment of Pipe Sandstone showing Ground Surface

Source: RSB, 2014

Chemapato is an important site. The difficulty of access and its isolation from most other Farming Community and current residential sites indicate that it is a social site rather than one of habitation. Associated with Tonga-speaking communities, most probably the resident Toka-Leya, it is a site of great significance associated with living cultural traditions of rainmaking and appeasement of the spirits believed to reside in the Zambezi River. The guides who accompanied the consultant, after they first received permission from the site's 'guardians', confirm that the hill was once used annually by the Toka-Leya community, and more often during times of severe drought.

The recent descriptions of the ceremonies are similar to those mentioned in the 1998 report, although the recent guides insisted that all the local residents were involved, both Toka-Leya and others. The local spirit medium and site guardian guided the elders, especially women, to the site. They would take beer in specially prepared traditional clay vessels and a black goat. The beer was placed in a specially constructed shelter constructed of poles. The vessels were then smeared with ash from fires on the hilltop. This ash was pasted around the neck and across the body symbolically dividing it into four parts. The goat was then slaughtered to the spirit guardians and a night of ceremonial song and drumming ensued during which time the beer was consumed. After the ceremony the pots used were left on the site. The authors of the 1998 report stress that they were not broken and the current guides could not explain this feature. However, similar damage to vessels in sacred circumstances is a widespread tradition. Even today where vessels are left on burials they are purposefully broken in this manner.

This general Toka-Leya interpretation seems, in part, to conflict with the conclusions of the 1998 team. It appears that the family associations of the nearby resident Magomba family were not duely considered. The 1998 report describe the activities as an 'invented tradition' that provided the Magomba family direct economic advantage from tourists who used to exit the Gorge at this point after Whitewater Rafting. They describe Spiritual Medium Magomba as the *"self-proclaimed Traditional Custodian of the site*. While

accepting its spiritual associations, it appears that the 1998 team concluded that the site was only being used by those living in Zambia.

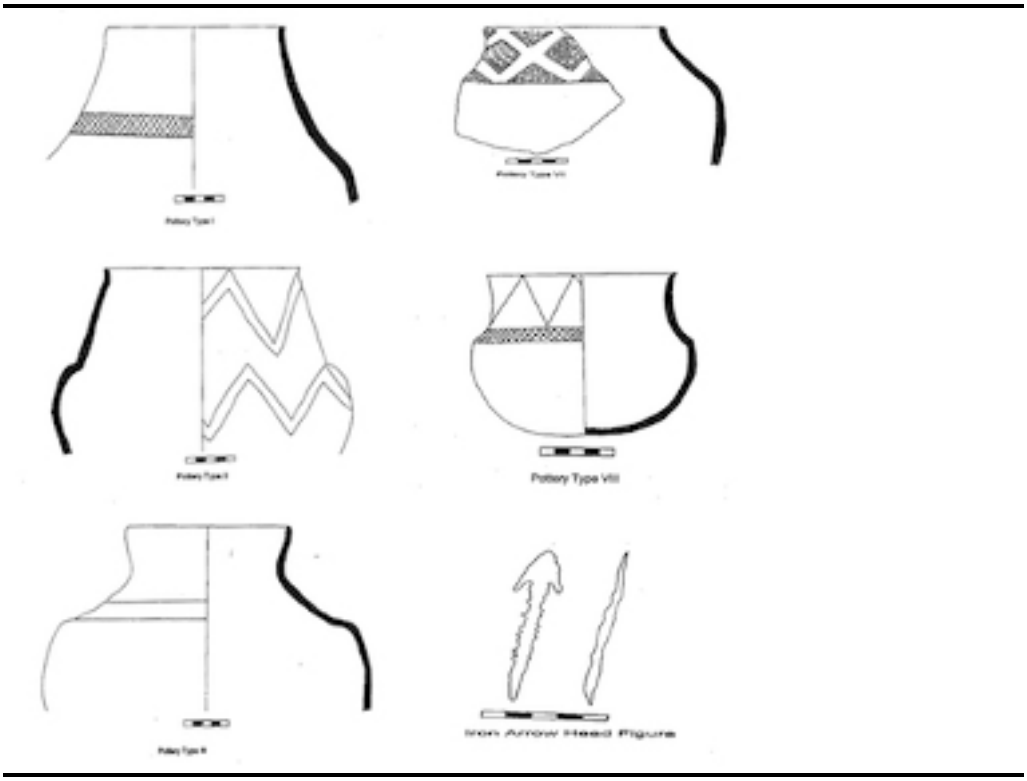
As a result, in the 1998 report the site's significance is not accurately presented. It does not take into consideration resident minority groups whose subculture was derived before the arrival of the Nambya (a Shona associated group) and the more recent Ndebele migrants who now dominate the local traditional political and social strata. In the 1998 report eight local traditional leaders where interviewed and their views are not necessarily representative of the users of the site. Most of these leaders are members of more recent migrant communities:

- Chief Shana;
- Headman Chisuma;
- Headman Mpinami;
- Spirit Medium Magomba;
- Spirit Medium Ncube; and
- Three others unnamed.

However, it is no longer an active site. The 1998 team believe with the death of the previous key Spirit Medium Mhande, that the ceremony moved to a more accessible site on the mainland. While not denying this observation, the consultant's guides suggested that it had more to do with Christianisation and the abandonment of previous 'pagan ceremonies'. The imposition of the international boundary between Zambia and Zimbabwe may have further broken regional Tonga ties, especially during the Rhodesian Civil War and military restrictions in the 1970s.

All of the pots illustrated in the 1998 report are still on the hill, *Figure 165*.

Figure 0.165 Site 12 – Artefacts Illustrated in 1998 Report on Chemapato Hill, Decorated Whole Pots and Iron Arrowhead



Source: ZRA 1998

There has been more recent damage to the site caused by baboons grubbing in the deposit and unlawful tree felling of various hardwood species for use in wood carving to the tourist industry, *Figure 166*. There appears to be a loss of respect for the site and its traditional values.

Figure 0.166 Site 12 – Recent Unsanctioned Tree Cutting on Chemapato Hill

Source: RSB, 2014

1.7.5 Previously Reported Sites

The section briefly summarises what is known about previously reported sites and the potential impact of the proposed project. It is assumed that the descriptions in the 1993 and 1998 ESIA reports are accurate. Mitigation procedures suggested in those reports have been reassessed and are included in *Sections 1.8-1.9.*

1725 D4 Victoria Falls

Six additional sites have been recorded on this map, *Figure 36*.

56. Museum Record 1725:DD:13
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0373900 8010400
Description = On Kalahari Sand palaeo-dune above the Victoria Falls.
Site Integrity = eroding
Field Assessed Site Significance = 1

57. Museum Record 1725:DD:18
Archaeological Site = Middle Stone Age and Early Farming Community
ARC 1950 reading = 35K 0377400 8019400
Description = On Kalahari Sand palaeo-dune above the Victoria Falls near the Big Tree.
Site Integrity = eroding

Field Assessed Site Significance = 1

58. Museum Record 1725:DD:19
Archaeological Site = Late Farming Community
ARC 1950 reading = 35K 0377020 8018690
Description = On Kalahari Sand palaeo-dune above the Victoria Falls. Remains of historical village of Toka-Leya chief. Outside Project Footprint
Site Integrity = eroding
Field Assessed Site Significance = 2 but lies outside Project Footprint.

59. 1998 Record 20
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0388500 8010100
Description = Lithic artefacts on basalt edge to Batoka Gorge.
Site Integrity = already disturbed.
Field Assessed Site Significance = 0

60. 1998 Record 27
Archaeological Site = Middle Stone Age and Late Stone Age
ARC 1950 reading = 35K 0393000 8009800
Description = Scatter of lithics on basalt plains beside the Batoka Gorge.
Site Integrity = eroding
Field Assessed Site Significance = 1

61. 1998 Record 28
Archaeological Site = Late Stone Age
ARC 1950 reading = 35K 0393900 8009800
Description = Lithic artefacts on basalt edge to Batoka Gorge.
Site Integrity = eroding
Field Assessed Site Significance = 1

1726 C3 Batoka Gorge

Nineteen additional sites have been recorded on this map, *Figure 66*. There were no previous NMMZ records.

62. 1998 Record 1
Archaeological Site = Late Farming Community
ARC 1950 reading = 35K 0408900 8011400
Pottery and fragments of pole impressed dhaka in cultivated field of basalt soil.
Site Integrity = eroding
Field Assessed Site Significance = 1

63. 1998 Record 2
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0407400 8011400
Description = Scatter of lithics on edge of low basalt ridge.
Site Integrity = eroding
Field Assessed Site Significance = 1

64. 1998 Record 3
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0407500 8011500
Description = Scatter of lithics on edge of low basalt ridge.
Site Integrity = eroding
Field Assessed Site Significance = 1

65. 1998 Record 4
Archaeological Site = Middle Stone Age and Late Stone Age
ARC 1950 reading = 35K 0407500 8011900
Description = Diffuse scatter of lithics on basalt plateau adjacent to stream.
Site Integrity = eroding
Field Assessed Site Significance = 1

66. 1998 Record 5
Archaeological Site = Middle Stone Age and Late Stone Age
ARC 1950 reading = 35K 0408600 8011200
Description = Small scatter of lithics on edge of low basalt ridge.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

67. 1998 Record 7
Archaeological Site = Late Farming Community
ARC 1950 reading = 35K 0410600 8012500
Description = Localised scatter of pottery between stream and cultivated field.
Site Integrity = eroding. While not relocated this area is now intensely cultivated and the site may have been destroyed thus negating the mitigation procedures recommended in the 1998 report. Nonetheless it is important to investigate this site as no other Farming Community site has been identified for further scientific investigation.
Field Assessed Site Significance = 2 (?)

68. 1998 Record 8
Archaeological Site = Middle Stone Age and undiagnostic Farming Community
ARC 1950 reading = 35K 0409400 8012400
Description = A mixture of earlier lithics and more recent pottery and dhaka fragments on low basalt interfluve and probably within 1970s minefield.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

69. 1998 Record 9
Archaeological Site = Middle Stone Age and undiagnostic Farming Community
ARC 1950 reading = 35K 0409300 8012800
Description = Mixture of pottery and lithics in old cultivated fields on low basalt interfluve and probably within 1970s mine field.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

70. 1998 Record 10

Archaeological Site = Late Stone Age
ARC 1950 reading = 35K 0408700 8012700
Description = Small scatter of lithics on low basalt ridge.
Site Integrity = eroding
Field Assessed Site Significance = 1

71. 1998 Record 11
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0407600 8013000
Description = Eroded scatter of lithics on low basalt ridge.
Site Integrity = eroding
Field Assessed Site Significance = 1

72. 1998 Record 12
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0409200 8013400
Description = Concentration of lithics on eroded edge of basalt ridge. Possibly just out of 1970s minefield.
Site Integrity = eroding
Field Assessed Site Significance = 2

73. 1998 Record 17
Archaeological Site = Middle Stone Age and Late Stone Age
ARC 1950 reading = 35K 0413800 8014800
Description = Scatter of lithics on small hill overlooking deeply eroded stream. Well outside of Project Footprint.
Site Integrity = eroding
Field Assessed Site Significance = 1

74. 1998 Record 18
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0413700 8014900
Description = Diffuse scatter of lithics on small hill overlooking deeply eroded stream. Well outside of Project Footprint.
Site Integrity = eroding
Field Assessed Site Significance = 1

75. 1998 Record 19
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0412900 8013500
Description = Localised concentration of lithics in deeply incised valley. Possibly in secondary contexts and fluvially derived? Outside Project Area.
Site Integrity = eroding
Field Assessed Site Significance = 2 but lies OUTSIDE Project Footprint.

76. 1998 Record 21
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0409200 8013900
Description = Diffuse scatter of lithics on low basalt hill overlooking deeply eroded valley. Possibly just outside 1970s minefield.

Site Integrity = already disturbed
Field Assessed Site Significance = 0

77. 1998 Record 22
Archaeological Site = Middle Stone Age and Farming Community
ARC 1950 reading = 35K 0410800 8012900
Description = Mixture of pottery and lithics on edge of basalt ridge and probably within the 1970s minefield.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

78. 1998 Record 23
Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0408200 8010700
Description = Localised concentration of lithics on edge of basalt plateau and adjacent to stream.
Site Integrity = eroding
Field Assessed Site Significance = 2

79. 1998 Record 30
Archaeological Site = Late Farming Community
ARC 1950 reading = 35K 0396200 8012100
Description = Iron smelting debris near edge of Batoka Gorge.
Site Integrity = already disturbed.
Field Assessed Site Significance = 0

80. 1998 Record 31
Archaeological Site = Late Stone Age
ARC 1950 reading = 35K 0395400 8012100
Description = Diffuse scatter of lithics on basalt edge to Batoka Gorge.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

1825 B2 Victoria Falls Airport

Five additional sites have been recorded on this map, *Figure 78.* The two NMMZ records are too generalised to locate on the map, being recorded in the 1940s.

81. 1998 Record 25

Archaeological Site = Late Stone Age
ARC 1950 reading = 35K 0392100 8009100
Description = Scatter of lithics on open basalt plateau next to Batoka Gorge.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

82. 1998 Record 26

Archaeological Site = Middle Stone Age

ARC 1950 reading = 35K 0392200 8009300
Description = Diffuse scatter of lithics in intensely cultivated field at the margins of Kalahari Sand outcrop
Site Integrity = eroding
Field Assessed Site Significance = 1

83. 1998 Record 33

Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0389500 8008300
Description = Diffuse scatter of lithics in disturbed contexts within the Chisuma village.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

84. 1998 Record 34

Archaeological Site = Middle and Late Stone Age
ARC 1950 reading = 35K 0389400 8008600
Description = Scatter of lithics in open and disturbed area of shallow basalt soil and adjacent to stream.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

85. 1998 Record 35

Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0389800 8008800
Description = Scatter of lithics in open and disturbed area of shallow basalt soil and adjacent to stream.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

1826 A1 Lukunguni

Six additional sites have been recorded on this map, *Figure 115*. The two NMMZ records are too generalised to locate on the map, being recorded in the 1940s.

86. 1998 Record 13

Archaeological Site = Middle Stone Age, undiagnostic Farming Community and 'Sacred baobab'
ARC 1950 reading = 35K 0407400 8006700
Description = Localised scatter of pottery and *dhaka* fragments as well as lithics associated with a large baobab on Kalahari Sand palaeo-dune. This tree is important as a place of spiritual intercession and offerings. Outside of Project Footprint.
Site Integrity = archaeological remains already disturbed but of great intangible value to local community who continue to use the site

Field Assessed Site Significance = 6

87. 1998 Record 14

Archaeological Site = undiagnostic Farming Community
ARC 1950 reading = 35K 0407000 8008500
Description = Localised scatter of pottery and iron working debris on northern edge of Kalahari Sand palaeo-dune.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

88. 1998 Record 15

Archaeological Site = Late Farming Community
ARC 1950 reading = 35K 0407400 8008700
Description = Isolated scatter of iron working debris (slag) on eroded basalt below the northern edge of Kalahari Sand palaeo-dune.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

89. 1998 Record 16

Archaeological Site = Late Farming Community
ARC 1950 reading = 35K 0407600 8008800
Description = Isolated scatter of iron working debris (slag) on eroded basalt below the northern edge of Kalahari Sand palaeo-dune.
Site Integrity = already disturbed
Field Assessed Site Significance = 0

90. 1998 Record 24

Archaeological Site = Late Stone Age
ARC 1950 reading = 35K 0407800 8009200
Description = Eroded basalt plateau adjacent to stream.
Site Integrity = eroding
Field Assessed Site Significance = 1

91. 1998 Record 29

Archaeological Site = Middle Stone Age
ARC 1950 reading = 35K 0412200 7998700
Description = Scatter of lithics on low ridge in a heavily dissected area of basalt ridges. Well outside Project Footprint.
Site Integrity = eroding
Field Assessed Site Significance = 1

1826 A2 Ombi River

There were no sites recorded in this map, either in the NMMZ records or in the previous investigations, *Figure 143.*

1.8 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT AND IMPACT ASSESSMENT PRIOR TO MITIGATION

Tangible Cultural Heritage is by nature a site-specific resource. The remains are particular to the context in which they are found. Developments such as the proposed Batoka HES project are likely to destroy or cause irreversible change to such sites through physical disturbance. Therefore, the Cultural Heritage Assessment process aims to minimise this destruction where possible, seek alternatives or recover the data should disturbance be inevitable. However, not all Cultural Heritage sites are of equal significance, or require the same degree of intervention.

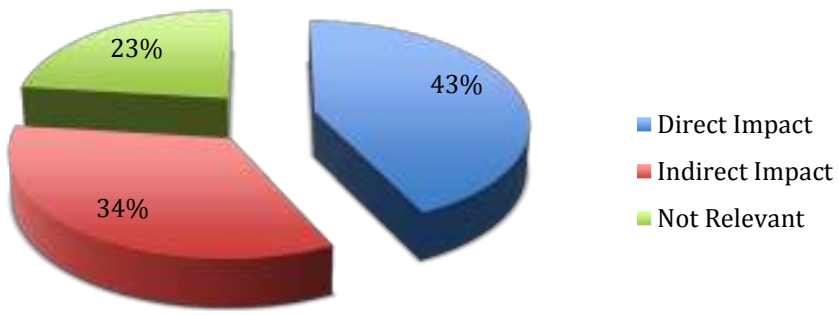
1.8.1 *Potential Cultural Heritage Impact*

Table 3 lists the various sites and how the proposed Batoka HES will impact them. Figures 167-168 show these relationships. Those shown in capitals are likely to be **directly impacted** by the project once construction commences. They are within or adjacent to the proposed developments. Some of these sites might be avoided where there is careful realignment of infrastructure such as roads, borrow pits and the transmission lines.

The other sites are likely to be **indirectly impacted** as they lie on the edge of Project Footprint. They will be impacted but this will probably come about through the action of other landusers who will be attracted to the area for purposes of residence, recreation and tourism. In this circumstance the Project Proponent is not directly responsible the required mitigation, although it may be directed to do so by NMMZ given the many other sites in the Project Area will be destroyed in construction, some of which may not as yet been recorded. It is recommended that authorities such as the Hwange Rural District Council, NMMZ and EMA should ensure that all other parties who are granted land are required to undertake their own ESIAs in accordance with Zimbabwean legislation.

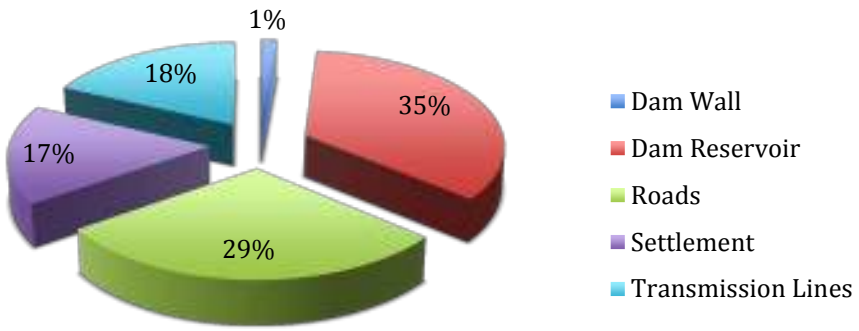
Twenty-one (21) of the 91 sites listed in *Sections 1.7.3 – 1.7.5* can be excluded from further discussion as they lie outside of the intended Project Footprint and the development alternatives. They were recorded so as to provide a wider understanding of the Cultural Heritage Baseline of the Project Area indicating what may be present. This includes several sites of significance – a community cemetery; a 'sacred baobab'; and several larger, intact archaeological sites. The existence of these nearby features should be considered and avoided as much as possible as the project engineers finalise the actual routes and footprint of the intended roads and transmission lines.

Figure 0.167 Sites Recorded and Directness of Likely Impact



Source: RSB, 2014

Figure 0.168 Sites Recorded and Cause of Likely Impact



Source: RSB, 2014

Table 0.3 Cultural Heritage Impact

Map No.	Site No.	Impact	Cause of Impact
1725 D4	**Vic Falls**		
	1	Indirect	Dam
	2	Indirect	Dam
	3	Indirect	Dam
	4	Indirect	Dam
	5	Indirect	Dam
	6	Indirect	Dam
	7	Indirect	Dam
	8	Not Relevant	
	9	Not Relevant	

	10	Indirect	Dam
	11	Indirect	Dam
	12	DIRECT	DAM
	13	Not Relevant	
	14	Not Relevant	
	15	Indirect	Dam
	16	Indirect	Dam
	56	Not Relevant	
	57	Not Relevant	
	58	Not Relevant	
	59	Indirect	Dam
	60	Indirect	Dam
	61	Indirect	Dam
1726 C3	**Batoka Gorge**		
	17	DIRECT	TRANSMISSION LINES
	18	DIRECT	SETTLEMENT
	19	DIRECT	TRANSMISSION LINES
	20	DIRECT	DAM WALL
	21	DIRECT	TRANSMISSION LINES
	22	DIRECT	TRANSMISSION LINES
	62	DIRECT	SETTLEMENT
	63	DIRECT	SETTLEMENT
	64	DIRECT	SETTLEMENT
	65	DIRECT	SETTLEMENT
	66	DIRECT	SETTLEMENT
	67	DIRECT	TRANSMISSION LINES
	68	DIRECT	SETTLEMENT
	69	DIRECT	SETTLEMENT
	70	DIRECT	SETTLEMENT
	71	DIRECT	SETTLEMENT
	72	DIRECT	TRANSMISSION LINES
	73	Not Relevant	
	74	Not Relevant	
	75	Not Relevant	
	76	DIRECT	TRANSMISSION LINES
	77	DIRECT	TRANSMISSION LINES
	78	Not Relevant	
	79	Indirect	Dam
	80	Indirect	Dam
1825 B2	**VF Airport**		
	23	DIRECT	ROAD
	24	DIRECT	ROAD
	25	DIRECT	ROAD
	26	Indirect	Road
	27	DIRECT	ROAD
	28	Indirect	Road
	29	DIRECT	ROAD
	30	Indirect	Dam
	31	Indirect	Dam
	32	Indirect	Dam
	33	Indirect	Dam
	34	Not Relevant	
	35	Indirect	Dam
	36	Indirect	Dam
	37	Indirect	Dam

	38	Indirect	Road
	39	Indirect	Road
	40	Indirect	Road
	81	DIRECT	ROAD
	82	Indirect	Dam
	83	DIRECT	ROAD
	84	Not Relevant	
	85	Not Relevant	
1826 A1	**Lukunguni**		
	41	DIRECT	ROAD
	42	DIRECT	ROAD
	43	DIRECT	ROAD
	44	Not Relevant	
	45	DIRECT	TRANSMISSION LINES
	46	DIRECT	TRANSMISSION LINES
	47	Not Relevant	
	48	Not Relevant	
	49	Not Relevant	
	50	Not Relevant	
	51	Indirect	Settlement
	52	Indirect	Settlement
	53	DIRECT	ROAD & TRANSMISSION LINES
	54	DIRECT	ROAD & TRANSMISSION LINES
	86	Not Relevant	
	87	DIRECT	ROAD
	88	DIRECT	ROAD
	89	DIRECT	ROAD
	90	DIRECT	ROAD
	91	Not Relevant	
1826 A2	**Ombi River**		
	55	DIRECT	TRANSMISSION LINES

1.8.2 Cultural Heritage Impact Significance

Those sites both directly and indirectly impacted can be rated according to magnitude and sensitivity of impact. Magnitude refers to the extent that the site may be impacted in terms of area that will be damaged and changes to current access to the site. Sensitivity considers the site's uniqueness; its local/national/international significance; the community values that it carries; and its scientific importance in terms of research potential. *Table 4* combines these attributes to provide a 'Rating Significance' from which relevant mitigation proposals are established[50]. This rating is shown in *Figure 169.*

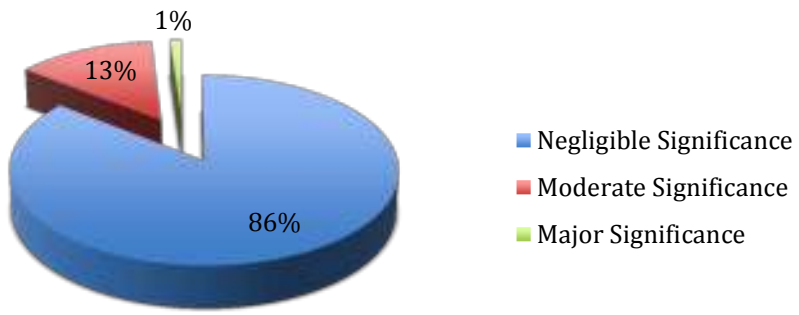
[50] The results of this procedure are similar to the system of Field Assessed Site Significance outlined earlier in Section 1.5.2

Table 0.4 Means by which to Determine Cultural Heritage Site significance[51]

			Cultural Heritage Site Sensitivity		
			Low	Medium	High
		Definitions	**Defining Characteristic(s):** Site is not specifically protected under local, national, or international laws or treaties; Site can be moved to another location or replaced by a similar site, or is of a type that is common in surrounding region; site has limited or no cultural value to local, national, or international stakeholders; and/or site has limited scientific value or similar information can be obtained at numerous sites. (Replicable Cultural Heritage)	**Defining Characteristic(s):** Site is specifically or generically protected by local or national laws but laws allow for mitigated impacts; Site can be moved or replaced, or data and artefacts recovered in consultation with stakeholders; Site has considerable cultural value for local and/or national stakeholders; and/or Site has substantial scientific value but similar information can be obtained at a limited number of other sites. (Non-replicable Cultural Heritage)	**Defining Characteristic(s):** Site is protected by local, national, and international laws or treaties; Site cannot be moved or replaced without major loss of cultural value; Legal status specifically prohibits direct impacts or encroachment on site and/or protection zone; Site has substantial value to local, national, and international stakeholders; and/or Site has exceptional scientific value and similar site types are rare or non-existant. (Critical Cultural Heritage)
Magnitude of Impact	Negligible	No discernible change in the physical condition, setting, or accessibility of the site.	Negligible	Negligible	Negligible
	Small	Small part of the site is lost or damaged, resulting in a loss of scientific or cultural value; Setting undergoes temporary or permanent change that has limited effect on the site's perceived value to stakeholders; Stakeholder/public or scientific access to site is temporarily impeded; and/or Historic building suffers minor, reparable, structural damage.	Negligible	Minor	Moderate
	Medium	A significant portion of the site is lost or damaged, resulting in a loss of scientific or cultural value; Setting undergoes permanent change that permanently diminishes the site's perceived value to stakeholders; Site becomes inaccessible for the life of the Project to stakeholders including traditional users or researchers; and/or Historic building suffers major structural damage that is not reparable.	Minor	Moderate	Major
	High	The entire site is damaged or lost, resulting in a nearly complete or complete loss of scientific or cultural value; Setting is sufficiently impact to cause site to lose nearly all or all cultural value or functionality; Site becomes permanently inaccessible to stakeholders including traditional users or researchers; and/or Historic building suffers major structural failure.	Moderate	Major	Major

[51] ERM , 2012, Annex B – 5: p. 15

Figure 0.169 Sites Recorded and Their Rated Significance



Source: RSB, 2014

The majority of the sites located are of negligible significance. They are small and in many cases disturbed. This disturbance is both natural and/or cultural and the original context of the artefacts has been lost. These sites are not directly specified under local Zimbabwean legislation and they appear to hold no social value. The sites are without additional scientific value as many similar sites exist in the area and the loss of these examples would not hinder future research - the data is replicable elsewhere outside of the Project Footprint.

Twelve (12) of the sites are of moderate significance and are worthy of further investigation. They are sites with archaeological deposit and there are indications of limited disturbance. While none appear to have current cultural significance, these sites have scientific value as they represent the full variety of sites in the Project Area. As such their excavation by an appointed Cultural Heritage expert will ensure a proper record of the Cultural Heritage of the Batoka HES footprint before likely destruction.

One site is of major significance. Chemapato Hill has been previously highlighted as one of the most significant Cultural Heritage sites in the Project Area. It is likely that it will not be destroyed but rising water will transform the hill into a peninsular. It is unlikely that the hill would become an island as the land separating the hill from the main edge of the Gorge is expected to remain above the level of intended inundation. This change in setting will lead to increased visits by non-residents and may attract boat mooring and sightseers. This new traffic has the potential to destroy the fragile remains that are found on the hilltop. Artefacts may be removed by visitors who lack an appreciation of the contextual importance of these relics, while trampling and recreational fires may do considerable damage.

1.9 *MITIGATION MEASURES AND ASSESSMENT OF IMPACT SIGNIFICANCE AFTER MITIGATION MEASURES*

No mitigation recommendations are provided for those sites outside of the Project Footprint. It is assumed that their current settings will not alter to any significant degree. Neither are mitigation recommendations made for those sites with negligible significance even though they may fall within the Project Footprint. It is assumed that NMMZ will permit the destruction of the latter without further investigation.

Of the 13 documented sites of moderate and major significance, only six lie within the actual Project Footprint and as such require mitigation[52]. Mitigation procedures include:

- Initial mapping to record what artefacts are present, their distribution, their context and to identifying any topographical associations. Sometimes this may involve controlled surface collection.

- Based on these maps the heritage specialist will select representative places to excavate, recovering the artefacts under scientific procedures. Careful field notes must be taken and the artefacts, notes and all photographs must be lodged with NMMZ following analysis. This work may include costs of dating the material and getting specialist reports.

- The analysis of all finds is necessary as the work is more than simply removing artefacts from the site. This work is often more time consuming than the actual field reconnaissance. Publication is also important so the baseline data is made available to other archaeologists.

- NMMZ will assess all finalised excavation and analysis reports and may require additional work. This will be specified in writing.

- Once work is complete NMMZ will issue a letter authorising, where this applies, destruction of the remaining portions of the site.

Site-specific mitigation proposals for the six identified sites include:

Site 12 – Chemapato Hill is the only site in the Project Area classed as having major significance. It is a site of considerable tangible and intangible value to the local community, more especially the Toka-Leya. The site and its artefacts are unique. It will be directly impacted with the flooding of the dam.

Previous investigations included both mapping of the site and recording of some of the cultural remains. This work is described in the 1998

[52] Seven other sites of 'significance' are identified in this report, but the Developer cannot be held directly responsible for their mitigation as they lie above the area to be inundated or are outside the sites of ancillary infrastructure. These are Sites 2, 4, 10, 33, 37, 38 and 41. It is possible that they will be destroyed by future developments along the new lakeshore and both EMA and NMMZ are advised to take these sites into consideration should there be any future applications by other parties to develop facilities along the edge of the future lake shore. These sites require mapping and excavation.

report. Given the perception of the studies by the local people, who suggest that heritage material was 'stolen' at the time, it is recommended that NMMZ engage directly with the local people and the traditional leadership about the future of the site. With their full approval and participation an updated site assessment should be undertaken. The hilltop must be put off bounds to visitors. Entry should only be permitted with the prior approval of the local headman. Mooring by boats should be prohibited and enforced by the appropriate authority such as the Zimbabwe Parks and Wildlife Management Agency (ZPWMA). The authorities should be informed and advised on the requirements for the site to be protected.

It is desirable that the site be granted National Monument status. This would give it added legal protection. The legal paperwork for this designation should be compiled by the Project Proponent and the Hwange Rural District Council as soon as possible.

Given the recent unlawful tree-feeling both on the island and nearby on the 'mainland', it is necessary that a resident custodian be appointed to watch over the site, preventing unwanted visitors and resource extraction. This person must live within sight of Chemapato. It is suggested that a local person be engaged through the local traditional structures. It is recommended that the Project Proponent should facilitate the process. This person must come be from one of the adjacent families. Employment is not necessarily offered, but the provision of suitable housing by the Project Proponent may attract a suitable person to take up the task.

With the commissioning of the Batoka HES it is important that the Project Proponent and ZPC become further involved at this site. This could be in the form of relevant Corporate Social Responsibility (CSR) and Inclusive Business with the host community. Already there are growing calls in Zimbabwe for all company and state enterprises to recognise the rights of local host communities, granting shares in their business and investing some of the profits locally. Developments at Chemapato Hill offer an ideal opportunity.

It is proposed that a small site museum be developed on the mainland near Chemapato Hill. This museum would cover the natural and social heritage of the area, as well as including details on the Batoka HES. It could provide the public with a good understanding of the diversity of this part of Zimbabwe, along with providing the local community somewhere where their heritage is documented with pride. It could also provide information on the Batoka HES project. Establishing the museum would require a building and the production of relevant displays, aimed at both local people as well as visitors. It may also have the potential to attract visitors from Victoria Falls.

Although falling under the future management of NMMZ, the costs of both construction and operations would have to borne by the Project

Proponent. It is recommended that a subsidy from the ZRA should cover utilities, staff wages, cleaning, maintenance to the access track, and any future refurbishment. The development of this facility requires further discussion between all interested parties – the Project Proponent, NMMZ, traditional leadership and local residents (most especially the spirit medium of this area).

Site 27 – This scatter of MSA and LSA lithics on a terrace just eastern of the Dibu Dibu River has a reasonable archaeological deposit. The mixture of cultural traits is either the result of post-depositional processes or the site could represent the Tshangula Tradition, a transitional phase which is not well understood in Zimbabwe. It requires mapping and excavation. As the purposed widening of the nearby road will directly impact this site, this work must be carried out by the Project Proponent.

Site 51 – This is a very significant site being a MSA factory site, more or less intact. It appears to belong to the Bambata Tradition. Localised erosion has exposed several individual workstations, patches of stone knapping debris. There are few such factory sites known in Zimbabwe and this deposit would provide important scientific information for the understanding of the Stone Age in the Victoria Falls and Zimbabwe as a whole. It requires mapping and extensive excavation.

It lies on the margin of one of two alternative residential settlements being considered and will only be impacted indirectly should this option be developed. If this is the case it is desirable that the Project Proponent carry out the work. If this location is not to be developed no party can be held responsible for the required mitigation costs and it is hoped that NMMZ may take the matter further. To leave it without excavation will result in the loss of a unique MSA assemblage.

Site 67 – Although this Late Farming Community site was not relocated, its importance is highlighted in the 1998 report where mapping and excavation is recommended. If this deposit is still intact, and not now cultivated as a result of the expanding fields around Kasikiri, this work would provide valuable scientific information. If it has been disturbed mapping and surface collection are still necessary. As the site will be impacted directly both by the proposed residential settlement and the intended route of the transmission lines to Hwange Power Station, it is necessary that this work be carried out by the Project Proponent.

Site 72 - The site was identified as important in the 1998 investigation, but was not relocated during the current field reconnaissance. This large concentration of MSA lithics on a basalt ridge must be investigated to provide additional scientific information about the MSA in the Victoria Falls area. It requires mapping and excavation. The full extent of the work required can only be known once the site is revisited. The issue of the antipersonnel mines remains a concern.

Lying directly in the path of the proposed transmission lines to Hwange Power Station, it is recommended that the Project Proponent carry out this work even if the pylon foundations will not disturb the actual archaeological deposits.

Site 78 - This site was identified as important in the 1998 investigation, but was not relocated. The concentration of MSA lithics on a basalt plateau should be investigated to provide additional scientific information. It requires mapping and extensive excavation. The full extent of the work can only be known once the site is revisited. The issue of the antipersonnel mines remains a concern.

The above mitigation procedures have to be approved by NMMZ. In line with the NMMZ Act, copies of this report are to be made available to the Executive Director of NMMZ who will review the contents and make an informed decision. The Project Proponent may take no further action until feedback from NMMZ as all sites, even those classed as 'negligible significance' are protected under the NMMZ Act.

In its written response NMMZ may raise additional concerns. Once agreement is reached, NMMZ will issue the relevant permits issued allowing for the destruction of the sites indicated or directing relevant mitigation. It must be stressed to the Project Proponent that NMMZ is not obliged to implement the suggestions made in this report, and that it may offer alternatives.

With receipt of NMMZ communication it is important that the mitigation procedures are implemented before construction of the dam and ancillary infrastructure commences. The Project Proponent should engage suitable heritage specialists to undertake the work. This work can be conducted either by an independent and NMMZ-approved heritage specialist, or by NMMZ employees appointed directly by the Executive Director, NMMZ. Costs associated with this work and all laboratory-based investigations are the responsibility of the Project Proponent.

1.10 CONCLUSION AND RECOMMENDATIONS

The Batoka HES project is of both national and regional importance. However, the development of the project is likely to impact negatively on some of the Cultural Heritage resources in the Project Footprint. This investigation was undertaken in order to understand these resources prior to development, allow sites of significance to be located and offer relevant mitigation procedures. The latter require NMMZ approval. The approval letter covering their recommendations is to be included in the ESIA report to be submitted to EMA.

The majority of sites located are small or disturbed. As such they have limited cultural and academic significance. It is suggested that NMMZ permit their destruction, although a written directive is required. Others lie outside of the direct Project Footprint and as such the Project Proponent cannot be held

responsible for mitigation, although they will be impacted by secondary developments that are likely to develop along the intended lakeshore. EMA and NMMZ should keep in mind this report where future project proposals are made for this area.

The six sites identified include a cross-section of the various heritage sites in the area. Their mapping and excavation will provide important baseline data for the interpretation of the human history of the Victoria Falls area. For this mitigation the Project Proponent is directly responsible. Work on three of these sites should be undertaken soon (Numbers 12, 27 and 51). The remainder, previously highlighted in the 1998 report, are subject to a field reassessment as they were not accessible (Numbers 67, 72 and 78). This fieldwork should be undertaken as soon as security concerns are adequately answered.

Only one of the many sites located has any significance to the current residents. Chemapato Hill has been associated with traditional rainmaking activities, possibly for millennia. It is desirable that this site is preserved. It is recommended that the site be treated with utmost care. The local community must be consulted. It is important to view it as a Toka-Leya site, belonging to and serving the interests of the original Tonga, although they are now minority community. The site itself must not be developed and all unauthorised access must be prevented through appointing of a legal custodian. The Project Proponent together with the local people, the Hwange Rural Distinct Council and NMMZ, must pursue this. Developing a small site museum near the site is a medium-term project. This will highlight local heritage, both cultural and natural and would be a CSR activities for the Project Proponent. It might also circumvent increasing political pressure that is being put on corporate organisations, including national parastatals, to be open to host communities and to foster local development.

Although a general picture of the Cultural Heritage of the Project Footprint is now known through the recent field reconnaissance as well as the 1993 and 1998 reports, the entire Project Footprint has not been fully investigated and assessed. For reasons of limited resources there remain a number of areas and project components that require additional survey as they may include important sites not yet recorded. Further work on these areas must form part of the necessary post-ESIA investigations. The Project Proponent must fund this and all reports compiled and submitted to both EMA and NMMZ for their approval and further direction. This additional work includes:

- A water-based reconnaissance of the entire length of the actual Batoka Gorge from the head of the intended dam (taking at the highest point according to the various alternative engineering designs) to the point of exit of water from the power plants. This work must consider all caves on the sides of the Gorge and any waterfall, rapid or pool. Chimamba Rapids and the Moemba Falls are places of particular importance.

- The major tributary gorges where these will be flooded, even only in part, must be investigated to identify caves and potentially fossiliferous travertine deposits.

- The dissected and isolated area west of Kasikiri must be surveyed. This first requires clarification on the antipersonnel landmines. This area has the potential to have many sites such as those described in this report, but the topography may allow for other cultural heritage sites.

- All points of gravel and aggregate extraction both along the roads and for the construction of the dam and all ancillary infrastructure must be subject to a ESIA. These points must be identified and a consultant engaged before any construction work starts.

- The finalised routes of the two new roads have not as yet been investigated. The point of crossing to Zambia below the intended dam wall is of concern. It will require substantial earth movement and should this be a tradition point of crossing it may have sites of Cultural Heritage as yet unrecorded.

- All auxiliary developments around the residential settlement need to be included – access roads, sewage and water facilities and waste disposal areas. Where these are outside the current proposed boundaries these additional areas must be investigated.

- The transmission lines from the power plant to Hwange must be subject to its own ESIA. This should cover not only the foundations of the required pylons, but any accompanying access road and the wider area of natural vegetation and landscape that is cleared along the route.

- Should there be any deviation of the current engineering plans or significant changes to the Project Footprint, the new areas must be investigated.

It is important to note that any Archaeologists undertaking these further studies must be registered with NMMZ.

1.11 REFERENCES

Armstrong, A.L. and Jones, N. 1936. The antiquity of man in Rhodesia as demonstrated by stone implements of the ancient Zambezi gravels, south of Victoria Falls. *Journal of Royal Anthropological Institute LXVI*: 331-368.

Bandama, F. 2013. A reappraisal of Stone Age hunter-gather research in Zimbabwe with special focus on later periods in eastern Zimbabwe. In M. Manyanga and S. Katamudanga (eds), *Zimbabwean Archaeology in the Post-Independence Era*. Harare: Sapes Books. pp. 17-35.

Bond, G. 1973. *The Palaeontology of Rhodesia*. Salisbury: Government Printer (Rhodesia Geological Survey Bulletin No. 20.

Bond, G. and Clark, J.D. 1954. The Quaternary Sequence in the Middle Zambezi Valley. *South African Archaeological Bulletin IX (36):* 115-130.

Brooks, A.S. and Yellen, J.E. 1987. The preservation of activity areas in the archaeological record: ethnoarchaeological and archaeological work in north-west Ngamiland, Botswana. In S. Kent (ed.), *Method and theory for activity area research*. New York: Columbia University Press. pp. 63-106.

Burrett, R.S. 1998. Shadows of our Ancestors: some preliminary notes on the archaeology of Zimbabwe. Harare: Prehistory Society of Zimbabwe.

ERM. 2012. *The ERM Impact Assessment Standard v1.0*. Annex B – 5 Cultural Heritage.

Clark, J.D. 1950. *The Stone Age Cultures of Northern Rhodesia*. Claremont: The South African Archaeological Society.

Clark, J.D. 1952. Prehistoric Man at the Falls. In Clark, J.D. (ed.), *The Victoria Falls Illustrated: a handbook to the Victoria Falls, the Batoka Gorge and part of the Upper Zambezi Valley*. Livingstone: Commission for the Preservation of Natural and Historical Monuments and Relics: Northern Rhodesia. pp. 57-66.

Clark, J.D. 1955. *Third Pan-African Congress on Prehistory. Excursion Handbook Northern Rhodesia*. Lusaka: Government Printer.

Clark, J.D. 1975. Stone Age man at Victoria Falls. In D.W. Phillipson (ed.), *Mosi-oa-Tunya: a Handbook to the Victoria Falls Region*. Salisbury: Longman Rhodesia. pp. 28-47.

Denbow, J. 1979. Cenchrus ciliaris: an ecological indicator of Iron Age Middens using aerial photography in eastern Botswana. *South African Journal of Science 76: 405-8.*

Du Toit, R.F. 1982. *A preliminary assessment of the Environmental Implications of the proposed Mupata and Batoka Hydro-Electric Schemes (Zambezi River, Zimbabwe)*. Harare: Natural Resources Board.

Fagan, B.M., Phillipson, D.W., and Daniels, S.G.H. 1969. *Iron Age Cultures in Zambia (Dambwa, Ingombe Ilede and the Tonga) Vol. 2*. London: Chatto and Windus (National Museum of Zambia Robins Series No. 6).

Huffman, T.N. 1989. *Iron Age Migrations: the ceramic sequence in southern Zambia.* Johannesburg: Witwatersrand University Press.

IUNC 1992. *Workshop Report, The Batoka Gorge Hydropower Scheme*. Scanned copy supplied by ZRA.

Mitchell, P. 2002. *The Archaeology of Southern Africa*. Cambridge: Cambridge University Press.

Moore, A. 2013. *The Geology of the Victoria Falls Area*. Geological Society of Zimbabwe Annual Summer Symposium, Victoria Falls. (Field excursion Guidebook).

Moore, A. and Cotterill, F. 2010. Victoria Falls: Mosi-oa-Tunya - The Smoke that Thunders. In P. Migoñ, P, *Geomorphological Landscapes of the World*. Springer. pp. 143-153.

Mubitana, K. 1975. The traditional history and ethnography. In D.W. Phillipson (ed.) *Mosi-oa-Tunya: a Handbook to the Victoria Falls Region.* Salisbury: Longman Rhodesia. pp. 59-72.

National Museums and Monuments of Zimbabwe. 1998. *Archaeological Impact Assessments: Guidelines for Planning Authorities and Developers*. Harare: NMMZ.

Ncube, G.T. 2004. *A History of Northwestern Zimbabwe 1850-1960.* Kadoma: Mond Books.

Roberts, R.S. 2009. *Journeys Beyond Gubulawayo*. Harare: Weaver Press.

Phillipson, D.W. 1975. *The Iron Age in Zambia.* Lusaka: National Educational Company of Zambia (The Historical Association of Zambia, Booklet 5).

Pwiti, G. 1996. Settlement and subsistence of prehistoric farming communities in the mid-Zambezi Valley, northern Zimbabwe. *The South African Archaeological Bulletin 51 (163):* 3-6.

Tabler, E.C. *Zambezia and Matabeleland in the Seventies*. London: Chatto and Windus. (Livingstone Museum Robins Series No. 1).

Varian, H.F. 1953. *Some African Milestones*. Oxford: George Ronald.

Vogel, J. 1971a. *Kamangoza: an introduction to the Iron Age Cultures of the Victoria Falls region*. Lusaka: Oxford University Press (Zambian Museum Papers 2).

Vogel, J. 1971b. Kumagzulo: an early Iron Age village site in Southern Zambia (Zambian Museum Papers 3).

Vogel, J. 1975a. *Simbusenga: the archaeology of the Intermediate Period of the Southern Zambian Iron Age*. Lusaka: Oxford University Press (Zambian Museum Papers 4).

Vogel, J. 1975b. The Iron Age archaeology. In D.W. Phillipson (ed.) *Mosi-oa-Tunya: a Handbook to the Victoria Falls Region.* Salisbury: Longman Rhodesia. pp. 48-59.

Walton, J. 1929. The fossil flora of the Karroo System in Wankie District, Southern Rhodesia. In B. Lightfoot, *The Geology of the Central Part of the Wankie Coalfield*. Salisbury: The Rhodesia Printing and Publishing Company (*Southern Rhodesia Geological Survey Bulletin No. 15*).

Walker, N. and Thorp, C. 1997. Stone Age archaeology in Zimbabwe. In Pwiti, G. (ed.) *Caves, Monuments and Texts*. Uppsala: Societas Archaeologica Upsaliensis. (Studies in Archaeology 14). pp. 9-32.

ZRA, 1993. Batoka Gorge Hydro Electric Scheme Feasibility Study. Final report, September 1993. Scanned copy supplied by ZRA.

ZRA, 1998. Batoka Gorge Hydro Electric Scheme Feasibility Study. Scanned copy supplied by ZRA.

1.12 *Appendix 1 - Points of Possible Cultural Heritage Interest along the Proposed Transmission Lines as Identified on Google Earth*

The following list relates to the map in *Figure 21*. They are points of concern noted on Google Earth along the proposed path of the Transmission Lines from the Batoka HES to Hwange Power Station. For further discussion see Section 1.6.3 and Section 1.6.4.

1.12.1 *Main Proposed Transmission Line (Purple)*

- M01 - Rough ground. This area is unlikely to have much in the way of Cultural Heritage. It has low natural 'carrying capacity' that would not have attracted past human behaviour.
- M02 - Kasikiri Village consisting of houses and fields. Development here will result in major resettlement issues while there is also the persistent problem of landmines. Several archaeological sites were recorded in this area in the 1998 reconnaissance but most small and disturbed. Some however are cited as worthy of mitigation.
- M03 - East of Kasikiri Village. The open area east of the hill at headwaters of NE flowing stream has great potential for Cultural Heritage remains. It needs further investigation.
- M04 – OF MAJOR CONCERN. Established settlement with school, church and shops. The open and 'undeveloped' area on the south side of road should not be treated as empty space. It may include a cemetery. It is best to avoid this area.
- M05 - Densely populated areas exist along the Lukunguni and Jambezi Rivers. The associated rich alluvial soils will have attracted people in the past as they do now. This area of 'dambo' is similar to the site locations of the major Early Farming Community villages which are an important feature of Zambian heritage studies. No sites are currently known in this area but recent investigations showed the possibility. The finding of these isolated sites reiterates the need to investigate the entire route of the transmission lines when the Project engineers have finalised their choice.
- M05 - Undeveloped patch of Kalahari Sand Forest. This indigenous copse is particularly dense. That it has been left undisturbed, uncultivated and used for timber, suggests that it has some social purpose eg graves or ritual activity. Best avoided.
- M06 - Jambezi Business Centre. This is a major regional centre with shops, schools and administrative offices. As it has been long established there will be an associated cemetery nearby, possibly to the SE of the settlement where there is a three-sided rectangle of trees
- M07 - Dissected area along stream. This location is likely to have many sites of archaeological interest. It needs further investigation.
- M08 - Former exposure of Kalahari Sand Forest but now cleared. It is unlikely to have major Cultural Heritage sites, although recent fieldwork found many small, early Tonga village' sites often associated with scattered baobabs of same age. It needs further investigation.
- M09 - Established school and should be avoided.
- M10 - Broken country as a result of tilted basalt layers. Likely to have limited archaeology, although all flat ridges and the margins of all the

streams should be subject to further investigation. This area is currently set aside for CAMPFIRE hunting. This community-based initiative will be undermined once roads are cut into this area and people follow as settlers. This could be a serious social challenge.

- M10a - Natural pan that may be associated with sites. It needs further investigation.
- M10b - Open area, possibly a former occupation site. It needs further investigation.
- M11 – This could be a site of major importance. It is associated with a perennial pool in the Matetsi River adjacent cliff face. The availability of surface water would have attracted prehistoric settlement and Cultural Heritage sites should exist nearby. Such locations are also often important spiritual sites for local and regional peoples where they conduct various activities including rainmaking, cleansing and the veneration of the ancestors. There are a number of spiritually important Nambya sites in Hwange District, although it is not known if this is one of them.
- M11a - Possible archaeological village site. It needs further investigation.
- M11b - Possible archaeological village site. It needs further investigation.
- M12 - As with Point M11. Note the access track that leads to this site. This could give access for spiritual devotees, but it may also be associated with hunting and the CAMPFIRE scheme. It needs further investigation.
- M13 - As with M11. The minor waterfall and pool in rock may be of spiritual importance to the Nambya and or Tonga residents. It needs further investigation.
- M14 – Open area that may be an archaeological site. It needs further investigation.
- M15 - Appears to be natural spring. It may have social importance. It needs further investigation.
- M16 -Localised patch of current occupation taking advantage of local resources. This area may also have attracted human residence in the past. It needs to be investigated. There will also be serious issues of resettlement and compensation should it be developed.
- M17 – Local school that should be avoided.
- M18 - As with M16 the open areas around this point may include archaeological evidence. This area requires extensive investigation on the ground.
- M19 - Scattered homesteads in this area. This suggests presence of water and cultivatable soils. These may also have attracted interest in the past. Area needs further investigation.
- M20 - Numerous open areas that may represent former occupation sites. However there is the possibility of these being of geomorphological origin, sodic soils or the presence of shallow bedrock. The area requires investigation all along the river and adjacent hills.
- M20a - Possible archaeological site on hilltop. It needs further investigation.
- M20b - Possible archaeological site on hilltop. It needs further investigation.
- M21 - Open areas of basalt forming localised plateaux near the rivers. These flat-topped hills may have evidence of past habitation. These features require investigation.

- M21a - Large plateau with sparse vegetation. There is ample space for habitation and it may have site of Cultural Heritage. It requires further investigation.
- M21b - Large plateau, sparse vegetation and with ample space for habitation. Requires investigation
- M22 - Natural pool in stream with thick riparian fringe. This site will have attracted past human habitation while the remaining presence of the vegetation suggests that it is somehow protected from timber extraction. Possibly this is a site of social significance to local community. It needs further investigation.
- M23 - Area of broken relief near the Deka River. Such sites with access to surface water would have attracted human habitation in the past. The area needs further investigation.
- M23a - Possible archaeological site at base of prominent conical hill. It needs further investigation.
- M23b - Possible archaeological site. It needs further investigation.
- M23c - Possible archaeological site. It needs further investigation.
- M23d - Possible archaeological site. It needs further investigation.
- M24 - Wankie Colliery borehole and water station. This needs to be avoided.
- Black Line – This is the approximate junction of the Basalt rock to NW of the line and the Karroo Sediments to the SE. In the basalt layers there may exists small, localised lenses of sandstone which elsewhere have been found to have fossils. More important is the fact that SE of this line in the Karroo sediments there is a VERY good chance of fossils. These areas require further investigation by palaeontologist.
- M25 – Approximate site of known plant fossils in the Karroo Sediments. Very likely to have plant fossils. It needs further investigation.
- M26 - Wastewater ponds and other contaminated waterways coming from the Wankie Colliery and the ZPC Hwange Power Station. This area is marshy and badly polluted. Avoid if possible.
- M27 - Thompson Junction. This is a MAJOR railway junction, siding and station. It must be avoided as it is a major infrastructural node and there are presently plans afoot by National Railways of Zimbabwe to upgrade these facilities in partnership with others.
- M28 - Wankie Colliery, Colliery Number 2 and related infrastructure. Avoid.
- M29 – Somewhere in this area and not visible on the Google Erath image is the new Hwange Cemetery. This must be avoided.
- M30 – There is a need to engage with Hwange Power Station as to actual plans near the town. There are proposals to relocate the current residential areas associated with the plant, its wastewater treatment plant, ash dams, etc. This landscape may alter significantly in the next few years during the upgrade of the Power Station that is due to start fairly soon. Do not assume that this will remain the same as shown.
- M31 - Old Hwange Cemetery. This is still in use as there are scattered open plots. There are several locally important people buried in the cemetery and it cannot be relocated.

1.12.2 Alternative Transmission Line (red)

- A1 - This alternative was provided at the request of the ZPC who wanted it along an existing road and transmission line. However the Google Erath image does not appear to follow any existing route southward. The former road to the Bingwa Loop Road is to the west of the area shown. It is important to check with the ZPC that the correct area is being assessed as it may in fact be elsewhere and thus has not been investigated.
- A2 – As with M11 this could be a site of major importance. It is associated with a perennial pool in the Matetsi River adjacent cliff face. The availability of surface water would have attracted prehistoric settlement and Cultural Heritage sites should exist nearby. Such locations are also often important spiritual sites for local and regional peoples where they conduct various activities including rainmaking, cleansing and the veneration of the ancestors. There are a number of spiritually important Nambya sites in Hwange District, although it is not known if this is one of them.
- A2a - Possible archaeological site. It needs further investigation.
- A2b - Possible archaeological site. It needs further investigation.
- A2c - Possible archaeological site adjacent to well established riparian fringe. It needs further investigation.
- A4a - Possible archaeological site. It needs further investigation.
- A4b - Possible archaeological site. It needs further investigation.
- A5 - Local spring in open country. This site may be associated with Cultural Heritage remains or local traditional values. It needs further investigation.
- A6 – The Bingwa River is an important water source with a fertile strip of alluvial soil. It is likely that this location will have Cultural Heritage sites, both archaeological and current traditional ones. It needs further investigation.
- A6a - Possible archaeological site. It needs further investigation.
- A6b - Possible archaeological site. It needs further investigation.
- A6c - Possible archaeological site. It needs further investigation.
- A6d - Possible archaeological site. It needs further investigation.
- A7 - Minor rapids and pool on the Bingwa River. These may be of Cultural Heritage significance. It needs further investigation.
- A8 – At this point the Bingwa River is very degraded. This may indicate an area of rich alluvial soil. This would have attracted past human habitation and the area must be investigated.
- A8a - Possible archaeological or historical site. The latter could be old cattle byre/kraal when this was a commercial farm. It needs further investigation.
- A8b - Possible archaeological or historical site. The latter could be old cattle byre/kraal when this was a commercial farm. It needs further investigation.
- A9 - Area shows extensive evidence of past habitation/disturbance. This site may have been the old commercial farmstead of 'Railway Farm 51'. It needs further investigation.

- A10 - Area of several open plateaux that may have traces of past human habitation. Surface water is present in the stream that flows along side the Bingwa Loop Road and this would have been significant in attracting people to this area. It is also a major natural pass, something that is also often associated with human habitation or use. Sites of Cultural heritage are very likely. The whole area needs further investigation.
- A10a - Possible Cultural Heritage site. It needs further investigation.
- A10b - Possible Cultural Heritage site. It needs further investigation.
- A10c - Possible Cultural Heritage site. It needs further investigation.
- A10d - Possible Cultural Heritage site. It needs further investigation.
- A11 - Former homestead of commercial farm. The residential buildings and associated infrastructure may now be resettled with new functions such as schools and shops. The local residents should be consulted.
- A11a - Old farm dam. This may be important to the new residents on this resettled farm. They must be consulted.
- A11b – Open area, probably associated with cultivation or livestock on the former commercial farm. Now resettled and it is important to engage with the new farmers to avoid conflict.
- A12 – This area is becoming increasingly resettled with new homes, cultivated fields and community infrastructure. It should not be assumed that it is still open. The interests of the new residents must be taken into consideration.
- A13 – Area of major coal works. Avoid.
- A14 - This area is becoming increasingly resettled with new homes, cultivated fields and community infrastructure. It should not be assumed that it is still open. The interests of the new residents must be taken into consideration.
- A15 - Existing 88kV line.

Appendix A

Addendum for the Proposed Quarry Site associated with the BGHES

ARCHAELOGICAL / CULTURAL HERITAGE IMPACT ASSESSMENT ADDENDUM FOR THE PROPOSED QUARRY SITE ASSOCIATED WITH THE BATOKA GORGE HYDRO ELECTRICITY SCHEME –ZIMBABWE

Rob S. Burrett[1]

1. *Introduction*

A Cultural Heritage Assessment of the Batoka Gorge Hydro-electric Scheme (HES) was carried out on the Zimbabwean side of the intended project in August 2014. The 2014 report updated two earlier heritage assessments of the Batoka Project [1993 & 1998], as well as investigating additional areas identified in the current project footprint. The resultant tangible heritage report described the sites located in all three investigations and provided relevant mitigation procedures in line with the standards of National Museums and Monuments of Zimbabwe [NMMZ] and the International Finance Corporation [IFC] Performance Standard 8. This report was subsequently approved by NMMZ.

The 2014 investigation concluded that most of the sites in the project footprint were ephemeral or disturbed. As such they were of limited social and academic significance. The vast majority of these sites lie further to the south and to the west of the broken country where the Batoka HES will be constructed. In the area of the intended dam wall [the wall itself and associated powerhouse, spillway, and access roads] nothing of heritage significance was located.

Only one confirmed site was identified in 2014, however, this is modern and of no heritage significance. '*The only site located was a recent historical one dating from the 1993 engineering survey. The cement beacon, together with nearby debris from a Landrover is of no further significance* [Burrett 2014: 41]'. A single "Later Stone Age flake" was reported to have been located in 1993 during the heritage investigation of the already constructed gravel airstrip. This is of little

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significance; it may not even be of human origin[2]. Unconfirmed community reports of an "old village" on the plateau overlooking the Chimamba Rapids and Moemba Falls [that section of the Zambezi River upstream of the proposed dam] have still to be verified. It is more likely, if at all this is true, that the settlement remains lie further to the west on the large plateau overlooking the Zambezi where the falls are visible[3] - these features of the river channel have sacred associations for the local Toka-Leya people.

The area of the intended quarry is rough, inaccessible country. The underlying basalt is deeply dissected, and the countryside comprises of steep sided valleys and razor-backed ridges and dry plateaux. It is an area completely unsuited to agriculture, is of low biomass productivity, and has a severely limited ecological carrying-capacity (Figure 1). As such this area is unlikely to have attracted past human habitation, hence there is little chance of finding cultural heritage remains.

Figure 1: Basalt hilltops near Batoka Gorge Dam site

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[2] This item was not documented, nor does it appear to have been collected as there is nothing of this nature in the collections held by NMMZ. However the consultant has seen many natural flakes produced by grading activities in the quarries and roadsides in this area - the chalcedony inclusions in the basalt are easily fractured and the pieces may be mistaken as human fashioned artefacts by those with a less critical eye.

[3] The 1993 report cites local community representatives mentioning this heritage site but it was not visited. Time and funds again precluded investigation.

Historically the area was not occupied. Instead settlement was limited to adjacent areas where there are more suitable open river valleys or more easily cultivated margins of the Kalahari palaeo-dunes. We have also been advised that during the Rhodesian Civil War of the 1970s, ZPRA [Zimbabwe Peoples' Revolutionary Army] fighters did indeed cross the Zambezi River at this point from Zambia, but they quickly moved south so as to avoid detection by South African and later Rhodesian forces. When the belt of anti-personnel landmines was laid parallel to the border, north of Kasikiri village, this transit route was subsequently dropped [D. Dabengwa 2015, *pers comm*.]. It is unlikely that there will be remains from that era.

2. *Current Project*

This addendum covers the south bank quarry area, which is required to provide aggregate for the construction of the Batoka Dam (Figure 2). The coordinates for the central point of the proposed quarry site is 17º 56' 14.46" S & 26º 06' 48.07" E. This is in line with recommendations made in the original heritage assessment report: "*All points of gravel and aggregate extraction both along the roads and for the construction of the dam and all ancillary infrastructure must be subject to a ESIA. These points must be identified and a consultant engaged before any construction work starts* [Burrett 2014: 160]". The location of this quarry has since been finalised by the project engineers, hence the need for this report.

The area was initially reviewed using Google Earth Pro, informed by the consultant's previous experience of the area. The latter includes the original field inspection undertaken for the 2014 heritage assessment, and two further visits made since that time. These personal visits were undertaken in an effort to find an easier way to get to the Chimamba Rapids and Moemba Falls by going overland rather than by water [a long-distance and difficult raft excursion from Victoria Falls]. These geological features in the course of the Zambezi River are now thought to be in someway associated with the process of river capture of the Upper Zambezi and with the origin of the Victoria Falls. This work was undertaken as an independent academic investigation, but which traversed the area in question[4].

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[4] *In addition to the August 2014 impact assessment, the consultant has traversed this area in September 2017 and August 2018.*

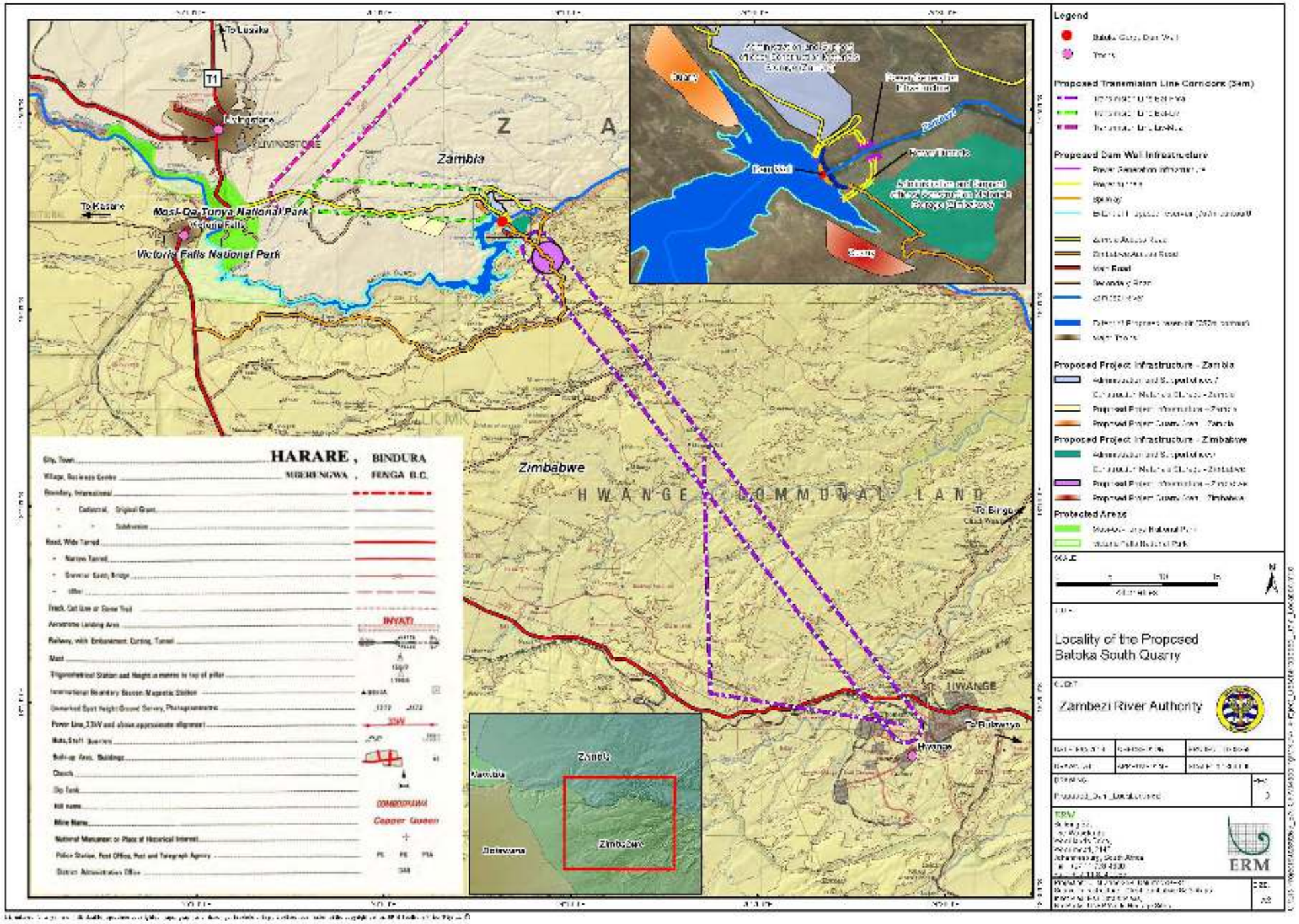

Figure 2: Locality of the Proposed Batoka South Quarry

It was planned to undertake an additional site-specific visit to the quarry site in early January 2019, however political turbulence in Zimbabwe at the time meant that it was not possible to conduct this study. However, it is our view that the area has been sufficiently covered by the previous ESIA survey and our own independent visits so as to inform this study. The findings of the 2019 heritage study of the equivalent north bank [Zambian] quarry site are also relevant. This Zimbabwean consultant inadvertently traversed the Zambian quarry area in August 2018 while seeking a north bank access route to the Zambezi River. It is identical to the Zimbabwean quarry site as far as geology and topography, and the heritage footprint is likely to be the same, there being nothing present.

3. Chance Finds Procedures

While the developer may work to avoid adverse impacts on known cultural and fossil heritage, there is always the chance that material, hitherto unexpected, may be uncovered during excavation, construction and operation. This is because it was buried and without surface indication. Very often these occurrences are human burials, although other sites may also be fully covered in the soil profile. However, given the shallow soils in this area this situation seems very unlikely.

Although there is no provision for "Chance Finds Procedures" in the NMMZ Act, its importance is stressed in the IFC Standard 8 [Clause 8]. This requires clear statements as to what to do in those circumstances were heritage remains are unexpectedly uncovered.

The following recommendations should be made clear to all contractors and subcontractors engaged in working in the quarry area:

- In the case of inadvertedly exposing or impacting on heritage resources all on-site work should be stopped. IFC Standard 8 [Clause 8] stresses the point that '*The client will not disturb any chance find further until an assessment by competent professionals is made and actions consistent with the requirements of this Performance Standard are identified*';

- There should be immediate notification of NMMZ as to the discovery of heritage remains [and the police in the case of all human skeletal remains];

- Where possible an employee of NMMZ will then come to the project area to make further suggestions as to the proper way forward. This usually involves excavation and the removal of the heritage remains before allowing development to proceed. The use of police and local residents in excavation and recovery alone is inconsistent with proper heritage mitigation procedures and the NMMZ Act. These interested third parties should be engaged with and should be present during excavations, but with NMMZ directing the process;

- The developer will be required to pay all costs incurred by NMMZ, and may be also to the other parties as mentioned above.

4. *Conclusion*

On the basis of what is known I believe that it is unlikely that there are any cultural heritage resources present in the Zimbabwean quarry area. If there is anything, these traces are likely to ephemeral, probably disturbed and of little further significance. We therefore recommend that the proposed project can continue without further pre-construction mitigation measures.

Rob Burrett
Black Crystal Consulting PL
Bulawayo
29th January 2019

Fig. 3. General view of area of intended Zimbabwean Quarry. RSB August 2014

Fig. 4. Location of Proposed Quarry Sites in relation to the Batoka Gorge Project

Annex M

Cultural Heritage Report
Zambia

THE BATOKA DAM ARCHAEOLOGICAL AND INTANGIBLE HERITAGE REPORT-FEBRUARY 2015

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EXECUTIVE SUMMARY

This desk-based and mini reconnaissance assessment of Archaeological and Intangible Cultural Heritage in Zambia likely to be affected by the Batoka Dam proposals was carried out from 14th February to 19th 2015. The objective of this exercise was to update the 1998 Heritage Assessments in accordance with guidelines from the Zambia Environmental Management Agency (ZEMA) EIA Regulations, and the Zambian National Heritage Conservation Commission Act CAP 173 . This assessment also provided new information by investigating additional areas identified as part of the proposed development footprint that were not surveyed in the earlier study.

A total of 61 Archaeological and Traditional (sacred/ritual) sites are recorded in this report. Of these 25 sites were recorded in the previous research, while 36 new ones were located and recorded during the current field reconnaissance. Relevant mitigation measures have been proposed for those sites considered important to the history of the people that hail from this part of Zambia.

This report therefore identifies and describes sites of archaeological, historical and anthropological nature in the study area. It also outlines the potential impacts of the proposed development on these heritage resources. It further highlights possible mitigation measures for the negative impacts. Some recommendations have also been proffered to the developer to enhance the project's heritage sustainability.

This historical and archaeological review has revealed that the sacred or ritual sites in the area are intact and still in use by the local Leya people of Chief Mukuni for either rituals or traditional ceremonies. As such, these sites still have a lot of social and academic significance on the Zambian side of the Zambezi River. Full scale reconnaissance and mapping for the project area is suggested in order to have a complete understanding of the Cultural Heritage of the project area and its surrounding environs.

The report also showed that only two sacred sites (one burial and the other Ritual) lie within the proposed route for the power transmission lines betwee Munwana and Chibule Villages. The report further verified that Chemapato Hill has not been used by the Leya of Chief Mukuni for any rituals or rain-making supplications. The most propable explanation for its existence could be that it was used by early Tonga groups that initially settled in this part of the Zambezi Valley before the arrival of the Leya speaking people of chief Mukuni.

Introduction

1.1 Background of the Project

The Zambezi River Authority (ZRA) is considering developing the proposed Batoka Gorge Hydro-Electric Scheme (HES) on the Zambezi River. This bilateral project between Zambia and Zimbabwe includes the construction of a concrete gravity arch dam that will provide up to 800 MW of electrical power each for Zambia and Zimbabwe with a total capacity of 1600 MW. The proposed Scheme is located approximately 50km downstream of the Victoria Falls within southern Province. A total of five (5) districts namely ; Livingstone, Kazungula, Zimba (newly created), Kalomo and Choma will be affected by the power transmission lines.

The following are the key components of the proposed Batoka HES Project:

- A 181m high dam wall and water impoundment upstream toward Victoria Falls World Heritage Site. The maximum height of the reservoir is tentatively set at 757m above mean sea level at which stage the reservoir surface area will cover approximately 25.6 km^2.
- Powerhouses shall be constructed on each riverbank below the proposed dam wall.
- Power Transmission lines to Livingstone and Choma,
- Access roads to the HEP project area and,
- New permanent residential areas and construction camps

2.0 Methodology

The preparation of this archaeological and intangible heritage report comprised three components namely ; desktop review, mini field/reconnaissance survey and oral interviews with the chief's Indunas (advisors). The project baseline determination consisted of an initial desktop review of earlier cultural heritage assessments as well as literature review. This was followed by a six-day field visit to the Batoka HES Project area on the Zambia side. A subsequent desktop review and consultation with Chief Mukuni and his Indunas/headmen over the proposed route for power transmission lines was undertaken. As for the proposed transmission power lines to Choma, the actual alignment is not yet known. However, if these lines will follow the existing transmission lines, then very little work will need to be done. At the moment there are no known archaeological or traditional sites along the existing route of transmission line. The oral interviews proved to be

particularly useful in getting information about the locations and significance of the many sacred and ritual sites within the project area, given that very little is written about them.

The mini field survey was undertaken for six days during the month of February 2015. This method was utilised to identify (on the ground) and describe archaeological and traditional sites in the proposed project area that could have been missed by the 1998 survey. A number of field transects along the lip of the gorge, using purposeful sampling method were made in the area. Using this method, a number of known sites of heritage interest in the project and adjacent areas were assessed. All the identified sites in the area were recorded and referenced using a hand-held Global Positioning System (GPS). Digital photographs of all identified archaeological sites in the area were taken to help with analysis of the same.

3.0 Study Limitations

There were a number of limitations that affected the output of this report as outlined below;

3.1 Inadequate Baseline information of sacred sites

The project area has had very little published research on traditional sites as these are kept as a secret by the elders of the communities. This scenario hampers the location of such sites on topographic map

3.2 Field work limitations

This report is informed by a reconnaissance Survey of those areas which current design suggest will be directly impacted by the proposals. In combination with the evidence from the 1993 and 1998 surveys this is sufficient to identify the key cultural constraints in the area. However, once designs for settlement areas and access road alignments are finalised, it is recommended that further intensive, systematic survey is undertaken.

4.0 General Desktop Review of Project Study Area

This activity mainly involved desktop study and review of available background information about the project area, including the review of relevant pieces of legislation. Documents reviewed included the generalised plan of the project area, survey maps, and records of the archaeological survey conducted in 1998. Some of these records are housed at Kariba House-ZRA Headquarters in Lusaka, while others were found in Livingstone. A further review was conducted on the other archaeological records held by NHCC at its Documentation Center in Livingstone.

A number of sources were consulted as part of the desk-based assessment and prominent among the were :-

- The 1998 ESIA Report
- The 1995 and 1996 SEA report by IUCN
- The archaeological register kept by the National Heritage Conservation Commission
- The 1993 ESIA Report

Other sources are listed in the bibliography

5.0 Legal and Planning Framework

The overall policy on environmental management in Zambia is largely based on the 1982 National Conservation Strategy Report and the 1992 National Environment Plan (NEAP). The National Conservation Strategy (NCS) was adopted as a Policy document by the government in 1985 and this led to the enactments of environmental legislation such as the Environmental Protection and Pollution Control Act (EPPCA) number 12 of 1990 and the establishment of a number of institutions. In 2009 the government launched the National Policy on Environment (NPE) which outlines the the environment and natural resources management policies needed to to address current and future threats to the environment, and provides Policy guidelines for sustainable develpment.

5.1 The National Heritage Conservation Commission Act (CAP 173 of 1989)

The Act provides for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, prehistoric, archaeological or scientific value by preservation, restoration, rehabilitation, reconstruction, adaptive use and good management. Sections 35 and 36 of this Act requires a developer to state the nature and extent of the development and to report to the Commission any new discoveries of items of archaeological or historical nature. This requirement applies to both the pre and post construction stage, particularly for archaeological resources which might not have been established at the time of the study.

5.2 The Environmental Management Act, No. 12 of 2011

This Act and its subsidiary regulations require Environmental Impact Studies for projects. Section 29 of this Act, Part 1, read together with Statutory Instrument No. 28 of the EIA

Regulations of the EPPCA of 1990 provides the framework for conducting and reviewing Environmental Impact Assessments.

6.0 Topography and Geology

The Victoria Falls and their immediate surrounding environs manifest elements of the exposed basaltic rock that underlie them. Basalt, the most common variety of the volcanic rock, is composed almost entirely of dark, fine-grained silicate minerals. The underlying Karroo Series Basalt dates to about 180 million years ago. It results from a repeated series of lava extrusions. Between these eruptions there were periods of sedimentation and it is in these lenses of sandstone that fossil remains may occur. Although not known locally, such remains have been found nearby in Lake Kariba Basin where the same geological sequence occurs. The potential for finding these paleontological sites has been raised in previous investigations, but as yet nothing has been found (Chikumbi, 1995).

The basalt forms both sides of the Batoka Gorge as well as constituting the dominant land surface of the Project Area. Generally soils are shallow or have been stripped bare by geomorphological surface processes – surface wash, soil and talus creep and fluvial incision. Away from the deeply incised Batoka Gorge, harder layers of basalt form ridges or plateaux. Where the rock is softer or brecciate, the basalt has decayed to form plains of deep deposits of granular rubble or finer dark soils. The process of seasonal alternate wetting and drying causes these soils to have a distinctive self-churning character.

In general, the geology of the Batoka Gorge is marked by a blanket of Kalahari Sand. The Kalahari Sands formation is comparatively recent in origin and overlies the basalt in many places. It is a relic of an extensive palaeo-lake and palaeo-dune system that was once a feature of this part of the world. The Kalahari sand is underlain by the Karoo beds including sandstones, chalcedony, gravels and clays (Fanshawe, 2010).
The Kalahari sands are the weathered product of the weak upper Karoo sandstone. These sands can be divided into whitish to golden coarse-grained sands of very low fertility, and the transitional grey or brown finer sands.

7.0 Archaeological and Historical Baseline

Based on the 1998 survey, IUCN Reports (1995, 1996) and other archaeological records held by the National Heritage Conservation Commission (NHCC) and Livingstone Museum revealed that most of archaeological work in the Victoria Falls area has been conducted on the Zambian side of the Zambezi River out of the Livingstone Museum and the National

Monuments Commission (now NHCC). In Zambia five archaeological areas have been identified and recorded. Hence, the Victoria Falls area and Livingstone in general are well known in terms of their archaeological and historical heritage. As such the archaeological sensitivity of the Zambian side is greater than its neighbours. The following is a brief summary of the known archaeological history on the Zambian side of the Zambezi valley.

7.1 The Stone Age

Stone Age Archaeology is well represented in the Zambezi Valley especially on both the Zambia side of the river. This is a result of intensive studies carried out in and around the Victoria Falls area and Livingstone in general. These studies have revealed a rich and long antiquity of human settlement in the Zambezi Valley. The earliest evidence in the area is found in the older gravels in the rocks of the Kalahari sands (Clark, 1995). The chalcedony, quartzite and Sandstone provided early man in the Falls area with raw materials for the manufacture of his implements. However, most glazed and patinated flakes, cores and retouched stone tools are more pronounced on the Zambian side.

To this effect, the Zambezi valley was one of the first places in Central Africa where stone tools were identified in the opening years of the Twentieth Century.

7.2 The Early Stone Age (Lower-Middle Pleistocene)

Archaeological evidence has shown that the earliest forms of humans to appear in Zambia belong to the genus Australopithecus. Though there are yet no fossil bone remains of these hominids in Zambia, a large assemblages of the Oldowan stone tools associated with the early hominid groups have been recovered at sites within the area of Victoria Falls and greater Livingstone. The Oldowan industry in the lower pleistocene is characterised by choppers and other heavy duty tools (crushers) made from flakes of various stone materials. These forms of earliest tools are dated to between 1.7 to 1.4 million years before present (BP). These simple, facetted cobblestones are found in secondary contexts in the older alluvial gravels of the Zambezi River (Katanekwa, 1981).

7.2 The Middle Stone Age (Upper Pleistocene)

As the Oldowan industry was gradually replaced by the Acheulian industry, so came the specialised manufacture and use of large and well-made tools. Early humans of this cultural epoch had began to attain appreciable level of standardisation in tool making that can be discerned from the Pear-shaped handaxes and straight-edged cleavers. These diagnostic

tool forms date between 1.4 million to 300,000 years ago. These tools have been found both in secondary contexts in the alluvial gravels where they occur as isolated tools, as well as in localised concentrations of several hundred. A particularly important Acheulean site was excavated as a tourist display near Songwe Point Lodge in Zambia.

The Bembezi or Sangoan Tradition (300,000 to 200,000 years BP) represents a later refinement of the lithic tools to smaller, pointed handaxes with the adoption of a more skilled flaking technique. These tools and those of the following Middle Stone Age (dating to between 200,000 to 35,000 years BP) are common throughout the region. The earliest tools in the Charama Tradition are chunky and irregular, but they become more refined with time. There are several temporal and regional variations in the Middle Stone Age with the Bambata Tradition the most common in the Victoria Falls area.

It appears that these early hunter-gatherer communities favoured this part of the Zambezi Valley. Their use of the characteristic Levallois flaking technique, large pyramidal cores, flakes with multi-facetted striking platforms and several standard formal tool forms makes for easy identification of these lithic assemblages. Triangular points, large rectangular blades and chunky scrapers are diagnostic tool forms. These groups are likely to have consisted of roaming bands that followed the larger plains game during their seasonal migrations, hunting being their principle economic sustenance.

7.3 The Late Stone Age (Lower-Middle Holocene)

About 40,000 years ago a new microlithic tradition emerged. These assemblages date from 35,000 to recent historic times, although most predate 1,000 AD. The Late or Later Stone Age is characterised by very small lithic artefacts. These microlithic tools were components in larger tools made from organic material, the latter rarely survives. Bladelets, small retouched tools and thumbnail scrapers are diagnostic tool forms, while cores show multiple parallel flaking or are smaller pyramidal forms.

The earliest assemblages combine several characteristic Middle Stone Age tool forms. Incidentally, the the Late Stone Age people did not practice food production or metallurgy, though they achieved an efficient level of socio-economic integration. The hunter-gatherer mode of production which first emrged in the lower pleistocene continued and still remained a viable cultural formation in the middle Holocene. The majority of the LSA sites have been found on the edges of dambos, valleys, along steams and river banks.

In the Zambezi valley, LSA assemblages have been lumped into regional variations of the 'Wilton Techno-Industrial complex'. The local Zambezi Wilton requires further research in

the light of research elsewhere in the country which shows significant change through time.

It must be noted that in space these sites overlapped with that of the earlier Middle Stone Age sites, but are more often found in locations closer to the margins of the Zambezi and on local high points, especially where there are small natural rock overhangs. In most cases, the spread of occupation by the LSA people in relation to later groups shows that these groups moved in small family groups. Their smaller extent reflects the more limited band structure of these communities. They were somewhat more sedentary, exploiting smaller territories and placing a greater value on plants and small game as principle foods.

7.4 Iron Age (Upper Holocene)

At about 2,000 years ago, Zambia like other territories in central-southern Africa was occupied by early agro-pastoral farmers who practiced food production, animal husbandry and metallurgy. Some sites in Zambia show evidence of any early but gradual displacement of the LSA population groups by the Early Iron Age peoples. Iron Age economy implied intensive land use which effectively modified the environment by clearing vegetation and using land for both farming and cattle grazing.

The Iron Age seems to have evolved with the domestication of food plants and animals, and the introduction of iron and copper working technology, which revolutionized agriculture through the use of hoes and axes. Common forms of material evidence found at most Iron Age archaeological sites are pottery, iron slag tuyere (Clay pipes) fragments, iron products such as arrow heads and spears, bodkins, copper ingots, iron bangles and beads.

Research suggests that crop cultivation, the building of permanent village settlements and the working of iron and copper, appear as a cultural package in the opening years of the First Millennium AD. Studies of the remains of these settlements and the changing sequence of pottery decoration have been conducted along the Zambia side of the Zambezi River. A few isolated records suggest that similar sites exist on the Zimbabwean side of the Batoka Gorge.

7.5 Farming Community Sites

The cultural complexity and efficiency that was attained during the Iron Age triggered a mass movement of people from their original settlements in search of land, water, peace

and other resources. It was largely this momentum for a rapid flow of the peoples in this region that may have brought the ancestors of the present ethnic groups into Zambia.

The earliest Farming Community villages date to 200 AD. Assigned to the Shongwe Tradition, the earliest groups were scattered pioneers who occupied large, centralised villages built away from the Zambezi and adjacent to large marshy areas (*dambos*) that lie between the palaeo-dunes (Vogel 1971, 1975b). These first groups were gradually replaced or more likely evolved into the current Tonga-speaking communities who traditionally occupied this area. The archaeological record in Zambia suggests that the Toka-Leya have been present in this area since at least the Sixteenth Century AD.

8.0 Intangible Heritage

8.1 Cultural Context

On the Zambian side there are over Twenty (20) shrines or sacred sites within the Victoria Falls and along the Zambezi River that are revered by the Mukuni Royal Establishment (MRE). Thus the Victoria Falls were not only considered to be a holy place but as the ritual capital and lifeline for the Baleya people (Mukuni, 48:2013). These shrines have become part of cultural and medicinal inheritance of the Leya speaking people. These sites are used for various purposes at different times of the year. Below is a description of some of these sites and their significance for the people of Mukuni chiefdom.

8.1.1 Chizabingo Shrine

This shrine is in the vicinity of the Victoria Falls. It is used for invoking leza (God) for good rains during the Basilombelombe Lwiindi ceremony. At this site Chief Mukuni, Bedyango (female co-ruler) and Mutoozi we Namunaki placate the ancestral spirits of the Namunakela royal burial grounds. Here ritual warriors, Basilombelombe, smear their bodies with "Mpemba" - limestone clay - and dress in leaves to symbolize their having become one with nature. As such they are supposed to take up responsibility henceforth to live in harmony with the natural environment. This site is still active and in use for rain-making ceremonies (Nzala, Pers Comm., 2015).

8.1.2 Kaanda Kaleza Shrine (Rain Temple)

Literally meaning the rain temple, the people in the chiefdom practice the Leya Tribal Religion as it was before the coming of colonial rule and Christianity. The use of water from the Victoria Falls confirms the tribal belief that the abode of their god was in the Falls area. They believed that god was the one that brings rain and not ancestral spirits. The role of the ancestral spirits was to intercede with god on behalf of the living. At this shrine beer is not allowed as it viewed as a product of human hands which have no magical powers to create rain. This site is significant to locals as it is used to seek solutions to various societal needs (Mukuni, 43:2013).

8.1.3 Simukale Cultural Site (17° 55' 16.7"S, 025° 53' 39.7"E)

This is a site of history or memory. It is from whence the current dual origin of the "Bene Mukuni Leya kingdom" of Nsyungu Namutitima (Victoria Falls) was harmonized to bring about gender sensitive dual ruler-ship between Mukuni and Bedyango. This site serves as a place for re-enactment of the journey Mukuni made from Kola (Congo) to Victoria Falls area. It was at this site where Mukuni was received into the Baleya Kingdom (Mukuni, Pers Comm. 2013). Every year the annual Lwiindi ceremony of Mukuni is held at this historical site. The events start with rituals from the grave of the first Mukuni and the final rituals are performed at this site in the presence of invited regional chiefs, presidents and other royals.

Figure 1: Simukale cultural site showing symbolic baobab tree and memrial dias and stairs that represent past chiefs.

8.1.4 Namunakela Royal Burial Grove

Like with most chiefdoms, Mukuni has a special place where state functions of tribal importance are conducted. Namunakela is place where coronation of chiefs is done. Further the death of the chief is also announced from this place. Bwande (receiving of first crops from the fields) rites and funerary rites for the departed chief are performed here. This is one of the most active sites in the chiefdom since Bwande is performed every year. This royal grove is to the west of Mukuni village (Mukuni, 44:2013).

8.1.5 Kwa-Sichichele Site

This is a royal grave for his majesty Sichichele Mukuni VII who was buried alive after successfully surviving poisoning attempts according to tradition in Namilangu. He was liable to be killed due to symptoms of incipient decay. This was done to avert a situation where pretenders could usurp state functions. He was later exhumed and given a befitting royal burial at Namunakela royal grove (Mukuni, 50:2013).

8.1.6 Siloka Island Shrine

This Island previously known as "Long Island" served as one of the Headquarters of Mukuni chiefdom besides Mukuni Royal Village, for Siloka I Mupotola II Mukuni XIV who had established his village on this Island. He was buried on this Island temporarily but was later transferred to Namunakela Royal grove. Arising from this, Siloka Island is a pilgrimage site for the Leya people of Mukuni chiefdom (Mukuni, 47: 2013).

8.1.7 Katola Buseka (Bunji Jump Point)[17° 55' 46.7"S, 025° 51' 23.8"E]

This was one of the most valued shrines. It was from here that offerings of most valued possessions were conducted. This shrine is no longer in use though the people still revere it. The offering of valued gifts was done to placate ancestral spirits and ask for blessings in the chiefdom. The offerings called for a cheerful giver or else anyone giving grudgingly would be swallowed up! It is for this reason that chief Mukuni himself took the first Bunji Jump from this place as a way of pleasing the spirits.

8.1.8 Nsamba Dwazi [17°55' 20.0"S, 025° 51' 47.8"E]

This shrine is located within the Victoria Falls eastern cataract area. The site is still in use though infrequently. This site is used for disease-cleansing rituals. Here the Bedyango (Female Co-Ruler) exercises her office's miraculous gift of healing various diseases. This site was partly disturbed by the construction of sluice intake canals for power generation

by ZESCO Ltd. Despite this disturbance, the site is still revered by many elders of the chiefdom.

Figure 2: Nsamba Dwazi shrine in the Victoria Falls

8.1.9 Chiposyo (Boling-Pot area)

This is another important shrine in the chiefdom where "holy water" is drawn for rain making rituals. The site is significant in the traditions of the Leya speaking people of chief Mukuni because without it, it would be impossible to carryout rain making activities in the chiefdom.

8.2.0 Chisamu Chilikumbede (Lip of the Falls) [17°55' 32.6"S, 025° 51' 47.0"E]

This is also one of the most important shrines in the Victoria Falls area. It is at this point that the ritual warriors commonly known as "Basilombelombe" draw water during the November Lwiindi ceremony also known as 'Lwiindi la Basilombelombe".

Figure 3: Rain Warriors Shrine showing grove

9.0 Results of Current Archaeological Fieldwork

This section lists all the sites located during the current field reconnaissance carried out between the 14th and 19th February 2015. It provides a general description of each site located, its cultural assemblage and an assessment of site integrity. An evaluation of sites' significance both from community and academic importance was made. Finally, all the sites recorded are individually named.

9.1 ZESCO Sub-Station Site

This is a Middle Stone Age site adjacent to the main power generation Sub-station. It is on coordinates : 17 56′ 07″S and 25 51′ 51.0″ E. This site is currently disturbed by ground clearance during maintenance of the the power station.

Figure 4 : MSA Artefacts : Source RM 2015

9.2 Gorge Swing Site 1

Located on the northern section of the launch pad for the Gorge Swing activity, this is a Late Stone Age site. It is located on coordinates ; 17 56′ 42.3″ S and 25 51′ 26.4″ E. This site is completely disturbed by vegetation clearing at the launch pad area.

Figure 5 : MSA Artifacts from Gorge 1 : Source RM 2015

9.3 Gorge Swing Site 2

Located on the southern end of the activity platform, the site has the following coordinates ; 17 56′ 43.5″ S and 25 51′ 36.8″ E. This is a Late Stone Age site with an extent of about 100 square meters. The site is still intact.

Figure 6: MSA Artifacts from Gorge Swing sites

9.4 Gorge Swing site 3

This site is located on coordinates 17 56′ 51.6″ S and 25 51′ 33.4″ E. It extends to about 50 Square meters. The site is generally in good condition.

9.5 Gorge Swing Receiving Point

This is another Late Stone Age site. It is located on coordinates 17 56′ 47.3″ S and 25 51′ 23.0″ E. The site is still intact besides being near the access road to the Park.

9.6 Songwe Gorge Road Site

The site is located on coordinates 17 56′ 36.2″ S and 25 51′ 23.0″ E. This is another MSA site still intact. It is significant for further research as sits at the confluence of the Songwe River and the Zambezi River. The Zambezi-Songwe river confluence is a very important research area as earlier research has shown a continuous sequence of habitation by all stages of development. Archaeological research by John Desmond Clark at Songwe MSA National Monument site which is just above the confluence, for example, revealed the presence of both ESA and MSA artefacts. In this regard, the Zambezi-Songwe river confluence provides an alternative research site after the earlier excavated site was destroyed by rafting companies that were using the area as orientation and disembarking platform for their clients.

Figure 7 : MSA artifacts from Songwe Gorge Area

9.7 Old Look out Platform LSA Site

This site is located on top of hill over looking the Victoria Falls. Its coordinates are ; 17 56′ 34.6″ S, and 25 52′ 09.0″ E. This site heavily disturbed by campers that frequent this area on picnics.

9.8 Songwe Gorge MSA/LSA site

This site is a declared National Monument. Its coordinates are 17 58′ 03.8″ S and 25 51′ 56.4″ E. The size of this site exceeds 100 square meters. The site is partially disturbed by many Rafting companies that launch their activities at this site.

Figure 8: showing artifacts from Songwe MSA National Monument site

10.0 Songwe Point Site 1

This is a LSA site on coordinates 17 58′ 07.5″ S and 25 51′ 54.5″ E. The site was once excavated and its artifacts displayed for tourists that visited a Lodge that was constructed here. This site is now completely destroyed by developments that took place here.

10.1 Songwe Point Road LSA

This is a big MSA/LSA site located on coordinates 17 58′ 08.8″ S and 25 52′ 39.8″ E. The stretches over 200 metres on both side of the access road to Songwe gorge. This site is partially disturbed by road construction works.

10.2 Songwe Point Site 2

This site shows the shows the occurrence of both LSA and IA settlements. It is on coordinates 17 58′ 16.3″ S and 25 52′ 03.7″ E. The site extends over 40 square meters and is still intact. It is signigficant for further academic research.

10.3 Songwe Point Site 3

Located at the lip of the Songwe Point Gorge, this site bears both the LSA and IA attributes. Pottery and micrilithic stone tools are present. Its coordinates are 17 58′ 24.7″ S and 25 52′ 11.4″ E. This site was destroyed by the construction of the now gutted Somgwe Point Lodge.

Figure 9 : Settlement site at Songwe point Lodge

10.4 Rapid 14 Site

This is a LSA site located where Over lands Mission station is built. It streches over 100 square meters. Its coordinates are 17 58′ 45.5″ S and 25 53′ 07.0″ E. The site is now disturbed by construction of various structures by the missioneries.

10.5 Taita Falcon Lodge Site

This site located above rapid 16 and 17. Its coordinates are 17 58′ 52.7″ S and 25 54′ 39.2″ E. The site has assemblages of both the LSA and IA technologies. The site was disturbed by the construction of the Taita Falcon Lodge structures.

10.6 Machenje Road MSA Site

Located near the access road to the proposed power station, the site is still intact. Its coordinates are17 58′ 50.6″ S and 25 59′ 12,3″ E. The site is likely to be disturbed if the access road to the project area is expanded further to the east.

11.0 Observations from the reviewed previous ESIA materials

- **The Proposed Residential Settlements**

  Of particular concern are the footprints of the residential settlements planned for the both the temporary construction staff of the Batoka HES and those permanently employed in its subsequent operations. These locations will have an extensive Cultural Heritage impact as they will cover large areas suited to past human habitation.

  The previous Environmental and Social Impact Assessment (ESIA) reports done in 1993 and 1998 respectively were reviewed for accuracy of information presented. It is noted that these reports covered some of the Cultural Heritage resources in the project area. However, in the process of reviewing these reports, several gaps in the Cultural Heritage Baseline were identified. Firstly, all the 25 sites identified in the 1998 survey were archaeological in nature. No traditional or ritual sites were recorded. Secondly, the report did not record any important historical sites (coronation, memorial and royal burial grounds) that are present in the area. This omission could have created serious tension between the local people and developer.

  Similarly, the report did not make any mention of the rain-making sites in the vicinity of Mukuni village and those in the Victoria Falls area. These sites are important because they regulate what happens in the entire chiefdom.

- **The 1993 and 1998 Assessments**

  Through this assessment, the archaeological history of the region was summarised. A very limited number of sites on the Zambian side were recorded by the consultant. No precise grid references for these sites are given in the 1993 report, although these were later established in the 1998 investigation. Although the 1998 report was comprehensive and several areas were investigated, there is still a need to update the 1998 assessment with photographic records and full location references taken by GPS.

- **Desktop Review of Transmission Lines**

  It is necessary to review the likelihood of possible cultural heritage resources along the two proposed electricity transmission lines linking the Batoka HES to the Victoria Falls Power Station in Livingstone. A desktop review was carried out in order to provide an overview and assist the project engineers in assessing the transmission lines route options. A mini reconnaissance survey to this area and oral interviews

with the chief's advisor were conducted. Therefore, a comprehensive Cultural Heritage Impact Assessment of the proposed transmission line routes to Livingstone and those going north east wards to Choma has not been undertaken. This requires additional work on the ground reconnaissance and a separate Cultural Heritage report for approval.

However, along the current proposed power transmission route there are no known archaeological sites except for two sacred sites; one burial area and a ritual site. These two sites are on the extreme left side of the proposed area near Munwana village. There is need to verify the actual route to avoid destroying or disturbing these important traditional sites.

- **Batoka Gorge Dam Wall site**
  The Batoka dam wall area itself was not fully explored, although investigated to a limited extent. The relief around this area is too steep and lacking in essential resources to support past human settlement on the slopes of this gorge. However, the absence of human habitation may be real but there remains a strong possibility that heritage sites may have been missed along the greater length of the Gorge that were not fully surveyed. On the Zambian side two small caves/overhangs near Taita Falcon Lodge were reported to exist by the lodge owners. However, these small overhangs were ruled out of having any significant archaeological material or let alone supporting human habitation since they occur in the mid section of the gorge slopes. It is practically impossible for humans to reach these overhangs in their current position. It was further reported that only Leopards use these small overhangs as their homes.

12.0 Conclusion and Recommendations

The proposed construction of the Batoka gorge HEP project will have both negative and positive impacts on the environment and heritage resources in the area. However, most of the archaeological resources are well above the areas that will be flooded. On the Zambian side of the project, all the archaeological sites recorded are well above the flood level of the reservior. As such, they will not be affected by the flood waters of the new dam. As for those in and near the proposed residential areas and construction camps, the only possible impact will be during land crearing by heavy earth moving equipment.

It must also be noted that most of the sacred sites are within the Victoria Falls World Heritage Site, which is far away from the physical impacts of the construction process. The only two sites that may be impacted negatively by power transmission lines are the two local cemeteries near Munwana and Chibule villages. Some underground archaeological artefacts may also be affected in areas proposed construction since these can only be seen upon excavation of the ground

In order to ensure that the client adheres to the rules and regulations of the state, there is a need to carry out intensive, systematic surveys of all areas directly affected by the proposals, including within Gorge itself. This should be conducted at an appropriate time (July to October) when there is no vegetation cover in the area. It is also recommended that archeologists visit the construction site regularly during the ground breaking period at various construction sites (housing roads, and Dam Wall area).

In the event that archaeological findings are found during the construction and operational phases of the project, the NHCC archaeologist should be contacted as a matter of urgency for specialist advice and interventions.

With regards to the signifiance of Chemapato Hill to the local people of chief Mukuni, no information was made available by our informants. The people chief Mukuni seem not to have any connection or reverence to this site. The chief's advisor (Induna) categorically denied having any ancestral or ritual connection with the hill. He instead infered that the site could have been used by earlier Tonga gropus that originally lived in the area before the arrival of the Leya speaking people.

This belief is reinforced by the fact that pottery found at Chemapato fits into the the Kalomo Tradition that was practiced by the early Tonga groups that lived in this area, but now found on the plateau area of Choma and Kalomo (Vogel, 1971).

Appendix I

List of all sites identified and recorded in the project area on the Zambia side during the 1998 Survey

Batoka Dam, Zambia - Cultural Heritage Site Gazetteer					
Site No	**Name**	**Description**	**Co-ordinates Grid Ref**	**Period**	**Source/Reference**
01	Chibongo	Archaeological	042188	ESA	1998 Survey
02	Mukuni	Archaeological	901199	MSA	1998 Survey
03	Mukuni	Archaeological	899198	ESA/MSA	1998 Survey
04	Mukuni	Archaeological	897197	MULT	1998 Survey
05	Sing'andu	Archaeological	911192	ESA/MSA	1998 Survey
06	Sing'andu	Archaeological	934187	MSA	1998 Survey
07	Sing'andu	Archaeological	932188	EIA	1998 Survey
08	Sing'andu	Archaeological	948185	EIA	1998 Survey
09	Kabozya	Archaeological	864186	ESA/MSA	1998 Survey
10	Kabozya	Archaeological	975186	ESA	1998 Survey
11	Proposed Area A	Archaeological	001182	LSA	1998 Survey
12	Proposed Area B	Archaeological	001196	LIA	1998 Survey
13	Proposed Area C	Archaeological	993194	LIA	1998 Survey
14	Proposed Area D	Archaeological	993192	LSA/LIA	1998 Survey
15		Archaeological	014203	LSA	1998 Survey
16	Lombelombe	Archaeological	044207	LIA	1998 Survey
17	Lombelombe	Archaeological	051208	MSA/LSA	1998 Survey
18		Archaeological	019205	LSA	1998 Survey
19	Chibonga	Archaeological	043195	ESA	1998 Survey
20	Kanbozya	Archaeological	951185	LIA	1998 Survey
21	Momba Highlands	Archaeological	026183	LIA	1998 Survey
22	Momba	Archaeological	990168	ESA/MSA	1998 Survey
23	Momba	Archaeological	994166	MSA/LSA	1998 Survey
24	Momba flood plane	Archaeological	010166	MSA/LSA	1998 Survey
25	kABOZYA	Archaeological	967114	MSA	1998 Survey

Appendix II

List of all sites identified and recorded in the project area on the Zambia side during the current Survey (February 2015).

Batoka Dam, Zambia - Cultural Heritage Site Gazetteer					
Site No	**Name**	**Description**	**Co-ordinates**	**Period**	**Source/Reference**
01	ZESCO Sub-Station Site	Archaeological	17 56, 25 51	ESA	RM Field Survey
02	Gorge Swing 1	Archaeological	17 51, 25 51	MSA	RM Field Survey
03	Gorge swing 2	Archaeological	17 56, 25 51	LSA	RM Field Survey
04	Gorge swing 3	Archaeological	17 56, 25 51	LSA	RM Field Survey
05	Gorge Swing Point	Archaeological	17 56, 25 51	ESA/MSA	RM Field Survey
06	Songwe Gorge Rd	Archaeological	17 56, 25 51	MSA	RM Field Survey
07	Look out Platform	Archaeological	17 58, 25 52	LSA	RM Field Survey
08	Songwe Gorge MSA	Archaeological	17 58 25 51	MSA/LSA	RM Field Survey
09	Songwe Point 1	Archaeological	17 58, 25 51	ESA/MSA	RM Field Survey
10	Songwe point Rd	Archaeological	17 58, 25 52	ESA	RM Field Survey
11	Songwe Point 2	Archaeological	17 58, 25 52	LSA	RM Field Survey
12	Songwe Point 3	Archaeological	17 58, 25 53	LIA	RM Field Survey
13	Rapid 14	Archaeological	17 58, 25 53	LSA	RM Field Survey
14	Taita Falcon Lodge	Archaeological	17 58, 25,54	LSA/LIA	RM Field Survey
15	Machenje	Archaeological	17 58, 25 59	MSA	RM Field Survey
16	Machenje Rd	Archaeological	17 56, 25 57	MSA	RM Field Survey
17	Chibule 1	Archaeological	17 54, 26 02	MSA/LSA	RM Field Survey
18	New Batoka Gorge Rd	Archaeological	17 54, 26 05	LSA	RM Field Survey
19	Chibule 2	Archaeological	17 55, 26 01	MSA	RM Field Survey
20	Chizabango Shrine	Traditional			Chief Mukuni
21	Kaanda Ka Leza	Rain Temple			Chief Mukuni
22	Simukale Site	Historical	17 55, 25 53	C18th	Chief Mukuni
23	Namunakela Shrine	Coronation			Chief Mukuni
24	Kwa-Sichichele	Royal Burial			Chief Mukuni
25	Siloka Island	Royal Burial			Chief Mukuni
26	Katola Buseka	Shrine	17 55, 25 51		Chief Mukuni

27	Nsamba Dwazi	Ritual shrine	17 55, 25 51		Chief Mukuni
28	Chiposyo	Rain Rituals			Chief Mukuni
29	Chisamu Chilikumbede	Lwiindi Rituals	17 55, 25 52		Chief Mukuni
30	Munwana Grave	Local Burial			Nzala Ernest
31	Lumpasa Palace	Residence			Chief Mukuni
32	Gundu	Mukuni Royal Vlge		C18th	Chief Mukuni
33	Namakabwa Is	Settlement		C18th	Chief Mukuni
34	Namuchila	Sacred Chamber		C18th	Chief Mukuni
35	Namunaki	Holy Tomb		Pre-C18th	Chief Mukuni
36	Nanjina Palace	Residence-Co ruler		Pre-C18th	Chief Mukuni

13.0 REFERNCES

Armstrong, A.L. and Jones, N. 1936. The antiquity of man in Rhodesia as demonstrated by stone implements of the ancient Zambezi gravels, south of Victoria Falls. *Journal of Royal Anthropological Institute LXVI*: 331-368.

Bond, G. and Clark, J.D. 1954. The Quaternary Sequence in the Middle Zambezi Valley. *South African Archaeological Bulletin IX (36):* 115-130.

ERM. 2012. *The ERM Impact Assessment Standard v1.0*. Annex B – 5 Cultural Heritage.

Chikumbi D.C 1998. Specialist report on Archaeology and Cultural History Issues. Special report S2 of the environmenta Impact Assessment for the proposed Sun International Hotel, Sandton, Johannesburg.

Clark, J.D. 1950. *The Stone Age Cultures of Northern Rhodesia*. Claremont: The South African Archaeological Society.

Clark, J.D. 1952. Prehistoric Man at the Falls. In Clark, J.D. (ed.), *The Victoria Falls Illustrated: a handbook to the Victoria Falls, the Batoka Gorge and part of the Upper Zambezi Valley*. Livingstone: Commission for the Preservation of Natural and Historical Monuments and Relics: Northern Rhodesia. pp. 57-66.

Clark, J.D. 1955. *Third Pan-African Congress on Prehistory. Excursion Handbook Northern Rhodesia*. Lusaka: Government Printer.

Clark, J.D. 1975. Stone Age man at Victoria Falls. In D.W. Phillipson (ed.), *Mosi-oa-Tunya: a Handbook to the Victoria Falls Region*. Salisbury: Longman Rhodesia. pp. 28-47.

Denbow, J. 1979. Cenchrus ciliaris: an ecological indicator of Iron Age Middens using aerial photography in eastern Botswana. *South African Journal of Science 76: 405-8.*

Du Toit, R.F. 1982. *A preliminary assessment of the Environmental Implications of the proposed Mupata and Batoka Hydro-Electric Schemes (Zambezi River, Zimbabwe).* Harare: Natural Resources Board.

Fagan, B.M., Phillipson, D.W., and Daniels, S.G.H. 1969. *Iron Age Cultures in Zambia (Dambwa, Ingombe Ilede and the Tonga) Vol. 2*. London: Chatto and Windus (National Museum of Zambia Robins Series No. 6).

Huffman, T.N. 1989. *Iron Age Migrations: the ceramic sequence in southern Zambia.* Johannesburg: Witwatersrand University Press.

IUNC 1996. *SEA Report, The Batoka Gorge Hydropower Scheme*. Scanned copy supplied by ZRA.

Katanekwa, N.M 1972. National Monuments of Zambia, Livingstone.

Mitchell, P. 2002. *The Archaeology of Southern Africa*. Cambridge: Cambridge University Press.

Mukuni Munokalya, 2013. Short History of the Mukuni Royal Dynasty

Moore, A. and Cotterill, F. 2010. Victoria Falls: Mosi-oa-Tunya - The Smoke that Thunders. In P. Migoñ, P, *Geomorphological Landscapes of the World*. Springer. pp. 143-153.

Mubitana, K. 1975. The traditional history and ethnography. In D.W. Phillipson (ed.) *Mosi-oa-Tunya: a Handbook to the Victoria Falls Region.* Salisbury: Longman Rhodesia. pp. 59-72.

Phillipson, D.W. 1975. *The Iron Age in Zambia.* Lusaka: National Educational Company of Zambia (The Historical Association of Zambia, Booklet 5).

Phillipson, D.W. 1977 The later prehistory of eastern and southern Africa. London : Heinemann.

Vogel, J. 1971a. *Kamangoza: an introduction to the Iron Age Cultures of the Victoria Falls region*. Lusaka: Oxford University Press (Zambian Museum Papers 2).

Vogel, J.O. 1971b. Kumagzulo: an early Iron Age village site in Southern Zambia (Zambian Museum Papers 3).

Vogel, J.O. 1975a. *Simbusenga: the archaeology of the Intermediate Period of the Southern Zambian Iron Age*. Lusaka: Oxford University Press (Zambian Museum Papers 4).

Vogel, J.O. 1975b. The Iron Age archaeology. In D.W. Phillipson (ed.) *Mosi-oa-Tunya: a Handbook to the Victoria Falls Region*. Salisbury: Longman Rhodesia. pp. 48-59.

ZRA, 1998 EISA Report. Scanned Report Volume 4a. Pp 161-209

Appendix A

Addendum for the Proposed Quarry Site associated with the BGHES

ARCHAEOLOGICAL/CULTURAL HERITAGE IMPACT ASSESSMENT ADDENDUM FOR THE PROPOSED QUARRY SITE ASSOCIATED WITH THE BATOKA GORGE HYDRO ELECTRICITY SCHEME – ZAMBIA

COMPILED BY

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30TH JANUARY 2019

Revised 11 February 2019

1.0. Introduction

1.1. Background to the Project

The Zambezi River Authority (ZRA) proposes quarry sites in both Zambia and Zimbabwe to facilitate various construction works during the implementation of the Batoka Gorge Hydro-electrical scheme (HES). This report relates to the proposed quarry on the Zambian side and is an addendum to the 2016 archaeological impact assessment (van der Walt & Mbewe 2016) for the Batoka HES, forming part of the overall Environmental Impact Study (EIS) conducted by ERM.

The main aim of the current study is to investigate, identify, assess and document any significant archaeological and other cultural heritage resources in the proposed quarry footprint. The results and recommendations of this addendum should be read in conjunction with earlier baseline studies (van der Walt & Mbewe 2016) conducted on the Zambian side for the proposed settlement areas, access roads, and the Dam wall and transmission corridors. Further, the current study seeks to evaluate any negative impacts and provide mitigation measures on any heritage resources that might be affected by the quarry operations.

2.0 Project Description

The ZRA is considering opening up two areas, one in Zambia and the other in Zimbabwe respectively, providing quarry aggregate for the construction phase of the Batoka Gorge HES and other associated infrastructure. On the Zambian side, the area of direct impact was subjected to a field assessment by a professional archaeologist.

2.1. Location and size

The proposed quarry site is located on the north bank of the Zambezi River adjacent to the area proposed for the Batoka Dam Wall (Figure 1). The coordinates for the central point of the proposed quarry site is 17º 54’ 59.28” S & 26º 05’ 28.74” E. The main area of direct impact is about 70 hectares within the Southern Province of Zambia within Kazungula District (Katapazi ward), which falls under Chief Mukuni’s Traditional jurisdiction.

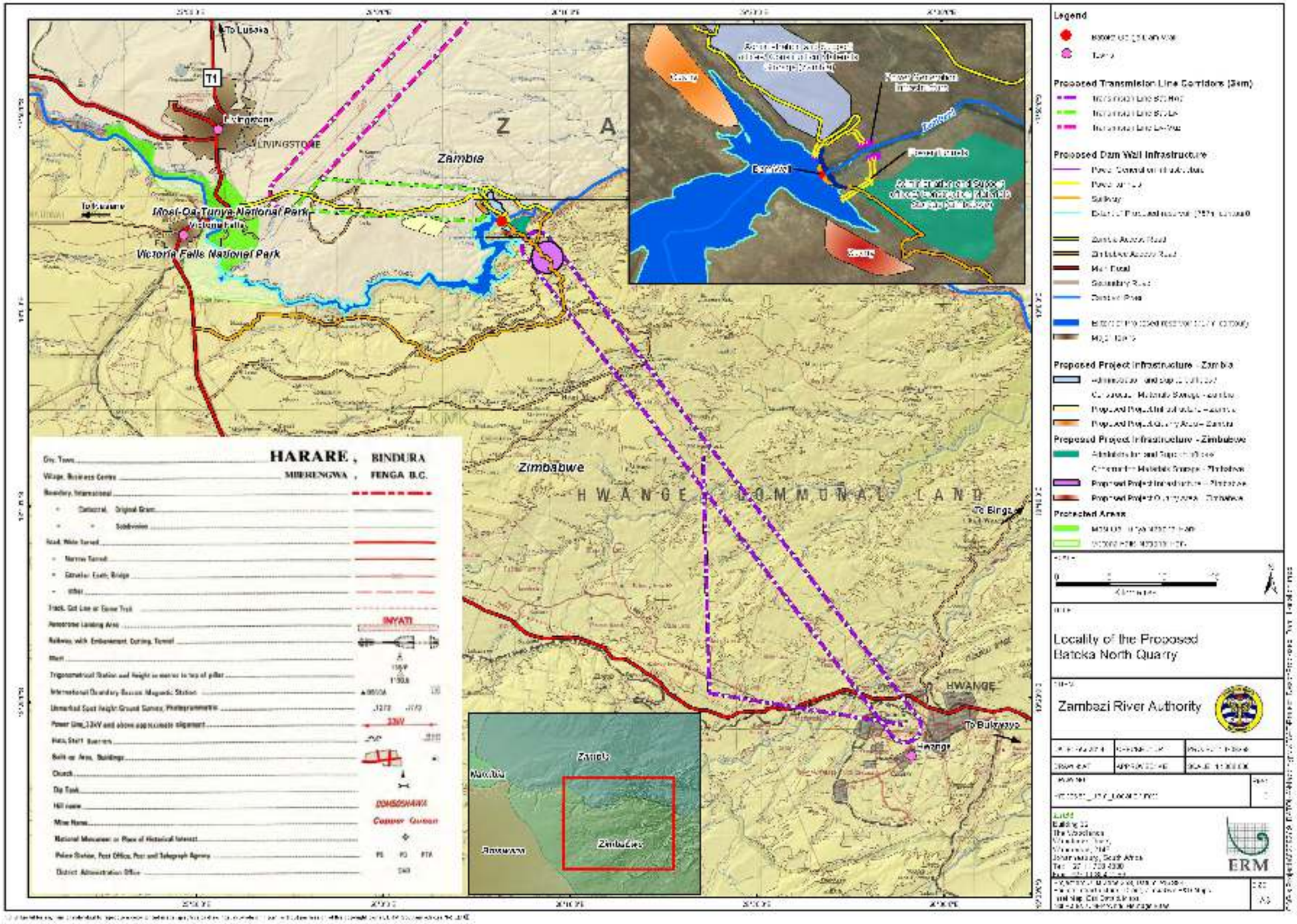


Figure 1: Locality of the Proposed Batoka North Quarry

2.2. Heritage Assessment TOR

The Terms of Reference (ToRs) for the Archaeological/Cultural Heritage Impact Assessment for the proposed Batoka HES quarry site in Zambia is outlined below:

Terms of Reference

1) A literature review of previous research/assessments conducted on archaeology and cultural heritage baseline;
2) The adopted methodology for the assessment;
3) Description of archaeological and other cultural heritage resources, if any, in the proposed project area;
4) Table showing the list of identified archaeological and cultural heritage sites in the project area;
5) Appendix of photographs of any identified archaeological and cultural heritage sites, and
6) References and bibliography.

3.0. Study Team

The team that conducted the current survey consisted of **Richard Mbewe**, a Zambian Archaeologist from the National Heritage Conservation Commission in Zambia. He was accompanied in the field by **Belinda Huddy** from ERM and **Mavis Nawa** from ZRA. **Mr. Mbewe** is a holder of a Master of Arts (MA) in Archaeology (Rock Art Studies) - Wits University, South Africa; Bachelor of Arts Degree (History and English, UNZA). He has also completed a certificate in Cultural Heritage Management, a Certificate in Rock Art Management (Cape Town) and a Certificate in Heritage Impact Assessment (ZEMA). Richard is currently the Senior Conservation Officer-Cultural Heritage [Archaeologist] at the National Heritage Conservation Commission in Zambia.

4. 0 Methodology

The following methodologies were employed to determine the potential occurrence of archaeological and heritage sites and the significance of such identified sites.

4.1 Literature Review

This activity was undertaken together with information relating to known archaeological and other cultural heritage resources within the proposed quarry site. A variety of primary and secondary sources such as Journals, Textbooks, Heritage Register, National Monument Guide and other professional reports and records were consulted for additional information relevant to the study.

4.2 Kick-off meeting

Prior to the fieldwork, a kick-off meeting was held between the author, representatives of both the ZRA and ERM on the morning of 18th January 2019.

4.3 Field Surveys (18 January 2019)

A physical survey of the proposed quarry site was conducted on 18th January 2019, primarily on foot, as the rugged terrain (Figure 2) restricted vehicle access. The archaeological survey consisted of non-intrusive methods, relying solely on surface observations. Focal points during the current survey activities concentrated on patches of Pleistocene gravels and drainage lines. Open areas in the natural topography were also surveyed for any evidence of heritage resources. No excavations were conducted.

Figure2: General view of the proposed quarry site

4.4 Assumptions and limitations

4.4.1 Assumptions

Although the archaeologist surveyed the area as thoroughly as possible, there is a possibility that some cultural remains may not have been discovered during the surface survey, both due to the subsurface nature of cultural heritage remains and the rugged terrain. It is therefore incumbent upon the developer to inform the relevant heritage authority should any cultural heritage remains be unearthed during the quarrying process, as this study does not claim to have recorded every site/artefact on the landscape.

4.4.2 Limitations

One limiting factor during the current study was the steep slopes of the quarry site, which made it practically impossible to reach the bottom/base of the gorge for a visual assessment.

4.5 Consultation

Before undertaking the field survey, the archaeological consultant, Mr Richard Mbewe consulted Mr Enerst Nzala (special advisor to his Royal Highness Chief Mukuni of the Leya People) on any possibility of the presence of Sacred or Ritual sites in the proposed quarry site. In his response, Mr Nzala confirmed to the consultant that there were no Sacred or Ritual sites within the proposed quarry development footprint (Personal Communication, 15th January 2019).

5.0 Findings

The survey was conducted using "West-to-East" transacts within the proposed quarry footprint. Different environmental areas were surveyed for possible heritage resources. These included both open and forested areas (Figure 3).

Figure 3: Some of the areas surveyed for heritage resources

No archaeological or other cultural heritage resources were identified in the proposed quarry area. Furthermore, no fossils, graves, sacred or traditional sites were discovered in the study area. This is largely attributed to the fact that the proposed quarry site has never been inhabited by the Leya or any other ethnic group in the past or at present as the area in question is generally hilly, rocky and rugged (Figure 4) and not suited to human settlement.

Figure 4: Rocky and rugged landscape characteristic of the project area

6. Conclusion

From a heritage perspective, the proposed quarry site is viable as no known heritage resources occur in the impact area. As outlined in the 2016 impact assessment, there are sufficient mitigation measures proposed that will reduce the impacts to chance finds in the project area.

REFERENCES

1. Burrett, R. 2015. Tangible Cultural Heritage Report – Batoka Gorge Hydro-Electric Scheme, Zimbabwe. Unpublished Report for ERM.
2. Clark, J.D. 1950. *The Stone Age Cultures of Northern Rhodesia*. Claremont: The South African Archaeological Society.
3. Clark, J.D. 1952. Prehistoric Man at the Falls. In Clark, J.D. (Ed.), *The Victoria Falls Illustrated: a hand book to the Victoria Falls, the Batoka Gorge and part of the Upper Zambezi Valley*. Livingstone: Commission for the Preservation of Natural and Historical Monuments and Relics: Northern Rhodesia. pp. 57-66.
4. Katanekwa, N.M 1972. National Monuments of Zambia, Livingstone.
5. Mbewe, R. 2015. The Batoka Dam Archaeological and Intangible Heritage Report-February 2015
6. National Register of Heritage Resources, 2005.
7. Van der Walt, J and Mbewe, R. 2016. Archaeological Impact Assessment For The Infrastructure Component Of The Batoka Gorge Hydro-Electric Scheme, Zambia
8. Vogel, J. 1971a. *Kamangoza: an introduction to the Iron Age Cultures of the Victoria Falls region*. Lusaka: Oxford University Press (Zambian Museum Papers 2).

Annex N

Review of ESIA against the WCD and IHA Guidelines & background on the World Commission on Dams & International Hydropower Association's Sustainability Guidelines & Hydropower Sustainability Assessment Protocol

N1 REVIEW OF IMPACTS ASSESSED AGAINST THE WCD AND IHA GUIDELINES

This Annex reviews the proposed BGHES ESIA report against the Guidelines for Good Practice from the *World Commission on Dams November 2000 Report "Dams and Development – A New Framework for Decision-Making" (Final Version of 17 November 2008)* and the International Hydropower Association's Sustainability Guidelines (SGs).

Serving as an advisory tool, the WCD guidelines provide an overview of how to assess options and plan and implement dam projects to meet the Commission's criteria. The IHA Sustainability Guidelines promote greater consideration of environment, social, and economic sustainability in the assessment of new hydropower projects to assist with the evaluation and management of often competing environmental, social and economic issues that arise in the assessment, operation and management of hydropower projects. The Sustainability Guidelines suggest a number of environmental and social strategies to optimise environmental and social outcomes for Hydropower Schemes.

The WCD Guidelines and IHA's environmental and social strategies to optimise environmental and social outcomes for Hydropower Schemes are outlined in *Table N1.1, Table 3.2* and *Table 3.3*, respectively. The tables then refer the reader to where the issue/ topic are addressed in the ESIA report. If the issue / topic is not applicable at the ESIA stage it is denoted as 'N/A'.

Table N1.1 Guidelines for Good Practice

Guidelines	Reference in this ESIA
Strategic Priority 1: Gaining Public Acceptance	
Stakeholder Analysis	Refer to: • Chapter 7 – Public Participation Process • Annex B – Stakeholder Engagement Plan • Annex C – Public Participation Documentation • Annex E – Grievance Mechanism
Negotiated Decision-Making Processes	Refer to: • Chapter 7 – Public Participation Process • Annex B – Stakeholder Engagement Plan • Annex C – Public Participation Documentation • Annex E – Grievance Mechanism
Free, Prior and Informed Consent	Refer to: • Chapter 7 – Public Participation Process • Annex B – Stakeholder Engagement Plan • Annex C – Public Participation Documentation • Annex E – Grievance Mechanism
Strategic Priority 2: Comprehensive Options Assessment	
Strategic Impact Assessment for Environmental, Social, Health and Cultural	Refer to: • Chapter 6 – Analysis of Alternatives • Chapter 10 - Biophysical Environment Impact Assessment • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment
Heritage Issues	Refer to: • Chapter 9 – Socio-economic Environment Baseline • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment • Annex L - Cultural Heritage Report, Zimbabwe • Annex M - Cultural Heritage Report, Zambia
Project-Level Impact Assessment for Environmental, Social, Health and Cultural Heritage Issues	Refer to: • Chapter 10 - Biophysical Environment Impact Assessment • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment
Multi-Criteria Analysis	N/A
Life Cycle Assessment	N/A

Guidelines	Reference in this ESIA
Greenhouse Gas Emissions	Refer to: • Chapter 10 - Biophysical Environment Impact Assessment • Annex H - Climate Change Risk Review
Distributional Analysis of Projects	N/A
Valuation of Social and Environmental Impacts	• Annex K - Economic Assessment Specialist Studies
Improving Economic Risk Assessment	N/A
Strategic Priority 3: Addressing Existing Dams	
Ensuring Operating Rules Reflect Social and Environmental Concerns	Refer to: • Chapter 10 - Biophysical Environment Impact Assessment • Annex J - Environmental Flow Assessment Specialist Study
Improving Reservoir Operations	Refer to: • Annex I - Reservoir Water Quality Modelling Study • Annex J - Environmental Flow Assessment Specialist Study
Strategic Priority 4: Sustaining Rivers and Livelihoods	
Baseline Ecosystem Surveys	Refer to: • Chapter 8 – Biophysical Environment Baseline
Environmental Flow Assessment	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex J - Environmental Flow Assessment Specialist Study
Maintaining Productive Fisheries	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex J - Environmental Flow Assessment Specialist Study
Strategic Priority 5: Recognising Entitlements and Sharing Benefit	
Baseline Social Conditions	Refer to: • Chapter 9 – Socio-economic Environment Baseline • Annex K - Economic Assessment Specialist Studies • Annex L - Cultural Heritage Report, Zimbabwe • Annex M - Cultural Heritage Report, Zambia
Impoverishment Risk Analysis	Refer to: • N/A
Implementation of the Mitigation, Resettlement and Development Action Plan	Refer to: • Chapter 9 – Socio-economic Environment Baseline • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment • *Please note - Resettlement Action Plan for the Dam Footprint and Resettlement Policy Framework for the Transmission Lines and Access Roads are forthcoming.*

Guidelines	Reference in this ESIA
Project Benefit-Sharing Mechanisms	Refer to: • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment • *Please note - Resettlement Action Plan for the Dam Footprint and Resettlement Policy Framework for the Transmission Lines and Access Roads are forthcoming.*
Strategic Priority 6: Ensuring Compliance	
Compliance Plans	N/A
Independent Review Panels for Social and Environmental Matters	N/A
Performance Bonds	N/A
Trust Funds	N/A
Integrity Pacts	N/A
Strategic Priority 7: Sharing Rivers for Peace, Development, and Security	
Procedures for Shared Rivers	Refer to: • Chapter 4 - Administrative Framework

Table N1.2 Optimising Environmental Outcomes for Hydropower Schemes

Issue for Management Consideration	Mitigation Options/Strategies	Reference in this ESIA
1. Water quality Changes in water quality are likely to occur within and downstream of the development as a result of flow regime changes. The residence time of water within a reservoir is a major influence on the scale of these changes, along with bathymetry, climate and catchment activities. Major issues include ○ reduced oxygenation, ○ temperature, ○ stratification potential, ○ pollutant inflow, ○ propensity for disease proliferation, ○ nutrient capture, ○ algal bloom potential; and ○ the release of toxicants from inundated	• Adequate data collection and an ESIA process that identifies potential problems prior to design are critical. • Design and operational systems that minimise as much as possible the negative impacts within the storage and downstream; examples include multilevel off-takes, air injection facilities, aerating turbines, and destratification capability. • While removal of vegetation from proposed impoundments is expensive, the potential benefits for water quality means that at least some removal should be considered. • Working with local communities and regulatory authorities in improving catchment management practices can have significant water quality benefits for hydro reservoirs.	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex I - Reservoir Water Quality Modelling Study • Annex J - Environmental Flow Assessment Specialist Study

Issue for Management Consideration	Mitigation Options/Strategies	Reference in this ESIA
sediments. Many water quality problems relate to activities within the catchment beyond the control of the proponent.		
2. *Sediment transport and erosion* The creation of a reservoir changes the hydraulic and sediment transport characteristics of the river, causing increased potential sedimentation within the storage and depriving the river downstream of material. Sedimentation is an important sustainability issue for some reservoirs and may reduce the long-term viability of developments. Reduction in the sediment load to the river downstream can change geomorphic processes (eg. erosion and river form modification).	• Development proposals need to be considered within the context of existing catchment activities, especially those contributing to sediment inflow to the storage. • Reducing reservoir sedimentation through cooperation with local communities and regulatory authorities in improving catchment management practices is an option. Specific actions, such as terracing or reforestation, may need to be considered. • In some cases sediment by-passes, flushing systems or dredging should be investigated. • Operational or physical mitigation measures to reduce erosion of downstream should be considered for both proposed and existing developments and appropriate objectives set.	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex J - Environmental Flow Assessment Specialist Study
3. *Downstream hydrology and environmental flows* Changes to downstream hydrology impact on river hydraulics, instream and streamside habitat, and can affect local biodiversity. Operating rules should not only consider the requirements for power supply, but also be formulated, where necessary and practicable, to reduce downstream impacts on aquatic species and human activities.	• Operating schedules should, where necessary and practicable, incorporate environmental water release patterns (including environmental flows) within the operational framework for the supply of power. • Downstream regulating ponds and other engineering solutions may provide cost-effective alternatives to environmental flow releases directly from power stations. • It is important that the environmental objectives of any flow release are identified in a clear and transparent manner. These releases need to be developed within the context of environmental sustainability and also take into account local and regional socio-economic factors. It is desirable that the environmental	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex J - Environmental Flow Assessment Specialist Study

Issue for Management Consideration	Mitigation Options/Strategies	Reference in this ESIA
	flow objectives be agreed with local communities.	
4. Rare and endangered species The loss of rare and threatened species may be a significant issue arising from dam construction. This can be caused by the loss or changes to habitat during construction disturbance, or from reservoir creation, altered downstream flow patterns, or the mixing of aquatic faunas in inter-basin water transfers. Hydropower developments modify existing terrestrial and aquatic habitats, and when significant changes cannot be avoided, mechanisms to protect remaining habitats at the local and regional scale should be considered in a compensatory manner.	• Plans to manage this issue need to be developed prior to construction and options for mitigation identified and assessed. • Habitats of critical importance should be identified (within a wider regional context) and impacts to these avoided or minimised as much as possible during the design phase. • Targeted management plans need to be developed for species of conservation significance. Translocations or habitat rehabilitation may be options, along with identification of suitable habitat for 'reserve' management.	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex F – Biophysical Baseline Data
5. Passage of fish species Many fish species require passage along the length of rivers during at least short periods of their life-cycle. In many places the migration of fish is an annual event and dams and other instream structures constitute major barriers to their movement. In some cases the long-term sustainability of fish populations depend on this migration and in developing countries local economies can be heavily reliant on this as a source of income.	• The passage of fish is an issue that must beconsidered during the design and planning stage of proposed developments (dam site selection) and adequate consideration should be given to appropriate mechanisms for their transfer (eg. fish ladders, mechanical elevators, guidance devices and translocation programs). • Large-scale downstream migration of some species may require mitigation measures to reduce mortality by passage through turbines. • Appropriate and feasible options for facilitating passage are also an issue for existing developments.	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex F – Biophysical Baseline Data
6. Pest species within the reservoir (flora & fauna) In some regions a significant long-term issue with reservoirs, irrespective of their use, is the introduction of exotic or native pest species. The change in environment caused by storage	• Identifying the risk of infestation prior to development should also help identify potential options for future management or mitigation. Shorter residence time of water is one viable mechanism for reducing risk. • Downstream water uses must also be considered when examining potential options	Refer to: • Chapter 8 – Biophysical Environment Baseline • Chapter 10 - Biophysical Environment Impact Assessment • Annex F – Biophysical Baseline Data

Issue for Management Consideration	Mitigation Options/Strategies	Reference in this ESIA
creation often results in advantageous colonisation by species that are suited to the new conditions, and these are likely to result in additional biological impacts. In some instances, proliferation may interfere with power generation (eg. clogging of intake structures) or downstream water use through changes in the quality of discharge water (eg algal bloom toxins, deoxygenated water).	for control.	
7. Health issues The changes brought about by hydropower developments have the capacity to affect human health. Issues relating to the transmission of disease, human health risks associated with flow regulation downstream and the consumption of contaminated food sources (eg, raised mercury levels in fish) need to be considered. The potential health benefits of the development should also be identified.	• Public health and emergency response plans should be developed in conjunction with local authorities. These plans, and their associated monitoring programs, should be relevant to the levels of risk and uncertainty. • The health benefits due to improved water supply, economic improvements and flood control should be recognised. Proper reservoir management can be highly effective in eliminating mosquito-borne illnesses such as malaria.	Refer to: • Chapter 9 – Socio-economic Environment Baseline • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment
8. Construction activities Construction needs to be carried out so as to minimise impacts on the terrestrial and aquatic environment. Where a new development is planned, there are a range of activities that can result in environmental impacts, both terrestrial and aquatic. Noise and dust may also be issues where the development is close to human habitation.	• These issues should be adequately addressed during the EA stage and plans developed to manage these issues. Plans to manage specific issues may be required; e.g., rehabilitation of borrow pits, management of construction site drainage, storage and handling of chemicals. Similar plans to manage disturbance to terrestrial and aquatic fauna may also be required.	Refer to: • Chapter 10 - Biophysical Environment Impact Assessment • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment
9. Environmental management systems It is recommended that all hydropower schemes implement an independently audited environmental management system.	• An environmental management system should allow for effective management of the range of environmental issues associated with the on-going operation of the hydropower scheme. • The associated monitoring programs and • environmental plans should ensure a program	Refer to : • *Please note an Environmental and Social Management Plan is forthcoming.*

Issue for Management Consideration	Mitigation Options/Strategies	Reference in this ESIA
	• of continuous improvement in environmental management over the life of the project.	

Table N1.3 Optimising Social Outcomes for Hydropower Schemes

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes	Reference in this ESIA
1. Changes to resource use and biodiversity in the area of the proposed project and the impacts this may have on the local community.	• Providing affected communities with improved living conditions.	The project proponent should ensure that: • the community and environmental resources are managed in a sustainable way, and on-going monitoring and liaison with local community groups continues through the life of the project. • the proposed project is the best alternative, following the consideration of relevant stakeholders concerns; • adequate consultation is undertaken, with relevant local, regional and national agencies consulted, and any legislation, regulations, codes of practice or guidelines of government agencies complied with; and • impacts on the community, stakeholders and the environment are identified and that stakeholders are informed about the project and the implications for them, as well as being regularly consulted throughout the planning and implementation phases.	Refer to: • Chapter 7 – Public Participation Process • Chapter 9 – Socio-economic Environment Baseline • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment • Annex B – Stakeholder Engagement Plan • Annex C – Public Participation Documentation • Annex E – Grievance Mechanism

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes	Reference in this ESIA
2. Distribution of benefits among affected parties.	• Ensuring equitable distribution of the benefits of the project, particularly to affected and vulnerable communities, through processes such as revenue sharing, training programmes and educational outreach. • Supporting additional community infrastructure associated with the project, particularly water and electricity connection, where positive benefits to the community will result.	The project proponent should ensure that: • stakeholders who may be affected by the project are provided with the opportunity to be represented during the different phases of project development.	Refer to: • Chapter 9 – Socio-economic Environment Baseline • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment • Annex B – Stakeholder Engagement Plan • Annex C – Public Participation Documentation • Annex E – Grievance Mechanism
3. Effectiveness and on-going performance of compensatory and benefits programmes.	• Ensuring that the local knowledge of communities and stakeholders is utilised in project planning.	The project proponent should ensure that: • those communities or individuals affected by the project are compensated for impacts caused by the project.	Refer to: • Chapter 7 – Public Participation Process • Annex B – Stakeholder Engagement Plan • Annex E – Grievance Mechanism • *Please note - Resettlement Action Plan for the Dam Footprint and Resettlement Policy Framework for the Transmission Lines and Access Roads are forthcoming.*
4. Public health issues that can result from the modification of hydrological systems, especially in tropical and sub-tropical areas, where water-borne diseases can be a significant issue. In some reservoirs, a further concern is the management of the temporary rise of mercury levels in fish.	• Improving public health conditions for impacted communities.	The project proponent should ensure that: • the community and environmental resources are managed in a sustainable way, and on-going monitoring and liaison with local community groups continues through the life of the project.	Refer to: • Chapter 9 – Socio-economic Environment Baseline • Chapter 11 – Socio-Economic, Health and Cultural Heritage Impact Assessment • Annex B – Stakeholder Engagement Plan • Annex E – Grievance Mechanism • *Please note an Environmental and Social Management Plan is forthcoming*

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes	Reference in this ESIA
5. The impacts of displacement on individuals and communities. These impacts may include: ○ the physical loss of homes and lands; ○ the transition to alternative means of earning a livelihood, particularly for populations that rely heavily on local land and resources for their way of life or that have a traditional existence; ○ disruption of established community networks and loss of cultural identity.	Ensuring that displacement is dealt with in a fair and equitable manner. The broad guidelines required to address displacement are: ○ to investigate all possible project alternatives to ensure that displacement is avoided or minimised where feasible; ○ to plan the resettlement thoroughly, where displacement is necessary, ensuring that adequate resources are available to enable the displaced groups to share in the benefits of the project; ○ to ensure adequate and on-going consultation with those groups or individuals that will be displaced, so that they have input into both the planning and the implementation of the resettlement program; ○ to provide displaced groups with sufficient assistance to ensure that their livelihoods are improved or, as a minimum, to ensure that they are re-established at no disadvantage; and ○ to improve standards of living for both the	The project proponent should ensure that: • a negotiated and agreed outcome is achieved wherever possible.	Refer to: • Chapter 6 - Project Alternatives • Annex B – Stakeholder Engagement Plan • Annex E – Grievance Mechanism • *Please note - Resettlement Action Plan for the Dam Footprint and Resettlement Policy Framework for the Transmission Lines and Access Roads are forthcoming.*

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes	Reference in this ESIA
	displaced communities as well as the host community, where applicable.		

N2 WORLD COMMISSION ON DAMS (WCD)

Please note that the text on the World Commission on Dams (WCD) contained within this Annex was compiled from two key sources: Dams and Development: A New Framework for Decision-Making, Earthscan Publications Ltd, November 2000; and Dams and development: A new framework for decision-making, Overview of the report by the World Commission on Dams, December 2001. Issue Paper 108, Drylands Programme, IIED.

N2.1 INTRODUCTION

The Dams and Development: A New framework for Decision-Making report is the product of over two years of intense study, dialogue and reflection by the WCD, the WCD Stakeholders' Forum (1) and hundreds of individual experts on all aspects of dams. The report addresses key issues at the heart of the debate on dams, and recommends fundamental changes in the way in which water development options are assessed and project cycles planned, implemented, monitored and evaluated. As discussed in *Chapter 4* of the ESIA, to support this new framework for decision-making, the Commission outlines seven strategic priorities and related policy principles, criteria and a set of 26 guidelines that should enable stakeholders at all levels to find and achieve the most appropriate means of exploiting and protecting water and energy resources.

N2.2 STRATEGIC PRIORITIES AND POLICY PRINCIPLES

The seven strategic priorities for future decision-making developed by the Commission (see *Box 2.1*) set out to advocate significant innovations in assessing options, managing existing dams, gaining public acceptance and negotiating and sharing benefits. A key message and a set of policy principles underpin each of the priorities which are expressed in the form of achieved outcomes (*Table 2.1*).

(1) Comprised of 68 members, the WCD Stakeholders' Forum served as a sounding board and advisory group through which WCD achieved a reconciliation of positions, interests and opinions previously held to be irreconcilable (Source http://www.unep.org/dams/documents/default.asp?documentid=512 accessed on 18 November 2015).

Box 2.1 *The WCD's Seven Strategic Priorities*

Source: World Commission on Dams, 2000a.

Table 2.1 *Strategic Priorities and Policy Principles*

Strategic Priority 1 - Gaining Public Acceptance	
Key Message	
Public acceptance of key decisions is essential for equitable and sustainable water and energy resources development. Acceptance emerges from recognising rights, addressing risks, and safeguarding the entitlements of all groups of affected people, particularly indigenous and tribal peoples, women and other vulnerable groups. Decision-making processes and mechanisms are used that enable informed participation by all groups of people, and result in the demonstrable acceptance of key decisions. Where projects affect indigenous and tribal peoples, such processes are guided by their free, prior and informed consent.	
Effective implementation of this strategic priority depends on applying these policy principles:	
1.1 Recognition of rights and assessment of risks are the basis for the identification and inclusion of stakeholders in decision-making on energy and water resources development.	1.3 Demonstrable public acceptance of all key decisions is achieved through agreements negotiated in an open and transparent process conducted in good faith and with the informed participation of all stakeholders.
1.2 Access to information, legal and other support is available to all stakeholders, particularly indigenous and tribal peoples, women and other vulnerable groups, to enable their informed participation in decision-making processes.	1.4 Decisions on projects affecting indigenous and tribal peoples are guided by their free, prior and informed consent achieved through formal and informal representative bodies.

Strategic Priority 2 - Comprehensive Options Assessment	
Key Message	
Alternatives to dams do often exist. To explore these alternatives, needs for water, food and energy are assessed and objectives clearly defined. The appropriate development response is identified from a range of possible options. The selection is based on a comprehensive and participatory assessment of the full range of policy, institutional, and technical options. In the assessment process social and environmental aspects have the same significance as economic and financial factors. The options assessment process continues through all stages of planning, project development and operations.	
Effective implementation of this strategic priority depends on applying these policy principles:	
2.1 Development needs and objectives are clearly formulated through an open and participatory process before the identification and assessment of options for water and energy resource development.	2.4 Increasing the effectiveness and sustainability of existing water, irrigation, and energy systems are given priority in the options assessment process.
2.2 Planning approaches that take into account the full range of development objectives are used to assess all policy, institutional, management, and technical options before the decision is made to proceed with any programme or project.	2.5 If a dam is selected through such a comprehensive options assessment process, social and environmental principles are applied in the review and selection of options throughout the detailed planning, design, construction, and operation phases.
2.3 Social and environmental aspects are given the same significance as technical, economic and financial factors in assessing options.	

Strategic Priority 3 - Addressing Existing Dams
Key Message
Opportunities exist to optimise benefits from many existing dams, address outstanding social issues and strengthen environmental mitigation and restoration measures. Dams and the context in which they operate are not seen as static over time. Benefits and impacts may be transformed by changes in water use priorities, physical and land use changes in the river basin, technological developments, and changes in public policy expressed in environment, safety, economic and technical regulations. Management and operation practices must adapt continuously to changing circumstances over the project's life and must address outstanding social issues.

Effective implementation of this strategic priority depends on applying these policy principles:			
3.1	A comprehensive post-project monitoring and evaluation process, and a system of longer-term periodic reviews of the performance, benefits, and impacts for all existing large dams are introduced.	3.4	The effectiveness of existing environmental mitigation measures is assessed and unanticipated impacts identified; opportunities for mitigation, restoration and enhancement are recognised, identified and acted on.
3.2	Programmes to restore, improve and optimise benefits from existing large dams are identified and implemented. Options to consider include rehabilitate, modernise and upgrade equipment and facilities, optimise reservoir operations and introduce non-structural measures to improve the efficiency of delivery and use of services.	3.5	All large dams have formalised operating agreements with time-bound licence periods; where re-planning or relicensing processes indicate that major physical changes to facilities or decommissioning, may be advantageous, a full feasibility study and environmental and social impact assessment is undertaken.
3.3	Outstanding social issues associated with existing large dams are identified and assessed; processes and mechanisms are developed with affected communities to remedy them.		

Strategic Priority 4 - Sustaining Rivers and Livelihoods

Key Message

Rivers, watersheds and aquatic ecosystems are the biological engines of the planet. They are the basis for life and the livelihoods of local communities. Dams transform landscapes and create risks of irreversible impacts. Understanding, protecting and restoring ecosystems at river basin level is essential to foster equitable human development and the welfare of all species. Options assessment and decision-making around river development prioritises the avoidance of impacts, followed by the minimisation and mitigation of harm to the health and integrity of the river system. Avoiding impacts through good site selection and project design is a priority. Releasing tailor-made environmental flows can help maintain downstream ecosystems and the communities that depend on them.

Effective implementation of this strategic priority depends on applying these policy principles:			
4.1	A basin-wide understanding of the ecosystem's functions, values and requirements, and how community livelihoods depend on and influence them, is required before decisions on development options are made.	4.4	Project options are selected that avoid significant impacts on threatened and endangered species. When impacts cannot be avoided viable compensation measures are put in place that will result in a net gain for the species within the region.
4.2	Decisions value ecosystems, social and health issues as an integral part of project and river basin development and prioritise avoidance of impacts in accordance with a precautionary approach.	4.5	Large dams provide for releasing environmental flows to help maintain downstream ecosystem integrity and community livelihoods and are designed, modified and operated accordingly.

4.3	A national policy is developed for maintaining selected rivers with high ecosystem functions and values in their natural state. When reviewing alternative locations for dams on undeveloped rivers, priority is given to locations on tributaries.

Strategic Priority 5 - Recognising Entitlements and Sharing Benefits

Key Message

Joint negotiations with adversely affected people result in mutually agreed and legally enforceable mitigation and development provisions. These provisions recognise entitlements that improve livelihoods and quality of life, and affected people are beneficiaries of the project. Successful mitigation, resettlement and development are fundamental commitments and responsibilities of the State and the developer. They bear the onus to satisfy all affected people that moving from their current context and resources will improve their livelihoods. Accountability of responsible parties to agreed mitigation, resettlement and development provisions is ensured through legal means, such as contracts, and through accessible legal recourse at national and international level.

Effective implementation of this strategic priority depends on applying these policy principles:

5.1	Recognition of rights and assessment of risks is the basis for identification and inclusion of adversely affected stakeholders in joint negotiations on mitigation, resettlement and development related decision-making.	5.3	All recognised adversely affected people negotiate mutually agreed, formal and legally enforceable mitigation, resettlement and development entitlements.
5.2	Impact assessment includes all people in the reservoir, upstream, downstream and in catchment areas whose properties, livelihoods and non-material resources are affected. It also includes those affected by dam related infrastructure such as canals, transmission lines and resettlement developments.	5.4	Adversely affected people are recognised as first among the beneficiaries of the project. Mutually agreed and legally protected benefit sharing mechanisms are negotiated to ensure implementation.

Strategic Priority 6 - Ensuring Compliance

Key Message

Ensuring public trust and confidence requires that governments, developers, regulators and operators meet all commitments made for the planning, implementation and operation of dams. Compliance with applicable regulations, criteria and guidelines, and project-specific negotiated agreements is secured at all critical stages in project planning and implementation. A set of mutually reinforcing incentives and mechanisms is required for social, environmental and technical measures. These should involve an appropriate mix of regulatory and non-regulatory measures, incorporating incentives and sanctions. Regulatory and compliance frameworks use incentives and sanctions to ensure effectiveness where flexibility is needed to accommodate changing circumstances.

Effective implementation of this strategic priority depends on applying these policy principles:	
6.1 A clear, consistent and common set of criteria and guidelines to ensure compliance is adopted by sponsoring, contracting and financing institutions and compliance is subject to independent and transparent review.	6.4 Corrupt practices are avoided through enforcement of legislation, voluntary integrity pacts, debarment and other instruments.
6.2 A Compliance Plan is prepared for each project prior to commencement, spelling out how compliance will be achieved with relevant criteria and guidelines and specifying binding arrangements for project-specific technical, social and environmental commitments.	6.5 Incentives that reward project proponents for abiding by criteria and guidelines are developed by public and private financial institutions.
6.3 Costs for establishing compliance mechanisms and related institutional capacity, and their effective application, are built into the project budget.	

Strategic Priority 7 - Sharing Rivers for Peace, Development and Security

Key Message

Storage and diversion of water on transboundary rivers (1) has been a source of considerable tension between countries and within countries. As specific interventions for diverting water, dams require constructive co-operation. Consequently, the use and management of resources increasingly becomes the subject of agreement between States to promote mutual self-interest for regional co-operation and peaceful collaboration. This leads to a shift in focus from the narrow approach of allocating a finite resource to the sharing of rivers and their associated benefits in which States are innovative in defining the scope of issues for discussion. External financing agencies support the principles of good faith negotiations between riparian States.

Effective implementation of this strategic priority depends on applying these policy principles:	
7.1 National water policies make specific provision for basin agreements in shared river basins. Agreements are negotiated on the basis of good faith among riparian States (2). They are based on principles of *equitable and reasonable utilisation, no significant harm, prior information* and the Commission's strategic priorities.	7.4 For the development of projects on rivers shared between political units within countries, the necessary legislative provision is made at national and sub-national levels to embody the Commission's strategic priorities of 'gaining public acceptance', 'recognising entitlements' and 'sustaining rivers and livelihoods'.

(1) 'Rivers' is used here as a general term. The strategic priority and policy principles relate equally to all types of waters which are or might be impacted by dams.

(2) The terms 'riparian State' is used to mean any State through which a transboundary river flows or forms part of its boundary, or which includes part of the catchment area of a transboundary river.

7.2	Riparian States go beyond looking at water as a finite commodity to be divided and embrace an approach that equitably allocates not the water, but the benefits that can be derived from it. Where appropriate, negotiations include benefits outside the river basin and other sectors of mutual interest.	7.5	Where a government agency plans or facilitates the construction of a dam on a shared river in contravention of the principle of good faith negotiations between riparians, external financing bodies withdraw their support for projects and programmes promoted by that agency.
7.3	Dams on shared rivers are not built in cases where riparian States raise an objection that is upheld by an independent panel. Intractable disputes between countries are resolved through various means of dispute resolution including, in the last instance, the International Court of Justice.		

N2.3 FIVE KEY DECISION POINTS: THE WCD CRITERIA

In order to apply the strategic priorities and their respective policy principles into planning and project cycles, the Commission identified five key stages and associated decision points that have a strong influence in the way water and energy management plans are developed and projects are designed and implemented. The first two decision points relate to water and energy planning, leading to decisions on a preferred development plan:

1) Needs assessment: validating the needs for water and energy services.

2) Selecting alternatives: identifying the preferred development plan from among the full range of options.

Where a dam emerges from this process as a preferred development alternative, three subsequent decision points occur:

3) Project preparation: verifying that agreements are in place before tender of the construction contract.

4) Project implementation: confirming compliance before commissioning.

5) Project operation: adapting to changing contexts.

The five decision points are supported by a set of criteria that describe the processes required for compliance. The criteria are set out in the form of checklists for each decision point that illustrates a transparent and open mechanism for determining if the Commission's recommendations have been followed and the processes can proceed to the next level of planning or implementation.

The most fundamental of the decision points is the selection of the preferred development plan. This determines the path for what options will be pursued to meet needs and whether or not a dam is to be built. This decision is only made after the needs and available options to meet those needs have been fully assessed. Each of the five stages requires a commitment to agreed procedures culminating in a decision point that governs the course of future action and allocation of resources (see *Figure 2.1*). At each decision point it is essential to test compliance with preceding processes before giving authority to proceed to the next stage. These points are not exhaustive, and within each stage many other decisions are taken and agreements made. The five key stages and associated decision points are generic and must be interpreted within the overall planning context of individual countries.

1) *Needs assessment: validating the needs for water and energy services.* Confirmation is required that plans for water and energy development reflect local and national needs adequately. An appropriate decentralized consultation process is used to validate the needs assessment and modify it where necessary.

2) *Selecting alternatives: identifying the preferred development plan from among the full range of options.* The preferred development plan is selected through a participatory multi-criteria assessment that gives the same significance to social and environmental aspects as to technical, economic and financial aspects and covers the full range of policy, programme, and project options. Within this process, investigations and studies are commissioned on individual options to inform decision-making as required; for example, demand-side management studies or feasibility studies.

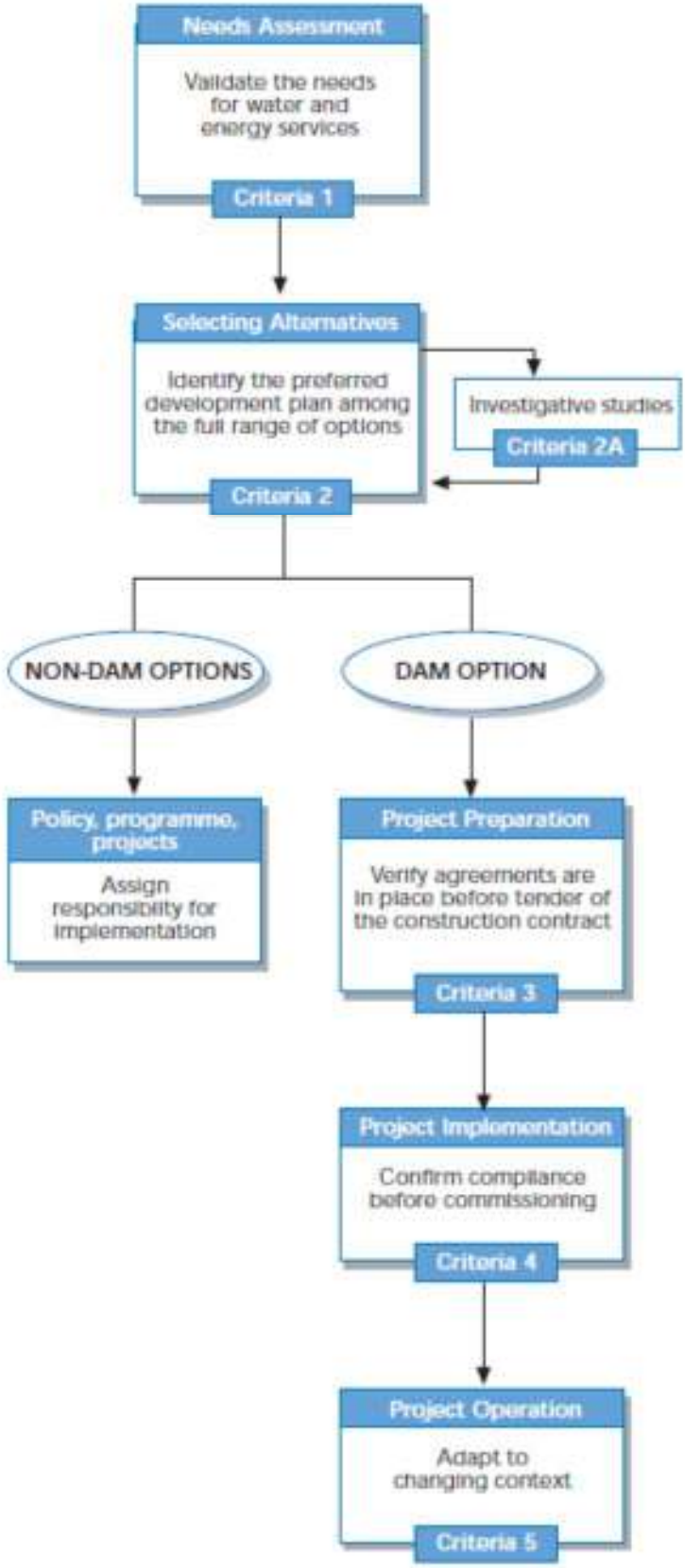
Where a dam emerges as a preferred option, the following key decision points occur for project preparation, implementation and operation.

3) *Project preparation: verifying agreements are in place before tender of the construction contract.* The preparation stage covers detailed planning and design. Licences issued for development of a project incorporate any conditions that emerge from the options assessment process. Tendering the construction contract is conditional upon reaching negotiated agreements for benefit sharing mechanisms and for mitigation, compensation, development and compliance measures, in addition to technical requirements.

4) *Project implementation: confirming compliance before commissioning.* The implementation stage covers procurement and construction. Issuing the licence to operate is contingent on implementation of specific benefit sharing and mitigation measures at various stages through the implementation period. Compliance with all relevant time-bound commitments is required before commissioning the project.

5) *Project operation: adapting to changing contexts.* Any decisions to modify facilities, operating rules, and licence conditions to meet changing contexts are based on a participatory review of project performance and impacts.

Figure 2.1 Five Key Decision Points in Planning and Project Development



The five key stages and decision points provide a framework within which decision makers and stakeholder groups can be assured of compliance with agreed procedures and commitments.

The following *Figure 2.2* provides a related list of criteria for checking compliance for each of the five key stages.

Figure 2.2 Criteria Checklist

Stage 1 Criteria Checklist

Needs Assessment	Selecting Alternatives	Project Preparation	Project Implementation	Project Operation

Needs assessments may have been conducted through a range of processes including national, regional, sector-specific, or basin-wide plans. The verification process to be applied will need to be tailored to suit the particular circumstances.

Gaining Public Acceptance

- A consultation plan was developed using a stakeholder analysis to define the groups involved. The plan defines mechanisms for verifying needs at the local, sub-national and national level (Guideline 1 - *Figure 2.3*).
- Verification of the needs for water and energy services was achieved through a process of public consultation and the results of public consultation were disseminated to stakeholders.
- Development objectives reflect a river basin-wide understanding of relevant social, economic, and environmental values, requirements, functions, and impacts that identifies synergies and potential areas of conflict.
- An appropriate process was established to address any disparities between the needs expressed through the public consultations and the stated development objectives.

Comprehensive Options Assessment

- Legal, policy and institutional frameworks were reviewed and any bias against resource conservation, efficiency and decentralised options, and any provisions that hindered an open and participatory assessment of needs and options were addressed.

Addressing Existing Dams

- Outstanding social and environmental impacts from past projects were evaluated and incorporated into the needs assessment (policy principle 3.3 - *Table 2.1*).

Sustaining Rivers and Livelihoods

- Ecosystem baseline studies and maintenance needs were assessed at a strategic level (Guidelines 14, 15 - *Figure 2.3*).

Stage 2 Criteria Checklist

Needs Assessment	Selecting Alternatives	Project Preparation	Project Implementation	Project Operation

Gaining Public Acceptance

- Stakeholders participated in creating the inventory of options, assessing options, and in negotiating those outcomes that may affect them (Guidelines 1, 2 - *Figure 2.3*).
- An agreed dispute resolution mechanism for negotiated processes was established with the participation and agreement of stakeholders (Guideline 2 - *Figure 2.3*).
- Indigenous and tribal peoples gave their free, prior and informed consent to the

- Approval to proceed with any project-level investigations was informed by a comprehensive assessment of options (see Criteria Checklist 2A).
- Rejection of any options was explained in an open and timely manner.

Addressing Existing Dams

- Provisions were made for resolving outstanding social and environmental impacts (policy principle 3.3 *Table 2.1*)

Sustaining Rivers and Livelihoods

- An established policy exists to maintain

inclusion in the development plan of any planned option that would potentially affect them (Guideline 3 - *Figure 2.3*).

Comprehensive Options Assessment

- Strategic impact assessments and life cycle analysis were integrated and undertaken as an initial step in the process (Guidelines 4, 7, 8, 14, 17 - *Figure 2.3*).

- A multi-criteria assessment was used to screen and select preferred options from the full range of identified alternatives (Guideline 6 - *Figure 2.3*).

- The screening of options:
  - covered all policy, programme, and project alternatives;
  - gave social and environmental aspects the same significance as technical, economic and financial factors;
  - gave demand-side options the same significance as supply options;
  - prioritised consideration of improving performance of existing systems;
  - considered river-basin-wide aspects and cumulative impacts;
  - took account of potential changes in climate; and
  - reflected the precautionary approach.

- Distributional and risk analyses were conducted at an appropriate level (Guidelines 9, 11 - *Figure 2.3*) and environmental and social impacts were valued where appropriate (Guideline 10 - *Figure 2.3*).

selected rivers with high ecosystem functions and values in their natural state.

- Consideration of options took into account: avoiding dams on the main-stem of rivers wherever possible; avoiding or minimising negative impacts on endangered species, ecosystems, livelihoods, human health and cultural resources; and respecting the provisions and guidance of relevant international treaties.

Recognising Entitlements and Sharing Benefits

- For any project option, stakeholders negotiated the guiding principles and criteria for: benefit sharing, mitigation, resettlement, development and compensation measures (Guidelines 2, 18, 20 - *Figure 2.3*).

Ensuring Compliance

- Sufficient institutional capacity exists, or will be enhanced, to monitor and enforce commitments for social and environmental components.

Sharing Rivers for Peace, Development and Security

- Any objections from riparian states were resolved through good faith negotiations or independent dispute resolution procedures (Guideline 26 - *Figure 2.3*).

Stage 2A Criteria Checklist

Needs Assessment	Selecting Alternatives	Project Preparation	Project Implementation	Project Operation

Project-related pre-feasibility and feasibility studies need to meet the following criteria. Policy and programme related studies may also be required, and are covered in Criteria Checklist 2.

Gaining Public Acceptance

- Stakeholders participated in baseline, impact and investigative studies and the negotiation of outcomes that potentially affect them (Guidelines 1, 2, 14, 17 - *Figure 2.3*).

- The studies and impact assessments were open and independent, and were preceded by a participatory scoping phase (Guideline 5 - *Figure 2.3*).

Comprehensive Options Assessment

- The investigations were analysed on a

- Impacts on fish have been assessed and measures to avoid or minimise impacts were considered, including an effective fish pass where feasible (Guideline 16 - *Figure 2.3*).

Recognising Entitlements and Sharing Benefits

- Stakeholders negotiated agreements for compensation, mitigation, resettlement, development and monitoring measures affecting them, including draft contracts where necessary (Guideline 19 - *Figure 2.3*).

- Effective benefit-sharing strategies were

river basin-wide understanding of social, economic, and environmental values, requirements, functions, and impacts including cumulative impacts, and the precautionary approach was applied. (Guideline 5 - *Figure 2.3*).

- The recommendations of studies undertaken on resource conservation measures, demand-side management, local supply-side options and improvement of existing systems were reflected in the demand forecast for the sector.

- Within-project alternatives were assessed using a multi-criteria approach (Guideline 6 - *Figure 2.3*).

Addressing Existing Dams

- Studies examined possible synergies from interactive operation of related water resource infrastructure in the basin.

Sustaining Rivers and Livelihoods

- An environmental flow requirement to maintain downstream species, ecosystems and livelihoods was defined (Guideline 15 - *Figure 2.3*).

identified and agreed with people adversely affected by the project (Guideline 20 - *Figure 2.3*).

Ensuring Compliance

- Institutional capacity to monitor and enforce commitments for social and environmental components of the project was analysed and measures to strengthen capacity identified.

- An independent panel reviewed the assessment of impacts and the planning of social and environmental mitigation plans (Guideline 22 - *Figure 2.3*).

Sharing Rivers for Peace Development and Security

- Riparian states were notified of options affecting them and agreed procedures for impact assessments. Objections were addressed through good faith negotiations and agreed dispute resolution procedures (Guideline 26 - *Figure 2.3*).

Stage 3 Criteria Checklist

Needs Assessment	Selecting Alternatives	Project Preparation	Project Implementation	Project Operation

Gaining Public Acceptance

- Stakeholders participated in the project design and the negotiation of outcomes that affect them (Guidelines 1, 2 - *Figure 2.3*).

- Indigenous and tribal peoples gave their free, prior, and informed consent to the project as designed (Guideline 3 - *Figure 2.3*).

Comprehensive Options Assessment

- The stakeholder forum participated in assessing alternatives for the detailed layout of the dam, associated infrastructure, and its operation.

Addressing Existing Dams

- Cumulative and interactive impacts of existing infrastructure were addressed in the design of the dam and agreements reached with stakeholders and operators to modify operating rules of existing dams where needed.

Sustaining Rivers and Livelihoods

- Acceptable rules were developed for reservoir filling, commissioning and

- Detailed benefit sharing mechanisms, and the means to deliver them, have been agreed and set in place with affected groups (Guideline 20 - *Figure 2.3*).

Ensuring Compliance

- Independent panels reviewed and endorsed mitigation plans (Guideline 22- *Figure 2.3*).

- Provisional sums for mitigation are included in the tender, and their financing has been confirmed.

- A Compliance Plan was prepared, presented to the stakeholder forum and formalised. Individual compliance measures include mechanisms for dispute resolution (Guideline 21 - *Figure 2.3*).

- The developer has allocated funds for an effective monitoring and evaluation system covering project performance, safety and impacts. Institutional capacity exists to monitor and enforce agreements effectively.

- A transparent process for short-listing contractors and selecting tenders is in place

operation.

- The final design includes provisions for emergency drawdown and decommissioning and is sufficiently flexible to accommodate changing future needs and values, including ecosystem needs and ecosystem restoration (Guideline 12 - *Figure 2.3*).

- An environmental management plan incorporating environmental flows and other mitigation and enhancement measures was agreed with stakeholders and defines monitoring and evaluation programmes.

- The developer provided sufficient evidence to demonstrate that proposed mitigation and development measures will be effective in meeting their objectives.

Recognising Entitlements and Sharing Benefits

- Mitigation, resettlement, monitoring, and development plans were agreed with affected groups, and relevant contracts signed (Guideline 19 - *Figure 2.3*).

and contractors with a record of under-performance or corruption on past projects were identified and debarred where appropriate.

- Relevant performance bonds have been secured, trust funds established and integrity pacts signed (Guidelines 23, 24, 25 - *Figure 2.3*).

- The licence for project development defines the responsibility and mechanisms for financing decommissioning costs.

Sharing Rivers for Peace Development and Security

- Resolution was achieved where affected riparian states had outstanding objections (Guideline 26 - *Figure 2.3*).

Stage 4 Criteria Checklist

Needs Assessment	Selecting Alternatives	Project Preparation	Project Implementation	Project Operation

Gaining Public Acceptance

- Stakeholders participated in monitoring mitigation measures and in negotiating outcomes that affect them (Guidelines 1, 2 - *Figure 2.3*).

- Consultation mechanisms were agreed in advance with stakeholders for any technical, social, environmental, or other problems that may be encountered during reservoir filling and commissioning.

- Contingency plans for emergency drawdown of the reservoir were agreed with stakeholders before commissioning and were widely disseminated.

Comprehensive Options Assessment

- Affected stakeholders have reviewed any changes proposed to the tender design that substantially affect impacts, mitigation measures, benefit sharing, operational practices, or the monitoring programme.

Addressing Existing Dams

Institutional co-ordination mechanisms

Recognising Entitlements and Sharing Benefits

- The mitigation, resettlement and development action plan has been implemented and disputes resolved (Guideline 19 - *Figure 2.3*).

Ensuring Compliance

- An independent panel reviewed and endorsed implementation of social, environmental, health and cultural heritage mitigation measures (Guideline 22 - *Figure 2.3*).

- Preparations have been made to implement licence conditions for operations, implement continuing mitigation measures, undertake monitoring and regular evaluation, and disseminate information.

- Monitoring of social, environmental and technical aspects includes an intensive phase to cover the rapid changes that occur in the impoundment and commissioning period.

- The developer has complied with pre-commissioning commitments as defined in the Compliance Plan (Guideline 21 - *Figure*

- that recognise interactive effects and cumulative impacts are in place to adjust operation of existing dams.

Sustaining Rivers and Livelihoods

- Required environmental mitigation measures were implemented.

2.3).

Sharing Rivers for Peace Development and Security

- Mechanisms were initiated for sharing monitoring information with riparian provinces or States (Guideline 26 - *Figure* 2.3).

Stage 5 Criteria Checklist

Needs Assessment	Selecting Alternatives	Project Preparation	Project Implementation	Project Operation

These criteria are relevant to both existing dams (Strategic Priority No.3) and the operational stages of future dams.

Gaining Public Acceptance

- Stakeholders are identified for consideration of operational issues and any proposed changes that impact on them or the environment (Guideline 1 - *Figure* 2.3).

Comprehensive Options Assessment

- Periodic evaluations of all aspects of project operation and performance are undertaken with the involvement of the stakeholder forum every 5 to 10 years and agreements renegotiated as necessary.
- Modernisation programmes and alternative operational regimes are considered as part of periodic reviews, replanning, or relicensing exercises through a participatory multi-criteria approach (Guideline 13 - *Figure* 2.3).
- Monitoring and evaluation programmes should explicitly consider the influence of climate change (namely increasing and decreasing rainfall and flows) on benefits and dam safety.
- A full feasibility study, including analysis of alternatives and impact assessment, is undertaken for any proposal for any major physical change, including decommissioning.

Sustaining Rivers and Livelihoods

- Operations take account of environmental flow requirements (quantity and quality) and ecosystem and social impacts are monitored (Guideline 15 - *Figure* 2.3).

Recognising Entitlements and Sharing Benefits

- Detailed benefit-sharing mechanisms are modified as necessary with the agreement of affected groups (Guideline 20).

Ensuring Compliance

- Adverse social and environmental impacts and reparations issues are referred to the appropriate recourse body (Guideline 19).
- Annual reports of project monitoring programmes, including social and environmental aspects, are issued promptly and corrective measures are initiated to address issues raised in the reports.
- The requirements of remaining performance bonds or trust funds outlined in the Compliance Plan are periodically reviewed, and financial guarantees are released on satisfactory compliance with agreed milestones (Guideline 23).
- Dam safety and inspection programmes are implemented.

Sharing Rivers for Peace Development and Security

- Mechanisms exist to share monitoring information and resolve issues as they arise.

N2.4 GUIDELINES

The guidelines outlined below in *Figure* 2.3 provide an overview of how to assess options and plan and implement dam projects to meet the Commission's criteria. The guidelines serve as advisory tools which assist in

decision making and need to be considered within the framework of existing international guidance and current good practice. The guidelines are presented under the same sub-headings as the Commission's seven strategic priorities. There are apparent linkages between individual guidelines and cross references to them are given in the criteria checklists for the key decision points of the planning and project cycles in *Figure 2.2*.

Figure 2.3 Guidelines for Good Practice

	Strategic Priority 1: Gaining Public Acceptance		**Strategic Priority 4: Sustaining Rivers and Livelihoods**
1	Stakeholder Analysis	14	Baseline Ecosystem Surveys
2	Negotiated Decision-Making Processes	15	Environmental Flow Assessment
3	Free, Prior and Informed Consent	16	Maintaining Productive Fisheries
	Strategic Priority 2: Comprehensive Options Assessment		**Strategic Priority 5: Recognising Entitlements and Sharing Benefits**
4	Strategic Impact Assessment for Environmental, Social, Health and Cultural Heritage Issues	17	Baseline Social Conditions
		18	Impoverishment Risk Analysis
		19	Implementation of the Mitigation, Resettlement and Development Action Plan
5	Project-Level Impact Assessment for Environmental, Social, Health and Cultural Heritage Issues	20	Project Benefit-Sharing Mechanisms
6	Multi-Criteria Analysis		
7	Life Cycle Assessment		**Strategic Priority 6: Ensuring Compliance**
8	Greenhouse Gas Emissions		
9	Distributional Analysis of Projects	21	Compliance Plans
10	Valuation of Social and Environmental Impacts	22	Independent Review Panels for Social and Environmental Matters
11	Improving Economic Risk Assessment	23	Performance Bonds
		24	Trust Funds
	Strategic Priority 3: Addressing Existing Dams	25	Integrity Pacts
12	Ensuring Operating Rules Reflect Social and Environmental Concerns		**Strategic Priority 7: Sharing Rivers for Peace, Development, and Security**
13	Improving Reservoir Operations	26	Procedures for Shared Rivers

N3 INTERNATIONAL HYDROPOWER ASSOCIATION (IHA) SUSTAINABILITY GUIDELINES AND HYDROPOWER SUSTAINABILITY ASSESSMENT PROTOCOL

Please note that the text on the IHA Sustainability Guidelines and Assessment Protocol contained within this Annex was compiled from two key sources: IHA Sustainability Guideline, February (2004); and IHA Hydropower Sustainability Assessment Protocol, November 2010.

N3.1 IHA SUSTAINABILITY GUIDELINES

N3.1.1 Purpose of the Guidelines

The IHA published the Sustainability Guidelines (SGs) in order to promote greater consideration of environment, social, and economic sustainability in the assessment of:

- new energy projects;
- new hydro projects; and
- the management and operation of existing hydropower facilities.

The principles encompassed in the SGs, which are directly applicable to the Baynes Project include the following elements:

- The role of governments;
- Decision making processes;
- Hydropower - environmental aspects of sustainability;
- Hydropower - social aspects of sustainability; and
- Hydropower - economic aspects of sustainability.

The principles have been drafted by the IHA to assist hydropower developers and operators with the evaluation and management of often competing environmental, social and economic issues that arise in the assessment, operation and management of hydropower projects.

N3.1.2 The Role of Governments

The social, environmental and economic trade-offs required to establish national and regional development plans are the responsibility of governments. IHA encourages countries to have in place national and/or regional energy policies. These should:

- Clearly set out energy development strategies.

- Include a Strategic Assessment (SA) process that involves an assessment of cumulative impacts, determination of land use and environmental priorities, as well as goals for poverty alleviation and economic growth.

- Be framed in the context of the global need to reduce greenhouse emissions.

- Incorporate the three elements of sustainability -- economic, social and environmental -- in energy planning.

- Be a participatory, streamlined process, focused on major issues, using common sense and readily available information, and with short and definite time limits for its completion.

N3.1.3 Decision Making Processes

Alternatives Hydropower Options

According to the IHA, sustainability criteria should be utilised in order to provide an effective comparison of hydropower project alternatives. Such criteria are required in order to eliminate unsustainable hydropower projects early in the project planning phase. *Table 3.1* below focuses on hydro-electric alternatives and their prioritisation based on sustainability criteria.

Table 3.1 Key Criteria that should be used in Comparing Hydro-electric Project Alternatives

Key Criteria	Discussion
1. Prioritise upgrading of existing facilities.	• Refurbishment and modification of operational regimes, particularly of older power stations, can often result
2. Prioritise alternatives that have multiple-use benefits.	• Hydro-electric projects normally have a variety of other uses and benefits. These can include: o Irrigation, o water supply, o fishing, o flood mitigation, o water-based transport, o tourism and recreation.
3. Prioritise alternatives on already developed river basins.	• While consideration of cumulative and other environmental impacts is necessary it is often preferable to develop new hydro-electric projects on already regulated river systems.
4. Prioritise alternatives that minimise the area flooded per unit of energy (GWh) produced.	• The selected site and project design should tend towards minimising the flooded area per unit of energy produced (square kilometres per gigawatt hour)
5. Prioritise alternatives that maximise opportunities for, and do not pose significant unsolvable threats to, vulnerable social	• Where vulnerable social groups will be affected, projects should include comprehensive social and cultural enhancement programs.

Key Criteria	Discussion
groups.	
6. Prioritise alternatives that enhance public health and / or minimise public health risks.	• Hydropower developments can often provide significant new public health benefits to poorly developed areas. • Projects can also pose risks, such as increases in waterborne diseases and a temporary rise of mercury levels in fish.
7. Prioritise alternatives that minimise population displacement.	• Where population displacement is necessary, comprehensive resettlement and rehabilitation plans need to be developed and implemented in consultation with the affected population.
8. Prioritise alternatives that avoid exceptional natural and human heritage sites.	• Developers should make every effort to avoid, or reduce to a minimum, alterations to sites of exceptional national and international value.
9. Prioritise alternatives that have lower impacts on rare, vulnerable or threatened species, maximise habitat restoration and protect high quality habitats.	• Potential impacts on rare, vulnerable or threatened species should be carefully assessed as part of the decision-making process. • Consideration of the creation of alternative habitats or the protection of adjacent areas should be considered as part of any mitigation program. • Significant damage to areas of high conservation value (including critical habitat for endangered species) should be avoided when adequate mitigation or compensation is not feasible.
10. Prioritise alternatives that can achieve or complement community-supported objectives in downstream areas.	• Regulation of a river, or its diversion, creates environmental change in the downstream reaches. Environmental flow regimes should be developed on the basis of community-supported objectives.
11. Prioritise alternatives that have associated catchment management benefits and lower sedimentation and erosion risks.	• Sites and options should be assessed for sedimentation and erosion risks, both within the reservoir and downstream. • Catchment management strategies can reduce sediment load entering reservoirs. Developers need to assess the need for the creation of catchment reserves or other management strategies to reduce erosion and sediment transport. • Construction programs should be geared to ensuring minimum disturbance and appropriate rehabilitation of disturbed sites.

Source: IHA, Sustainability Guidelines, 2004

Environmental Impact Assessment Principles

IHA's policy position is that Environmental Assessments (EAs) should be applied at the project level. These EAs should:

- take account of higher-level national and/or regional policies and strategic assessments, including assessments already completed for the relevant river basin(s).

- conduct initial screening to determine if a project is likely to have significant effects on the environment by virtue of its nature, size or location.

- be conducted for all hydro-electric projects that have the potential for significant impacts on the environment.

- be based on good science and factual information.

- be relevant to the scale and nature of the project in question and factor in existing information.

- apply appropriate procedures or codes of practice regarding stakeholder participation and environmental protection.

IHA acknowledges that an EA for a large infrastructure project, such as a hydro-electric power scheme, takes place in a broad political, social and economic context. It is one step in a wider decision making process, and should thus generally be written to provide authorities with the following information:

- A full description of the project;

- A statement of objectives, including clear targets and proposed indicators of success;

- A description of the existing environment in the area where the project is to be developed;

- Project justification, including evaluation of project alternatives;

- Economic, social and environmental considerations, including the consequences of not undertaking the project;

- Any mitigation measures that will be implemented to minimise environmental harm and / or enhance the environment; and

- A description of the stakeholder communication / consultation process.

In addition, the IHA recommends post-construction auditing to measure performance against objectives, targets and proposed indicators of success detailed in the project EA.

Safety

According to the IHA guidelines, the first priority for dam designers, builders, owners and operators is dam safety and the protection of life, property and the environment from the consequences of dam failure. Potential dam and reservoir sites thus need to be thoroughly assessed from a safety perspective.

IHA stipulates that comprehensive dam safety risk assessments should be completed for selected sites in any proposed schemes. Design and construction practices should ensure that defined safety requirements, as identified in the risk assessment and agreed with appropriate regulatory authorities, are met.

The guidelines stipulate that, all operating dams should have a dam safety management plan. This should define the scale, frequency and nature of monitoring requirements, including types of instrumentation required and levels of expertise needed to implement the plan. In addition dam safety programs need to include emergency response plans. These should be developed in conjunction with relevant regulatory authorities and stakeholders – particularly downstream residents. They should clearly specify responsibilities for action and be supported by appropriate awareness and training programs.

Managing Existing Hydropower Schemes

IHA encourages appropriate management of environmental and social issues throughout the life of the project.

Legal and Institutional Arrangements

Operators of hydro-electric schemes should ensure that they have processes in place to ensure compliance with all relevant laws, policies, permits, agreements and codes of practice for the jurisdictions in which they operate.

These may include, but are not limited to:

- Electricity supply industry legislation;
- Water management legislation and policies, including licences, water management plans and water quality standards;
- Environment protection legislation and associated regulatory standards and permits;
- Conservation and threatened species legislation;
- Cultural heritage and indigenous rights legislation;
- Resettlement and compensation regulations and/or agreements;
- Occupational health and safety legislation;
- National, regional and local government policies;
- International agreements and protocols;
- Corporate law requiring financial and environmental reporting;

- Relevant international laws, conventions and protocols; and

- Voluntary commitments and signed agreements.

Environmental Management Systems

IHA believes hydro-power operators should adopt internationally recognised environmental management systems (such as ISO 14001). According to the SGs, the components of an environmental management system should include the following:

- Management Commitment;
- Environmental Policy;
- Environmental Aspects and Impacts;
- Objectives and Targets;
- Roles and Responsibilities;
- Planning and Programs;
- Regulatory Compliance;
- Document Control;
- Operational and Emergency Procedures;
- Training;
- Monitoring and Measuring; and
- Review (including environmental audits) and Improvement.

N3.1.4 *Hydropower – Environmental Aspects of Sustainability*

Optimising Environmental Outcomes for hydropower schemes

In line with improvements in the understanding of the impacts of dams on riverine environments, the management of environmental issues arising from hydropower is undergoing rapid improvement. Targeted studies and monitoring programs have identified viable mitigation options and provided long-term assessments of their effectiveness. Strategies suggested by the SGs to maximise positive outcomes and reduce the severity or avoidance of negative impacts is outlined in *Table 3.2*, below.

Table 3.2 Optimising Environmental Outcomes for Hydropower Schemes

Issue for Management Consideration	Mitigation Options/Strategies
1. Water quality Changes in water quality are likely to occur within and downstream of the development as a result of impoundment. The residence time of water within a reservoir is a major influence on the scale of these changes, along with bathymetry, climate and catchment activities. Major issues include ○ reduced oxygenation, ○ temperature, ○ stratification potential,	• Adequate data collection and an EIA process that identifies potential problems prior to dam design are critical. • Design and operational systems that minimise as much as possible the negative impacts within the storage and downstream; examples include multilevel off-takes, air injection facilities, aerating turbines, and destratification capability. • While removal of vegetation from proposed impoundments is expensive, the potential benefits for water quality means that at least some removal should be

Issue for Management Consideration	Mitigation Options/Strategies
○ pollutant inflow, ○ propensity for disease proliferation, ○ nutrient capture, ○ algal bloom potential; and ○ the release of toxicants from inundated sediments. Many water quality problems relate to activities within the catchment beyond the control of the proponent.	considered. • Working with local communities and regulatory authorities in improving catchment management practices can have significant water quality benefits for hydro reservoirs.
2. Sediment transport and erosion The creation of a reservoir changes the hydraulic and sediment transport characteristics of the river, causing increased potential sedimentation within the storage and depriving the river downstream of material. Sedimentation is an important sustainability issue for some reservoirs and may reduce the long-term viability of developments. Reduction in the sediment load to the river downstream can change geomorphic processes (eg. erosion and river form modification).	• Development proposals need to be considered within the context of existing catchment activities, especially those contributing to sediment inflow to the storage. • Reducing reservoir sedimentation through cooperation with local communities and regulatory authorities in improving catchment management practices is an option. Specific actions, such as terracing or reforestation, may need to be considered. • In some cases sediment by-passes, flushing systems or dredging should be investigated. • Operational or physical mitigation measures to reduce erosion of downstream should be considered for both proposed and existing developments and appropriate objectives set.
3. Downstream hydrology and environmental flows Changes to downstream hydrology impact on river hydraulics, instream and streamside habitat, and can affect local biodiversity. Operating rules should not only consider the requirements for power supply, but also be formulated, where necessary and practicable, to reduce downstream impacts on aquatic species and human activities.	• Operating schedules should, where necessary and practicable, incorporate environmental water release patterns (including environmental flows) within the operational framework for the supply of power. • Downstream regulating ponds and other engineering solutions may provide cost-effective alternatives to environmental flow releases directly from power stations. • It is important that the environmental objectives of any flow release are identified in a clear and transparent manner. These releases need to be developed within the context of environmental sustainability and also take into account local and regional socio-economic factors. It is desirable that the environmental flow objectives be agreed with local communities.
4. Rare and endangered species The loss of rare and threatened species may be a significant issue arising from dam construction. This can be caused by the loss or changes to habitat during construction	• Plans to manage this issue need to be developed prior to construction and options for mitigation identified and assessed. • Habitats of critical importance should be identified (within a wider regional

Issue for Management Consideration	Mitigation Options/Strategies
disturbance, or from reservoir creation, altered downstream flow patterns, or the mixing of aquatic faunas in inter-basin water transfers. Hydropower developments modify existing terrestrial and aquatic habitats, and when significant changes cannot be avoided, mechanisms to protect remaining habitats at the local and regional scale should be considered in a compensatory manner.	context) and impacts to these avoided or minimised as much as possible during the design phase. • Targeted management plans need to be developed for species of conservation significance. Translocations or habitat rehabilitation may be options, along with identification of suitable habitat for 'reserve' management.
5. Passage of fish species Many fish species require passage along the length of rivers during at least short periods of their life-cycle. In many places the migration of fish is an annual event and dams and other instream structures constitute major barriers to their movement. In some cases the long-term sustainability of fish populations depend on this migration and in developing countries local economies can be heavily reliant on this as a source of income.	• The passage of fish is an issue that must be • considered during the design and planning stage of proposed developments (dam site selection) and adequate consideration should be given to appropriate mechanisms for their transfer (eg. fish ladders, mechanical elevators, guidance devices and translocation programs). • Large-scale downstream migration of some species may require mitigation measures to reduce mortality by passage through turbines. • Appropriate and feasible options for facilitating passage are also an issue for existing developments.
6. Pest species within the reservoir (flora & fauna) In some regions a significant long-term issue with reservoirs, irrespective of their use, is the introduction of exotic or native pest species. The change in environment caused by storage creation often results in advantageous colonisation by species that are suited to the new conditions, and these are likely to result in additional biological impacts. In some instances, proliferation may interfere with power generation (eg. clogging of intake structures) or downstream water use through changes in the quality of discharge water (eg algal bloom toxins, deoxygenated water).	• Identifying the risk of infestation prior to development should also help identify potential options for future management or mitigation. Shorter residence time of water is one viable mechanism for reducing risk. • Downstream water uses must also be considered when examining potential options for control.
7. Health issues The changes brought about by hydropower developments have the capacity to affect human health. Issues relating to the transmission of disease, human health risks associated with flow regulation downstream and the consumption of contaminated food sources (eg, raised mercury levels in fish) need to be considered. The potential health benefits of the development should also be identified.	• Public health and emergency response plans should be developed in conjunction with local authorities. These plans, and their associated monitoring programs, should be relevant to the levels of risk and uncertainty. • The health benefits due to improved water supply, economic improvements and flood control should be recognised. Proper reservoir management can be highly effective in eliminating mosquito-borne illnesses such as malaria.
8. Construction activities	• These issues should be adequately addressed during the EA stage and plans

Issue for Management Consideration	Mitigation Options/Strategies
Construction needs to be carried out so as to minimise impacts on the terrestrial and aquatic environment. Where a new development is planned, there are a range of activities that can result in environmental impacts, both terrestrial and aquatic. Noise and dust may also be issues where the development is close to human habitation.	developed to manage these issues. Plans to manage specific issues may be required; e.g., rehabilitation of borrow pits, management of construction site drainage, storage and handling of chemicals. Similar plans to manage disturbance to terrestrial and aquatic fauna may also be required.
9. Environmental management systems It is recommended that all hydropower schemes implement an independently audited environmental management system.	• An environmental management system should allow for effective management of the range of environmental issues associated with the on-going operation of the hydropower scheme. • The associated monitoring programs and • environmental plans should ensure a program • of continuous improvement in environmental management over the life of the project.

N3.1.5 Hydropower Social - Aspects of Sustainability

Managing Social Impacts

There are various issues that require management to ensure that change affecting communities and individuals is effectively managed during the planning, construction and operation of hydropower facilities. The IHA SGs have identified possible social impacts/issues that would require consideration and have set outcome aims and strategies to achieve this. These are detailed in *Table 3.3*.

Table 3.3 Optimising Social Outcomes for Hydropower Schemes

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes
6. Changes to resource use and biodiversity in the area of the proposed project and the impacts this may have on the local community.	• Providing affected communities with improved living conditions.	The project proponent should ensure that: • the community and environmental resources are managed in a sustainable way, and on-going monitoring and liaison with local community groups continues through the life of the project. • the proposed project is the best alternative, following the consideration of relevant stakeholders concerns; • adequate consultation is undertaken, with relevant local, regional and

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes
		national agencies consulted, and any legislation, regulations, codes of practice or guidelines of government agencies complied with; and • impacts on the community, stakeholders and the environment are identified and that stakeholders are informed about the project and the implications for them, as well as being regularly consulted throughout the planning and implementation phases.
7. Distribution of benefits among affected parties.	• Ensuring equitable distribution of the benefits of the project, particularly to affected and vulnerable communities, through processes such as revenue sharing, training programmes and educational outreach. • Supporting additional community infrastructure associated with the project, particularly water and electricity connection, where positive benefits to the community will result.	The project proponent should ensure that: • stakeholders who may be affected by the project are provided with the opportunity to be represented during the different phases of project development.
8. Effectiveness and on-going performance of compensatory and benefits programmes.	• Ensuring that the local knowledge of communities and stakeholders is utilised in project planning.	The project proponent should ensure that: • those communities or individuals affected by the project are compensated for impacts caused by the project.
9. Public health issues that can result from the modification of hydrological systems, especially in tropical and sub-tropical areas, where water-borne diseases can be a significant issue. In some reservoirs, a further concern is the management of the temporary rise of mercury levels in fish.	• Improving public health conditions for impacted communities.	The project proponent should ensure that: • the community and environmental resources are managed in a sustainable way, and on-going monitoring and liaison with local community groups continues through the life of the project.

Issue for Management Consideration	Outcome Aims	Strategies to achieve proposed outcomes
10. The impacts of displacement on individuals and communities. These impacts may include: ○ the physical loss of homes and lands; ○ the transition to alternative means of earning a livelihood, particularly for populations that rely heavily on local land and resources for their way of life or that have a traditional existence; ○ disruption of established community networks and loss of cultural identity.	Ensuring that displacement is dealt with in a fair and equitable manner. The broad guidelines required to address displacement are: ○ to investigate all possible project alternatives to ensure that displacement is avoided or minimised where feasible; ○ to plan the resettlement thoroughly, where displacement is necessary, ensuring that adequate resources are available to enable the displaced groups to share in the benefits of the project; ○ to ensure adequate and on-going consultation with those groups or individuals that will be displaced, so that they have input into both the planning and the implementation of the resettlement program; ○ to provide displaced groups with sufficient assistance to ensure that their livelihoods are improved or, as a minimum, to ensure that they are re-established at no disadvantage; and ○ to improve standards of living for both the displaced communities as well as the host community, where applicable.	The project proponent should ensure that: • a negotiated and agreed outcome is achieved wherever possible.

Community acceptance of a project, particularly in its early phases, will greatly assist in the successful implementation of that project. To achieve community acceptance, the IHA has developed a list of recommendations (

Box 3.1) and suggests that these recommendations be undertaken by the proponent and /or regulatory authorities.

Box 3.1 Strategies to Achieve Proposed Outcomes

1. Ensure that benefits and costs of the project, including environmental, social and economic, are clearly identified, documented and disseminated to stakeholders.
2. Identify stakeholders and impacted communities and provide them with the opportunity to have informed input into the decision making process. The community must view the process as being open, fair and inclusive.
3. Affected stakeholders should participate in the development and implementation of mitigation measures, including the formulation of a Resettlement Plan or Policy.
4. A process for addressing future concerns or risks from the project needs to be outlined to stakeholders at the start of the project.
5. Specifically identify any minority and / or vulnerable groups and ensure that they are adequately represented in any consultation process and are not adversely impacted by the project.
6. Communities and / or groups that are impacted by a project should be the first to benefit. These groups should also participate in the identification, planning and distribution of benefits.
7. Communities that will be affected should be compensated for their loss. This will include those persons or groups displaced by associated infrastructure developments, such as roads, those communities both upstream and downstream who experience loss of livelihood, and those who depend on common resources such as forests and agricultural land that might be altered by the project.
8. Where compensation is to be paid, this is undertaken in a timely manner to ensure that the displaced persons are not disadvantaged.
9. Where involuntary displacement is necessary, following consideration of all other alternatives, the same compensation and support standards should apply to all groups whether they have agreed to relocation arrangements or not.
10. All displaced persons should be informed about their rights and options in relation to resettlement.
11. Local and regional resources (particularly labour) should be utilised in the development and operation of the project. Local communities will then more readily see the benefits of the scheme to their community.
12. Social compensation projects (such as new roads) should undergo appropriate environmental assessment.

N3.1.6 Hydropower – Economic Aspects of Sustainability

Institutional Framework

Governments need to establish a suitable investment climate and communicate this widely, in the process making known their project priorities. In particular, governments should ensure that:

1. The legislative framework for decision making is one in which an investor can have confidence in terms of clarity, the impartiality of the legal process, and the ability to resolve disputes without undue costs or delay.

2. An efficient institutional framework is in place to ensure that all parties concerned with the development of any project are fully aware of the factors of interest to themselves and that, as far as possible, unnecessary delay and conflict of interest are avoided.

3. In determining project priorities, the long-term interests of the state should be taken into account, in terms of the selection of the preferred project and the finalisation of its ultimate configuration.

4. Economic and financial analysis should take account of the effects of assumed interest rates, and some allowance taken of the needs for price escalation.

5. Wherever possible mechanisms should be implemented to reconcile the gap between short-term price competitiveness and long term wealth creation. Multilateral development banks should be encouraged to play their full part in this process.

Identifying Costs and Benefits

Economic sustainability decisions should be based on a comprehensive evaluation of resources affected and project costs and benefits, some of which will be difficult to quantify in precise terms. As far as possible the following elements should be taken into account:

Costs

1. Construction, operations and maintenance costs should be fully detailed, recognising the split between foreign and local currency, financing options and the anticipated exposure that these might give in terms of exchange rate variation.

2. Land acquisition costs should be evaluated in terms of actual economic value of land, as opposed to arbitrary valuations based on little substance.

3. The full capital and recurrent costs of environmental and social mitigation plans should be included.

4. Allowance should be made for the replacement of the main items of equipment after a defined period, and for the rehabilitation of civil works where this becomes necessary.

Benefits

1. Allowance should be made of the accrued benefits at a national or regional level, including any additional taxes, industrial development and improved infrastructure or multiple use benefits that could be attributed to the project.

2. Recognition of savings on greenhouse gas emissions, and improved local air quality, to the extent that this can be quantified.

3. Where feasible, allowance should be made for benefits that accrue to local communities including job creation, local industry, recreation, training, improved health care and sanitation, or environmental benefits.

4. Full quantification of the energy and power benefits (generally measured in terms of the displaced alternative) and ancillary benefits such as spinning reserve, system regulation and improved thermal efficiency.

5. Multi-purpose / multiple use benefits to downstream users and other riparian interests, including irrigation, water supply, flood mitigation, water-based transport, and the improved regulation of other hydropower stations downstream.

Allocation of Benefits

In most countries water resources belong to the State, and this is generally also the case for the land on which the project is built. A hydro project, particularly one with reservoir storage, can affect a large number of people, some of whom are remote from the site itself. These facts raise some important issues regarding the sharing of benefits arising from a project. The most fundamental point is that some of the benefit must accrue, either directly or indirectly, to the State.

For internal projects supplying domestic electricity demand, this might take the form of stable energy prices and other benefits to the utility in the form of ancillary services; but for an export project where power is being used in another country, a more explicit system of payment is needed.

The principal stakeholders in any project are the developer, the electricity user/supplier (if different), governments, financing agencies, communities and individuals directly affected by the scheme (for example, traditional resource users). These stakeholders should be identified early in the planning and development approval process and their legitimate interests acknowledged and taken into account in the financial and economic evaluation processes.

The above objectives imply the need for the following:

- Balanced commercial agreements in the case of privately funded projects;
- Reasonable returns on equity, consistent with the risk profile and international norms;
- Transparency in procurement processes;
- Directly negotiated contracts to be subject to independent audit; and
- Ongoing auditing/monitoring of economic performance against projected benefits.

To support the Sustainability Guidelines the IHA has also developed the Hydropower Sustainability Assessment Protocol to assist in assessing performance against criteria described in the IHA Sustainability Guidelines.

N3.2 INTERNATIONAL HYDROPOWER ASSOCIATION (IHA) - HYDROPOWER SUSTAINABILITY ASSESSMENT PROTOCOL

N3.2.1 *The Hydropower Sustainability Assessment Forum*

The IHA in close collaboration with a range of partners launched the Hydropower Sustainability Assessment Forum (HSAF) in March 2008. The HSAF comprised representatives of organisations from a diversity of sectors, with differing views and policies on sustainability issues related to hydropower development and operation. The aim of the HSAF's was to develop an enhanced sustainability assessment tool to measure and guide performance in the hydropower sector and to provide more consistency in the approach to assessment of hydropower project sustainability. The HSAF built on the IHA"s Sustainability Assessment Protocol 2006 and in November 2010, released a revised, updated and expanded Protocol.

N3.2.2 *Purpose and Target Users*

The Hydropower Sustainability Assessment Protocol (the Protocol) is a sustainability assessment framework for hydropower development and operation. It enables the production of a sustainability profile for a project through the assessment of performance within important sustainability topics.

To reflect the different stages of hydropower development, the Protocol includes four sections, which have been designed to be used as standalone documents. Through an evaluation of basic and advanced expectations, the Early Stage tool may be used for risk assessment and for dialogue prior to advancing into detailed planning. The remaining three documents, Preparation, Implementation and Operation, set out a graded spectrum of practice calibrated against statements of basic good practice and proven best practice.

Assessments rely on objective evidence to support a score for each topic, which is factual, reproducible, objective and verifiable. Assessment results may be used to inform decisions, to prioritize future work and/or to assist in external dialogue.

The development and evaluation of a hydropower project will involve many actors with different roles and responsibilities. It is recognized that both development and operation may involve public entities, private companies or combined partnerships, and responsibilities may change as the project progresses through its life cycle. It is intended that the organisation with the primary responsibility for a project at its particular life-cycle stage will have a central role in any Protocol assessment.

N3.2.3 *Principles Underpinning the Protocol*

The principles underlying the Protocol stipulate that:

- Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

- Sustainable development embodies reducing poverty, respecting human rights, changing unsustainable patterns of production and consumption, long-term economic viability, protecting and managing the natural resource base, and responsible environmental management.

- Sustainable development calls for considering synergies and trade-offs amongst economic, social and environmental values. This balance should be achieved and ensured in a transparent and accountable manner, taking advantage of expanding knowledge, multiple perspectives, and innovation.

- Social responsibility, transparency, and accountability are core sustainability principles.

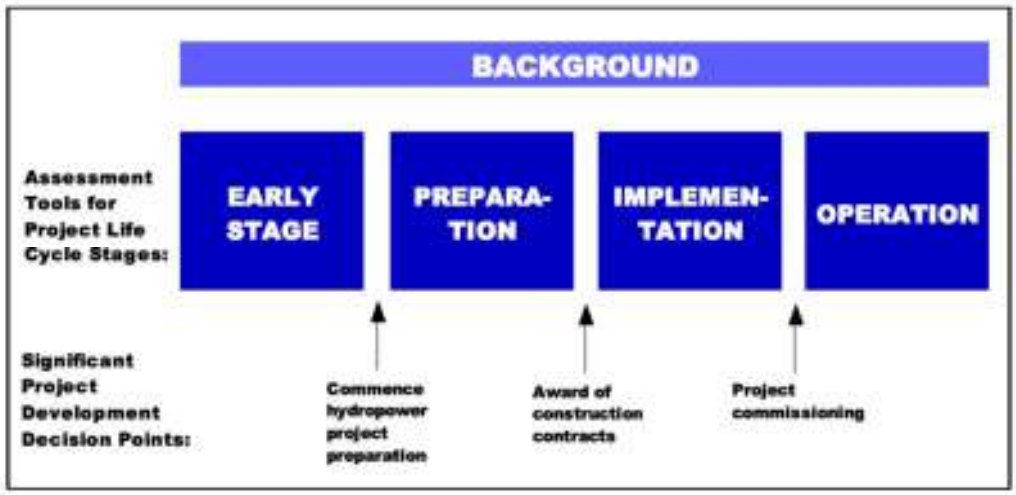
- Hydropower, developed and managed sustainably, can provide national, regional, and local benefits, and has the potential to play an important role in enabling communities to meet sustainable development objectives.

N3.2.4 Protocol Structure

Assessment Tools

The Protocol comprises four assessment tools for the different stages of the project life cycle, as shown in *Figure 3.1*.

Figure 3.1 Protocol Assessment Tools and Major Decision Points



The four Protocol assessment tools – Early Stage, Preparation, Implementation, and Operation – are designed to be stand-alone assessments applied at particular stages of the project life cycle. An assessment with one tool does not depend on earlier stage assessments to have been undertaken.

The **Early Stage** assessment tool is a preliminary screening tool to assess the strategic environment from which proposals for hydropower projects emerge. It identifies project risks and opportunities at an early stage, in order to identify the challenges and management responses to proceed with a more detailed project investigation. The Early Stage assessment tool differs from the other three assessment tools in that it is an assessment guide but not a scoring protocol. This is because there is not a clearly formulated project at this stage, nor a strong basis of information from which to derive sustainability scores. In addition, project specifics at this stage may be of a confidential nature. As soon as detailed technical, environmental, social and financial feasibility studies are undertaken, often under a strict governmental process, the use of the Preparation assessment tool will be appropriate.

The **Preparation** assessment tool assesses the preparation stage of a hydropower project, during which investigations, planning and design are undertaken for all aspects of the project. This project stage is normally subject to national regulatory processes regarding project-specific Environmental and Social Impact Assessment (ESIA) requirements as well as project management processes. Following project preparation, there is a critical decision point in the decision to award the construction contracts. An assessment conducted at this point in time would assess whether all preparatory requirements have been met, management plans are in place, and commitments are appropriate and binding. This Protocol assessment tool can be used prior to, and to inform, the decision to move forward with project implementation. This decision is governed by national regulatory processes to obtaining a construction permit and an operating license based on the ESIA and project specific governmental requirements. Following this point, construction commences along with relevant elements of environmental and social management plans.

The **Implementation** assessment tool assesses the implementation stage of a hydropower project, during which construction, resettlement, environmental and other management plans and commitments are implemented.

The **Operation** assessment tool assesses the operation of a hydropower facility. This Protocol assessment tool can be used to inform the view that the facility is operating on a sustainable basis with active measures in place towards monitoring, compliance and continuous improvement.

Protocol Topics

Within each Protocol assessment tool is a set of topics important to forming a view on the overall sustainability of that project at that point in its life cycle. Topics, when taken together, provide the list of issues that must be considered to confidently form a view on the overall sustainability of a hydropower project at a particular point in its life cycle.

Table 3.4 provides a list of topics for each assessment tool. Not every topic will be relevant to every project, and so at the front of the Preparation, Implementation and Operation documents is a Topic Relevance Guide to

assist in determining relevant topics. For example, if there is no Resettlement the Resettlement topic does not need to be assessed.

Assessment Criteria

There are six criteria that may be utilised for the scoring statements on each topic – Assessment, Management, Stakeholder Engagement, Stakeholder Support, Conformance/Compliance, and Outcomes. These provide an ability to assess both the processes in place to ensure sustainability of the project or operation, and the performance of that project or operation on that particular sustainability topic.

Table 3.4 Hydropower Sustainability Assessment Protocol Topics by Section

ES - Early Stage	P - Preparation	I - Implementation	O - Operation
ES-1 Demonstrated Need	P-1 Communications & Consultation	I-1 Communications & Consultation	O-1 Communications & Consultation
ES-2 Options Assessment	P-2 Governance	I-2 Governance	O-2 Governance
ES-3 Policies & Plans	P-3 Demonstrated Need & Strategic Fit		
ES-4 Political Risks	P-4 Siting & Design		
ES-5 Institutional Capacity	P-5 Environmental & Social Impact Assessment & Mgmt	I-3 Environmental & Social Issues Mgmt	O-3 Environmental & Social Issues Mgmt
ES-6 Technical Issues & Risks	P-6 Integrated Project Management	I-4 Integrated Project Management	ES-6 Technical Issues & Risks
ES-7 Social Issues & Risks	P-7 Hydrological Resource	O-4 Hydrological Resource	ES-7 Social Issues & Risks
ES-8 Environmental Issues & Risks	O-5 Asset	ES-8 Environmental Issues & Risks	O-5 Asset Reliability & Efficiency
ES-9 Economic & Financial Issues & Risks	P-8 Infrastructure Safety	I-5 Infrastructure Safety	O-6 Infrastructure Safety
P-9 Financial Viability	I-6 Financial Viability	O-7 Financial Viability	P-9 Financial Viability
P-10 Project Benefits	I-7 Project Benefits	O-8 Project Benefits	P-10 Project Benefits
	P-11 Economic Viability		
	P-12 Procurement	I-8 Procurement	
	P-13 Project Affected Communities & Livelihoods	I-9 Project Affected Communities & Livelihoods	O-9 Project Affected Communities & Livelihoods
	P-14 Resettlement	I-10 Resettlement	O-10 Resettlement

ES - Early Stage	P - Preparation	I - Implementation	O - Operation
	P-15 Indigenous Peoples	I-11 Indigenous Peoples	O-11 Indigenous Peoples
	P-16 Labour & Working Conditions	I-12 Labour & Working Conditions	O-12 Labour
	P-17 Cultural Heritage	I-13 Cultural Heritage	O-13 Cultural Heritage
	P-18 Public Health	I-14 Public Health	O-14 Public Health
	P-19 Biodiversity & Invasive Species	I-15 Biodiversity & Invasive Species	O-15 Biodiversity & Invasive Species
	P-20 Erosion & Sedimentation	I-16 Erosion & Sedimentation	O-16 Erosion & Sedimentation
	P-21 Water Quality	I-17 Water Quality	O-17 Water Quality
		I-18 Waste, Noise & Air Quality	
	P-22 Reservoir Planning	I-19 Reservoir Preparation & Filling	O-18 Reservoir Management
	P-23 Downstream Flow Regimes	I-20 Downstream Flow Regimes	O-19 Downstream Flow Regime

N3.2.5 *Understanding the Protocol's Gradational Assessment Approach*

The gradational approach undertaken in the Preparation, Implementation and Operation assessments tools can be understood by examination of *Table B3.5.* This table provides general guidance on characteristics that are likely to be exhibited for these different criteria at the five different scoring levels. The scoring statements found in the Preparation, Implementation and Operation assessment tools have been guided by the approach shown in *Table B3.5.*. This table is not intended to be the basis for assigning of scores, however, this table can be referred to during an assessment if there is insufficient information in the topic scoring statements and in the topic-specific assessment guidance to help the assessor to determine a score.

N3.2.6 *Assigning Scores and Presenting Results*

The Preparation, Implementation and Operation assessment tools enable development of a sustainability profile for the project under assessment. For each topic, scoring statements describe what should be exhibited by the project to address that important sustainability issue. It is recognised that different organisations may have the primary responsibility for different sustainability topics. Because it is likely that these responsibilities vary amongst countries and at project life cycle stages, no specification on organisational responsibilities is made in the Protocol scoring statements. It would be expected in the assessment reports to indicate where organisational responsibilities lie.

Scoring Levels

In the Preparation, Implementation and Operation assessment tools, each topic is scored from Level 1 to 5. The Level 3 and Level 5 statements provide meaningful and recognisable levels of performance against which the other scores are calibrated.

Level 3 describes **basic good practice** on a particular sustainability topic. Level 3 statements have been designed with the idea that projects in all contexts should be working toward such practice, even in regions with minimal resources or capacities or with projects of smaller scales and complexities. Note that the Protocol does not state that Level 3 is a standard that must be achieved; expectations on performance levels are defined by organisations that make decisions or form views based on Protocol assessments.

Level 5 describes **proven best practice** on a particular sustainability issue that is demonstrable in multiple country contexts. Level 5 statements have been designed with the idea that they are goals that are not easy to reach. However, they have been proven that they can be attained in multiple country contexts, and not onlyby the largest projects with the most resources at their disposal. 5s on all topics would be very difficult to reach, because practical decisions need to be made on priorities for corporate/project objectives and availability/allocation of resources (time, money, personnel) and effort.

On the topic pages, the Level 3 statements are provided in full, and the Level 5 statements provide what is exhibited in addition to that described in the Level 3 statement. Consequently, the Level 5 statements are meant to be read in conjunction with the Level 3 statements.

The other scoring levels are represented by standard statements which use basic good and proven best practice as reference points:

Level 1 - There are significant gaps relative to basic good practice.

Level 2 - Most relevant elements of basic good practice have been undertaken, but there is a significant gap.

Level 4 - All elements of basic good practice have been undertaken and in one or more cases exceeded, but there are one or more significant gaps in the requirements for proven best practice.

Methodology for Assigning Scores

The Protocol has been designed so a score can be readily assigned for each sustainability topic in the Preparation, Implementation and Operation assessment tools. The following steps are involved in the assignment of a score for each Protocol topic:

1. The assessor evaluates if the scoring statements for each of the criteria specified at Level 3 are met by the project.

2. If there is a significant gap relative to the Level 3 statements (all or part of a criterion is not fulfilled), then a score of 2 is assigned to the topic.

3. If there is more than one significant gap relative to the Level 3 statements, then a score of 1 is assigned to the topic.

4. If all of the Level 3 statements are met, then the assessor evaluates if the scoring statements for each of the criteria specified at Level 5 are met by the project.

5. If there are one or more significant gaps relative to the Level 5 statements, then a score of 4 is assigned to the topic.

6. If all of the Level 5 statements are met, then a score of 5 is assigned to the topic.

"Significant" means important in effect or consequence, or relatively large. If there are minor gaps, these will not affect the score. That is to say, if there are minor gaps in meeting the requirements specified in the Level 3 statements, a score of 3 is still assigned. The significance of any gap is tested by the assessor through inquiry about the importance or magnitude of the effect or consequence of that gap.

The assessment guidance for each topic is provided to assist the assessor in understanding what is meant by different terms or phrases in the scoring statements. These are not absolute lists of requirements that must be met, but rather are often expressed as examples. The Glossary of Terms is also found in each assessment tool document, and contains many of the commonly used terms throughout the Protocol. The table entitled "Understanding the Protocol's Gradational Assessment Approach" is also included in each assessment tool document; if the assessor is having difficulties assigning scores based only on the topic page information, this table could be referred to as a form of assistance in determining scores.

There is the potential to assign scores for each of the topic criteria appearing on a topic page, in the interests of eliciting greater insights from the assessment.

Table B3.5 Understanding the Protocol's Gradational Approach

Level	Assessment	Management	Stakeholder Engagement	Stakeholder Support	Outcomes	Conformance / Compliance
5	• Suitable, adequate and effective assessment with no significant opportunities for improvement. • In addition to basic good practice (Level 3), the assessment are likely to take a relatively broader, external or regional view or perspective; emphasise opportunities; and show a high level of examination of interrelationships amongst relevant sustainability issues.	• Suitable, adequate and effective management processes with no significant opportunities for improvement. • In addition to basic good practice (Level 3), management plans and processes are likely to show excellent anticipation of and response to emerging issues or opportunities; senior management and/or executive decisions are likely to be timely, efficient and effective in response to monitoring data, investigations and issues arising; and in cases commitments in plans are public, formal and legally enforceable.	• Suitable, adequate and effective stakeholder engagement processes with no significant opportunities for improvement. • In addition to basic good practice (Level 3), the engagement is likely to be inclusive and participatory with the directly affected stakeholders. • Thorough feedback is likely to be available on how directly affected stakeholder issues are taken into consideration; • In cases there is likely to be directly affected stakeholder involvement in decision-making; and • Information identified through engagement processes to be of high interest to stakeholders is released publicly in a timely and easily accessible manner.	• There is support of nearly all directly affected stakeholder groups for the assessment, planning or implementation measures for that topic, or no opposition by these stakeholders • In cases formal agreements or consent with the directly affected stakeholder groups have been reached for management measures for that topic	• In addition to basic good practice (Level 3), there may be exhibited enhancements to pre-project conditions; contributions to addressing issues beyond those impacts caused by the project; leveraging of opportunities; or significant contribution to capacity building.	• No non-compliances or non-conformances.
4	• Suitable, adequate and effective assessment with only a few minor gaps. • In addition to basic good practice (Level 3), the assessment is likely to exhibit some recognition of broader, external or regional issues; opportunities; and interrelationships amongst relevant sustainability issues.	• Suitable, adequate and effective management processes with only a few minor gaps • In addition to basic good practice (Level 3), management plans and processes are likely to exhibit good anticipation of and response to emerging issues or opportunities; and in cases commitments in plans are public and formal.	• Suitable, adequate and effective stakeholder engagement processes with only a few minor gaps. • In addition to basic good practice (Level 3), there is likely to be good feedback on how directly affected stakeholder issues have taken into consideration; and information on sustainability topics understood to be of high interest to stakeholders is voluntarily released publicly.	• There is support of a large majority of directly affected stakeholder groups for the assessment, planning or implementation measures for that topic, or only very low opposition by these stakeholders.	• In addition to basic good practice (Level 3), there may be exhibited full compensation of negative impacts; some positive enhancements; or evidence of capacity building associated with the project .	• Very few minor non-compliances and non-conformances that can be readily remedied.
3	• Suitable, adequate and effective assessment with no significant gaps. This would typically encompass (as appropriate to the topic and life cycle stage) identification of the baseline condition including relevant issues, appropriate geographic coverage, and appropriate data collection and analytical methodologies; identification of relevant organisational roles and responsibilities, and legal, policy and other requirements; appropriate utilisation of expertise and local knowledge; and appropriate budget and time span. At level 3 the assessment encompasses the considerations most relevant to that topic, but tends to have a predominantly project-focused view or perspective and to give stronger	• Suitable, adequate and effective management processes with no significant gaps. These would typically encompass (as appropriate to the topic and life cycle stage) development and implementation of plans that: • integrate relevant assessment or monitoring findings; • are underpinned by policies; • describe measures that will be taken to address the considerations most relevant to that topic; • establish objectives and targets ; • assign roles, responsibilities and accountabilities; • utilise expertise appropriate to that topic; • allocate finances to cover implementation requirements with some contingency; • outline processes for monitoring, review, and reporting; and	• Suitable, adequate and effective stakeholder engagement processes with no significant gaps. These would typically encompass (as appropriate to the topic and life cycle stage): • identification of directly affected stakeholders; • appropriate forms, timing, frequency and locations of stakeholder engagement, often two-way; • freedom for affected stakeholders to participate; • attention to special stakeholder engagement considerations relating to gender, minorities, cultural sensitivities, level of literacy, and those who might require particular assistance; • mechanisms by which stakeholders can see that their issues are recognised and acknowledged, and how they have been or are being responded to; and • disclosure of information on significant sustainability topics (in cases this may be on	• There is general support amongst directly affected stakeholder groups for the assessment, planning or implementation measures for that topic,or no significant ongoing opposition by these stakeholders.	• As appropriate to the topic and the life cycle stage, there may be exhibited avoidance of harm; minimisation and mitigation of negative impacts; fair and just compensation; fulfilment of obligations; or effectiveness of implementation of plans.	• No significant non-compliances and non-conformances.

Level	Assessment	Management	Stakeholder Engagement	Stakeholder Support	Outcomes	Conformance / Compliance
	emphasis to impacts and risks than it does to	• are periodically reviewed and improved as required.	request).			
2	• A significant gap in assessment processes relative to basic good practice (Level 3).	• A significant gap in management processes relative to basic good practice (Level 3).	• A significant gap in stakeholder engagement processes relative to basic good practice (Level 3).	• There is support amongst some directly affected stakeholder groups for the assessment, planning or implementation measures for that topic, with some opposition.	• •A significant gap relative to basic good practice (Level 3), for example some deterioration in baseline condition.	• A significant non-compliance or non-conformance.
1	• Significant gaps in assessment processes relative to basic good practice (Level 3).	• There are significant gaps in management processes relative to basic good practice (Level 3).	• There are significant gaps in stakeholder engagement processes relative to basic good practice (Level 3).	• There is low support amongst directly affected stakeholder groups for the assessment, planning or implementation measures for that topic, or a majority oppose.	• Significant gaps relative to basic good practice (Level 3), for example deterioration in baseline condition with delay or difficulties in addressing negative impacts.	• Significant non-compliances and non-conformances.

N3.2.7 *Relationship of Scores to Compliance with Regulatory Obligations*

The preparation, implementation and operating phase of a hydropower project are framed by national regulations. First and foremost, a project is expected to comply with the laws and concessions/permits of the government. The Protocol offers a complementary tool, on a voluntary basis and in the spirit of continuous improvement, that identifies opportunities for improvement with respect to sustainability criteria relevant to an international context.

Compliance with relevant regulatory requirements is expected for all projects, and is an essential component of good practice. National or state requirements may be more or less stringent than the Level 3 statements in the Protocol. The Protocol is a globally applicable assessment tool, and makes no judgements on national requirements which are set for reasons of relevance to that country. There may in fact be cases where local law sets out, for example, compensation measures that a proponent should not legally go above or below.

Compliance with regulatory requirements does not equate to a particular scoring level in the Protocol, but should be recorded by the assessor if it is a substantive issue for the assessment.

If a conflict between regulatory requirements and the level of statements in the Protocol arises as a point of issue in the assessment, the assessor should note if the project has met the regulatory requirements for a particular criterion and what these regulatory requirements are with respect to the Protocol specifications, in addition to assigning a scoring level based on the Protocol specifications. Decision-makers will then be able to determine their own views on this information.

Presenting the Results

Based on the Protocol assessment, a report is developed. A formal template for reporting and presentation of results will be developed in the future, based on review of application experience as well as better understanding of the needs and interests of utilising organisations. Analysis of areas of strength, weakness and opportunity, and recommendations for the project, could be included if this has been specifically requested for the assessment report.

The emphasis is not on an overall single score or a pass/fail for a project, but rather on provision of a sustainability profile for the project accompanied by information that assists in systematically analysing and understanding the strengths, weaknesses and pathways towards improvement.

In provision of a summary table and diagram, the scores are presented to show topic by topic performance and are not aggregated. If a topic is Not Relevant or is Not Scored, it is shown as such in the report, summary table and summary figure. A simple bar chart, histogram or webgram could work well for a summary figure. Averaging, totalling, or calculating percentages

with scores is not intended, as it will mask areas of low performance and hence diminish credibility in the Protocol assessment as an aid to advancing project sustain

Annex O

Dam Safety Plan for the BGHES

Zambezi River Authority

BATOKA GORGE HYDRO-ELECTRIC SCHEME

Phase III - FEASIBILITY

Vol.7 DAM SAFETY PLAN

September 2019

Number												
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studio pietrangeli consulting engineers

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Vol.6 – 320 SEI R SP 001 – SEISMIC HAZARD ASSESSMENT REPORT

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GLOSSARY & ABBREVIATIONS

CDP	Controlled Drawdown Procedure
EAP	Emergency Action Plan
EDP	Emergency Drawdown Procedure
EM eq	Electro-mechanical equipment
EPP	Emergency Preparedness Plan
GS	Gate Shaft
HPP	Hydro Power Plant
HSS eq	Hydraulic Steel Structure equipment
IL	Invert level
MLO (or MO)	Middle Level Outlet (or Middle Outlet)
OHL	Over Head Line (electric transmission high voltage line)
PMS	Plant Management Structure
PH	Power House
PP	Plunge Pool
PT	Power Tunnel
RCC	Rolled Compacted Concrete
SS	Surge Shaft
SWY	Switchyard
SP	Studio Ing. G. Pietrangeli - Rome
ZRA	Zambezi River Authority

GENERAL INTRODUCTION

1.1 CONTENT AND STRUCTURE OF THE DAM SAFETY PLAN

The Dam Safety Plan is articulated in the following parts:

A. CONSTRUCTION SUPERVISION AND QUALITY CONTROL PLAN
   This part contains the organization, procedures and activities required for supervision of the construction of the Batoka Plant.
B. INSTRUMENTATION PLAN
   It describes the monitoring system of Batoka Dam, and it contains the instruction for measurements to be collected by the instruments, for their presentation, use and assessment.
C. OPERATIONAL PLAN (Preliminary Plan)
   It provides the guidelines for the operation of the Batoka scheme, including the dam, power waterways, power house and other appurtenant structures.
D. MAINTENANCE PLAN (Preliminary Plan)
   It outlines the operation and maintenance activities and procedures relevant to the Batoka Dam and Hydro Power Plants.
E. EMERGENCY PREPAREDNESS PLAN (FRAMEWORK PLAN)
   It contains the Batoka Emergency Preparedness Plan that includes the description of types of emergencies and how to identify them, the actions to take in case of emergency and the preparedness and Emergency Response. Moreover, the dam break analysis is included in this part.

The Dam Safety Plan is prepared according to the World Bank Dam Safety safeguard policy (ESS4 e.g. Environmental and Social Standard 4 -Community Health and Safety).

This revision B has been updated in order to add the results of the dam break analysis in part. E.

Each part is self-standing. The dam safety plan is provided on the basis of the knowledge of the project at this feasibility design stage and shall therefore be integrated and detailed with the development of the project, to become an operative tool for the operation of the dam and of the plants.

It is assumed that:

- The Dam Safety Plan, and in particular the operation and maintenance of the Dam and of the two Power Plants, will be assigned by the Plant Owners to their departments or entities or internal/external consultants dedicated to the control, operation and maintenance of dam and national power plants, that in this report will be always referred as "Plant Management Structure" (PMS).
- The project at this stage is considered as a whole, and this document is conceived as a base from which it will be possible:

  - To split it in lots, and to identify possible limits and definition of responsibility among the actors involved in the owning and management of the dam and plants.
  - to develop in detail the Dam Safety Plan, progressively with the subsequent developments of the project, to become an operative tool for the operation of the dam and of the plants.
- This report is based on the Feasibility Design of Batoka Project, to which reference is made. This report is deemed therefore integrated by the Feasibility Design reports and drawings.

  It is assumed in particular that this plan will be integrated progressively with:
  - detailed design drawings and reports
  - then the as-built drawings
  - original equipment or materials (as far as applicable) manufacturers' operations and maintenance recommendations and manuals,
  - EM and HSS Equipment Operation and Maintenance Manuals.
- This plan must be reviewed and updated as necessary:
  - To reflect the conditions of the detailed design and then of the construction on site whenever they will result substantially different from what assumed in this report.
  - Whenever any significant change to the scheme occurs, including any changes to the operating rules.
  - At intervals of 5 years after Plant commissioning.
  - Following any ownership change.

PART A - CONSTRUCTION SUPERVISION and QUALITY CONTROL PLAN

A.1 INTRODUCTION

A.1.1 CONTENT AND STRUCTURE OF THIS PART

This is the **PART A "CONSTRUCTION SUPERVISION and QUALITY CONTROL PLAN"** of the Batoka Dam Safety Plan.

This part contains the organization, procedures and activities required for supervision of the construction of the Batoka Plant.

Some of the guidelines provided in this section shall be detailed when the relevant construction contract(s) is put in place.

A.2 METHODOLOGY

A.2.1 INTRODUCTION

This chapter provides the description of the organization, staffing levels, procedures, equipment, and qualifications for supervision of the construction of Batoka dam.

It is developed at feasibility design stage, being assumed to be fine-tuned at the moment of these tasks assignment.

It is focused on the activities to be carried out for the Design Review, Construction Management, Supervision, Testing and Commissioning of Batoka Project.

It is conceived assuming that the works will be executed by the relevant Contractor(s) through EPC procurement method, therefore the duties of supervision will be in compliance with the requirements of the international practice foreseen in the "SILVER Book", prepared by the International Federation of Consulting Engineers (FIDIC) for this type of Contract.

Any adjustments in respect to the above assumptions are still possible in the further steps of design and construction phases, when also the structure that the Owner will put in place for the supervision (that for simplicity will be called hereinafter "Supervisor", that can be within his internal resources or recurring to external consultancy) will be defined.

A.2.2 CONSTRUCTION SUPERVISION AND QUALITY CONTROL PLAN ACTIVITIES

The Construction Supervision and quality control include the classical activities for the supervision of construction such as:

- DESIGN REVIEW
  Review and approval of the Contractor's design following the design implementation schedule in order to ensure technical soundness and compliance with the Client's requirements, prior to commencement of the Works.
  Design's review includes Feasibility Design appraisal, Draft Final and Final Design prepared by the Contractor for all Civil Works, Electro-mechanical equipment and Hydraulic Steel structures.
- REVIEW of TECHNICAL SPECIFICATIONS and BILL of QUANTITIES
  Review and approval of Technical Specifications and Bill of Quantities for all Civil Works, Electro-mechanical equipment and Hydraulic Steel structures to ensure that they fully comply with the Client's Requirements being economically sound.
- REVIEW of WORK PROGRAMME
  Review of Contractor's Work programme in order to verify its compliance with the Implementation Plan and to verify progress of the Works, actual and planned rate of production and highlight any criticality and/or delay emerged during the implementation of Design / Works.

- REVIEW of METHOD STATEMENTS
  Review of Contractor's Method Statements for all Civil Works, Electromechanical Works, Electrical Works and Hydraulic Steel Works, in order to ensure technical soundness of the proposed solutions.
- REVIEW of MANAGEMENT PLANS
  Review of the Management Plans of all the elements / personnel / equipment involved in the production chain of the Works to ensure timely production and quality of the Works.
- SUPERVISION during CONSTRUCTION, ERECTION TESTING and COMMISSIONING
  Supervision of construction, erection, testing and commissioning of all project Works to ensure their compliance with the approved Designs, Drawings, Specifications, Conditions of Contract, Work Programme and state-of-the-art Engineering Practice.
  During this phase of the assignment, it will be carried out a supervision and control of all environmental activities, including but not limited to those related to quarry exploitation, dumping of materials, impounding process and demobilization stages.
- MANAGEMENT of INVOICES and PAYMENTS
  Verification of all payment invoices issued by the Contractor and preparation of acceptance certificates for the Works completed.
- ADMINISTRATION of CLAIMS arising from the Contractor.
- POST-CONSTRUCTION SERVICES during defects liability period.
  Verification that the performances of all the elements of the project comply with the Contract, Technical Specifications and Client's Requirements.

The activities listed above, and detailed in the following paragraphs, shall be carried out throughout the entire Contract period, including Defect Liability Period, under and in close cooperation with the staff of the Client. The activities shall be carried out in order to guarantee a smooth implementation of the works in accordance with the EPC contract, Client's Requirements and state-of-the art technology. For this purpose, periodical and also specific Design / Managerial Coordination meetings are to be organized.

For sake of completeness, the minimum qualifications and experience of personnel responsible for the Level 1 and Level 2 design and review process are illustrated in the following table.

No.	***Position***	***General Qualifications and Specific Experience***	***Total experience*** *(min. years required)*	***In similar works*** *(min. years required)*	***As manager/s pecialist of similar works*** *(min. years required*
1.	Project Manager	Bachelor's degree in Engineer with international experience in design, planning and construction of hydropower plant (at least rated 100 MW), contract budgeting and staff coordination capabilities. Familiar with FIDIC Contract	20	15	5
		Designer Team Mambers			
2.	Hydropower Engineer/Resposible Design	Bachelor's degree in Engineer experienced in preparation of detailed design for hydropower plants of more than 100 MW	20	10	5

		adequate experience as a Team Leader and Responsible Designer			
3	Dam Engineer	Bachelor's degree in Engineer with internatinal experienced in preparation of detailed dam according to ICOLD criteria.	15	10	5
4.	Geology/Geotechnics specialist	Bachelor's degree in Geology Engineer with experienced in engineering geology, research interpretation as a responsible design engineer in geology/geotechnical designs for hydropower plants	15	7	5
5.	Hydraulic specialist	Bachelor's degree in civil Engineer with experience as a responsible design engineer in hydro-structure of a facility and experienced in hydraulic modelling of hydropower plants of more than 100 MW and dam according to ICOLD criteria	15	7	5
6.	Structural and Construction specialist	Bachelor's degree in civil Engineer with experience as a responsible design engineer in designing structures of hydro-construction facilities of more than 15 MW and dams according to ICOLD criteria	15	7	5
8.	Roads specialist	Bachelor's degree in Civil Engineer with experience in designing of different categories of roads	10	7	5
10.	Mechanical equipment specialist	Bachelor's degree in Mechanical Engineer with experience as a responsible design engineer of detailed designs of mechanical equipment in hydropower plants of more than 100 MW	15	7	5
11.	Hydromechanical equipment specialist	Bachelor's degree in Mechanical Engineer or Graduate Civil Engineer with experiencw as a responsible design engineer of detailed designs for hydromechanical equipment in hydropower plants of more than 100 MW	15	7	5
12.	Electrical equipment specialist	Bachelor's degree in Electrical Engineer experienced as a responsible design engineer of detailed designs for electrical equipment of voltage up to 110kV in HPP	15	7	5
13.	Electrical equipment specialist for control protection and monitoring system	Bachelor's degree in Electrical Engineer with experience in designing as a responsible design engineer of detailed designs for control protection and monitoring system of the hydropower plants	10	7	5
15.	Quality Assurance/Quality Control Manager	Graduated Specialist, experienced in QA/QC activities in hydropower projects	10	10	5
17.	Health & Safety Engineer	Bachelor's degree in a safety or technical engineering field of study, as well as several years of experience managing and working in the field of health and safety in hydropower plants	10	7	5
17.	Environmental and Social expert	Graduated Specialist experienced in implementation and monitoring of environmental and social issues in the civil construction activities	10	7	5

A.2.3 LEVEL 1 DESIGN REVIEW

In compliance with the condition of Contract and Client's Requirements, the Contractor will prepare and submit the Level 1 design of the civil, electrical and mechanical works. It is stressed that in this phase of the Design the Contractor shall start all the investigation activities required to finalize the Design of the Works.

Therefore, before starting construction activities, the Supervisor will review the investigation programme proposed by the Contractor and the Level 1 design, carrying out the following main activities:

- review the design in accordance with the Client Requirements, condition of Contract, state-of-the art engineering international practice;
- review the design in accordance with the actual site requirements and the results of latest investigations available;
- ensure that the most cost effective and technically sound alternatives are examined and appropriate designs are produced accordingly;
- examine thoroughly the technical documentation (bill of quantities, specifications and methods of measurement etc.) in order to point out any discrepancy or mistake which may jeopardise the prompt implementation of the project causing major changes, disputes and claims.

The Supervisor will verify that the Level 1 Design includes all the elements required for a full understanding by the Client or the Clients Representative of the key features proposed, such as:

- general arrangement and emplacement of the project structures;
- general hydraulic design of:
  - diversion structures;
  - main gated spillway;
  - Middle Level Outlets;
  - Ecological Discharge devices;
  - power waterways (including head losses calculations and basic transient analyses);
- design of electrical equipment;
- design of civil works;
- design of the mechanical equipment;
- design of the hydraulic steel structures;
- sizing and general characteristics of the main equipment of each powerhouse;
- drawings of the turbine parts and of the discharge pit and tailrace dimensioned at Level 1 stage;
- calculations verifying the average annual energy production;
- single line diagrams;
- Level 1 arrangement and assembly drawings of the powerhouse complex, showing construction of main components, leading dimensions and masses and confirmed locations;
- Level 1 study of the equipment erection sequence and requirements, to the extent needed to determine space and facilities required in the powerhouse erection areas;
- calculations and studies required to justify and support the proposed technical solutions. They will also include:
  - results of the field and laboratory investigations performed up to that moment and program for any additional investigations deemed necessary;
  - design criteria, standards and design codes proposed for the development of the designs during construction;
  - technical specifications for the civil and building works;
  - technical specifications for the hydraulic steel structures;

- technical specifications for the electrical works, including generating equipment and powerhouse electrics;
- technical specifications for the powerhouse lighting, ventilation, air conditioning, and fire-fighting systems;
- Quality Assurance Plan and manuals.
- a detailed program of the phases of design, material supply, manufacture, delivery, erection and commissioning of the equipment;
- any other technical documents to be submitted according to the Contract.

A "No Objection" will be issued when the submitted documents are correct and complete. "Verified-Comply with Comment" will indicate that the calculations and/or the main arrangements defined by the documents are considered essentially correct, but require minor rectifications so as to complete or clarify certain points having only trivial influence on the design, the behaviour and/or the safety of the structure or of the equipment. On the contrary, should the Supervisor consider the documentation insufficient, or as giving inadequate guarantee on the behaviour and/or the safety of the structure or equipment, the document will be classified as "Rejected, comply with comments, Re-submittal required". Such labelling will be transmitted together with the necessary explanations to correct the document so that the Contractor may re-submit the rectified documents.

A.2.4 CONTRACTOR'S COORDINATION ACTIVITIES

The Contractor will be requested to submit a clear procedure, to be approved by the Supervisor, which specifics the detailed design process of both the civil engineering structures and EM and HSS equipment. The main aim of this procedure is to guarantee that the design of these elements and also the erection process is carried out consistently and with the required coordination:

- reducing the problems of construction interfaces;
- guaranteeing the timely delivery on site of the necessary information for construction (construction drawings, method statements, installation manuals);
- assuring the availability on site of the required equipment, man-power and permanent materials.

The everyday follow-up of these procedures will be the responsibility of the Contractor who will report to the Supervisor.

A.2.5 LEVEL 2 CONSTRUCTION DESIGN REVIEW

The Supervisor will review the construction drawings and reports of the civil works, of the hydro-mechanical, mechanical and electrical equipment.

The review performed at this stage is aimed to verify that the construction and manufacturing design documents correspond to the design solutions and relevant comments formulated during the previous phase. In this regard the Contractor will submit for review the general arrangement drawings and relevant specifications and calculations of all components parts of the Works, i.e. all the documents required by the Contractor to construct, erect, test and commission all the components of the Permanent Works (construction drawings, detailed technical specifications, construction and erection method statements, commissioning and testing procedures, etc.).
The Contractor will prepare a list and a time schedule for preparation for the submission of the Construction and Manufacturing Design documents.

The design activity during construction includes the progressive preparation of "As-built" drawings, which are an essential part of the documentation needed to properly maintain all the works and the equipment in their lifetime and to eventually rehabilitate them.
The Contractor will be required to prepare and keep a complete, up-to-date, set of as-built drawings showing the locations, sizes and details of the works as executed, adopting the format, referencing system and other relevant details previously agreed.
The Supervisor will verify that all modifications of the civil, hydro-mechanical, electro-mechanical and electrical drawings, introduced after the acceptance of the drawing, have been correctly and properly recorded and that the drawings are complete in all parts and comply with the latest accepted version of the technical calculations.

A.2.5.1 Hydro and Electro-mechanical equipment

Before proceeding with the manufacturing of the:

- gates, linings, and other steel structures;
- mechanical, hydro-mechanical and electrical equipment

The Contractor will be required to submit the following documents for review and comment on conformity with design criteria by the Supervisor:

- calculations carried out for determining the plate thicknesses, the welding and other structural characteristics of the penstocks, clearly indicating the principles on which calculations are based;
- general assembly drawings, sufficient sub-assembly drawings and details to demonstrate that all parts will conform to the provisions and intent of the Contract and to the requirements of their installation and maintenance. These drawings will show all necessary dimensions and sub-assemblies in which the Contractor proposes to ship the steel elements. The Contractor will also submit grounding location and details installation drawings;
- other detailed design drawings and documents that the Supervisor may require.

The Contractor will submit all erection drawings, showing the sequence of EM and HSS erection, erection equipment required, field welding works, erection / welding / concrete embedment sequence, etc. for review.

A.2.5.2 Civil Works and Ancillary Installations

The Contractor will develop the detailed design for construction and manufacturing of the civil works and ancillary installations basing on the comments relevant to previous Design phase.

Submissions to the Supervisor for its review and comment related to the Design of civil works typically include:

- Level 2 drawing of the outdoor and underground excavations, together with the required rock support and slopes stabilisation measures, supported by the necessary geotechnical analyses;
- Level 2 drawings and calculations of RCC dam, including stability analysis, thermal analysis, dam zoning, instrumentation system;
- Level 2 concrete outline drawings, showing all dimensions, first and second stage concrete, contraction and construction joints, classes of concrete and finishing, etc.;
- concrete reinforcement drawings, showing bars diameters, and spacing, supported by the necessary structural analyses and by the equipment design data which may be necessary to check the loads and design criteria applied;
- arrangement and details of embedded parts (water stops, piping systems, conduits, embedded parts for equipment erection etc.);
- architectural and miscellaneous finishing drawings;
- Level 2 method statements for all civil construction activities;
- details of the installations (crushing plant, batching plant, cooling system, conveyor system, etc…);
- other Level 2 design drawings and documents that the Supervisor may require.

Notwithstanding any Supervisor review and comment, in the frame of the EPC Contract nature the Contractor will be fully responsible for the correctness of the detailed drawings of the civil works, particularly in relation to the loads, dimensions, embedded parts and any other interface with the equipment.

The Contractor will submit the Level 2 Design of the civil structures in an orderly sequence, following the priorities of the construction program, so that the time allocated for the Supervisor's comment and review and possible request for corrections and/or modifications will not cause delays, and excessive simultaneous submissions are avoided.

Any other drawing, calculation note and design document that the Contractor may deem necessary for his own use, such as reinforcing bars bending schedules, materials lists, etc. will be submitted to the Supervisor for its information.

A.2.5.3 Modification to Design

In case, during the implementation of the Works, the Contractor will propose modifications to the Design due to practical reasons or to account to un-expected local conditions or constrains, the Supervisor will verify and check:

- the need of such modifications,
- their suitability,
- the overall impacts on the Works in terms of time for completion, quality, safety, interferences and/or repercussions with other parts or subsequent phases of the project.

If the Supervisor finds that issuance of a variations would be essential and / or unavoidable (unless an emergency occurs affecting safety of the Works, or any delay with the variation shall give rise to a substantial time overrun) the Supervisor will provide a Level 1 report outlining the evaluation of such variation, including but not limited to the following:

- the Supervisor's opinion on the extent, if any, of the applicability of the varied Works compared to the approved Design;
- conformity to Client’s Requirements and international state-of-the-art engineering practice;
- potential interferences and/or repercussions with other parts or phases of the Project;
- potential impacts on Project Implementation Plan.

It will be arranged in the shortest possible time coordination meetings with the parties, in order to examine the proposal for modification and review / incorporate the modification in the detailed Contractor's Work Program. The Supervisor will verify that the approved modification to Design is reflected and incorporated in all relevant Design documents including Construction drawings, Method Statements and Quality plans. The above process will be carried out, as far as possible, in order not to disrupt the Construction Schedule.

In addition, all changes to work activities that move away from the approved designs shall require the Contractor to submit a change request form and the associated revised designs and drawings where applicable to the Supervisor for approval consistent with the Project Change Management Plan.

A.2.5.4 Structural Analysis

The Supervisor will ensure that the Contractor has carried out all the Level 2 calculations by applying the principles, rules, norms, and procedures discussed and verified beforehand by the Supervisor. The Supervisor will verify and approve detailed calculations, drawings and/or supporting reports submitted by the Contractor.

Structural analysis shall include all the main structures including but not limited to: RCC dam, embankments, powerhouse, diversion works, power tunnels, intake structures, shafts, switchyards, bridgesA.2.9and all the ancillary works of the project.

A.2.6 RESPONSIBILITY OF CONSULTANT'S TEAM

Design review, Supervision of manufacturing, testing, erection, commission and Construction Management of all the project elements will be the responsibility the Supervisor.
To achieve these goals the Supervisor will mobilize and maintain on site throughout the entire construction and commissioning period the supervisory team, composed by Resident Engineers, Key Staff and support Staff, as detailed in following paragraphs.

Whenever the Supervisor duty will be assigned by the Owner (intended as final Client of the EPC Contract) to an external international Consultant, typically the Consultant's team will be structured so to be assisted by a Client's Project Team designated by the Client, with the main goal to use the opportunity of the Design Review and Construction Management of Batoka Project to transmit the international experience of the Consultant to Client's Project Team.
The Client's Project Team will assist the Consultant's Team in the field; however, the activity of Client's staff will not relieve the Consultant from any obligation and/or responsibility foreseen in his contract for services.
The project's team may need to be equipped with the knowledge of FIDIC.
Typical structure and methodology for such Knowledge Transfer are given in relevant paragraphs.A.2

A.2.7 QUALITY ASSURANCE AND SCHEDULE OF EXECUTED WORKS

The Contractor will be required to guarantee the continuous control over the quality of the Works and its schedule through a Quality Assurance Plan (QAP). This QAP should define, in particular:

- organization of Contractor's Quality System;
- Quality Plan for Design;
- materials that he proposes to incorporate into the construction;
- methods planned to carry out every part of the works, and the resources needed;
- programme of the tests and controls (with relevant records) he intends to follow to prove that the requested quality is obtained;
- schedule of works and control of deviations and relevant countermeasures;
- management of non-conformities.

The Contractor under the EPC Contract will be required to be fully responsible of the quality of the proposed design and construction. The primary duty of the Supervision regarding quality are to make sure that the Contractor's Quality Plan is working properly.

The Supervisor will therefore review the Quality Assurance Plan, perform inspections in the workshops and laboratories and work areas to assess the application and conformity to the Quality Assurance Plan.

For each Work phase the Supervisor's staff, while verifying that the relevant Construction documentations are made available and that construction equipment is mobilized by the Contractor in accordance with the Work programme, shall pay particularly attention while checking the following aspects:

- Organization and conditions of the Laboratory, including the competence of the Laboratory Staff.
- Method Statements proposed by the Contractor.
- Main equipment and materials should be in accordance with the Specifications and suitable to the works to be carried out.
  The Contractor must submit, for each material and equipment that he proposes to incorporate in the construction, a full documentation to prove that it fulfils the requirements of the Technical Specifications.
- Control plan that the Contractor intends to implement, which should meet the Contract specifications and assure that quality is obtained.
- Number and Location of Hold Points (which needs a mandatory inspection before proceeding with the works) and Witness points (required by the Parties to verify, inspect and witness the process of work).

A.2.8 REVIEW OF TOPOGRAPHY AND SURVEYING

The Supervisor shall review and verify all methods and procedures, as well as the man-power, equipment and organization of the Contractor for carrying out topography and surveying Works. The Consultant shall request for verifications and cross checks, to be carried out in his presence, as deemed necessary.

The Supervisor shall carry out independently, as far as necessary, topography and surveying Works aimed to:

- Verify the local geodetic survey network;
- Dimensional control of the already built structures and setting out points;
- Document the progress of the works, their compliance with Construction Drawings and the quantities reported by the Contractor.
- Mapping of the underground works and excavations slopes.

The above tasks can be performed using modern technologies (like drones and laser scanning instruments).

The use of Drone, if possible, allows to acquire in short time a photo-mosaics of the entire surveyed area and a 3-dimensional model that can be used to generate contours map, slope maps, etc.… to be used for design, quantities calculation, documentation of work progress etc.

A.2.9 SITE SUPERVISION

The Supervisor will be required to mobilize and maintain on site throughout the entire construction and commissioning period the supervisory team, composed by Resident Engineer, Key Staff and support Staff. Before the starting of site activities (supposedly for a period of few months after the signing of the contract) the Project manager and the Key staff (in charge of Design Review coordination activities) will start the review of Contractor's Design as well as of all the Level 1 documentation to be provided by the Contractor (including Procedures, Programme, Quality and Management Plans) at home office.

The Supervisor shall define his Organization Structure, personnel's qualifications and specific assignments both at the Project Site and at the Home Office.
Whenever the Supervisor duty will be assigned by the Owner (intended as final Client of the EPC Contract) to an external international Consultant, typically the Consultant Organization Structure shall include staff supplied by the Client (Client Project Team).
The proposed general organization of the Supervisor for the EPC Contract Management should clearly reflect and show the relationship and communication flow between the Supervisor's Project Coordination Office and the EPC Contractor structure.

Supervisor's team shall supervise permanently all construction, hydro-mechanical and electrical equipment erection, testing, and commissioning operations in order to ensure the conformity of the Project and its portions to the Client's Requirements, Contract Conditions, Quality standards, applicable norms within the Time-Schedule foreseen in the Contract documents.

In addition, the Supervisor, through his technical personnel, shall carry out, whenever deemed necessary, in accordance with the progress of work, inspection visits to the site as well as to all Workshops and installations of hydro-mechanical and electrical equipment where Project components are manufactured, assembled, tested and /or prepared for shipment.
The Project Manager/Resident Engineer, with his team, will draft periodical Progress Reports and will develop a project administration system. Regular meeting will be scheduled with the staff of the Client and the Contractor. Reconciliation and grievance procedures will be established and finally all activities of backstopping and invoicing will be managed since the beginning of the project.

At the early stage of the assignment, the Supervisor will be responsible for the following:

- Development of Supervisor's Quality Assurance System;
- Development of project management information system;
- Development of detailed organization chart;
- Definition of methodology, timing and deliverables for the various activities;
- Creation of regular meeting schedule and setting of acceptance procedure;
- Monitoring and checking of design implementation;

- Setting up of Project filing system;
- Development and installation an Environmental Management System;
- Development and Installation of Project Management Approval System preferably a Web Based System;
- Conduct a project Management workshop with the whole Project Management Team including the Client's Team at the start of the Contract;
- Approval of the Baseline Schedule submitted by the Contractor;
- Initial Project Management training for the Clients Project Team;
- Approval of all initial project document submissions from the Contractor.

It is assumed that all official communications will be in writing. Verbal instructions could also be possible but the same will be confirmed in writing immediately. Minutes of all meetings drafted by the Project Manager will be kept and will be signed by the principal attendees as a true record of the proceedings of the meeting. These meeting records will provide a valuable reference if any controversy arises in the future.

Original outgoing and incoming correspondence together with attachments will be registered and filed into the main IN and OUT files and categorized as necessary (e.g. "for verification and comments"; "for information only"; "Verified, no objection"; "Verified, comply with comments"; "Verified, rejected: re-submittal required", etc..).
IN coming and OUT going correspondence will be stamped to identify the person who has drafted the letter and those team member that will receive it for information.

A.2.9.1 Testing

The Supervisor shall verify beforehand the program and procedures for tests to be carried out throughout the construction period. General testing principles, their frequency, typology, methodology, reference standards shall be reported in the Technical Specifications of the Project and detailed in relevant Method Statements and in the Inspection & Test Plan. Technical Specifications shall include the following principles:

- The Contractor will be responsible of all tests for the Quality Control to be performed in connection with the materials used for the construction of the Works.
- The Contractor shall supply, install, operate, maintain and remove at the end of the Works a site laboratory that will have to function as Quality Control of the Works.
- The laboratory shall be run by Contractor's personnel experienced in sampling and testing of materials, and quality control.
- The Contractor's laboratory shall be designed for performing most of the sampling and testing required in the Technical Specifications. Tests on samples and materials, which cannot be done at site due to impracticality of retaining such specialized equipment, shall be performed by reputable, competent and certified Quality Assurance laboratories.

- Quality Assurance of the Works shall be carried out by the Contractor who will manage the site laboratory.
- The Contractor shall be responsible for the handling and transport of all materials required by the Quality Assurance Laboratory.

Main tests to be verified by the Supervisor, before and during the execution of the works shall include, but are not limited-to, the following:

- foundation materials;
- RCC and its components;
- embankment materials,
- conventional concrete;
- shotcrete;
- grouting materials;
- steel bars, steel mesh, dowel, bolts, tendons, pipes;
- hydro steel structures,
- hydro mechanical/electrical equipment,
- materials and/or assembled parts, etc.

Some comments on the above tests are given in the Quality Control Section reported in the following paragraphs.

In additional, Third Party Independent Laboratory Tests shall be the responsibility of the Contractor when requested by the Supervisor. Third Party Independent laboratory service provider shall be approved by the Supervisor.

A.2.9.2 Quality Control of civil works

GENERAL

The civil works object of construction monitoring include:

- diversion works;
- RCC dam;
- spillway;
- Middle Level outlets;
- Intakes;
- Power tunnels;
- Gate Shafts;
- Surge shaft;
- Powerhouses;
- Outlet works;

- Switchyard;
- Etc.

The Supervisor's experts will provide the following services:

- check progress of supply, works construction and all operations against contract program requirements, and request remedial measures by the Contractor in case of delays or other deficiencies;
- supervise and check all tests and other quality control measures required by the Inspection & Test Plan submitted by the Contractor, up to the issue of the final acceptance certificate;
- check the equipment and systems for the permanent works, including dimensional checks on fabrication details for installation and erection operations;
- issue special instructions to the Contractor in case of emergency and, if necessary, plan consequent measures with the Project Management;
- supervise proper performance of the Contract, including assistance in finding an amicable settlement of disputes and claims with the Contractor, avoiding resort to litigation and/or arbitration;
- give advice as dictated by the course of the works, including requests for modifications;
- accounting and administrative control: checking monthly measurements with the Contractor, verifying Contractor's monthly progress statements and accounts, and issue of monthly certificates of payment;
- issue of all provisional and final acceptance certificates for the works;
- prepare monthly and other reports.

The test types and the required frequency of testing will be provided in the Contract documents, provided that the Supervisor may review the testing programme based on the analysis of the results obtained.
The Supervisor will verify all results.
In all cases, samples will be representative of the "real" materials to be used in the Works and sampling will be carried out in accordance with the requirements of reference standards, or an approved equivalent.
The whole process of monitoring will be in accordance with the established and approved Quality Assurance Plan; non-conformities will be identified by the Supervisor and corrective action procedures initiated and subsequently monitored.

The process of day-to-day inspection and monitoring of the Works will generate routine instruction from the Supervisor to the Contractor as the essential tool of the Supervisor to exercise control for ensuring that quality and operational requirements are being maintained in accordance with contract conditions.

All instructions will be given in writing. Instructions pertaining to variations of the Works will also be issued in writing. Only in cases of emergency, the Contractor will be required to act on verbal instructions, which will be followed by written confirmations as soon as practicable.
The site staff will make the appropriate inspections and tests as the works progress and as may be offered by the Contractor for acceptance in accordance with the procedures established under the Quality Plan for the project. Independent audit checks, through visual inspections and material testing, will also be undertaken by

the Supervisor to verify that the QA records provided by the Contractor are in accordance with the statements being made by the Contractor.

In the following pages there are provided some notes on the major issues and Quality Control relevant to some of the most critical Works of Batoka Project that is the RCC dam. Comments on Underground Works are given in the paragraph relevant to Geological Inspection.

RCC DAM

Dam Project includes an RCC main dam with a gated spillway on the top of the dam and Middle Level outlets embedded in the dam body.

RCC is a technology that involves:

- Materials (cement, aggregates, admixtures, pozzolan, etc.);
- Equipment/plants (crushing plants, cooling system, batching plants, conveying system, etc.);
- Procedures (delivery, spreading, compaction, curing, joint treatments, cleaning, etc.)

and may present several interferences with other work phases like:

- Foundation mapping and treatment;
- Cutting of contraction joint;
- Positioning of waterstops;
- Lifting of formworks;
- Installation of instrumentation systems and embedded parts
- Etc.

To achieve the quality of the works and the planned production rates it is mandatory to guarantee a close coordination between all the parties involved in the activities mentioned above and an extensive knowledge of the various processes.

As detailed further on, the Quality Control Program of the Contractor shall include also:

- a Quality Control for the Staff Training and
- Training Courses for the RCC Staff and Workers involved in the execution of the works.

These training activities shall start before the starting of RCC placing activities in order to anticipate as far as possible the achievement of learning-curve peak.

This point is extremely important and sometimes under-estimated since, usually, the most critical phases in building an RCC dam are those occurring at the beginning of the works. Higher hydraulic loads and higher stresses in fact characterize the RCC placed at the bottom of the dam. In this zone, also the interfaces with foundation and its treatment are generally the most challenging.

The Contractor shall make available on site a suitable laboratory equipped for the manufacturing, curing and testing of a large number of RCC cylinders and define a detailed Mix design test programme to be carried out well before the start of placement of RCC and the starting of Full Scale Trials.
The aim of this test programme is to identify the most suitable mixes to be used in the different zones of the dam and to confirm the design parameters for the dam including but not limited to: uniaxial compressive strength, tensile strength, density, deformability modulus, VeBe time, initial setting time, thermal properties, etc.
Most complex tests, especially those related to the thermal properties of the mix, may be carried out in international renowned laboratories.

Technical Specifications and relevant Method Statement shall include the details and the sequence of all the main items that concur in the manufacturing of RCC, including:

- Cement (type (generally, Frequency of chemical, physical, hydration heat, tests from factory and on-site, transport and stockpiling facilities);
- Aggregates (Source, type and frequency of tests, acceptance criteria, aggregate production plants, shape, gradation, transport and stockpiling);
- Water, filler, admixtures;
- Layout of RCC plant, peak and normal capacity; methods and equipment for handling, mixing, transporting, spreading, compacting, curing, protecting and cleaning

Moreover, it shall be defined:

- Methods for temperature control;
- Criteria for Joint classification (e.g. Lift Quality Index) and relevant treatments;
- Sampling facilities;
- Programme of Full Scale Trials;
- Types and frequency of tests, both at batching plant and on site.

The Supervisor shall meet the Contractor during the execution of all these tests and shall possibly perform own and independent evaluation of test results, joints classification and mapping.

The Contractor shall establish and maintain an effective quality control program for RCC to ensure compliance with the Contract requirements and for maintaining records of control, including tests and inspections, their findings, and remedial actions taken when necessary.
The Contractor's program will be established and run under the supervision of a full time experienced Quality Control Engineer who will review and approve all activities concerning the production of materials, planning and scheduling of construction activities for placing RCC and the running and evaluation of RCC tests.
The RCC Quality Control Program shall include but not be limited to the following: aggregate manufacture and gradation, moisture, batching requirements and mix proportions at the batch plant, mix delivery, compaction,

joints (insuring adequate materials are on hand), embedded items, erection of precast facings, and all other tests and inspections required by Specifications.
Quality Control Program shall include also Quality Control Staff Training as well as RCC Staff and Workers Training Courses for the execution of the works.

Tests at prototype scale are essential to verify the "real" characteristics of RCC. In fact, the entire production process, from batching plant to dam site, clearly affects the final quality of RCC in such a way that laboratory tests or even Full Scale trials may be not completely representative or the real performances of the dam.
In this sense following kind of tests are recommended to be carried out on site to better characterize the RCC dam:

- Large scale shear block tests on samples taken directly from the dam body using large diameter diamond circular saw;
- Detailed log of RCC cores drilled periodically in the dam body and statistical analysis over the distribution of segregated area, bonded on not-bonded lift-joints, etc.;
- Laboratory tests on RCC cores drilled in the dam body, including UCS, direct tensile strength, lift-joint shear strength, permeability;
- Mapping of U/S face of the dam soon after formwork removal in order to detect any defect;
- Mapping of dam permeability at large scale, executed by means of water tests on dam drain holes.

The above kind of prototype-tests can be required to be included in the RCC Quality Plan of Contractor.

A.2.9.3 Quality Control of Hydro-Mechanical and Electrical equipment

As indicated in the previous sections, the Contractor will submit, for the Supervisor's approval, the Detailed Design including all detailed data, calculations, explanatory documents and drawings necessary for manufacturing and testing of the Hydro-Mechanical and Electrical equipment.
These documents, duly reviewed by the Supervisor, should form the basis of the contractual procurement of the equipment from the manufacturers.

It is expected that the information to be supplied by the Contractor, and verified by the Supervisor during this phase, will include the following items:

- Hydro-mechanical Equipment:
    - up-to-date layout;
    - hydraulic design calculations for the full range of operations;
    - stress analysis of components;
    - tables with characteristics of main parts (flow, dimensions, weight, etc.);
    - critical operating conditions;
    - sequences, time, methods for assembling parts and erection rigs characteristics;
    - materials to be used for the various elements of the supply stating their durability;

- maintenance ways and ease of performance;
- quality control tests and operation safety.

- Hydro-electric Equipment:
  - up-to-date layout;
  - design calculations for stress bearing structures;
  - tables with final rating of main parts;
  - sequences, time, methods for assembling parts and erection rigs characteristics;
  - turbine critical speed;
  - requirements for unit bearings;
  - characteristics of cooling systems;
  - transport fittings and protections;
  - materials to be used for the various parts of the supply stating their durability;
  - quality control tests;
  - maintenance ways and ease of performance;
  - operation safety.

- Electrical Equipment:
  - generator design;
  - materials and technology;
  - quality control tests;
  - equipment ratings and test certificates for major plant components;
  - fault level calculations;
  - voltage regulation analyses;
  - reactive power control;
  - motor characteristics, duty cycle, starting performance of major and essential;
  - auxiliaries, selection of power cable ratings;
  - insulation, segregation and separation of power and control cables;
  - fire prevention measures;
  - design, types, performances and characteristics of HV equipment and electrical devices;
  - single line diagrams;
  - design and calculation of connection to HV line and substation.

- Electrical Instrumentation and Control:
  - compatibility among different suppliers' equipment and layouts;
  - P&I diagrams;
  - interface with ICS/LDC remote dispatching systems, if any.

The Supervisor will follow the different phases of the detailed design and will oversee the activities of the Contractor, as well as investigations and inquiries realized at site.

The Supervisor review will consist in examining the various documents to verify the:

- correct and adequate selection of materials depending on their specific destination and according to the Client's Requirements and international practices;
- proper dimensioning of the various parts with calculated maximum stresses within internationally accepted limits for the various load conditions and cases;
- appropriate construction design of main equipment adopting latest high-quality practices and especially facilitating assembly and future maintenance;
- satisfactory choice of performances and ratings of different components, with sufficient safety margins and adequate overcapacities to improve reliability;
- proper interface of the equipment with the 1st phase concrete.

MANUFACTURING

During manufacturing, the Supervisor will check the quality sensitive activities in the Contractor's Head Office, in the Manufacturers' workshops and at the construction site, reporting any significant discrepancies and suggesting corrective follow-up actions.

It will be required to verify that the inspection procedures submitted comply with Contract requirements and with specified quality standards of internationally accepted codes.

In particular, the controls will encompass:

- planning procedures;
- document control;
- verification and control of materials, parts and components, welding capability of specialists;
- control of welding and/or special processes;
- inspection for test control;
- control of measuring and testing equipment;
- handling, storage and transport records.

In order to achieve the above, the Supervisor will undertake the following actions:

- review the Quality Management System of the Manufacturers;
- inspect, where necessary, the major equipment and components during manufacturing at the Manufacturer's factories;
- evaluate the test results for materials and respective certificates issued by the Manufacturer's suppliers. Should critical situations be identified, the Supervisor will prepare a specific report on the matter in order to allow the Owner to take action;
- coordinate, expedite, schedule and report results of workshop inspection visits.

Sufficient records will be developed and maintained so that the results of the inspection are easily identifiable and traceable.

Before starting the construction works, the Supervisor will conduct inspections, audits and factory tests witnessing of materials and equipment during the manufacturing and procurement phase, with particular attention to type tests and acceptance of the main components, as well as "routine" and "sample" test relevant to the prototypes, ensuring the satisfaction of the features requested by technical specifications.

The Supervisor will participate in factory testing of major equipment, and preparation of corresponding acceptance certificates. The main equipment subject to this monitoring activity will be determined by agreement with the Supervisor.
The Contractor will submit the detailed program of work developed in all its phases (project, production, transportation to site, installation and testing) for verification and validation. Finally, the Supervisor will make sure that necessary operation and maintenance manuals, documentation, training, etc. are supplied by the Contractors to remove bottlenecks and expedite shipment
The Supervisor will review the results of the turbine model test report, to assess that the guaranteed equipment characteristics and performances have been satisfied in respect to the EPC Contract, as well as to confirm that the operating characteristics of the proposed machines are within acceptable levels.
In addition, the Supervisor will review and approve results of the Spillway Model Test.

SITE INSTALLATION AND ERECTION

The Supervisor will supervise the Contractors' activities for the installation of the electrical, electromechanical and hydro mechanical equipment since their arrival on site up to their commissioning. Basis of this activity will be a work breakdown structure whereby the entire project is broken down into successive small phases.

A schedule will be built up for each project section (e.g. power house equipment, substations, etc.). At the outset, the schedule will be set up based on the submitted contractor's schedule.
Whenever dam and power houses fall within different contracts and contractors, the schedule of each work will be coordinated with the others, and possible interferences and interconnected activities prescribed to be managed accordingly.

The schedule will identify the critical path and will be regularly updated as construction proceeds. Should maintenance of the critical path be endangered, the schedule will facilitate early recognition of this so that corrective action can be implemented in good time.
Once the schedule has been established and construction is in progress, our on-going work relating to this activity comprises monitoring and controlling. During the execution of the works, the Supervisor will closely check all operations so that those items not complying with the requirements are identified and consequent corrective actions suggested; where necessary, action will be taken to prevent recurrence of nonconformity conditions. During the implementation of civil works and installation of electrical, electromechanical and hydro-mechanical equipment, the Supervisor will closely monitor the progress of each phase of the Project.

The Supervisor will monitor the progress of the activities to have a complete, overall picture of the situation and agree on the activities to be performed.

During the supervision of erection, the Supervisor will check and validate the course of the implementation of the work, the compliance with the project and with the contracts and the quality assurance of:

- temporary structures built in situ;
- work schedule;
- possible additional work;
- any recommended changes required by the Supervisor;

and will perform the following activities:

- interpretation of drawings and specifications for the conformity of assembly work to contract;
- checking of the test procedures for facilities and equipment;
- consideration of any changes in the field that may be required;
- monitoring progress in respect to milestone dates and events;
- coordination and inspection of the detailed installation activities to ensure continuous and effective progress of all work and ensure compliance with specifications;
- monitoring and verification of all testing and other quality control measures required by the contract until the issuance of the Performance Certificate.
- Monitoring of the Contractor activities in respect to the compliance with local and international site safety and environment standards and regulations.

A.2.9.4 Geological Inspection

The following general principles shall be followed during the implementation of the works related to excavation activities:

- mapping methodology, procedures and their representation in a graphical format will be primarily checked, reviewed and agreed with the Supervisor, who shall have a geological team available to make visual inspections of all excavations jointly with the Contractor as well as independently;
- the Supervisor shall ensure that the geological mapping will be carried out both for open air excavation and underground excavation beforehand the excavation itself is covered by embankments, concrete, temporary and permanent support works etc.;
- the Supervisor has to ensure that no foundation surface shall be covered by any material before the mapping mentioned in previous point has been approved and the prescribed treatments of excavated surfaces completed;
- The Supervisor’s geological team, together with the Supervisor's Resident Engineer, shall give all recommendations to the Contractor(s) for the re-design of foundations due to un-foreseen rock conditions in the course of excavation, if needed.

<u>UNDERGROUND WORKS</u>

As far as power waterways tunnels excavation is concerned, the Contractor will carry out a comprehensive investigation campaign in order to obtain sound geotechnical parameters and a safe design, which will include:

- excavation methodology;
- excavation phasing;
- monitoring system (e.g. convergence);
- temporary support works;
- permanent support works.

The Supervisor will:

- review the investigation program and test results;
- review Contractor's design;
- perform periodical geo-structural inspections during the tunnel excavation phases in order to verify the geotechnical classification of the various stretches and the appropriateness of the temporary and permanent supports designed by the Contractor.
- perform periodical inspections to verify that the as-built corresponds to the design;
- perform rock-bolts pull out tests
- check tunnels sizes and verify their dimensional accordance with the project;
- Perform a topographical survey of the tunnels alignments;
- Analyze data of the monitoring system.

OPEN AIR EXCAVATIONS

Surface surveys are required to control the status of works and the geological conditions of the foundations. As explained in previous paragraphs, the possibility to make use of drones for the survey shall be explored, and welcomed, since it allows to obtain georeferenced photos of the inspected area and a Digital Terrain model, allowing to obtain a complete 3D model of the surveyed area elaborating all the sequential photos with engineering software.

Combining the site investigations (visual inspection, Schmidt hammer, geophysical tomography at small scale, etc.) with the superficial survey, it is possible to evaluate the main mechanical characteristics of the rock, such as:

- GSI (Geological Strength Index);
- RMR (Rock Mass Rating)
- Uniaxial Compressive strength
- rock type;
- degree of weathering of the rock;
- discontinuities in rock mass;
- etc.

and record them in a geo-referenced 3D database.

Drone and geological survey are generally carried out in local areas of limited extension, following the progress of the excavation works.
Since the information acquired with the proposed methodology is geo-referenced, it is always possible to assemble the local mapping in larger scale drawings obtaining a useful view of the foundation geology at the scale of the project.

A.2.9.5 Monitoring, Instrumentation System and Emergency Preparedness Plan

About this topics reference shall be made also to other dedicated sections of this Dam Safety Plan.

The detailed design of Monitoring and Instrumentation systems shall be carried out by the Contractor (requirements of the Instrumentation system are to be detailed in the Final Design phase) and verified by the Supervisor.
Supply and Installation of Instrumentation system shall conform to the following principles:

- instrumentation shall be of high quality, realized according to the best practice and international standards.
- all the instruments shall be subject to Contractor's acceptance procedure of inspection and testing at their arrival at the Site.
- acceptance of the instrumentation devices after installation shall derive from special procedures to be defined by the manufacturer/supplier and agreed with the Supervisor.
- testing, calibrating, installing and commissioning of the monitoring system shall be provided by supplier's skilled and qualified personnel, under the Contractor's coordination.
- all instruments shall be accompanied by Technical Specifications, Procedures for the installation and use; calculations and interpretation of the measured data (calibration curve, calculation formula and form, example of calculation); acceptance testing procedure and maintenance manuals (including list of recommended spare).

Design and review of the instrumentation system shall be ready before the commencement of the works in order to anticipate the identification of any possible interference with civil works and to plan all the installation facilities for correct placement and wiring connections of the instruments.
Moreover, some instruments shall be installed from the early stage of works in order to acquire all the necessary data regarding the performance of the Project.

The Supervisor shall review the Monitoring and Instrumentation system considering the guidelines suggested by international codes and standards such as:

- "Instrumentation for Concrete Structures" US Army Corps of Engineer, 1987;
- "Embankment Dam Instrumentation manual" USBR, 1987

- "Instrumentation of Embankment dam and levees", US Army Corps of Engineer, 1995;
- "Automated dam monitoring system", Icold bulletin 118, 2000
- "Dam foundation: Investigation, treatment and monitoring" Icold bulletin 129, 2005

Of course, the Supervisor will make use of his expertise to tailor the Monitoring System to the specific requirement of Batoka project.
The Supervisor shall be involved at the initial readings of each instrument to ensure that the methods and procedures used are correct and allow the determination of reliable "zero" values.

The Supervisor shall verify that the readings are carried out at the prescribed times and intervals, the procedures and methods of reading are correctly applied, and results are correctly registered, filed and analysed. During the First Impounding phase, as detailed in the First Impounding Programme, the rate of readings shall be increase and the data shall be elaborated in real time in order to verify the thresholds values corresponding to Alert and Alarm conditions.

Finally, as normal practice, the Emergency Preparedness Plan shall be reviewed and finalized by the BOT contractor.

A.2.9.6 Monitoring of Construction schedule

All what follows can be refined and adjusted if and when one or more contracts will be set for the construction of Batoka Project. In the case Dam and Power Plants are allocated to different Contractors, relevant construction programmes shall be analysed separately as well as together as far as possible interferences and dependences are concerned.
What follows is referred in general to the monitoring activity of the construction schedule(s).

The Supervisor shall check that the Contractor maintains a proper organization of the Works in all phases in order to keep the targets of the General Work Schedule and the final commissioning of the plant.
The Supervisor shall alert the Contractor in due time, whenever the Supervisor foresees any risk of delay and shall request the Contractor to re-analyze the programs and sequences of Works. The Supervisor will suggest partial or general adaptations of the program whenever deemed necessary.
Particular attention shall be given to the co-ordinations of the activities that imply interfaces between civil works, hydro-mechanical, electro-mechanical and mechanical equipment.

In order to ensure all the activities commented upon here above are correctly, timely and efficiently carried out by all parties, procedures and schedules for meetings on site shall be established in due time. The Supervisor shall be responsible for the enforcement of these procedures and schedules once they have been mutually agreed upon.

The basis of Monitoring activity is a work breakdown structure whereby the entire project is broken down into successive small working lots, typically over five levels as follows:

- Level 1 – Project Section;
- Level 2 – Task;
- Level 3 – Sub-Task;
- Level 4 – Work Package; and
- Level 5 – Individual Work Items.

A schedule will be built up for each project section (e.g. Diversion Works, Dam, Intakes, Tunnels, Surge Shafts, Spillway, Bottom Outlets, Power Houses, Switchyards, etc.), starting from Level 5 work items and the successive upwards aggregation to the higher levels. At the outset, the schedule will be set up based on the Contractor's submitted schedule.
The schedule will identify the critical path and will be regularly updated as construction proceeds. Should maintenance of the critical path be endangered, the schedule will facilitate early recognition of this so that corrective action can be implemented in good time.

Once the schedule has been established and construction is in progress, the Consultant shall:

- monitor the rate of progress for any given work item and the amount of resources required to achieve this rate;
- control and evaluate the data received from the monitoring process to identifies the necessity of any action.

Monitoring and control thus give input to planning and result in a cycle (planning-monitoring- control-planning-etc.) which is continuously repeated throughout the duration of construction.

The Supervisor will periodically monitor the progress of the activities so to have a complete, overall picture of the situation. A valid instrument to carry out the monitoring of the progress of works will be the monthly reports and any other necessary report, as detailed below:

- Inception Report;
- Monthly Progress Reports (suggested to be integrated with short-duration drone videos);
- Quarterly Progress Reports;
- Annual Reports;
- Reservoir Impounding reports;
- Final report before waterway system filling;
- Waterway system filling report;
- Commissioning acceptance test reports;
- Specific reports on special cases as required;
- Claim assessment reports;
- Supervisor's site and home office periodic activity reports;

- Project Final completion report;
- Defects Notification report.

A.2.9.7 Commissioning programme

The Contractor shall prepare the detailed programme of site tests with the overall goal of clearing the way to a successful introduction of the plant into the existing interconnected system. The programme shall outline the approach and methodology of the start-up operations, and will be subdivided in subsequent phases:

- Pre-commissioning tests;
- Commissioning tests;
- Trial operations and
- Performance and efficiency tests.

Prior to the execution of this programme, the Contractor should submit also a preliminary version of all as-built drawings and of Operation and Maintenance (O&M) Manuals.

Throughout the commissioning stage of the Project, the Supervisor will provide a Commissioning Manager and specialists in the applicable engineering disciplines to support the activities related to commissioning, performance tests and transfer to the Owner structure of systems and equipment.

The programme should define the areas of responsibility and detail technical, administrative and safety procedures. It should also define the principles for the technical requirements associated with the commissioning of individual components or of systems, including the use of commissioning check-lists to record the checks made and the tests undertaken, the results obtained, the signatures of the EPC Contractor commissioning, Specialists and of witnesses from the Supervisor and his commissioning staff.

The Commissioning Programme to be submitted by the Contractor should also include the procedures for performance and guarantee acceptance tests, specifying acceptance criteria, test parameters, instruments to be used and instrument accuracy requirements.

Moreover, all Commissioning Programme shall be approved by the Supervisor in consultation with the Client before program execution.

The Supervisor staff, will review the Commissioning Programme and the attached procedures, checking that design requirements are complied with, methods proposed are suitable to keep operations under control and all necessary verifications are carried out.
The Supervisor shall verify that all relevant parts and components are ready for the various tests and check periodically that the time-schedule to achieve critical steps of the programme are maintained, prescribing all the remedial actions required to minimize the risk of delay.

A.2.9.8 Reservoir Impounding

The First Impounding Plan (FIP) coordinates the work activities following the closure of the river diversion and, consequently, it deals with the reservoir filling, the work scheduling, the instrumental monitoring of the dam behaviour and the procedures to be adopted according to the most likely foreseen scenarios occurring during the reservoir impoundment.
Before the implementation if the First Impounding Plan the Supervisor shall receive and approve the Reservoir Operation and Maintenance Manuals prepared by the Contractor, verifying that the procedures described in the FIP are coherent with those indicated on the manuals.

The First Impounding Plan report will be structured in a similar manner to the example given below:

- KEY ROLES
  This chapter will describe the individual roles and responsibilities of the figures who will be involved in the first impounding procedure. In particular, there will be Dam Safety Committee (DSC) that will implement the Dam Safety Program (DSP). The DSC will be responsible for all the activities related to the safety and safe performance of civil works and equipment of the project and will involve delegates of Owner/Supervisor and Contractor any other authority indicated by the Owner or Stakeholders involved.

- DEFINITION OF THE CONDITION READY TO START
  This chapter will describe all the recommended pre-filling conditions.
  In particular:
  - a reliable Monitoring System shall be set up and tested before the start of impounding in order to evaluate Dam behavior under impoundment.
  - All the equipment and manpower necessary to proceed with the plugging of Diversion works shall be available on site.
  - All the devices necessary to release ecological flow, control the rising of the reservoir levels, protect the sensitive areas or portions of the works shall be ready and fully operative.

  The readiness for the start of impounding activities will be verified by a joint inspection of the DSC based on the recommendations given by the Supervisor.

- DESCRIPTION OF THE IMPOUNDING
  When all the activities indicated in the previous chapter have been correctly carried out, the DSC orders the start of the impoundment.
  This phase of impoundment will proceed to the full filling of the reservoir or pre-defined target levels unless differently prescribed by DSC based on the observed behavior of the dam.
  During the impounding all required measurements will be made (deformation, settlement, seepage, etc.) by the Contractor at the presence of the Supervisor and transmitted to the DSC.

The estimate time to perform the impounding of the Batoka Reservoir ranges between 4/5 months considering the below listed conservative hypothesis:

- Beginning of the impound process during the dry season (from November to February)
- Guarantee the environmental release in accordance to the ESIA requirements

Considering the above listed conditions and the time necessary to impounding, it possible assume that the impact of the impounding of Batoka Reservoir is negligible on the Kariba Reservoir.

- CONTROL PLAN

  This chapter will describe the recommendations for the acquisition of measurements, which allow assessing the behavior of the dam and of the main works and to verify the hypothesis at the base of geotechnical/hydrogeological/structural models assumed at the design stage, particularly:
  - level of the reservoir;
  - seepage (dam drainage);
  - seepage turbidity;
  - piezometers readings;
  - embankment settlings;
  - inclinometers readings;
  - topographical survey of the dam structure;
  - etc.

- INSPECTION PLAN

  This chapter will describe the inspections that will have to be carried out with regard to the works and downstream of Batoka Plant

- ROUTINE and ALERT CONDITIONS

  This chapter will describe the normal and threshold values of the monitoring instrumentation. The following procedures will also be defined:
  - Routine Procedure;
  - Alert Procedure;
  - Controlled Drawdown Procedure;
  - Emergency Drawdown procedure.
- CONTINGENCY PLAN

  Finally, this chapter will describe the plan of action to be taken in case of an impending catastrophic failure of the dam or a large and sudden release of stored water.

The Supervisor shall verify and approve the sequence of operation described in the First Impounding Plan to proceed with First Impounding, including monitoring program, definition of routine and alert conditions etc. and shall actively participate to the impounding process through the Dam Safety Committee.

Some of the aspects above described are already developed, at feasibility design stage, in other sections of this Dam Safety Plan.

A.2.9.9 Testing and Final Control of Equipment

The Supervisor, under the guidance of the Commissioning Manager, will take note of any faults or defects detected during the commissioning tests performed by the Contractor(s) and will monitor the interfaces with the plant operation.
Commissioning and testing procedures will include acceptance criteria, test parameters, instruments to be used and instrument accuracy requirements.

The commissioning tests will include performance, functional and operational tests. Tests on completion should usually be carried out in the following sequence:

- pre-commissioning tests, including appropriate inspections and dry or cold functional tests to verify the physical reliability of the individual equipment elements and their ability to function within their respective systems as per design;
- commissioning tests, including specified operational tests to demonstrate that the works or sections of them can be operated safely and as specified under all normal and exceptional operating conditions;
- trial operation tests (Trial Run), to demonstrate that the works or sections perform reliably and according to the contractual conditions and requirements.

At the completion of the erection and installation works, the Contractor will start carrying out the "dry" (or "cold") and "wet" functional tests, in accordance to the program submitted for the Supervisor approval.

The Supervisor is called on the field to carry out, jointly with the Contractor, the so-called "Final Inspection" of the installed equipment and plants. The aim of this inspection is to verify the compliance of the erection works to the project requirements, and to identify those items, which need small adjustment, settings or fine-tuning in view of the first energization and Trial Run of the plant.

Acceptance certificates will be issued by the Supervisor at the end of the successful acceptance tests of each unit and at the commissioning of any facility.
Acceptance Committee, consisting of delegates members from the Supervisor and the Contractor will be set up to fulfil these tasks. The Supervisor is responsible for all the preparatory verifications prior to the commissioning. Ministry of Energies of the power plant country who issues these certificates of acceptance, have typically the mandate to oversee that the facilities:

- conform with the approved final design and with the regulations and standards applicable internationally,
- can be integrated to the national grid
- are secured with respect to safety.

A.2.10 SERVICES DURING DEFECT LIABILITY PERIOD

What follows is a general guideline that shall be adapted to the type of construction contracts that will be put in place.

During the Defects Liability Period (DLP), when the Contractor is typically bound by the Contract to remedy any kind of defective works by his fault, the Supervisor will make available his own experts for hydro-mechanical, electrical equipment and Civil Works.

Supervisor' specialists will inspect the Works to determine precisely the actions that the Contractor took in accordance to the Contract and will inform the Contractor in writing about this.

During the Defects Liability Period the Supervisor will acting closely to the works for:

- the finalization of the remaining works at the date stipulated by Contract (List of Outstanding Works at the Taking Over);
- rectification of all defects during the warranty period with issuing of clearances for defects rectified as well as a prolongation of warranty for major parts, if applicable. The punch list is updated on the basis of the progress of the Contractor's activity
- preparation of a project completion report, which acceptance imply the end of the Supervisor's assignment versus the Contractor;
- overseeing compliance to contractual obligations;
- fixing of all the defects and the damages caused during the Defects Notification Period.

The Supervisor will carry out inspections as necessary, after commencement of DLP, and will prepare brief reports on any issues or defects discovered / repaired by the Contractor. Should be necessary, the Supervisor could require repetition of any test and check to be carried out by the Contractor. The Supervisor is also called to witness tests and accept relevant documentation.
The Contractor will update, accordingly to any repair work executed, the as-built drawings, documentations and O&M manuals.

The list of the remaining works to be executed during the Defects Notification Period is mentioned at the Taking-Over Report; these works should be completed within the respective deadlines. The Supervisor will monitor and notify the Contractor about any defects occurred during the Defects Notification period.

The Supervisor will inspect and verify the completion of the remaining as well as the remedying works to be executed. He will monitor the maintenance works recommended in the Operation and Maintenance Reports for the Defects Notification Period, elaborated in accordance to the Supervisor recommendations.

The Supervisor, following the approved procedures, will assist in the issue of the Final Acceptance Certificate at the end of Defects Notification Period (DNP) with respect to:

- Completion of Outstanding works as listed in the report which accompanies the Taking Over certificate;
- Listing of Construction Works with defects;
- Time schedule and activities of remedial actions
- Failure of the contractor to remedy defects;
- Conditions for approval of the site demobilization;
- Current stage of existing demands and claims;
- Previous conditions for the issuance of the Final Acceptance Certificate (FAC)

The Supervisor will ensure that the conditions for the issuance of the Final Acceptance Certificate (FAC) are accomplished at the end of the Defects Notification Period.

A.2.11 HANDLING OF CLAIMS

What follows is a general guideline that shall be adapted to the type of construction contracts that will be put in place.

The Supervisor will provide all efforts to settle any conflict with the Contractors. In case any dispute, controversy or claim arise with the Contractors relating to or arising from the relevant contractor's agreement (contract), or the breach, termination or validity thereof, the Supervisor will be aimed to resolve such matters amicably through negotiations.

Should such negotiations not lead to a mutually acceptable resolution of the dispute, the dispute, controversy or claim shall be settled according to the general conditions of contract and/or special conditions of contract. The Supervisor will verify that notice of claim has been given in due time after becoming aware of the situation giving rise to the claim. Should the notice be given too late or be not supported by the required information, the Contractor will not be entitled to any extension of time or additional payment.

After the inspection, the Supervisor will prepare an assessment of the Contractor's contemporary records and with his preliminary conclusions about the potential outcome of the claim and will define any instruction to issue to the Contractor about further contemporary records.

A.2.12 MANAGEMENTS OF PAYMENTS

What follows is a general guideline that shall be adapted to the type of construction contracts that will be put in place.

The Contractor is generally required (for instance as per typical FIDIC Conditions of Contract) to submit periodic applications for Interim Payment Certificates, together with supporting document and calculations, of the value of Works executed for which he considers himself entitled to payment. Each application should be based on the joint measurement and agreement of quantities of work performed by the Contractor and accepted by the Supervisor.

The Contractor will be required to submit progress payment requests, based on measurement, on a scheduled basis (usually monthly) throughout the construction phase. The supervision team will maintain adequate records to review and check the measurement and progress payment requests in detail. The supervision team will also review payment requests and prepare payment certificates recommending that a certain progress payment amount is due.

FIDIC places responsibility upon the Client and his Client's Representative (if any present) to perform a measurement after reasonable notice from the Contractor that he requires any part of the Works to be measured for purpose of interim payment.
FIDIC requires the Contractor to attend and assist the Client's Representative in making such measurement, failing which the Contractor has limited opportunity to dispute the Client's determination. In practicality and to avoid disputes the Supervisor will establish procedures whereby the intent will be jointly to perform and agree the measurement prior to the Contractor's submission of each and every monthly statement.

Based upon the information he has gathered during the month in question, and in accordance with the Conditions of Contract, the Client's Representative will determine monthly interim conformity to payment certificates for work completed and approved. Parallel with these activities, the Contractor is required to submit to the Client's Representative monthly statements, supported by relevant documents, calculations, sketches and drawings, of the works executed for which he considers himself entitled to payment.

In his preparation of Interim Payment Certificates, the Supervisor will apply the Contract provisions in respect of:

- schedule and percentages on the Bill of Principal Quantities of the Permanent Works established for civil, hydro mechanical and electrical Works stipulated in the EPC contract
- provisional and Lump Sum items;
- value of any day-works performed for which the Supervisor has issued prior instructions;
- payment for work undertaken by nominated sub-contractor(s) (such payment requires evidence that prior payment has been made to the nominated sub-contractor(s));

- materials on site;
- deductions in respect of recovery of any Advance Payment made to the Contractor;
- deductions in respect of retention monies;
- application of any adjustment factors allowed for in the Contract to allow for escalation of prices;
- deduction in respect of any statutory taxes or levies applicable under the Contract;
- deduction in respect of any Liquidated Damages applicable;
- any corrections required to previous Interim Payment Certificates;
- any interest to which the Contractor is entitled as a result of previous late payments; and any other costs to which it has been determined that the Contractor is entitled; for example claims and/or extensions of time.

The Supervisor will ensure that Interim Payment Certificates will be fully supported by back-up calculations (and sketches where necessary) indicating the location and scope of works measured and certified for payment.

After receiving the Performance Certificate, the Contractor shall submit to the Supervisor a draft of the final statement with supporting documents in an approved form indicating the value of the works done in accordance with the Contract and any further sums that the Contractor considers to be due to him under the Contract.
After the review of the Supervisor, the Contractor could be requested to provide additional information and then prepare and submit the Final Statement.

A.2.13 TRANSFER OF KNOWLEDGE

The optimal management and operation of dams over the years can be pursued only by employing highly qualified engineers and technicians and with a broad experience.
In the case the Owner will recur to the assistance of an international consultancy firm for Batoka Supervision, the training program and transfer of knowledge and technology are important aspects of such assignment.
The main goal of this task is to use the opportunity of the Design Review and Construction Management Supervision of Batoka Plant to transmit the international experience of the hired experts to Client Project Team staff nominated by the Owner.
What above and what follows is indicated for the Dam Owner, but as far as necessary in the case different contracts are put in place for the two Plants of Batoka Project, the guidelines provided can be applied for specific training activities for each of the Plant (and relevant Owners or operators).

In that case what is most important is that the Consultant will provide an <u>on-the-job training to the Client's personnel</u> on all aspects of the Consultancy during construction and commissioning stages, as illustrated here below.

Furthermore, the training program will be composed of workshops and presentations where not only Owner's Project Engineers and technical staff but also external personnel, for example, university students may actively participate.

A.2.13.1 Approach and Methodology

At the beginning of the assignment, the international Consultant will establish an updated training program for Owner's approval. The timing and content of the training program can be modified at Owner's request in order to benefit in the best possible way the transfer of knowledge at different stages of the project implementation.
The organization of the training program will basically include three major activities:

- on-the-job training to personnel of the Owner to ensure hands-on experience during construction and commissioning of the dam;
- presentations carried out by Consultant experts during their missions on site;
- technical workshops at the different milestones of the project

A.2.13.2 On-the-Job Training to Owner's Personnel

This activity will be carried out through continuous day-to-day collaboration of Owner's staff and consultant's experts, working together at the site.
The Owner will typically provide a Core Team of Assistant Engineers plus an Additional Staff of Assistant Engineers to participate to the Consultant's project team while working at the project site.

The training program will be designed specifically to the needs of staff. The rhythm and style of learning will be adapted to the needs of participants.
The training will be supported by examples from the concrete experience of the Consultant, illustrating the critical aspects encountered in the implementation of major dam projects. The presentation of existing cases will be extremely useful for the transfer of knowledge and will be done using videos, photos, drawings, diagrams, etc.
During these on-the-job training sessions, engineers will transfer to their counterparts the technical knowledge on many aspects related to construction, assembly, testing and commissioning of hydropower plants and transmission lines.

This on-the-job training will be specifically organized in different phases of the assignment, in order to include the following key aspects especially valuable for the construction and commissioning of the dam but also administration of the works contract:

- General Dam Engineering, in particular foundation treatment, RCC dams, embankment dams;
- Geotechnical mapping of underground and open-air excavation;

- Electrical and Mechanical engineering;
- Hydraulics of spillways;
- Dam Monitoring and Maintenance;
- Site supervision, management of claims during dam construction and dam rehabilitation projects;
- Quality Assurance Plan procedures during dam operation and maintenance
- Optimization of the design of the main components of the project;
- Environmental and social issues related to construction supervision, best international standards.

Moreover, during construction controls, the Consultant can train the Owner personnel on use of instruments (such as Differential GPS, drones, sclerometres, Permeametres, Flow measurement vessels, etc.).

A.2.13.3 Workshops and Presentations Carried out by Consultant Experts

This activity will be carried out especially through the presentation of case histories experienced by the Consultant that can be similar to the Batoka Project case.

It will be defined in collaboration with the Owner the detailed program of the proposed workshops and short presentations, considering the field specializations of the Owner's personnel and Owner's needs.

A.2.13.4 Technical Presentation at the Different Milestones of the Project

For each milestone of the project the findings of all the Consultant's activities will be illustrated through a specific presentation to which will follow a debate/discussion.
Together with the main findings of the studies, the most critical aspects will be especially illustrated in detail.

PART B - INSTRUMENTATION PLAN

B.1 INTRODUCTION

B.1.1 CONTENT AND STRUCTURE OF THIS PART

This is the **PART B "INSTRUMENTATION PLAN"** of the Batoka Dam Safety Plan.

This part of the document outlines the operation and maintenance activities and procedures relevant to the Batoka Dam MONITORING SYSTEM.

It describes the monitoring system of Batoka Dam, and it contains the instruction for measurements to be collected by the instruments, for their presentation, use and assessment.

The part B is divided in two sections:

- DAM INSTRUMENTATION OPERATION AND MONITORING
  describing (at feasibility Design level) the Batoka instrumentation and the monitoring activity.

- DAM INSTRUMENTATION MONITORING RESULTS ASSESSMENT
  providing indications on how to deal with the results collected by the instruments, together with some guidelines for the instrument monitoring assessment.

The drawings showing the location and relevant bill of quantity of the instruments foreseen will be provided in the feasibility design report.

This document shall be integrated and developed, when the detailed design and construction will be carried out, annexing the following:

- Detailed design of Batoka Plant instruments
- As-Build drawings showing the location and name of each instrument
- Instruments installation sheets (Manual and Automatic)
- Instruments data sheets & manuals
- Instruments Calibration sheets and certificates
- Software manuals

This part of the report is in fact specifically focused in the instruments monitoring activities. The whole Operations and Maintenance Plan for the Batoka Plant is provided in the Parts C and D of the report, to which reference is made for all the operation and maintenance activities and procedures relevant to the Batoka Plant.

B.2 DAM INSTRUMENTATION OPERATION AND MONITORING

B.2.1 INTRODUCTION

This chapter describes the monitoring activities that shall be carried out during the operation of the Batoka Plant.
They are referred to the period of operation of the plant, they are applicable also for the dam construction and first impounding periods (as far as applicable), for which any further specific instructions can be added during the detailed design and construction process.

In the following paragraphs the instructions dedicated to the dam instrumentation monitoring for the plant operation period are provided, describing which measures shall be carried out with which instrument, where and when.
In the next chapters there are indications on how to evaluate the results gathered by the instruments, and the instructions on how to proceed in case of routine or alert conditions.

All that follows is at feasibility design stage of knowledge, therefore to be considered preliminary and to be detailed and updated before coming into operation.

B.2.2 INSTRUMENTS CONTROL PLAN SUMMARY TABLE

For an easier control and implementation of the monitoring procedure a summary table is to provided indicating all the instruments to be used on site, along with the type and frequency of measures to be carried out.

Here below a format for this table is provided, with first indications on instrumentation, to be integrated during the detailed design and construction process.

The instruments object of monitoring, that will be recalled in the table below, are assumed will be illustrated in detail in relevant drawings before the plant enters in operation, and will make part of this document and will provide, where possible, indication of the number and position of each type of instrument installed. All the as built instrumentation drawings will be documented inn dedicated documents.

All the prescriptions mentioned in the table and in the following paragraphs refer to the standard systematic monitoring activities. Prescriptions can be modified as needed if measurements show some anomalous trend or some indication of concern for the dam stability.
The routines conditions and alert conditions are detailed in the second paragraph of the next chapter.

Initials		Instruments Type	Position			Scope	Notes	Monitoring schedule (1)	
			Area	Ref. dwg	Elev. m a.s.l.			Routine	alert
WL	LS	LEVEL STAFF	Dam upstream face	(*)	(*)	reservoir elevation manual reading		Weekly manually whenever LR is not in function	Twice daily
	LR	Water LEVEL RECORDER	Dam upstream face	(*)	(*)	reservoir elevation digital reading and registration		Daily	Twice daily
Pz	Ex	PIEZOMETER external to the dam body	downstream of the dam and of the reservoir	(*)	(*)	registration of deep aquifer and groundwater levels	they are fed by batteries, which functioning shall be periodically checked.	Daily automatically; monthly manual	Twice daily
	B	PIEZOMETER inside dam body (fixed) installation	Dam foundation	(*)	(*)	registration of water pressures at defined elevation below dam		Daily automatically; monthly manual	Twicedaily
DF (2) (4) (5)	V	V NOTCHES	inside dam galleries (and wherever applicable)	(*)	(*)	measures of amount of leakages through the dam and through the dam foundations. Measures of leakages through the rockmass around the Power Waterways.	The measurements shall be carried out and presented separately for drains attaining the dam upstream face (included dam joints drains) and drains crossing the dam foundations, in turn divided in bottom, right abutment and left abutment zones.. (4)	Monthly, or in any case every 10m of reservoir level raising.	Daily
	D	WATER LEVEL INDICATOR (data logger)	at pits in correspondence of dam galleries exit and in dam bottom gallery pump pits	(*)	(*)	measures of levels to quantify the amount of leakages through the dam and through the dam foundations	see above.	Daily	Every hour

Initials		Instruments Type	Position			Scope	Notes	Monitoring schedule (1)	
			Area	Ref. dwg	Elev. m a.s.l.			routine	alert
	L	WATER LEVEL GAUGE STAFF at galleries exits.	at pits in correspondence of dam galleries exits	(*)	(*)	measures of levels to quantify the amount of leakages through the dam and through the dam foundations	see above.	Monthly, or in any case every 10m of reservoir level raising.	Daily
	P	DRAIN FLOW measurement by means of PUMPS at bottom galleries pits	at dam galleries exit	(*)	(*)	measures of leakages through the dam and dam foundations recollected below tailrace water level	the operating criteria and conditions and alarm system for the dam drain pumping system is to be automatically implemented, to be integrated with pumps supplier operation manual. (4) (5)	Daily automatically or manually (with Staff) in case the automatic system is out of operation.	Twice daily
T	TC	THERMOCOUPLES	inside the dam body	(*)	(*)	registration of punctual temperature inside dam body.		Montly	Daily
	FO	FIBER OPTIC CABLES	inside the dam body	(*)	(*)	continuous registration of temperature inside dam body.		Monthly	Twice daily
DS (6)	Cl	COLLIMATORS	Internal: inside dam galleries alignments. External: alignments on dam crest and on d/s face	(*)	(*)	check of dam displacements (overall dam displacement or single block movements)		Monthly	Daily

Initials		Instruments Type	Position			Scope	Notes	Monitoring schedule (1)	
			Area	Ref. dwg	Elev. m a.s.l.			routine	alert
DS (6)	Fa Ma	FIXED AIM and MOBILE AIM	inside dam galleries and on dam crest	(*)	(*)	see above	to be used for displacements check together with collimator basements and mobile aims.	see above	Daily
	Jm	JOINT DEFORMOMETER automatic and manual types	inside dam galleries and on dam crest	(*)	(*)	check of joint movements		Daily	Daily
	PI	Inverted PENDULUM	On specific dam Instrumented Sections (IS)	(*)	(*)	Registration of relative displacement between dam and foundation.	Automatic readings by the Automatic Fixed Coordinometer	Daily automatic; monthly manual	Twice daily
	PD	Direct PENDULUM	On specific dam Instrumented Sections (IS)	(*)	(*)	registration of horizontal displacements at several elevations along the IS dam block.	Automatic readings by the Automatic Fixed Coordinometer	Daily automatic; monthly manual	Twice daily
E	EB	EXTENSOMETERS in boreholes	On specific dam Instrumented Sections (IS)	(*)	(*)	registration of foundation deformations in respect to the dam structure		Daily automatic	Daily
WL	MS	Meteo Station	(*)	(*)	(*)	Meteo data (temperature, wind, rain) records	Data need to be discharged from the instrument and elaborated on monthly basis.	Data discharge and elaboration on monthly basis	Weekly
	LR	Water levels Radar recorded	(*)	(*)	(*)	River level measurement		Data discharge and elaboration on monthly basis	Weekly

Initials		Instruments Type	Position			Scope	Notes	Monitoring schedule (1)	
			Area	Ref. dwg	Elev. m a.s.l.			routine	alert
WL	LS	WATER LEVEL STAFF at Dam downstream face	Dam downstream face	(*)	(*)	River level of plunge pool	Measures to be correlated with radar levels and turbine outputs	Manually on daily basis.	Twice daily
	AC	Accelerographs	Dam, inside galleries at location to be defined (*)	(*)	(*)	Seismic movements	Measures to be considered and examined only in case of seism. Recorded automatically.	Continuously in automatic, until seismic event is recorded.	Continuously in case of seism

(1) These are the frequencies of measuring activities.

(2) Flow-meters, manometers, drain pipes extensions, other tools and adaptors are at hand at Dam control building, available for spot measurements where occasionally required on single drains or piezometers holes registering important leaks.

(3) For DS instruments all reading devices equipment shall be at hand at Dam control building.

(4) Flow measurement of individual drains that are discharging important leaks shall be monitored with same criteria of the general monitoring of drainage system of the Dam.

(5) Drains recollecting warm water springs in foundations, if any, shall be possibly identified and monitored as separate datum also.

(6) Reading devices equipment shall remain at hand at Dam control building.

(*) To be filled at detailed design and construction stage.

Table 1 - SUMMARY TABLE of Instruments CONTROL PLAN

B.2.3 INSTRUMENTS MEASUREMENTS REPORTING

The measuring activity (that can be commenced during the impounding period) shall continue during the period of operation of the plant.
All data gathered shall be always available on site. A REPORT presenting all data gathered by the instruments shall be prepared on MONTHLY basis.

Several data of instruments installed in the dam body can be extracted from the synoptic panel of the Acquisition Unit that is assumed will be provided to gather all data at Dam Control Building, without need to inspect the single instruments unless for specific punctual verifications. The Acquisition Unit is assumed provided with dedicated software that allow selection and extraction of data in tabular and graphical format and combination of readings of different instruments at same time.

The report shall include and organize the data and information described for each type of measurements. The data required to be presented are listed along this chapter for each type of instrument, to be provided in tabular and graph format.

Typical graphical representations shall be provided during monitoring for the most relevant type of records, where necessary combined with or referred to the reservoir water levels, plant operation data or rain data, and also referred to relevant design reference graphs when available (for instance for dam uplift), to allow a prompt evaluation of the results, and consequently definition of actions to be taken if required.
The following indicative list of data to be presented is provided for reference:

1) TEMPERATURE
    a. Thermocouple: reading & charts
    b. Optic Fiber: reading & charts
2) DRAIN FLOW
    a. Piezometer inside Dam body: reading & charts
    b. Piezometer outside Dam body: reading & charts
    c. Dam Instrumented Sections: Piezometers Water level
    d. Drain: water flow monitoring
    e. V-notch: water flow monitoring
3) LEVEL
    a. River, impounding and RCC levels: reading & charts
    b. Plunge Pool water level readings
4) STRESS
    a. Multi-Points Extensometers: reading & charts
    b. Single-Point Extensometers: reading & charts

c. Mechanical Strain Gauges: reading & charts

5) DISPLACEMENT
   a. Inverted Pendulum: reading & charts
   b. Direct Pendulum: reading & charts
   c. Dam absolute movements: from inverted and direct pendula data elaboration
   d. Joint Deformometer (3D tern manual): reading & charts
   e. Joint Deformometer (3D tern automatic): reading & charts
   f. Collimator alignment: reading & charts
6) VARIOUS
   a. Weather report: meteo station data & charts
   b. Rainfall historical sequences: reading & charts

The report in ROUTINE or ALERT conditions (see par. 1B.3.2 CRITERIA FOR ROUTINE OR ALERT PROCEDURE APPLICATION also next chapter) shall be forwarded MONTHLY to the contacts reported in a table constructed as follows:

Plant Management Structure				
Name	Position	Telephone	E-mail	Mail address

Table 2 - Typical table of Contacts for Routine or Alert procedure implementation

For both conditions this task is a responsibility to be assigned to the manager of the PMS.

In case of need to trigger an ALARM condition, or in case of need to implement the CONTINGENCY PLAN, described in Part E of the Dam Safety Plan, the contacts reported in par. E.7.4 of the Dam Safety Plan shall be immediately contacted.

The table above as well as the tables reported in par. E.7.4 of the Dam Safety Plan shall be filled by all the parties within the Owner organization involved in the Plant operation.

B.2.4 METEO and RIVER LEVELS MEASUREMENTS

The Meteo station is foreseen to be installed near dam and shall continue to record the meteo data (rain, wind, temperatures) from the automatic acquisition unit on monthly basis, for correlation with other measurements, and finally presented in a yearly report (possibly without interruption since the construction period).
Readings of river levels downstream of the dam shall be plotted on the river rating curve to obtain flow data. This rating curve shall be updated (during the construction and impounding period, as well during the operation period) by calibration with direct measures of flow in both dry and wet season conditions.

Levels records (in automatic downstream of river diversion) shall be taken on daily basis.
Levels and flow data shall be gathered and presented in a monthly report, correlated to the Power House, Spillway, Middle Outlets and Ecological discharge valves outflows (as far as it is the case).

B.2.5 RESERVOIR WATER LEVEL MEASUREMENTS

The reservoir water levels measurements shall be carried out by means of automatic (Level indicators) and manual (graduated level staffs) instruments.

During the operation of the plant the automatic level indicators will record water levels in the reservoir, and will transmit the data to the acquisition unit system, that is supposed to be present to gather the results at Dam Control Building. Whenever the automatic acquisition does not work, manual and visual readings of the reservoir water levels on the staffs that are installed along the dam upstream face shall be carried out.

The levels records shall be available immediately on site for all the purposes requiring decisions or actions linked to the reservoir water levels.
The plot of the river levels shall be always included in the monthly reports associated to all the other instruments measurements, for correlation purposes.

B.2.6 OUTFLOWS AT POWER HOUSES

This applies for each Power House.
The Power House Outflows are automatically continuously measured on each unit outlet and results gathered at Power House control building.
This measurement is firstly used in automatic by the control system of the plant for the energy production and for the management of each of the unit.
The daily records of the overall flow discharged at Power House shall be also gathered and reported in the monthly report of the instruments monitoring for comparison (also with tailwater levels) and overall understanding purpose.

Together with this datum, whenever the Middle Outlets and/or Spillway is in function, the relevant outflow, derived by the use of the reservoir level measurements (see previous paragraph) and by the relevant rating curves, shall be also provided in the monthly report of the instruments monitoring.

B.2.7 WATERS MONITORING: SPRINGS

The existing natural springs, if any, are required to be identified by:

- position
- water flow
- water temperature

A regular record (possibly on monthly basis) of water flow for the springs shall be carried out. Data shall be presented correlated to the river and reservoir levels and to the rain records, as measured in the closest available meteo-station.

The data shall be presented in graph and tabular format in the monthly report.

B.2.8 WATERS MONITORING: DAM PIEZOMETERS

A) PIEZOMETERS INSIDE THE DAM BODY

The piezometers inside the dam body are to be monitored automatically by the Acquisition Unit that is supposed to be present to convey the data at Dam Control Building.

Measures of pressures (water levels) at each piezometer shall be done daily in automatic and manually on monthly basis. This frequency can be modified in occasion of important rain events, rapid raising/lowering of the reservoir, as well as in case of seism.

Measures of drain discharge shall be plotted versus the time on monthly basis, and presented in the monthly report, correlated for comparison purposes with other following outputs:

- foundation drains flow;
- dam drains flow;
- river levels;
- dam piezometers readings;
- readings of other piezometers located in the Batoka site area (see next paragraphs);
- rain records at the meteo-station;

- reservoir levels.

The data shall be presented as far as possible grouped along different alignments with water levels plotted on transversal and longitudinal dam vertical sections to visualize correlations and trends along the dam foundation. Measurements from external piezometers (see next paragraph) aligned along these sections shall be also shown on the same drawing.

B) PIEZOMETERS OUTSIDE THE DAM BODY

The water table in the flanks of the river valley below the maximum reservoir level downstream of the dam shall be monitored also by means of external piezometers, whose number and position will be defined during detailed design and construction stage and reported in a table constructed as follows:

No	ID	Length	Easting	Northing	Elevation	Type	Position
		m	m	m	m.a.s.l.		
1							
2							
…							

Table 3 - Typical table with positions of piezometers

The monitoring shall be regular (daily measurement in automatic, on monthly basis manually) and shall cover dry and wet season period.
Every month the measurements shall be collected by means of portable reading units and provided in graphical and tabular format, together with all the other information pertinent to the meteorological conditions and dam as indicated in the previous paragraph.

B.2.9 DAM DRAIN MONITORING

Monitoring of dam galleries conditions and relevant drainage system is very important to be carried out during the plant operation period.

The amount of water coming out from the Dam drain gallery shall be monitored by means of the water level sensors (divers) and V-Notches purposely foreseen.

The overall amount of water discharged at each gallery level shall be also measured at each gallery exit, where automatic (with diver in a dedicated pit) and manual (with V-notch, meter, or pit of known volume) measurements can be made.

For the galleries under tailrace level the same measure shall be taken recording the water levels in the pit and the pumps operation records.

Samples of the drain water, flowing out of the drainage pipes crossing the dam foundation, must be also taken in order to check the turbidity.
Frequency of turbidity test will be revised on the basis of flow measurements. At any significant increase of seepage, it will correspond an increase of test frequency.

The measurements shall be carried out and presented separately for drains attaining to the dam upstream face (see also prescriptions of next paragraph), the dam joints drains, and drains crossing the dam foundations, in turn divided in bottom, right abutment and left abutment zones.

Calibration of V-notch will be checked by means of a graduated bucket and a stopwatch.

In case of necessity (when there is evidence of significant or anomalous outflow from a single drain), measurements of single drains outflow can be carried out manually with a bucket after installing a bent pipe extending the drain pipe, as foreseen in design documents.
Adaptors, pipes extensions, flow-meters and manometers shall be available at Dam control building store to be used for spot measurements on single drains when needed.

The following additional aspects shall be considered in organizing such activity:

1. Consideration should be given to monitoring the depth and type of sediment at the gallery weirs before cleaning each gutter, rather than just removing and discarding it. This shall be done on monthly basis.
   Samples of the sediment should be analysed on occasion for grain size, plasticity, pH, and composition. This information can be very useful if any piping or erosion starts in any of the foundation drains. The pH can be used to indicate if some of the seepage is coming from internal drainage of the dam itself, picking up calcium hydroxide (basic) on the way. Consideration should also be given to using a hand held "pistol" type temperature indicator to check the temperature of water coming from foundation drains. Rather than rely only in keeping complex records that are not always readily available, a simple method of documentation can be also used to just write the date and temperature on the wall next to the drain with a pencil. If the temperature changes, the date and new temperature should be noted

2. Consideration should be given to recording the volume of water pumped per week or month from the gallery sumps. Seepage flows shall be measured using weirs in the gallery gutters, but the pump records can also be used as a check. Also, it is possible on very high dams to observe a

sudden increase in gallery flows sometime during the life of the structure due to a failed waterstop, a sudden crack, or a significant change in foundation seepage, that could flood the gallery gutter and weirs. In this case, checking the pumping records (time and capacity, or by a flow meter) can provide an idea of the amount of flow.

Monitoring of dam galleries drainage system shall be carried out monthly in routine conditions, as far as the manual readings are concerned.
Water levels indicators (data loggers) shall be recorded in continuous the levels in the pits at the exit of the galleries, and send the records to the control center.
The pumps pits can be equipped with a system of recording and progressive starting of pumps (details to be defined with the supplier)

All the records shall be presented on a monthly report.
Data shall be presented correlated to the impounding levels and with the rain records as measured in the meteo-station.

Graphs of following outputs (related to water measurements) shall be provided in the same plot, for comparison purposes:

- Foundation drains
- Dam drains
- Reservoir levels
- Springs drains
- Dam piezometers
- Readings of other piezometers located in the site area
- Rain records at the meteo station.
- Power Houses operation (turbines in function, discharged flow).

B.2.10 THERMOCOUPLES

At feasibility design stage, thermocouples are foreseen to be installed in the dam.

The output of the thermocouples installed during the dam construction shall be acquired (as far as possible) on monthly basis.

The results shall be plotted versus time on monthly basis, with indication of the location and RCC zoning characteristics at that location (placing temperature and time, cement content, etc.).

The results shall be compared with the expected trend of temperatures in the dam body as defined in the next chapter.

B.2.11 FIBER OPTIC CABLES

At feasibility design stage, fiber optic cables are foreseen to be installed in the dam. The prescriptions for the fiber optic sensors readings are recalled hereinafter.

The output of the installed fiber optic cable sensors (FBG) shall automatically acquired in routine conditions on monthly basis.

The results shall be plotted versus time on monthly basis, with indication of the RCC characteristics (placing temperature and time, cement content, etc.).

Graphs of thermocouples and fiber optic sensors output shall be provided in the same plot, for comparison purposes, and compared with the expected trend of temperatures in the dam body defined in the next chapter.

B.2.12 EXTERNAL BENCHMARKS

External benchmarks are foreseen to be available around the dam site. They will be used during construction and they are not object of systematic monitoring during the operation period, however the Operator shall know their existence for any willingness of re-calibrating at large scale existing monitoring system basepoints (for instance after a seism, if it is deemed necessary to re-check the position of the collimators basepoints on the dam abutments, or the one on the dam crest, in respect to points more distant from the dam structure).
The position of available external benchmarks shall be provided in a dedicated drawing before plant enters in operation.

B.2.13 COLLIMATORS WITH FIXED AND MOBILE AIM

Fixed and mobile aims with collimator are foreseen to be installed in the dam.
Measurements shall be carried out manually by means of an optical collimator and fix and mobile aims by a skilled surveyor, registering horizontal and vertical displacement on each aims alignment and for each aim (typically one for each dam block).

Measurements shall be done for routine conditions on monthly basis, or in case of sudden important change of levels occurred in the reservoir.

Records shall be presented on a monthly report, recorded and plotted on the longitudinal section where they are measured and on the cross sections of the Dam, together with the reservoir water levels and the following instruments measures (described in the next paragraphs):

- External Targets displacements
- Invert and direct pendula
- Extensometers
- Joint deformometers

The measurements must be always reported separately for each settlement-measuring device.
The results shall be assessed as described in the next chapter.

B.2.14 JOINT DEFORMOMETERS

Joint deformometers are foreseen to be installed inside the inspection and drainage galleries of the dam.
Joints deformometers automatic readings shall be carried out, registering horizontal and vertical displacement on each joint, with the Acquisition Unit, and manually with Portable reading units whenever a defect or interruption or anomalous trend is observed in the automatic readings.

Measurements shall be done on monthly basis, or in any case every 10m of sudden reservoir level raising.
Results shall be provided in a monthly report, organized and presented as done for the external targets and collimators displacements (see previous paragraphs).

B.2.15 PENDULA

The INVERT pendula are foreseen to be installed with the head mounted in the galleries above tailrace water level.
The DIRECT pendula will be installed in the dedicated shafts.

All pendulum measurement record is foreseen to be daily and automatic.
A monthly basis check by manual reading is by default required.

Measurements shall be recollected on monthly basis, recorded and plotted versus the time.
Records shall be provided, together with other displacements and deformation measures, plotted along the dam sections pertinent to the pendula, for an immediate comparison with the expected values of settlements (see next chapter).

B.2.16 EXTENSOMETERS

Extensometers are foreseen to be installed in the dam.
Extensometers automatic readings shall be carried out with the Acquisition Unit, and manually with Portable reading units whenever a defect or interruption or anomalous trend is observed in the automatic readings.

Measurements of extensometers shall be recollected on monthly basis (default automatic readings).
Results shall be provided in a monthly report, recorded and plotted versus the time with indication of the reservoir water levels, correlated to the other displacement measures (data available form external targets, collimators, pendula) for an immediate check, as described in the next chapter.

B.2.17 ACCELEROGRAPHS

Strong motion measurement record is continuous and automatic in case of seismic event. The Acquisition Unit is typically set to also register such measurements.
Measurements, whenever acquired by the instrument, shall be recorded and plotted versus the time and presented together with the other dam instrumentation measurements.

Any exceptional or anomalous record shall be transmitted as soon as possible to the National Authorities deputed to the seismic events monitoring of the region, and they shall be made available for comparison, for study and evaluation purpose, with the accelerographs of the seismic cases used for the dam stability verifications.

In case of seismic event, further specific measures for structural control of specific parts of the works will be decided on case by case basis.

B.2.18 DOWNSTREAM WORKS INSPECTION

The inspection of the works and the downstream areas aim to find and measures any signal of potential leakage or static problems to the structures connected with the operation of the Plant.

A careful visual inspection of the works should be carried out with particular attention to the hydraulic steel structures when they operate and Dam upstream zone (as far as possible to inspect it from upstream and from the galleries).

The inspection of the works (object, methodology, frequency, timing and reporting requirements) is described in more detail in Part D of the Dam Safety Plan, dedicated to the Plant maintenance, to which reference shall be made.

B.3 DAM MONITORING RESULTS ELABORATION: ROUTINE AND ALERT CONDITIONS

B.3.1 INTRODUCTION

This chapter:

- illustrates the principles of how to evaluate and assess the results of the measurements carried out with the instruments,
- consequently individuate the conditions to implement the procedures associated to the ROUTINE or ALERT and, in case, to the DRAWDOWN conditions.
- Describes the ROUTINE, ALERT, CONTROLLED DRAWDOWN and EMERGENCY DRAWDOWN procedures.

During the normal operation of the plant, within the PMS, an instrumentation monitoring reporting shall be organized and continued as done in first impounding period.
For some kind of measurements, there is not a fixed *a priori* specific threshold that marks the passage from routine to alert condition. In any case it is necessary to define or adjust threshold values after first (and subsequent) period of impounding and operation according to the first (and subsequent) measures, as well as the first assessment of the dam behavior and of any anomalous record of any instruments carried out during the first impounding period.

A general criterion for the application or the Routine or Alert procedure is in any case generally fixed as follows:

- When the reservoir level is stable (not raising or lowering), the alert procedure is activated if there is a trend of increasing with time of the datum recorded.
- When the reservoir level is raising or lowering, the alert procedure is activated if there is a trend of increasing of the datum recorded that is time dependant and not level dependant.

The assessment is focused and organized in this chapter on the following main aspects dealing with the dam stability and safety:

1. UPLIFT PRESSURES ON DAM FOUNDATIONS
2. GROUNDWATER CIRCULATION
3. LEAKAGES
4. DAM FOUNDATION SETTLEMENTS and DAM DISPLACEMENTS
5. DAM THERMAL CONDITIONS

The table at par. B.3.2 CRITERIA FOR ROUTINE OR ALERT PROCEDURE APPLICATION summarises the criterion of Routine or Alert procedure application. It shall be updated and detailed during detailed design and construction and first impounding phases.

B.3.2 CRITERIA FOR ROUTINE OR ALERT PROCEDURE APPLICATION

In order to evaluate the Dam behavior the criteria stated in the following tables shall be followed, for the most important parameters to be controlled, namely:

1. Dam **uplift pressures** and groundwater
2. Dam and Power Waterways **leakages**

Other parameters that shall be controlled are:

3. Dam foundation settlements
4. Dam displacements
5. Dam RCC temperatures

Such parameters will be controlled by means of some of the instruments available, as described in previous chapter 1 "
DAM INSTRUMENTATION OPERATION AND MONITORING", and assessed as described in this chapter.
The most critical parameters are the ones at points 1 and 2 above, that shall be firstly checked in respect of possible triggering of alert procedures.

Records of instruments devoted to the control of the other parameters will be collected systematically, but used only whenever necessary to analyze the possible causes and effects in case an unforeseen event or anomalous trend is found.

In the following tables, the threshold and acceptable limits, where indicated, are the ones defined in the subsequent paragraphs of this chapter.

STABLE WATER LEVEL IN THE RESERVOIR		
	Routine Procedure (1)	Alert Procedure (2)
UPLIFT PRESSURES ON DAM FOUNDATIONS	Within the threshold limit defined in the detailed design of the dam (see par. B.3.3 below). Stable	Exceeding threshold limit defined in the detailed design of the dam (see par. B.3.3 below). Increasing with time, independently from season trend.
GROUNDWATER	Stable or following season trend.	Increasing with time, independently from season trend.
LEAKAGES THROUGH DAM FOUNDATIONS, DAM BODY, POWER TUNNELS	Stable or (for foundation drains) variable according to rain/dry season trends.	Increasing with time (for foundation drains only if independently from season trend). For local drains when jetting continuously.
DAM FOUNDATION SETTLEMENTS	Stable.	Increasing with time.
DAM DISPLACEMENTS	Stable.	Increasing with time.
RCC DAM TEMPERATURES	Within acceptable limits fixed by the detailed design of the dam	Increasing above acceptable limits fixed by the detailed design of the dam

Table 4 - Criteria for Routine or Alert procedure application – case of stable reservoir water level

CONTROLLED RISING OF WATER LEVEL IN THE RESERVOIR		
	Routine Procedure (1)	Alert Procedure (2)
UPLIFT PRESSURES ON DAM FOUNDATIONS	Level dependant increasing with ratio <1. In any case within the threshold limit defined in the detailed design of the dam (see par. B.3.3 below).	Time dependant increasing. Above the threshold limit defined in the detailed design of the dam (see par. B.3.3 below).
GROUNDWATER	Level dependant increasing	Time dependant increasing.
LEAKAGES THROUGH DAM FOUNDATIONS, DAM BODY, POWER TUNNELS	Level and (for foundation drains) season dependant increasing	Time dependant increasing. For local drains when jetting continuously.
DAM FOUNDATION SETTLEMENTS	Level dependant increasing.	Time dependant increasing.
DAM DISPLACEMENTS	Level dependant increasing.	Time dependant increasing.
RCC DAM TEMPERATURES	Within acceptable limits fixed by the detailed design of the dam	Increasing above acceptable limits fixed by the detailed design of the dam

(1) for the application of the ROUTINE PROCEDURE all conditions stated in the table shall be verified;
(2) the ALERT PROCEDURE will be activated as soon as one of the conditions will be verified, or the Reservoir water level is higher than maximum operating level.

Table 5 - Criteria for Routine or Alert procedure application – case of raising reservoir water level

If above the Spillway sill level uncontrolled reservoir filling occurs due to an exceptional flood event that do not allows to maintain the water level in the reservoir within the maximum operating level:

- alert procedure will be firstly activated;
- then the procedure "OPERATION CRITERIA IN CASE OF EXCEPTIONAL HIGH FLOODS (RESERVOIR ROUTING) described in Part E of the Dam Safety Plan will be implemented;
- then, as far as necessary, the Emergency drawdown procedure described in this and in Part E of the Dam Safety Plan can be activated.

If according to the results of observations carried out during the Alert Procedure, an emergency state is triggered, the Controlled Drawdown Procedure or the Emergency Drawdown Procedure will be activated, as described in last paragraphs of this section.

B.3.3 UPLIFT PRESSURES ON DAM FOUNDATIONS

The levels registered in the piezometers inside the dam body intercepting the dam foundations, correlated with the upstream and downstream water levels reached during the impounding, shall be compared with the value of uplift pressure assumed in the dam stability calculations at the position and depth of the piezometer itself, scaled in proportion to the reservoir water level.

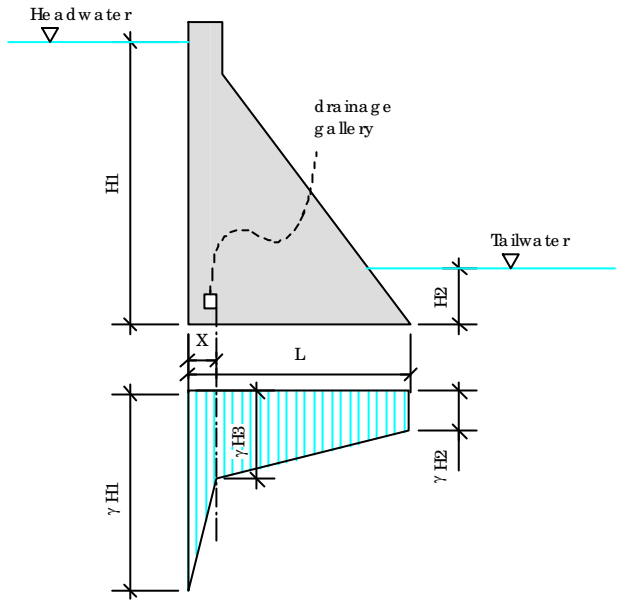
In principle, wherever the observed levels in the piezometers exceed the values assumed in the design, the ALERT procedure shall be activated, unless for minor deviations or local anomalies that can be imputed to local geological features or specific reasons, that can be evaluated on case by case basis.

In sake of simplicity for an easy first appraisal of the phenomenon the comparison can be made on the instrumented sections, in respect to the assumptions made on design uplift water levels for the Normal Operating Conditions in the Dam stability analysis that will be developed during the detailed design, from which the following figure represent a typical example.

Uplift pressures considered varying from the hydrostatic pressure relative to US Army Corps of Engineers, "Gravity dam design", EM 1110-2-2200, 1995:

- *at u/s toe* *H1 =the reservoir water level*
- *at d/s toe* *H2 = tailwater level*
- *at drainages* *H3= 0.33 x (H1-H2) x (L-X)/L + H2*

as illustrated in the following figure:



L = dam base length

X = drain distance from u/s toe

H2= tailwater depth

The readings of the piezometers shall be plotted and compared with the uplift design reference line (in the figure above shown in blue, as example) This kind of outputs shall be provided for all instrumented sections, to easily individuate any anomalous value exceeding the assumptions made in the dam design.

It's also important to observe the pressure increase versus reservoir level for the various piezometers; data shall be presented showing the water level in the piezometers installed at different galleries versus the time and the reservoir water level. If deemed necessary, correlation curves (H piezometers versus reservoir water level) may be drawn.

It is recommended that before operating the plant the present document be integrated with a table in which for each piezometer there are provided the following values of total head (expressed in meters above sea level) used for the purpose of calibration of the instruments:

1. ALERT TRESHOLD
   This is the value above which the monitoring of the piezometer shall pass from ROUTINE to ALERT conditions (see next dedicated paragraphs)

2. ALARM TRESHOLD
   This is the value above which an alarm shall be activated, being the head reaching about 90% of the value assumed in the design for the stability of the dam.

Of course in such case an analysis and check shall be made on the specific piezometer also in relation to the trends of other and adjacent piezometers.

Piezometers can be dependent from reservoir water elevation. For this reason the above threshold values shall not be univocally defined, but instead given as function of reservoir water level (H).

The software of the instruments acquisition unit can be already programmed to have inserted the following values, as function of H, for the automatic monitoring of the piezometers levels.

PIEZOMETERS typical threshold values		
Piezometer ID	1= ALERT TRESHOLD	2=ALARM TRESHOLD
-	m a.s.l.	m a.s.l.
1	>z1 +k1 * (H- z1)	> z1+k1' * (H- z1)
2	> z2 +k2 * (H- z2)	> z2 +k2' *(H- z2)

Table 6 – Piezometers typical threshold values

B.3.4 GROUNDWATER CIRCULATION

The monitoring activities of the groundwater is aimed at detecting potential anomalous or local unexpected trend of pressure or water flows increasing in connection to the progress of impounding or reservoir fluctuations.
The analysis will be made through the combined assessment of measurements of external waters (rain, river flows, springs) and the deep piezometers available. A table like the following shall be prepared with all the available piezometers listed, and the ones possibly intercepting any aquifer highlighted.

Piezometer	location	Top elevation	Bottom elevation	Notes
1	…	…	…	…
…	…	…	…	…

Table 7 – Typical list of piezometers

Typical outputs of the monitoring to be provided are plots of deep aquifer piezometers level versus time and versus impounding water level, allowing to check the criteria for routine or alert procedure application.

Anomalous records of leakages from the drains, among the ones listed in the table above, intercepting the dam foundation in correspondence of possible special or weak zones, shall be linked and correlated to the above observations.

All the above is mainly related to the dam structure, but at the same time useful information about the groundwater circulation and its dependence from the reservoir water level shall be acquired by the measurements available from the available drainage system/ other external drainages on all the Batoka site.

A table analogue to the one envisaged for the Dam piezometers shall be prepared, in which for each piezometer there are provided the following values of total head (expressed in meters above sea level) used for the purpose of calibration of the instruments:

1. ALERT TRESHOLD
   This is the value above which the monitoring of the piezometer shall pass from ROUTINE to ALERT conditions.

2. ALARM TRESHOLD
   This is the value above which an alarm shall be activated, in the case the deep piezometers level gets close to the limit compatible with the dam or other structure stability (according to the detailed design assumptions).
   Of course in such case an analysis and check shall be made on the specific piezometer also in relation to the trends of other and adjacent piezometers and on the reservoir.

Also these piezometers can be dependent from reservoir water elevation. For this reason the above threshold values are not univocally defined, but shall instead be given as function of reservoir water level (H).

Also in this case, the software of the instruments acquisition unit can be already programmed to have inserted the following values, as function of H, for the automatic monitoring of the piezometers levels.

As far as groundwater circulations (deep aquifers) no direct measures of the total seepage flow are supposed to be available and the influence of the groundwater, the surface water flow, of the precipitation and of the impounding process or reservoir fluctuations on the seepage flow is quantitatively unpredictable, making definition of sharp seepage threshold values unreliable.

As far as the flow is concerned, indicatively, the total amount of recollected water from these drains should remain in the range of some liters per second which, in terms of volume, cannot be considered critical at the scale of the project.
The temperature of the drained water shall be measured, to gain information about its origin.

B.3.5 LEAKAGES

LEAKAGE (SEEPAGE) THROUGH DAM FOUNDATIONS

The measurements gathered from the drains crossing the dam foundations will be analyzed considering the sum of contribution of all the drains crossing the dam between two subsequent galleries, and where necessary correlated to specific ground or foundation features or local weak zones.
As far as possible the total flow value sum of contribution of all the drains catching possible springs on dam foundation shall be recorded and assessed separately from other drains or water outputs.

Indicative threshold value of leakage through dam foundations will be provided after observations relevant to the first year of impounding and the specificity of the dam foundations, the flows will be monitored and any anomaly at local scale of a single drain as well as distributed or total leakage flows will be recorded and assessed. As far as the impounding and plant operation go on and further data and information are gathered and interpreted, leakage flow alert threshold values will be updated or refined, if necessary.
In any case, the monitoring of the leakage trends (that in normal conditions shall follow the reservoir level trends and generally be stable in absence of variation of the reservoir levels) is much more important than the absolute value of recorded leaks.

Whenever water is clearly flowing (and not dripping or oozing) from a specific drain or point, such drain shall be object of monitoring with alert procedure.

LEAKAGE THROUGH THE RCC DAM

Any water incoming in the dam body from RCC dam drains or from vertical joints drains shall be object of local monitoring.
Whenever water is clearly flowing (and not dripping or oozing) from a specific drain or point, such drain shall be object of monitoring with alert procedure.

As far as the overall flow measured at the exit of the drain galleries, threshold values can be established if needed during the operation of the plant, taking into account the monitoring results of the prior phases and on their interpretation.

The extreme limit threshold value of the total flow recollected at lowest gallery can be limited to the overall capacity of the pumps that will be installed (this applies also for the flow coming from drains crossing the foundations). The pumps in the pits will be set with a progressive water level based functioning and alarm system. If the maximum capacity flow is exceeded the contingency plan shall be triggered.

Typical outputs of leaks monitoring relevant to both leakages through foundations and through RCC dam are graphs reporting the amount of leaks versus the time, presenting the distinct contributions of V-notches and single drains and their location and type, allowing an immediate understanding of the correlation with the reservoir fluctuations and detection of possible local or generalized anomalous trends.
Additionally tabular outputs shall be also gathered with indication of water temperature, where measured (especially in drains through foundation).

B.3.6 FOUNDATION SETTLEMENTS and DAM DISPLACEMENTS

The dam foundation settlements, measured with the extensometers foreseen to be installed in boreholes and with the collimators along the dam downstream face, are assumed will be compared with the expected deformations resulting from the dam stability analysis at design level for the typical (calculation) sections and for different reservoir levels.

The comparison will be conducted using the nearest calculated section available, considering the scenario closest to the reservoir level at the moment of the measurement.
The assessment will be conducted considering, with engineering judgment, all possible causes of any movement recorded, and the levels of the impounding and of the dam at the moment of the measurements.

The same approach is foreseen for the dam overall displacements measured with direct and invert pendula and the relative displacements of dam single blocks or vertical joints measured by direct pendula or by collimators located on dam downstream face, that will be compared with the expected displacements resulting from the dam stability analysis carried out in the detailed design phase.

As a general indication, displacements and movements of few millimeters are considered negligible at the scale of the project and in consideration of the accuracy of the instrumentation used.

Typical outputs of the monitoring present displacements continuously plotted versus the time (in both upstream to downstream direction and left to right direction) and the same for pendula readings, together with reservoir elevations, allowing their interpretation and correlation.

Whenever significant anomaly, abrupt isolated displacements or a trend not following the rate of reservoir level fluctuations (ref. table at par. B.3.2 CRITERIA FOR ROUTINE OR ALERT PROCEDURE APPLICATION) and substantially not consistent with the assumptions made in the design will be detected, the alert procedure will be activated, and possible actions decided on case by case basis.

B.3.7 DAM THERMAL CONDITIONS

The readings of the thermal records provided by the thermocouples and fiber optic sensors in the dam body during the impounding shall be compared with the value of maximum temperatures assumed in the dam design thermal analysis to be carried out at detailed design stage at the position of the measurement.

To this purpose specific plots for temperature readings comparison are to be provided, for main sections and most representative scenario analyzed inn the detailed design.
Data extracted in tabular format from manual or automatic readings of both thermocouples and fiber optic sensors can be used to make such check. At the same time contours of temperatures can be plotted in significant sections and compared with the temperature filed assumed for design calculations, to detect possible macro zones of possible temperature deviation.

Whenever the observed temperatures reach values out of the designed range expectation, the ALERT procedure shall be activated.

B.3.8 ROUTINE PROCEDURE

During Routine procedure, instruments reading and reporting activities, are executed as described in this report (see in particular *Table 1* of par. B.2.2).

B.3.9 ALERT PROCEDURE

Instruments readings are incremented as follow:

- Daily readings will be carried out not less than twice per day (also during night time);
- Other readings will be carried out not less than daily.

More details are provided in see in particular *Table 1* of par. B.2.2.
The data, only pertinent to the instruments readings falling in the alert conditions, shall be promptly organized in reports for engineering evaluation.
If deemed necessary, according to the analysis of the results of observations carried out during the Alert Procedure, the Controlled Drawdown Procedure or the Emergency Drawdown Procedure will be activated.

B.3.10 CONTROLLED DRAWDOWN PROCEDURE

The Controlled Drawdown Procedure (CDP) is finalized to lowering the reservoir level without causing damages to the outlet structures such as Spillway, Power Waterways and Middle Outlets.

If according to the results of observations carried out during the Alert Procedure, an emergency state is triggered but any impending hazard is excluded, the Controlled Drawdown Procedure will be activated to perform inspections and repair works on the submerged structures as necessary and as far as possible (no dewatering is physically possible below the Middle Level Outlet minimum operating level).
This is valid only for a limited range of reservoir water levels and within the limits of capacity of the available discharging devices versus the incoming flows (therefore also depending on the season and on the duration of the emergency state).

In case it is required, for instance in order to inspect lower portions of dam upstream face or the portals of Power Tunnels, or for decisions consequent to the results of the instrumentation monitoring, to operate a reservoir drawdown aimed to maintain as much as possible the water level to the minimum possible level, the CONTROLLED DRAWDOWN PROCEDURE will be carried out in accordance to the instructions of the Contingency Plan provided in the Part E (Emergency Preparedness Plan) of the Dam Safety Plan.

It is to be noted that in exceptional conditions the Middle Outlets can be temporary work up to a exceptional minimum elevation, but it is to be reminded that maintenance operation in dry conditions in the reservoir and dam areas below this elevations are not physically possible.

B.3.11 EMERGENCY DRAWDOWN PROCEDURE

If the results of observations highlight an impending hazard for the dam safety, the Emergency Drawdown Procedure will be carried out in accordance to the instructions of the Contingency Plan described in the Part E (Emergency Preparedness Plan) of the Dam Safety Plan.

PART C - OPERATIONAL PLAN (Preliminary Plan)

C.1 INTRODUCTION

C.1.1 CONTENT AND STRUCTURE OF THIS PART

This is the **PART C "OPERATION PLAN (Preliminary Plan)"** of the Batoka Dam Safety Plan.

This part of the document, and its references, provides the feasibility design guidelines for the operation of the Batoka scheme, including the dam, power waterways, power house and other appurtenant structures.
It outlines the operation activities and procedures relevant to the Batoka Dam and Hydro Power Plants, to be detailed and implemented by the Project Management Structure that will be appointed by the Owner(s) of the Plant.
Being the design at Feasibility stage, this document has a Preliminary nature, being necessary to be developed and detailed during project implementation. The final plan is due prior to 6 months before initial filling of the reservoir according to the development and detail of the design, and further on according to the construction of the plant itself.

According to the structures of Ownership and Operation that Zambian and Zimbabwean countries and ZRA will put in place, the responsibility of operation of the dam and of the two plants can be assigned to different PMSs, that, in the frame of development of the manuals and of relevant implementation rules and structures, will organize (dividing and coordinating as appropriate) the work to be done and the limits and coordination of responsibilities. At the present stage of the design, and considering the importance to have an overall view of the Batoka scheme operation requirements, the document is developed as one manual for the whole scheme.

As far as the Batoka Plant OPERATION instructions are concerned, this part includes:

- The description and instructions for the OPERATION of the plant in normal condition of power production
- The instructions for the proper and safe operation of the hydraulic device and the use of the civil works.
- Other specific prescriptions for the use of civil works.

The instruction for measurements to be collected by the instruments available at Batoka, and for their presentation, use and assessment, are provided in Part B of the Dam Safety Plan.

This part of the report is divided in the following chapters:

1) INTRODUCTION
   Describes the content of the report and its structure.

2) ROLES and RESPONSABILITY

   Outlines the general frame of roles and responsibilities for the Batoka HEP operation and maintenance activities.

3) SYNTHESIS OF RESERVOIR AND PLANT OPERATING CONDITIONS

   In this chapter is provided a synthetic description of:

   - the plant operating rules and conditions,
   - the reservoir operating conditions,
   - the system of power supply feeding the Plant.

4) PLANT HYDRAULIC CONTROL DEVICES OPERATION

   In this chapter it is provided a description, for ordinary and exceptional cases of operation, of the opening and closure manoeuvres for each hydraulic control equipment (valves, gates, bulkheads, stoplogs) for all the hydraulic devices (Middle Outlets, Spillway, Power Waterways, Draft Tubes, etc.) of the Plant.

   The prescriptions for the environmental flows release are also reported, associated to the specific hydraulic devices devoted to the environmental releases.

5) HYDRAULIC CONTROL DEVICES RATING CURVES

   In this chapter it is mentioned that it will be provided a description of the hydraulic rating curve of each of the hydraulic devices of the Plant, including the reservoir rating curve.

6) OTHER PRESCRIPTIONS FOR CIVIL WORKS OPERATION

   In this chapter some specific prescriptions for the use of specific civil works at Batoka Plant are provided.

7) INSTRUCTIONS FOR PLANT OPERATORS FIRST TRAINING

   In this chapter there are guidelines and indications for the Operators, as well as a format for the spare parts check.

Drawings illustrating all the works are the ones of the Feasibility Design, separately issued.

C.2 ROLES and RESPONSIBILITY

C.2.1 LEGISLATIVE FRAMEWORK

The project has a transboundary nature, having the dam shared between Zambia and Zimbabwe.
The Zambezi River Authority (ZRA) is a transnational authority that deals with the Zambezi river, formed by the Council of Ministers of Zambia and Zimbabwe, the Board of Directors and the Executive Management.

The history of the Zambezi River Authority (ref. www.zaraho.org.zm) may be said to have begun in November 1964 when the Central African-Council appointed the Inter-Territorial Hydro-Electric Commission.
In May 1951 the Commission recommended the development of a dam at Kariba and hydro-electric power station. In June 1954 the Hydro-Electric Power Act was passed which provided for the establishment of the Federal Hydro-Electric Board charged with the function of Coordinating the generation and supply of electricity within the Federation.
In May 1956 the Federal Power Board was established pursuant to the enactment of the Electricity Act. This was a reconstitution of the Federal Hydro-Electric Board. The new Board was vested with the power to construct dams and power stations, to transmit electric power and sell same to Electricity undertakings. A hydrological data collection organization operating in each territory was also established.
In 1963, the Federation was dissolved. The integrated systems for the control of generation of power and its transmission continued to be operated and was fully developed as a single system under joint ownership and control of the two Governments of Northern and Southern Rhodesia under the Central African Power Corporation (CAPCO) which was established in the same year.
CAPCO was vested with the assets and liabilities of the Federal Power Board. The general function of CAPCO was to supply electricity to Electricity undertakings in the two territories while its conduct was regulated by a higher authority for power comprising two ministers appointed by each of the two Governments.
In 1987 the Zambezi River Authority Act was passed simultaneously in the two states of Zambia and Zimbabwe dissolving CAPCO and reconstituting it as Zambezi River Authority (ZRA).
CAPCO was divested of its electricity production and bulk distribution assets which were allocated to the National Electricity undertakings of the two states.
The ZRA was therefore left with the responsibility of the operation and maintenance of Kariba Dam Complex, investigation and development of new dam sites on the Zambezi River and analyzing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba.

ZRA is therefore assumed to be the dam Owner, intended as the organ charged to be responsible of the operation and maintenance of Batoka Dam.

The two national Plants linked to the dam can have different structures of Ownership and Operation, and that when will be appointed (by ZRA or by Zambia and Zimbabwe governments), will take the responsibility of the operation and maintenance of the Plant(s).
According to the structures of Ownership and Operation that Zambian and Zimbabwean countries and ZRA will put in place, the responsibility of maintenance of the dam and of the two plants can be assigned to different PMSs, that, in the frame of development of the manuals and of relevant implementation rules and structures, will organize (dividing and coordinating as appropriate) the work to be done and the limits and coordination of responsibilities. At the present stage of the design, and considering the importance to have an overall view of the Batoka scheme operation and maintenance requirements, the document is developed as one manual for the whole scheme.

It is assumed and recommended that the dam Owner (ZRA) is organized to be capable to manage, operate, maintain and protect the dam. In addition to this recommendation it should be noted that the dam Owner has liabilities to others under civil law.

C.2.2 MANAGEMENT STRUCTURE

The Owner of the Dam and of the Plants, within is structure or appointing external consultants, will build up one or more Plant Management Structure (PMS) that will be responsible of the management, operation and maintenance of the Dam and of the Plants. Such structure shall be such to cope with the need to properly operate and maintain the plant as described in parts C and D of the Dam Safety Plan, and to fulfill the reporting requirements described in Part D of the Dam Safety Plan.

C.2.3 SITE STAFF SKILLS AND TRAINING

The Batoka Dam and the two Power Houses are expected to be manned 24 hours per day.
Operation, inspection and maintenance of all aspects of the plant is to be undertaken by suitably qualified staff.
Training requirements related to operations of electrical and mechanical plant is described in dedicated section of this report. Training of staff is very important to achieve successful implementation of these Safety Plans.
Surveillance inspections are to be conducted by staff trained and certified as competent in dam safety inspections. Surveillance data assessments and dam safety decisions are required from qualified engineers experienced in dam safety management.

C.3 SYNTHESIS OF RESERVOIR AND PLANT OPERATING CONDITIONS

C.3.1 GENERAL

All that follows has to be revised and updated with the development of the detailed design and construction of the Plant.

The characteristics of the plant summarized below are referred to the current status of the feasibility design.

The main components of Batoka HES basically include:

- A dam, about 180 m high, hosting middle outlets and spillway with plunge pool
- no. 4 underground power waterways, two on each abutment, with intakes, tunnels, shafts, penstocks
- no. 2 outdoor power houses, one for each bank, for a total installed power of 2400 MW.

The dam body hosts on its central part a spillway divided into several independent channels controlled by gates, returning the floods into the river into a pre-excavated plunge pool in the river bed. Two middle outlets are also hosted into the dam body.

Each bank hosts No. 2 underground power waterways that including:

- Four intake structures, two on each abutment, all located close to the dam
- four power tunnels, two on each bank, about 600-700 m long each with a diameter of 9.5 m
- four high surge shafts and 200-300 m penstocks, ending into manifolds that feed the powerhouse.

The two outdoor powerhouses are located downstream of the pre-excavated plunge pool, currently about 450 m from the spillway lip. The powerhouse building is about 175 m long and 40 m wide, disposed quite parallel to the steep rock front and slightly rotated with the river alignment.

The two powerhouses host No. 12 turbines (No. 2x6x200 MW) obtaining a total installed capacity of 2400 MW. Six main step-up transformers are located in "open air" at the back of each Power House, on a dedicated deck.

C.3.2 PLANT OPERATING CONDITIONS AND FACILITIES DESCRIPTION

This chapter describes the operating conditions of the power plant in respect of:

- hydraulic constraints
- availability of those equipment which contributes to the minimum requirements of the safety of the power plant

For what the hydraulic conditions are concerned, the power plant is in normal operation whenever the following conditions occur:

- Reservoir water level (RWL) between Full Supply Level (FSL) and minimum operating level (MOL)
- generating units in operation
- no ecological flow released through the ecological discharge valve

An "exceptional" operating conditions is identified whenever the above conditions are not met, and in such case we can have different scenarios as indicated in following table.

CONDIITON	*Description*	*event occurrence*	*RWL, m a.s.l.*	*# units in op.*	*Q in each power tunnel, (max value in m^3/s)*	*MLO release*	*SPILLWAY release*
A	normal op	continuously	MOL ÷ FSL	12=(1 ÷ 6)+(1÷ 6)	Yes (411.2)	no	no
B	Controlled flood release	possibly yearly	< Spillway sill	12=(1 ÷ 6)+(1÷ 6)	Yes (411.2)	yes	no
C	Controlled flood release / flood event	possibly yearly	< FSL	12=(1 ÷ 6)+(1÷ 6)	Yes (411.2)	if needed (*)	if RWL > Spillway sill (*)
D	Flood event	possibly yearly	> FSL	12=(1 ÷ 6)+(1÷ 6) (if possible, (*))	>= (411.2) if plant operates (*)	if needed (*)	Yes (*)

Table 8 - Operation of Batoka - hydraulic condition

(*) Following OPERATION CRITERIA IN CASE OF EXCEPTIONAL FLOODS (RESERVOIR ROUTING) to be included at par. C.4.6.

For ordinary and exceptional cases of operation, the description of opening and closure manoeuvres for each of the hydraulic devices (valves, gates, bulkheads, stoplogs) of the Plant is preliminarily indicated and shall be provided in detail at further design and construction stages in the next chapter C.4 of this report and in the relevant manufacturer's specific operation and maintenance plans.

In the same chapter C.4 the environmental flows prescriptions are reported, associated to the specific hydraulic devices devoted to the environmental releases.

The reservoir rating curve, that shall be used to find out at any moment the incoming flows and reservoir volumes from the readings of the reservoir levels will be included in detailed design phase in chapter C.4 of this report, together with all the rating curves of each hydraulic device.

The most important hydraulic features, such as spillway, middle level outlet, ecological release valves, etc. of Batoka HEP are described in the Feasibility Design, to which reference is made.

Each of the two power plants is provided with the following generating facilities and equipment:

- No.6 Francis turbines with a rated output of 200 MW

- No.6 Main Inlet Valve, Butterfly type
- No. 6 synchronous generators
- No. 6 main step-up transformers

C.3.3 NORMAL OPERATIONS DESCRIPTION

The operating conditions of the power plant can be assumed to be "normal" whenever the plant is operated:

- within the equipment capabilities in respect to their nominal hydraulic, mechanical, electrical conditions

- with all the safety measures fulfilled by the Operator, according to
  - the O&M manuals of each single part/equipment/system of the power plant provided by the original manufacturers
  - the emergency preparedness plan specifically prepared for Batoka project

- without any outage or out of service of those facilities and systems which grant the safe operation of the equipment, such as
  - fire-fighting system
  - water drainage system of the Dam and Power House
  - Dam monitoring devices
  - Dam pumping station
  - SCADA system, HVAC system for ventilation and air conditioning, etc.

The "emergency" condition operation refers to a status of the plant wherein the occurrence of some events could affect the overall safe operation of the plant. For example, the prolonged outage of the generating units compels the running of the back-up supply (i.e. Emergency Diesel set and DC batteries system) in order to guarantee the availability of safety devices, such as the Dam Pumping system, the fire-fighting and HVAC systems, etc. The configuration of the power supply in such an event is given in the next paragraphs.

<u>SURGE SHAFTS</u>

Four (4) surge shafts, one per each waterway have been introduced into the system with the aim of reducing the amplitude of pressure fluctuations by reflecting the incoming pressure waves and providing stability to the system with respect to the small load variations.

The shaft diameter, the maximum and minimum water level in the surge shaft and the proper throttle orifice size were defined according to the results of the hydraulic calculations at feasibility design stage.

In the development of the detailed design further hydraulic analyses are assumed will be conducted, adopting the most severe combinations of turbines opening and closure maneuvers, with some freeboards considered. Whenever, in order to improve the stability in isolated operation condition of only one group of units (one

power waterway) a control signal device (Level Bias) will be introduced in the turbine governing system, the functioning, setting and operation requirements of this device shall be inserted in this report.

C.3.4 EXCEPTIONAL OPERATIONS DESCRIPTION

In principle, and considering the limited excursion of levels available at Batoka project, the power plants are not envisaged to work outside of the range of reservoir water levels indicated for normal operation case.

LARGE TRANSIENTS

The occurrence of the so called "large transients" are to be considered within the "exceptional" operating conditions of the power plant.
On each power waterway a throttled type surge shaft is adopted in order to improve the efficiency in damping oscillation due to load rejection or load acceptance. A throttling orifice, placed in the T junction between the final section of the power tunnel and the shaft itself, can increase the damping effect of friction losses.
In the development of the detailed design it is assumed that specific simulations will be carried out, considering the inputs of wicket gate closure time provided by the turbine supplier and different most critical scenarios of opening/closure of turbines.
Any prescription of possible requested time before reloading each unit (that in principle can be reloaded as quick as possible, without any time restrictions) that might come out from the detailed design hydraulic analysis shall be inserted in this document.

C.3.5 POWER SUPPLY FOR BATOKA PLANT OPERATION

This paragraph depicts the power supply sources available for the proper and safe functioning of the Batoka Plant, fed by main and backup power systems.

INTRODUCTION

The auxiliary power system in BATOKA HPP is conceived in such a manner to grant the supply in either "normal" and "emergency" operating conditions, whereas these conditions are defined in terms of (n-1) contingency. Whenever the outage of the "main" feeder occurs, the system will be able to automatically switch over the back-up feeder maintaining the supplied loads in service.
The "core" of the distribution system consists of a medium voltage (MV) bus, fed from different sources, namely:

- some of the turbine-generator units of each power house, via distribution transformers of adequate rated capacity
- the Diesel Emergency set installed in each Power House
- the unit auxiliary transformers in each power house, feeding their own auxiliary equipment

- the Dam auxiliary board, through a MV line, fed by the MV distribution board of the each Switchyard via MV overhead lines;
- the Diesel Generating Set installed at the dam

Each MV bus is configured in double-busbars with a coupler breaker for automatic transfer switching.

For the purpose of this document, some critical loads have been identified for the safety of the plant operation, i.e.:

- the Dam Pumping Station (DPS): this station provides drainage and pumping service for water collected by the drainage galleries of the dam
- the Dam Auxiliary System (DAS), which feeds the equipment relevant to the hydraulic structures equipment (service gate, hoists, etc.), emergency lighting, etc.
- the Power House general auxiliary system, which feeds the main equipment and device pertinent to unit auxiliary system, SCADA and communication system, HVAC system, emergency lighting, firefighting system, dewatering system, DC supply

The above identified loads will be fed in any operating status of the power plant (with/o the turbine-generators running). At the DAS, there is the provision of a spare bay for an additional Diesel set.

EMERGENCY OPERATION OF THE DPS AND DAS

In normal service, the two switchgears (i.e. the Dam Pumping Station and the Dam Auxiliary Board) are foreseen to be fed from the Power House through MV lines. In this case, dam and switchyard auxiliary loads are fully fed, and power flows from PH to DPS and DAS.

The emergency condition is intended to be a condition where both PH generating units and relevant distribution system are not available. The control system of the power plant, under recognized operating conditions, will automatically put the Diesel Generator Set, located at the Dam Pumping Station, in operation. In doing so, the control system will also provide to shed the non-essential loads, to allow energisation of the essential (and, among these, critical) loads.

Therefore, the LV switchgear of the Dam Pumping Station can be fed by the Diesel Emergency set and energise the DPS and the DAS. The control system (or the operator) shall then close the breakers corresponding to the loads at both switchgears (DPS and DAS). Power flows from DPS to DAS and SWY.

C.4 PLANT HYDRAULIC CONTROL DEVICES OPERATION

C.4.1 GENERAL

Description of operation for opening and closure manoeuvres for any hydraulic control device at Batoka (valves, gates, bulkheads, stoplogs, and relevant cranes and lifting devices) will be provided in the frame of the detailed design, and shall be then duly included in this report.
In this chapter the guidelines and basic principles assumed for the operation of the hydraulic devices are given. It is recommended that specific operating procedures are implemented by the PMS, on the basis of the instructions provided in the present chapter, taking into account also the information and inputs of the O&M detailed manuals and drawings made available by the suppliers, to which reference shall be always made. Such procedures shall include at least the following scenarios:

- Hydraulic control devices operation under main power supply - remote and local control;
- Hydraulic control devices operation under back-up diesel power supply - remote and local control;
- Operation of back-up diesel generator and switch-over of power supply.
- Special conditions, if any, for first impounding.

It is worthwhile to recall that any maintenance or repair operation on gates or stoplogs shall be programmed and executed by qualified competent staff, possibly during dry season, avoiding as much as possible potential concomitance with floods events.

The calculation, verification, calibration etc. of the rating curves pertinent to the various discharge and control structures of Batoka project are described in the hydraulics analysis report of the Feasibility Design, to which reference is made.
The rating curves will be refined during the detailed design and construction phases, and for ease of reference and use they will be gathered here, including:

1. RIVER rating curve (at Power Houses location)
2. RESERVOIR rating curve
3. ECOLOGICAL DISCHARGE VALVES rating curve
4. MIDDLE LEVEL OUTLETS rating curve
5. SPILLWAY rating curves
6. POWER TUNNELS rating curves

C.4.2 INSTRUCTIONS FOR ECOLOGICAL FLOW RELEASE

The requirements for environmental discharge will be provided in the ESIA study.

The minimum discharge defined by the above-mentioned study, according to the water levels available in the reservoir within the minimum and maximum operating levels and to the Plant Operator choice, will be released by means of:

- the Power House units in operation (if at least one is maintained in operation 24 hours per day),
- the Ecological Discharge Device.
- the Spillway,
- the Middle Outlets.

Until the minimum operating level in the reservoir is not reached, the flood release shall be foreseen to be discharged:

- through the River Diversion scheme, until possible;
- through the Middle Outlets, as soon as possible compatibly with the Dam construction and reservoir water levels;
- through the Ecological discharge valves for reservoir levels above minimum operating level.

C.4.3 MIDDLE OUTLET UPSTREAM GATE OPERATION

GENERAL

Two Middle Outlet upstream gates are foreseen, one for each Middle Outlet.

The purpose of the upstream gate is to isolate the Middle Outlet waterways from the reservoir and allow inspection and maintenance activities on Middle Outlets structures and gates.

The upstream gate is operated the from the dam crest.

In normal conditions each upstream gate can remain closed or opened, upon the Plant Owner choice. The closed position is safer for the dam because avoids to maintain the water pressure inside the dam. It has the disadvantage that the gates remain for long period under water.

The layout and description of the upstream gate with relevant hoist and auxiliary equipment will be indicated here as developed in detailed design by the supplier.

OPERATION

The bulkhead will be closed whenever an inspection/maintenance/repair of the Middle Outlet steel lining and/or gates has to be carried out.

The gate shall be operated **under balanced pressure** conditions.

Before lifting the gate, the by-pass valve shall be opened in order to equalize the water pressure (time required to fill the whole waterway will be provided by the gate (and by-pass) supplier in detailed design).

When the water flows through the Middle Outlets, the upstream gate must be lifted as necessary (about 15 to 20m minimum above the bottom sill, to have the whole intake of the MLO fully opened (time required to lift the gate above the bottom sill, including the time to remove one rod, will be provided by the gate (and by-pass) supplier in detailed design).

Typically a locking device will allow the removal and the insertion of the lifting rods of the gate.
Only for its inspection, maintenance or repair purposes the upstream gate can be raised up to the dam crest.

Before closing the gate, the MLO downstream gates must be closed. The gate will be lowered by gravity, from the dam crest.

C.4.4 MIDDLE OUTLETS DOWNSTREAM GATES OPERATION

Each Middle Outlet device will be equipped with two downstream gates, named gate no. 1 upstream and gate no. 2 downstream, both at the outlet section:

- The **gate no. 1** is an emergency gate that shall be closed only in extraordinary need of gate no. 2 maintenance, and it normally works fully opened. The gate will operate in balanced condition, but in case of need of sudden closure, the gate shall be able to work in unbalanced condition.
  This kind of exceptional closure shall be carried out only in case of real emergency, and after having made all attempt to release the gate no. 2, because such operation implies high risk of cavitation and dangerous pressure pulsation in the whole downstream portion of the Middle Outlet conduit.
  In case of necessity of closure in unbalanced condition, the operation shall be programmed to be executed minimizing its duration.
  In case of need of gate no.1 inspection or maintenance, the gate no. 2 shall be closed to empty the Middle Outlet conduit.
  All the operations gate no. 1 and gate no. 2 are conducted by means of the pertinent hydraulic units that are foreseen to be commanded directly locally and also connected to the Dam Control Building for remote control.

- The **gate no. 2** shall work fully closed or fully opened. It is normally closed and it is opened and closed in unbalanced conditions, at any need of Middle Outlet use. This gate is placed d/s the gate no. 1 and shall have a circular cross section.
  In case of need of gate no. 2 inspection or maintenance, the gate no. 1, that is upstream, shall be closed to empty the Middle Outlet conduit between the two gates.

From an operational point of view, the Middle Outlets can operate within their operating levels, in pressurized conditions, with jet falling in the Plunge Pool.

For lower levels MLO flows can pass from pressurized conditions to free flow conditions, with progressive reduction of water jets and, in the transient conditions, with possible entrainment of air in the conduit. The possible temporary or exceptional use of MLO out of the design range of operation shall be object of investigation at detailed design phase (possibly through physical model tests).

It is therefore recommended to **use the Middle Outlets in pressurized conditions**, keeping them closed by means of the downstream gates for reservoir water levels below their minimum pressurized operating level. **Below such level the use of Middle Outlets is not recommended**, and in any case shall be limited in time to minimize risks of possible damages to the dam downstream face and Middle Outlet conduit.

It is recalled again that:

- The **upstream gate** shall be **opened always in balanced conditions.**
- The **downstream gate no. 1** can work only **in fully closed or fully opened conditions**
- The **downstream gate no. 2** can work only **in fully closed or fully opened conditions.** It shall **usually** work in **balanced conditions,** and **only in emergency case** it can work **in unbalanced conditions.**

The closing speed for both gates will be defined by the supplier, for any normal or exceptional condition.

C.4.5 RESERVOIR DRAWDOWN

The reservoir drawdown is foreseen in two cases:

- During the dry season to allow the rafting activities on the Zambezi river upstream the dam
- In case of necessity to inspect:
    - lower portions of dam upstream face or
    - the first portion of Power Tunnels upstream of the gate shafts

The reservoir drawdown operations shall be carried out according to specific procedures that will be defined during the frame of the detailed design of the hydraulic structures.

The requirements for lowering of the reservoir during dry season for rafting activities will be provided in the ESIA study.

The reservoir will be lowered, according to the water levels available in the reservoir within the minimum and maximum operating levels and to the Plant Operator choice, by means of:

- the Power House units in operation (if at least one is maintained in operation 24 hours per day),
- the Ecological Discharge Device.
- the Spillway,
- the Middle Outlets.

Same criteria for lowering the reservoir can be applied in case of necessity of inspection of lower portions of dam upstream face or the first portion of Power Tunnels upstream of the gate shafts.

C.4.6 SPILLWAY GATES OPERATION

The Spillway gates can operate from el. 738.6 to el. 762 m a.s.l.

The operation of the Spillway shall be programmed by the Plant Owner in function of:

- Power Production and energy market requirements;
- flood release requirements;
- water availability, monitored through the river and reservoir water levels.

OPERATION

The sequence and degree of aperture that shall be adopted for gates opening and closure will be defined in detailed design phase, considering the Spillway physical hydraulic model tests that are assumed will be conducted, and taking into account that for ordinary flows the use of the spillway can be limited to some gates only, while for higher flows in principle all gates will be required to function simultaneously.

Analogue procedure will be reversely defined and applied for gate closure when the incoming flow decreases. The automatism for this procedure will be implemented by the gate supplier.

The control of the gates will be made locally (on the control unit foreseen near each gate) and remotely from the Dam Control building.

In case of one gate is blocked, or for any reason out of operation, when the Spillway shall be used, depending on which gate is out of operation the sequence defined for the normal operation criteria shall be rearranged consequently, with the aim to obtain the configuration of jets discharging in the pool as close as possible to the one originally envisaged.

The intervention of release, inspection, maintenance or reparation on a blocked gate shall be conducted by isolating the bay upstream side by means of the stoplogs, which use and operation is described in the next paragraph.

C.4.7 SPILLWAY STOPLOGS OPERATION

GENERAL

The purpose of the Spillway stoplogs is to allow the inspection of the Spillway structure and radial gates.
The stoplogs set will be made of **multiple interchangeable elements**. The elements will be designed to be lowered or raised in the slots in a vertical position after the release of the lifting beam by suitable grappling beam, of a self-latching and unlatching type.

OPERATION

The Spillway stoplogs will be operated by the crane, running along the dam crest structure.

The lifting and lowering of the stoplog elements is done only **under balanced head**, under zero flow. This means that, before opening or lowering of the stoplog, the radial gate must be completely closed.

The Spillway Stoplog **INSERTION PROCEDURE** is articulated as follows:

1. Ensure that the Spillway radial gate is closed
2. Engage the lifting beam with the crane
3. By mean of the crane, lower the lifting beam and engage the stoplog element which lies in the stored position.
4. Lift the stoplog element and check for correct stoplog engagement
5. Lower the stoplog element in the sluice till it reaches the sill
6. When the stoplog rests on the sill beam (the lifting beam automatically disengages)
7. Lift the beam and repeat steps from (3) - (7) with the others stoplog elements

The Spillway Stoplog **REMOVAL PROCEDURE** is articulated as follows:

- Ensure that the Spillway radial gate is closed
- Engage the lifting beam with the crane hook
- Lower the lifting beam in the sluice to engage the upper stoplog element
- Lift the upper stoplog element under unbalanced conditions for 100mm approximately
- Wait until balanced pressure condition is established.
- Lift the stoplog until the operation level and store it in the proper structure (the lifting beam automatically disengages).
- Lift the beam and repeat steps from (2) - (6) with the others stoplog elements

The details and procedures for operating lifting beam and the movement of the hook during insertion and removal of the stoplog will be provided by the supplier in detailed design phase, and included in the final version of the operation manual, as well as the stocking area and stoplogs handling and stocking details and procedures.

C.4.8 INTAKE BULKHEAD GATES OPERATION

GENERAL

The bulkhead gates will be installed in the intake tunnels upstream from the intake wheel gates. The main purpose of these gates is closure of the waterways to allow **maintenance** and **inspection** of:

1. the intake wheel gates
2. the power tunnels
3. the penstocks
4. the Main Inlet Valves.

OPERATION

Bulkhead gate is foreseen to be of slide type operated by stationary cable hoist, placed at the shaft top. Gate and hoist are assumed to be connected directly.

The bulkhead gates shall normally be kept in open position. For this reason locking devices are foreseen at the upper floor of the shaft.

Closing of the bulkhead gates shall be done **under balanced pressure** condition. For this reason, before the bulkhead are closed, the closure of the fixed wheel gates and/or main inlet valves must to be assured.
Opening of the bulkhead gate shall be done **under balanced pressure** condition.
In order to equalize the water pressure on both side, one by-pass valve is foreseen to be incorporated into the upper gate leaf. Before the bulkhead is lifted, the by-pass valve must be raised as necessary to equalize the water pressure filling the gap between the bulkhead and wheel gate. The gate normal opening speed will be set by the gate supplier, it is however recommended to maintain as far as possible low velocities (in the range of 0.5 m/min).

C.4.9 INTAKE WHEEL GATES OPERATION

GENERAL

Two gates of wheel type are foreseen to be placed in each power waterway of the power plant. These gates are installed in the intake tunnel downstream from the bulkhead gates.
The main purpose of these gates is the closure of the waterways to allow:

1. **maintenance** and **inspection** of:
   - the power tunnels
   - the penstocks
   - the Main Inlet Valves
5. **emergency closure** in case units are under load rejection and wicket gates and main inlet valves fail to close.

OPERATION

Each wheel gate will be operated by an oil pressure servomotor, mounted at the top of the shaft. Connection between the gate and piston rod is foreseen to be made by means of flexible connected lifting rods.
The wheel gates shall be normally kept in open position, by means of locking devices on gate shaft roof.
The wheel gate shall be used as an emergency gate. Closing of the wheel gate is done **under unbalanced pressure** condition. The wheel gate is foreseen to be capable to close under the full flow in case of emergency. For this reason, the wheel gate will be designed to be able to close by its own weight (including lifting rods) and by water column on the top of it, under any flow condition. While closing, the servomotor can act as a brake.

The gate is opened by oil pressure of the servomotor. Opening of the bulkhead gate must be done **under balanced pressure** condition. In order to equalize the water pressure on both side, one by-pass valve is foreseen to be incorporated into the upper gate leaf. Before the wheel gate is lifted, the by-pass valve must be raised to equalize the water pressure. The gate normal opening speed of the gate will be set by the supplier, it is however recommended to maintain in any case low velocities (in the range of 0.1 m/min).

C.4.10 POWER WATERWAYS EMPTYING AND FILLING OPERATION

The **EMPTYING PROCEDURE** of one waterway shall be defined in the detailed design, identifying what are the steps of closing and opening of each hydraulic or electric device, and relevant timing or possible constraints, taking into account the rate of velocity for the opening and closure procedure of the gates, and details about gates functioning as will be provided in relevant EM-HSS equipment operation and maintenance manuals.

In case power waterways empting is necessary, a large amount of water (until the river water level is reached) can be discharged in any condition through the Power House.
Thereafter penstocks emptying pipes, foreseen for each of the manifold branches, provided with gates valves manually operated, allow to discharge only the last volume of water inside penstocks, below the river level. Water inside draft tube, downstream of main turbine valves, will be drained by the dedicated pipes.

The details and the hydraulic calculations of the penstocks emptying procedures and relevant time requirements will be developed at detailed design stage.

The **FILLING PROCEDURE** of one Power waterway after an emptying process shall be defined in the detailed design, identifying what are the steps of closing and opening of each hydraulic or electric device, taking into account that the selection of the water pressure rising rate in the Power Waterways system shall be fixed considering any requirement of the steel penstocks prescribed by the Plant Contractor.

C.4.11 ACCESS TO EMPTY POWER WATERWAYS FOR INSPECTION & MAINTENANCE PURPOSES

The inspection of the horizontal part of tunnels downstream of the gate shafts can be made, once empty, getting access from the watertight doors foreseen to be available on the external side of each tunnel, upstream of the steel lined portion.

Inspection of steel lining of penstocks e Manifolds, as well as the surge shaft can be done accessing through:

1. Tunnels Watertight doors above mentioned, for their horizontal stretch (the surge shaft crest can be reached by stairs from external side).

2. Manholes on the upper bend of the steel lining penstocks (a chamber with hoist is foreseen to be available for each penstock, accessible from the dedicated upper access tunnel serving also as drainage tunnel).
3. Manholes upstream of the Main Inlet Valve, accessible from the Power House.

Access must be restricted to qualified people appointed and authorized by the PMS. A strict control shall be done in such exceptional maintenance operations that no free access is given to the empty tunnel.
Before entering the empty tunnel it must be verified that (if water level of the reservoir is not maintained below the tunnel invert level) the upstream gates are closed and don't leak, and that the conditions of water presence, temperature and humidity conditions inside the tunnel are compatible with the safety of the workers.
It shall be implemented a mobile communication system between people entering in the tunnel and people governing and monitoring the gates and the reservoir.

The exceptional inspection of the portal upstream of the gate shaft can be made only if the reservoir is lowered and maintained below the invert level of the tunnel.

Unless it is possible and convenient to lower the reservoir level (by means of the MLO) below the invert level of the tunnels, and to maintain such condition for the whole period needed for maintenance, the inspection and maintenance operations in the tunnel shall be conducted having closed the gate shaft gates, and being verified the certainty of such closure before entering in the tunnel.
Detailed procedures will be developed in detailed design phase and inserted in the final operation manual. As a general prescription, it is here recalled that the inspection of the tunnel should be programmed preferably dewatering one tunnel at the time, or in any case two at the time but not the two tunnels of the two plant simultaneously (unless strictly necessary), and in any case this exceptional operation shall be programmed in advance to allow to manage the consequences of a long period of plant(s) stop, and any period of water discharge through the Spillway/Middle Outlet.

The inspection of the main tunnel (and the eventual repair or maintenance operations required) shall be done only by skilled personnel, instructed and authorized by the Plant Owner for the operation required, with the assistance of a design specialist.

C.4.12 MAIN INLET VALVES OPERATION

GENERAL

Ten main inlet valves (MIV) are foreseen to be placed upstream each hydraulic unit.
The main purposes of these main inlet valves are the following:

- **Emergency closure**, with maximum flow under all extreme conditions, including the transient forces caused by water-hammer. Such condition occurs with a turbine accident as well as the guide vane

fails to close. The prompt closure of the valve assures safety of the turbine unit and avoid the turbine over-speed.

- **Closure** for **Normal shut down** of the unit**,** under balanced pressure conditions with the wicket gates completely closed. The closure of the valve prevents the leakage of the wicket gates for a longtime and reduces the water loss.
- Closure for **maintenance** of the unit, under balanced pressure conditions with the wicket gates completely closed.

DESIGN

The MIV is made by two major parts:

2. Valve body that includes the driving mechanism, valve body, valve disc, valve shaft, shaft seal components, automatic locking oil cylinder, hydraulic system and so on.
3. Auxiliary components, that includes bypass valve, bypass pipe, inlet pipe, outlet pipe and expansion joint, the hydraulic system and so on.

The MIV has two seals: the main seal (also named work seal) and maintenance seal. When the main seal is working normally, the maintenance seal is released. If the valves need maintenance, the maintenance seal is used.

OPERATION

The MIV opening is driven by oil operated servomotor; during the valve opening, the counterweight is lifted up to provide energy for closing. In fact the MIV closure is done by **gravity**, with counterweight.

Normal opening and **closing** will be **under balanced pressure**, with the by-pass valve opened and wicket-gates in closed position: suitable interlocks prevent the valve opening when pressures have not the same values.

When the valve is fully opened, the pressure of hydraulic system is maintained automatically. The hydraulic system will keep the oil pressure automatically when the valve is full open. The pump will stop when the oil pressure reaches the upper limit whereas the oil pump will start when the oil pressure drops below the lower limit. This function is available when the full open signal is sent out.

The hydraulic system has a redundancy closing function. This function allows the oil pressure to enter into the piston rod chamber with the purpose to help the valve closure. This function is not activated for normal or emergency closures. The redundancy function shall be activated when the friction force will increase, typically after many years of operation.

C.4.13 DRAFT TUBE GATES OPERATION

GENERAL

What follows refer to one power house and it is applicable of both Power Houses of Batoka Project.
Each powerhouse has six hydraulic turbines. Downstream of each turbine there is a draft tube that, after the elbow, is divided in two parts by a pier. Each draft tube has two sliding draft tube gates, one for each sluice of the draft tube.

The draft tube gates will serve for maintenance purposes only, in fact their main purpose is to isolate the turbine and draft tube from the tailrace. During normal operation these gates will be kept in the fully open position by a self-engaging and disengaging safety latch conveniently located either on the servomotor top cover or on its bottom pedestal.

The draft tube gates will be closed to dewater and to carry out maintenance in the turbines and draft tubes.

OPERATION

The gates will be raised and lowered by an oil operated servomotors. The draft tube gates are usually operated under **balanced pressure** on upstream and downstream sides. To this purpose each gate will have its own by pass system provided to allow the filling of the draft tube (with times that will be indicated by the gate supplier in detailed design phase). When the pressure on both sides of the gate is balanced, a pressure switch gives the consent for opening.

The control of operations of the draft tube gates can be done from local control panels and from Power House control building.
In case of maintenance the gate is lifted by a monorail crane.

C.4.14 DRAFT TUBE STOPLOGS OPERATION

GENERAL

For each draft tube two draft tube sliding gates are foreseen (see previous paragraph). Downstream these gates there is a slot for the draft tube stoplogs. There are typically two sets of draft tube stoplogs that will allow maintenance for two units at the same time.
The purpose of the draft tube stoplogs is to allow the inspection and maintenance of the draft tube sliding gates and draft tubes.

Each stoplog set of the draft tube is divided in elements. The bottom and top elements are typically not interchangeable because the top element is designed with a top seal against the sluice upper face. The elements are designed to be lowered or raised by suitable grappling beam, of a self-latching and unlatching type, they are operated by the draft tube crane from upper floor of PH.

In normal condition, when the generating units are working, each element of the stoplog is stocked in the relevant storage area. Steel grid covers are foreseen for closure the stoplogs slots at power house upper floor. During maintenance of powerhouse electro-mechanical equipment, the stoplogs are placed on both sluices of any draft tube, to close the water flow from the tailrace side.

OPERATION

The draft tube stoplogs will be operated by the relevant crane, running along the power house deck structure at upper floor. The storage area for the draft tube stoplogs is in the close proximity of the sluices and accessible by the hoisting facility.

The lifting and lowering of the stoplog elements will be done only **under balanced head**, under zero flow. This means that before opening or lowering of the stoplog it has to be sure that units are stopped and, preferably, draft tube sliding gates are closed.

The Draft tube Stoplog **INSERTION PROCEDURE** is articulated as follows:

- Ensure that the unit is stopped
- Ensure that the draft tube sliding gates are closed
- Engage the lifting beam with the draft tube crane
- By mean of the draft tube crane lower the lifting beam and engage the stoplog element which lies in the stored position.
- Lift the stoplog element and check for correct stoplog engagement
- Lower the stoplog element in the sluice till it reaches the sill: during this operation make sure that the beam guide shoes are properly engaged with the rails fixed in the concrete.
- When the stoplog rests on the sill beam, the lifting beam automatically disengages
- Lift the beam and repeat steps from (4) - (8) with the others stoplog elements

The Draft tube Stoplog **REMOVAL PROCEDURE** is articulated as follows:

- Engage the lifting beam with the crane hook.
- Lower the lifting beam in the sluice to engage the upper stoplog element: during this operation make sure that the beam guide shoes are properly engaged with the lateral fixed in the concrete.
- Lift the upper stoplog element under unbalanced conditions for 100mm approximately
- Wait until balanced pressure condition is established.
- Lift the stoplog until the operation level and store it in the proper structure: the lifting beam automatically diseganges.
- Lift the beam and repeat steps from (2) – (6) with the others stoplog elements

The description of the lifting beam and the movement of the hook during insertion and removal of the stoplog will be provided by the supplier in detailed design.

C.5 OTHER PRESCRIPTIONS FOR CIVIL WORKS OPERATION

C.5.1 GENERAL

The inspection of the works and the areas downstream of the dam shall be frequently conducted with the aim to find and measures any signal of potential leakage or static problems to the structures connected with the operation of the plant.
The monitoring of all the instrumentation foreseen shall be regularly conducted, following all the prescriptions that are provide in part B of this Dam Safety Plan (to which reference is made for all instrumentation monitoring activities), and that shall be updated and detailed during the development of detailed design and construction phases.

In addition, particular attention shall be paid to the hydraulic steel structures when they enter into operation, and to the Dam also in the upstream zone (as far as possible to be inspected from upstream and from the dam galleries).

All the above mentioned maintenance requirements are described in the Part D of the Dam Safety Plan (to which reference is made), and that shall be updated and detailed during the development of detailed design and construction phases.

Other specific prescriptions for the use or operation of the civil works will be typically provided during the detailed design and construction phases, to be included here.

C.5.2 RESTRICTED AREAS

In general is mandatory to restrict the access to the Plant to the authorized people only.

A tentative preliminary list of specific locations that require to be locked for safety reasons is provided hereinafter. The PMS shall maintain in good status and available for inspection of authorized people the accesses, the gates or doors or fences and relevant locking devices.
- Dam galleries
- Dam cable shaft
- Dam control building
- Dam crest and abutment yards
- Dam spillway gates control room
- Dam middle outlet gates control room
- Dam pumping system control building
- Dam pumping system pits
- Power Tunnels access tunnels to watertight doors and manholes

- Power Houses
- Power Houses diesel generator buildings
- Switchyards
- Switchyards control building
- Gate shafts and relevant yards
- Surge shafts and relevant yards
- Reservoir slopes around the Power Tunnel intakes.

It is to underline that the specific transboundary nature of Batoka Project implies the possible necessity of having border control posts on dam abutments, and specific regulations and rules for the access to the dam (for personnel working at Batoka Plant) and for persons that want to cross the border, to be defined and detailed by the Zambian and Zimbabwean Governments and implemented by the relevant Authorities.

The access inside the Power House, Switchyard and Dam control building and to the zones where there are EM equipment in tension (like the transformers) shall be restricted to the only persons authorized by the PMS, that shall be aware of the functioning of the equipment and control system.

At site, in visible places, panels shall be provided to inform clearly about the above prescriptions and limitations.

The control room of the Power Houses shall be manned, to allow adequate control of the Dam and Power Houses behavior in real time.

All the EM and HSS equipment present in the Power Houses shall be object of operation and maintenance activities as prescribed in the relevant manuals of the supplier.

The ordinary maintenance and cleaning of civil works and architectural components is required for the functionality and durability of the Dam, Shafts, Power House, Switchyard, as well as for all the other civil work structures, and it shall be therefore considered and planned as a part of the plant operation program, as described in part D of this report.

C.5.3 LOADS AND ACCESS LIMITATIONS

There are typically some restrictions for the loads allowed on the Power House erection bays and on dam crest loading areas.
Some zone are not designed for heavy loads and in others there are loads limitations and special prescriptions (for instance in power house erection bay for the exceptional case of two units erected simultaneously), or specific areas for stoplogs or other heavy equipment stock.
Also there will be restrictions for the access to vehicles on some areas: some zones will be not designed for vehicular loads and in others there will be loads limitations.

The stoplogs for the Power House tailraces shall be stocked in the specific areas identified by the detailed design, and the same applies for the stoplogs for the Dam spillway.
The prescriptions will be provided in detailed design and included in this manual with appropriate plan drawings showing areas and limits of loads, as required.

At site, in visible places, panels shall be provided to inform clearly about the above prescriptions and limitations.

C.5.4 TRANSFORMER OIL WATER RECOLLECTION SYSTEM OPERATION

Here below there is a brief typical description of the Power House transformers oil recollection and disposal system that will be defined and sized in detailed design.
Below each transformer a small basin partially filled with gravel will recollect in case of fire event the firefighting system waters and any oil leakage.
The basins will be connected to a steel pipe that conveys all the oil and water in a dedicated tank, buried at the extremity of the Power House.
In the tank the oil and the water are separated by gravity. Oil is foreseen to be recollected and disposed appropriately, water to be discharged in the river.

The final recollection tank will have a volume capable to contain the maximum possible amount of fire extinguishing waters, plus the transformer oil.
Two internal walls are also foreseen to facilitate the oil water separation, in order to avoid in any case that the oil is discharged directly in to the river.
There is a water bottom scour pipe on the bottom of the final recollection tank, for water discharge, discharging directly into the river. A portable pump is foreseen for oil disposal.

Two cases will be considered:

Case 1) Transformers oil leakage:
Should any one of the transformers have some oil leakage, the basin beneath transformers will collect the oil and dispose it in the final recollection tank. Such oil will be not pumped out by the water pump, since the corresponding volume is considered in the dead capacity of the final recollection tank.
In case of important leakages oil must be recollected from the final recollection tanks by means of portable pump, as described in the next case.

Case 2) Transformers fire:
Should any of the transformers be damaged by fire, the tanks beneath transformers will collect the oil that is discharged, together with the water used for the fire extinguishing, and dispose the oil and the water in the final recollection tank.

After some time, once oil and water are separated, the floating oil stratum in the final recollection tank will be removed by use of a portable pump on hand at the PH Mechanical Store.
Such pump is utilised by the appointed personnel who will manually insert the pump into the tank and position it to pump out only the oil which will be disposed of in barrels.
After this operation the water still present in the tank is foreseen to be discharged by manually opening the valve of the bottom outlet pipe.

C.5.5 PLUNGE POOL AND TAILRACE CLEANING

The tailrace hole (in front of the exit of the Power Houses draft tubes) shall be maintained free of stones and debris, to avoid clogging of the waterways of turbine outlets.
To this purpose periodic check of the tailrace hole shall be conducted (see Part D of the report), and in case it is found material accumulated in the bottom of the tailrace hole, at the exit of the draft tubes, if such deposed material is above the invert level of the draft tube canal, it shall be removed.
Material can be removed by using a barge or by similar equipment. Such operation shall be done with the correspondent unit not in operation.

Debris, loose rock elements or boulders accumulated in the plunge pool bottom do not constitute a problem, until they remain inside the pool. If, for instance after a flood event or a severe condition of use of the spillway, such material is transported by the currents out of the pool, if it falls inside the tailrace the above recommendations of tailrace cleaning apply.

After a flood event or a severe or prolonged condition of use of the spillway, it is recommended to check the status of the dam downstream toe. See Part D of the Dam Safety Plan.

C.5.6 USE of RESERVOIR FLOATING BARRIER

Floating barrier is typically conceived as instrument to protect from entrance of debris and trunks the following hydraulic works:

1. Middle Outlet,
2. Power Tunnel Intakes
3. Spillway.

Its use is not strictly necessary but recommended for the first impounding (especially to protect MLO and Power Waterways intakes) and also for the operation period, especially for the protection of the spillway.
Also for the emergency case (exceptional events) of reservoir drawdown, it can be used for the subsequent re-impounding.

If a barrier is adopted, maintenance and periodic cleaning of the material accumulated against the barrier shall be executed by the PMS, accessing to it by means of access roads surrounding the reservoir in the zone near the dam, or by barge, with frequency depending on the ground condition (floods, accumulation of debris), as set in Part D of Dam Safety Plan.

More details in this regard are assumed will come from the detailed design and construction phases.

C.5.7 ACCESS TO DAM AND RELEVANT GALLERIES

The access to the galleries inside the dam body will be permitted by the access galleries foreseen on both banks. From the dam crest (near the abutments) there will be the entrance to the upper gallery, from which also the cable shaft inside the dam and the pendula shafts will start.

It is strongly recommended to do not access with any vehicles the dam downstream face benches, with the exception of the wider ones designed as access roads for the galleries or HSS devices.

In any case access inside the galleries with vehicles shall not be allowed, because the galleries are usually not ventilated to cope with vehicles gas emissions.

All benches of the dam downstream face are typically not protected with any guard rails or fences, therefore if it is needed to pass with any vehicle on the dam, also along the access roads, in case of need for maintenance or repair works, a temporary fence shall be built where it is intended to get access, adequately sized to prevent any accident or falling down.

The gates giving access to the dam galleries shall be kept closed, for safety reasons, and the entrance shall be allowed to authorized persons only.

The lowest galleries usually have no direct access at their level. They are accessible only from the dam downstream face by shaft, typically equipped with stairs, for pedestrian access, and with a hoist, to lower equipment for maintenance, drilling or grouting operations. Here also no permanent ventilation system is usually present; it shall be provided on temporary basis in case equipment are introduced and prolonged works shall be carried out inside these galleries.
The same shafts serve the pumps pits on their bottom.
A cable shaft, equipped with a lift (for tools, not for persons) and staircase, puts in communication the galleries at different elevations. In case of emergency it can be used to enter or escape from another gallery.

In occasion of the periodic monitoring of the drainage system inside the galleries, it is recommended to carry out a cleaning of any obstruction, debris or other element that can be an obstacle to the discharge of the water.

C.6 ORGANIZATION, TRAINING AND FACILITIES FOR PLANT OPERATION

C.6.1 ORGANIZATION OF THE PLANT MANAGEMENT STRUCTURE

Details of the operational structure are defined by the Plant Owner and Plant Management Structure (PMS).

The PMS will be responsible for the maintenance of the dam, including the dam safety aspects. PMS will also be responsible for the operation of the dam and coordination of operation of the power houses, and in particular the operation of the hydraulic control devices.

They will prepare the reservoir operating rules for the power supply, reservoir and river base flow demand rules, taking into account the needs of an integrated operation of both Batoka Power Houses as well as the Batoka-Kariba cascade.

They will fill the formats provided at par. E.7.4 and they will use them for all needs.

Within this frame PMS will also develop daily operating arrangements for water releases from the reservoir.

The PMS defines how much staff shall be employed for the operation and maintenance of the plant. The following is a minimum anticipated requirement to carry out the basic dam maintenance and safety requirements for Batoka Plant:

- For operation of the flow control gates, valves and hydraulic devices, one operator (preferably two men for safety reasons) available when required.
- Monthly inspections and reports will require one man (preferably two men for safety reasons) to carry out the inspection and monitoring.
- It is recommended that the main valves and gates maintenance (both mechanical and electrical) are covered by a maintenance contract under PMS.

Additional people will be required as and when necessary to carry out larger maintenance work or specialist work.

C.6.2 OPERATORS TRAINING

The operators shall undergo a training programme covering the technical aspects of the dam and plant equipment and their operation. In view of the new commercial model where the scheme will be developed under the BOT and the possibility of an independent operator being engaged to run the plant for the agreed operation period, the training that will be conducted for the BOT O&M Contractor should include the Operators from the utilities and the Authority.

The programme shall cover both the features and performance of the equipment and their operation, to be illustrated both through off-site theoretical and on-site practical training sessions. These training sessions

should be carried out by the manufacturers of the equipment or someone else with an intimate knowledge of the equipment and of the plant functioning.
Specific training to learn how to use, monitor and maintain the instrumentation installed at dam is required.

Operators must have a certificate of competence, which will be recorded in a training register.
Maintainers must have a certificate of competence, which will also be recorded in a training register.
Both the operators and the maintainers must attend training courses covering:

1. The dam safety in emergency situations, through which they should gain a comprehensive awareness and competence in emergency identification and emergency actions.
2. Personal and general safety in the workplace.

The above training should be fully documented in a training register.

C.6.3 EQUIPMENT AND FACILITY REQUIREMENTS FOR BATOKA PLANT

In addition to the equipment installed (gate hoists, controls and emergency diesel generator) in detailed design it will be identified if there will be other equipment needed for operation and maintenance of the plant, for instance items (like for instance mobile cranes, or barges, or special tools) that might be required for exceptional maintenance cases.

A full list of the spares provided by the manufacturers and suppliers shall be added to this O&M manual by the PMS for a prompt consultation in case of need.

The list shall be carried out after check of all the items present on site filling a format like the one provided in sake of reference in the next paragraph.

C.6.4 FORMAT FOR SPARE PARTS LIST

Add lines and duplicate as far as necessary.

BATOKA SITE SPARE PARTS LIST											
LOCATION		ITEM			AVAILABILITY						
area	room	Description	Quantities	**Taken** in date	By (insert name and signature)	**Returned** in date	By (insert name and signature)	**Used or consumed** in date	By (name and signature)	**To be re-ordered**. **Ordered** in date	By (name and signature)
PH	*Mechanical Store*	*Pumps for oil dewatering*									
Dam	*Control Buidling*	*Mechanical tools box*									

Table 9 - Table of Batoka Site spare parts list format

C.6.5 CONTACTS FOR ROUTINE OR ALERT PROCEDURE IMPLEMENTATION

The data gathered from the instrumentations, as described in the Parts B, D and E of the Dam Safety Plan, and other reports and data collected in ROUTINE or ALERT conditions (ref. Part B of Dam Safety Plan) shall be forwarded to the following contacts:

Plant Management Structure				
Name	Position	Telephone	E-mail	Mail address

Table 10 - Contacts for Routine or Alert procedure implementation

C.6.6 CONTACTS FOR EMERGENCY or ALARM CASES

In case of need to trigger an ALARM condition, or in case of need to implement dedicated procedures described in Part E of the Dam Safety Plan, the addresses reported here below shall be immediately contacted:

Plant Management Structure				
Name	Position	Telephone	E-mail	Mail address

Local/Governmental Authorities				
Name	Position	Telephone	E-mail	Mail address

Table 11 - Table of Contacts for emergency or alarm cases

PART D - MAINTENANCE PLAN (Preliminary Plan)

D.1 INTRODUCTION

D.1.1 CONTENT AND STRUCTURE OF THIS PART

This is the **PART D "MAINTENANCE PLAN"** of the Batoka Dam Safety Plan.
This part of the report, and its references, comprises the guidelines for the Maintenance Plan of the Batoka Plant, including the dam, power waterways, power house and other appurtenant structures.
It outlines the operation and maintenance activities and procedures relevant to the Batoka Dam and Hydro Power Plants, to be detailed and implemented by the Project Management Structure that will be appointed by the Owner(s) of the Plant.
Being the design at Feasibility stage, this document has a Preliminary nature, being necessary to be developed and detailed during project implementation. The final plan is due prior to 6 months before initial filling of the reservoir according to the development and detail of the design, and further on according to the construction of the plant itself.

The project has a transboundary nature, having the dam shared between Zambia and Zimbabwe.
The Zambezi River Authority (ZRA) is a transnational authority that deals with the Zambezi river, formed by the Council of Ministers of Zambia and Zimbabwe, the Board of Directors and the Executive Management, and it is assumed to be the organ charged to be responsible of the operation and maintenance of Batoka Dam.
The two national Plants linked to the dam can have different structures of Ownership and Operation, and that when will be appointed (by ZRA or by Zambia and Zimbabwe governments), will take the responsibility of the operation and maintenance of the Plant(s).

According to the structures of Ownership and Operation that Zambian and Zimbabwean countries and ZRA will put in place, the responsibility of maintenance of the dam and of the two plants can be assigned to different PMSs, that, in the frame of development of the manuals and of relevant implementation rules and structures, will organize (dividing and coordinating as appropriate) the work to be done and the limits and coordination of responsibilities. At the present stage of the design and considering the importance to have an overall view of the Batoka scheme operation and maintenance requirements, the document is developed as one manual for the whole scheme.

As far as the Batoka Plant MAINTENANCE instructions are concerned, it is firstly illustrated the procedure to be adopted for the inspection and maintenance of the Plant, and in the subsequent chapters procedures are provided, as far as civil works are concerned, dedicated to each single work constituting the plant.
It is assumed that Electromechanical and Hydraulic steel structures equipment and devices detailed Operation and Maintenance manuals will be provided by relevant suppliers before Plant Commissioning: such manuals will be gathered and make part of the detailed Operation and Maintenance manual of the Plant.

D.2 PROCESS OF INSPECTION AND MAINTENANCE

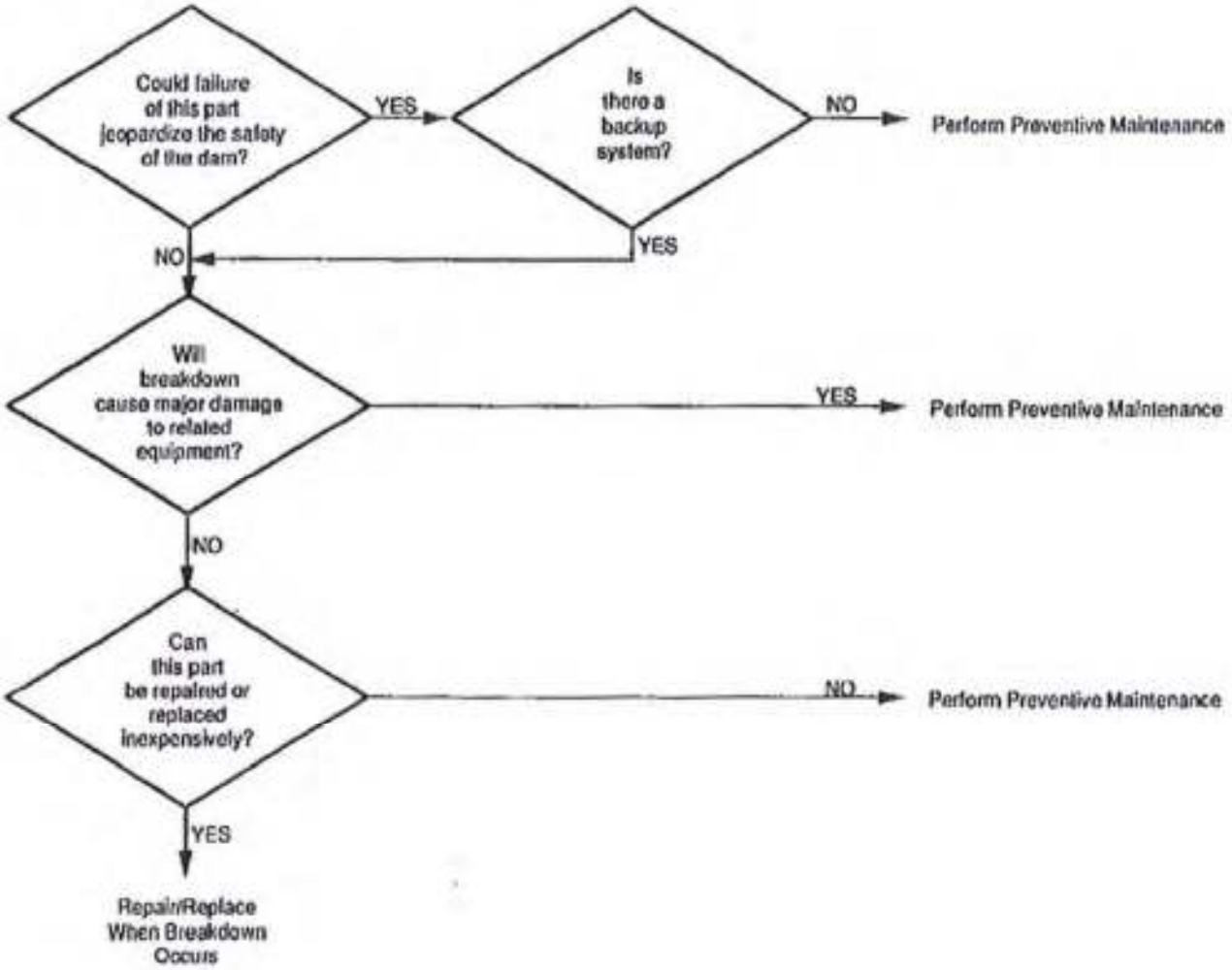
D.2.1 GENERAL APPROACH

The global process of operation and maintenance of a Hydro Power Plant is articulated through two types of actions: the preventive maintenance and the extraordinary maintenance.

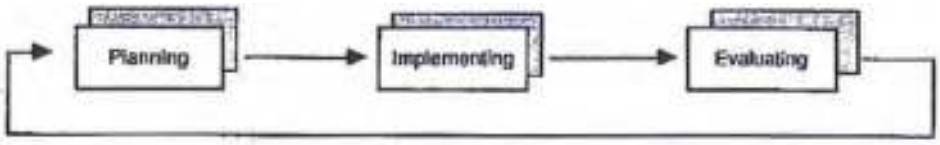
While the second one is applied in a specific case of malfunction or accident on a part of the plant, the preventive maintenance is ordinarily applied during the normal operation of the plant.

In general terms, the guiding principle of preventive/predictive maintenance is the regular and systematic application of engineering knowledge and maintenance attention to equipment and facilities to ensure their proper functionality and to reduce their rate of deterioration.
In addition to dedicated engineering, preventive/predictive maintenance encompasses regular examination, inspection, lubrication, testing and adjustments of equipment without prior knowledge of equipment failure. Preventive/predictive maintenance also provides the framework for all planned maintenance activity. The result is a proactive (rather than a reactive) environment, optimizing equipment performance and life.
It includes actions which extend the life of equipment and avoid unnecessary failures by substituting selective programmed effort for "fix it when it fails" maintenance.

The aim of any intervention is to promote cost-efficient decisions, to minimize the overall maintenance costs by means of preventive maintenance, following decision logic in terms of cost efficiency:



The conceptual process of implementing the Operation & Maintenance program is recalled here below for the benefit of understanding the general principal phases of the process.



Planning: During the planning phase, the O&M activities to be performed are identified. The frequency of each O&M activity is determined.

Implementing: During the implementation phase, the resource requirements for performing the O&M activities are identified, and the O&M activities are performed. Systems are established for monitoring and tracking O&M activities and expenditures. Finally, information is collected and records are maintained.

Evaluating: During the evaluation phase, the O&M Program is assessed. The costs and benefits of the Program are identified. Program strengths and weaknesses are identified. The assessment information is used to plan new actions for improving the O&M Program.

D.2.2 ROLES AND RESPONSIBILITY

Roles and responsibilities for the activities of operation and maintenance of the Plant are assumed to be assigned by the Plant Owner(s) to the "Plant Management Structure" (PMS), structured taking into account the Owners needs, the two Plants operation needs, and the transboundary nature of the project.

It is here recalled that monitoring inspections are to be conducted by staff trained and certified as competent in dam safety inspections; maintenance operations shall be conducted by skilled staff, and monitoring data assessments and dam safety decisions are required from qualified engineers experienced in dam safety management.

D.2.3 PROCEDURE FOR CIVIL WORKS INSPECTIONS AND MONITORING

Inspections are foreseen to be carried out periodically on dam and other plant structures, in order to:

1) carry out a DAM SAFETY MONITORING

   For the dam safety monitoring the inspections mainly consist in the periodic (typically on monthly basis) visual inspections and monitoring of the installed instruments, as described in the Operation manual of this report to which reference shall be made.

   The goal of monitoring is to confirm ongoing safe performance or to identify changes from usual performance so that corrective actions can be taken before a catastrophic failure occurs. The management of emergency events is the object of the Emergency Preparedness Plan provided in separate dedicated part of the Dam Safety Plan.

2) Identify MAINTENANCE NEEDS

   A Periodic visual inspection of all the main civil works and components of the Plant shall be conducted to check their status and identify maintenance needs. Such inspection can be combined with the one of point 1 above. The maintenance of the works will be conducted according to the results of these inspections.

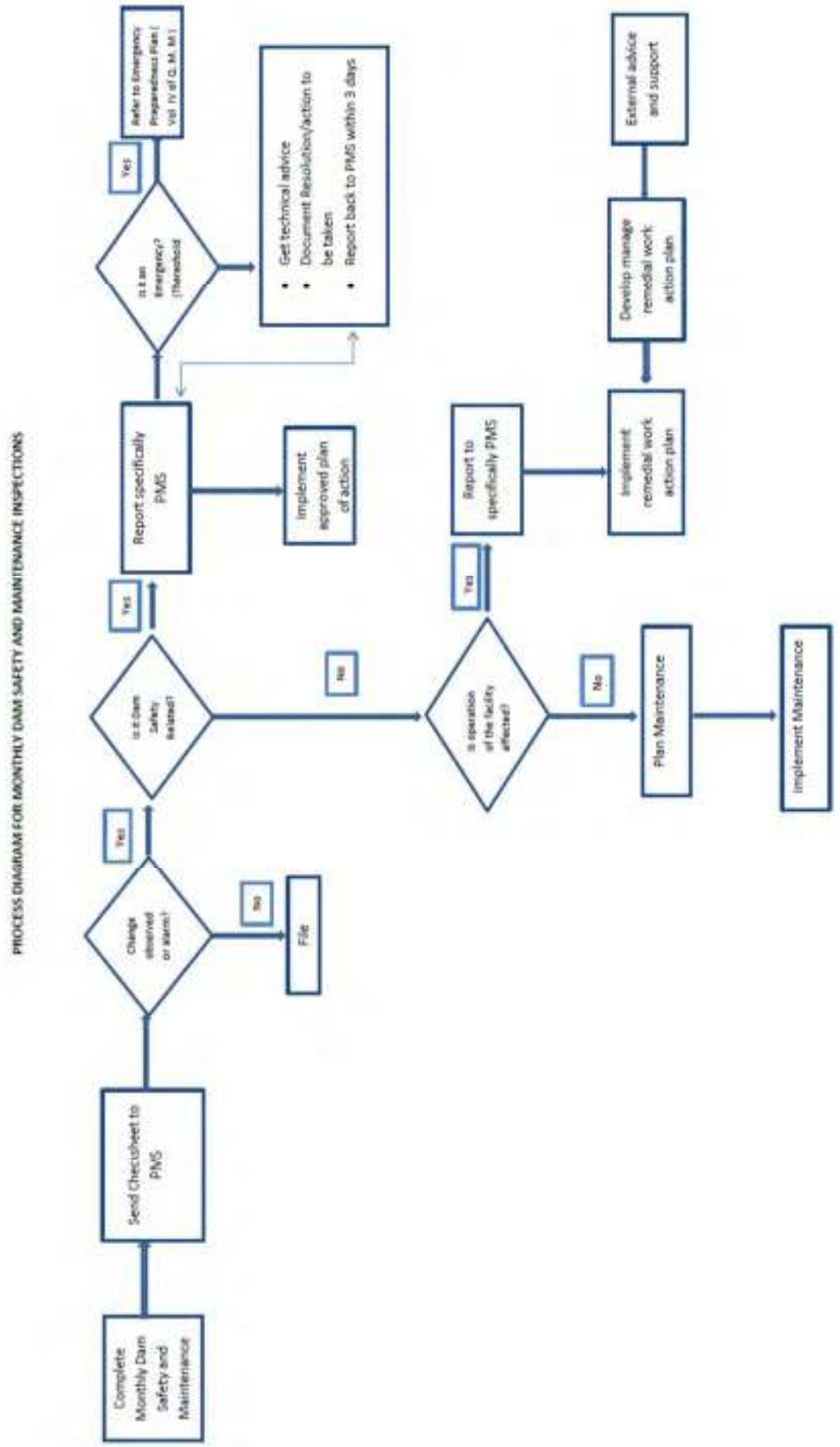
   Ordinary routine cleaning and maintenance activities are expected to be carried out systematically as far as needed to maintain in good and proper status the structures and their functionality.
   Such routine maintenance is that which can typically be scheduled on the basis of time (weekly, monthly, etc) usage (Number of cycles hours of operation, etc) or observed condition from periodic visual inspections that identify dirty, small damages, excessive wear, corrosion etc.
   Additional inspections should be carried out after significant events such as large floods or seismic events.

Specific items to be checked for each work or main component of the plant is provided in detailed lists in the following chapters of this report (each chapter dedicated to a specific work of the plant), with indication of minimum frequency required for the checks.

Operation and maintenance of all HSS and EM equipment pertinent to the dam structure will be detailed in relevant HSS and EM specific operation manuals. In the chapter D.3.14 "HYDRAULIC DEVICES AND MAIN CONTROL EQUIPMENT MAINTENANCE" at the end of this report it is however provided a table relevant to the basic guidelines for the proper inspection and testing of main hydraulic, mechanical and electrical devices which function is essential for the plant operation and dam safety. They shall be integrated with the dedicated detailed operation and maintenance manuals provided by the relevant suppliers.

Even with an effective preventative maintenance programme, there is a need to be prepared for emergency maintenance. This might include having critical spare parts, tools, equipment and trained competent staff ready in the event of an emergency.

A flowchart illustrating what to do if maintenance and / or dam safety issues are identified is included hereinafter. It can be further developed by the PMS according to his structure.


PROCESS DIAGRAM FOR MONTHLY DAM SAFETY AND MAINTENANCE INSPECTIONS
Complete Monthly Dam Safety and Maintenance
Send Checksheet to PMS
Change observed or warns?
Yes
No
File
Is it Dam Safety Related?
Yes
No
Report specifically PMS
Implement approved plan of action
Is it an Emergency? (Threshold
Yes
Refer to Emergency Preparedness Plan (Vol IV of G, M, M)
Get technical advice
Document Resolution/action to be taken
Report back to PMS within 3 days
Is operation of the facility affected?
Yes
No
Report to specifically PMS
Implement remedial work action plan
Develop manage remedial work action plan
External advice and support
Plan Maintenance
Implement Maintenance

As far as the first box of the above diagram is concerned, it is to be clarified that the inspection program may not necessarily be implemented for all items on a monthly basis, but according to the required frequency that will be coordinated with the dam monitoring program implemented by the Employer taking into account the prescriptions presented in this report.

Following each inspection the inspection record should be assessed by a maintenance supervisor for organizing the appropriate maintenance activity.
Records of all maintenance activities are to be kept to provide a cross reference with the initial maintenance inspection recommendation. In the last chapter of this report a format for this task, in form of a typical CHECKLIST table, is provided.
Consequent to the inspection process described here above, the implementation of the maintenance activities or other activities linked to the dam safety shall follow the general criteria outlined in next paragraphs.

Any maintenance or repair or modification action consequent to an inspection shall be duly recorded, and archived for future use and reference, for each component of the project. The operator will organize an archive in digital and paper format, divided per parts of the work and for each part, as appropriate, for type of works (concrete, E&M equipment, HSS equipment, services, masonry, finishing, etc.)
This is a need for the benefit of anyone in the future will operate the plant, and for an easy identification of any (even minor) modification or intervention occurred during the lifespan of the plant, that allow right knowledge for subsequent maintenance and repair interventions.
Record, a part the check list compilation, can include according to the need dedicated sketches or drawings, or prescriptions/instruction of a certain element supplier, or any specific action for the subsequent monitoring and maintenance activity if some change in respect to the previous status of the works/equipment occurred.

D.2.4 GUIDELINES FOR MAINTENANCE ACTIVITIES

In each of the tables reported in following chapters, dedicated to the single civil works, there are provided also, in the last column "action-remarks", some indication of actions to be taken as consequence of observed anomalies.
As far as the DAM MAINTENANCE is concerned, the observations gathered during the inspection shall be acquired at the appropriate level according to the case, and the indication of actions to be taken integrated by the consultation of the specific maintenance manual of single components or products (if available) or by recurring to specialists or consultants if necessary for not ordinary maintenance need cases.
The ultimate aim of the maintenance activities is to ensure that the plant is capable of reliably performing its operational functions with no forced outages and at the minimum maintenance cost.

For issues concerning the dam (or other major works) safety and stability, and in general as far as the outcomes of the DAM SAFETY MONITORING inspections are concerned, the above mentioned indications shall be managed within the PMS by the personnel with adequate knowledge and decisional capacity as appropriate, on case by case basis.
Whenever deemed necessary the Designer or other specialist consultant shall be consulted.
In any case, if an emergency case has to be faced, the Emergency Preparedness Plan provided in dedicated part of the Dam Safety Plan shall be applied.

The following shall be considered in the organization/ implementation of any maintenance activity:

- it is necessary for operators to be familiar with the performance of this equipment, especially if it is otherwise infrequently used.
- The timing of plant maintenance is based on routine inspections, testing and plant history, so that maintenance work is planned and effected before the risk and consequences of failure, or declined performance become incompatible with the availability, reliability and ratings required for operation.
- Essentially the maintenance regime is a combination of preventive and predictive maintenance, which minimizes the maintenance cost and the plant malfunctions.
- The plant manufacturer's maintenance instructions and recommended intervals form the initial basis for scheduling the extent and frequency of maintenance work. However extent and frequency are subject to change in the light of in service performance.
- In particular the mechanical and electrical equipment require appropriate maintenance and testing. Gates, lifting equipment and power supplies should be continuously maintained during frequent inspections and minor maintenance works, as illustrated in the last chapters of this report and in the relevant manuals of the Plant Contractor.

D.2.5 FIVE-YEARLY DAM SAFETY VERIFICATION

Five-yearly Dam Safety Verifications should include the hydraulic structure equipment essential for operation, namely all gate structures and hydraulic devices as listed in the chapter D.3.14 "HYDRAULIC DEVICES AND MAIN CONTROL EQUIPMENT MAINTENANCE".
These comprehensive inspections should be carried out by an independent expert examination team, comprising as a minimum a civil, an electrical and a mechanical reviewer, and include the following tasks:

- Comprehensive site inspection and witnessing of gate testing;
- Review of dam and gate structure design and potential failure modes;
- Review of dam monitoring data;
- Review of operations and maintenance issues and records;
- Review of emergency preparedness procedures and documentation;
- Review of personnel training record and competencies certification.

D.3 MAINTENANCE

D.3.1 RESERVOIR MAINTENANCE

Here below are resumed the principal aspects and actions required for the maintenance plan relevant to the **RESERVOIR**. Reservoir level monitoring and the monitoring of all topographic instruments are not included, being described in other section this report.

What indicated in the table above is indicative and preliminary and needs to be detailed and updated according to the detailed design and construction process, when it will be also available a list of detailed design or as built drawings to which reference be made for each item of the table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Reservoir shoreline	Clear and evident signals marking the shoreline, all around the reservoir perimeter.	First two years: 6 months. in case of absence of problems, from the third year: every 5 years , or in case of major flood or earthquake events.	Visual inspection of reservoir shoreline marks, all around the reservoir perimeter. If it is observed a defect in the proper and adequate identification of the shoreline for the main operation and flood reservoir levels, new marking or refurbishing of the existing one shall be carried out. In particular this activity is required in habituated lands areas.
2	Reservoir Slopes movements	Signal of movement or slides of reservoir slopes, all around the reservoir perimeter.	First two years: 6 months. in case of absence of problems, from the third year: every 5 years , or in case of major flood or earthquake events.	Visual inspection of reservoir slopes, all around the reservoir perimeter. In the dam proximity, topographic check with existing benchmarks can be implemented (see instrument monitoring system). If sliding phenomena or cracks opening on the ground are observed, they shall be monitored and, if necessary, slope stabilization measures considered (see **NOTES**)
3	Reservoir Slopes movements near dam	Signal of movement or slides of reservoir slopes in the vicinity of the dam.	First two years: 1 month. in case of absence of problems, from the third year: every 1 year , or in case of major flood or earthquake events.	Control of fix benchmarks coordinates, with a moveable sighting station and a theodolite or with a GPS. To be compared with the given coordinates given during construction. (see also instrument monitoring system). Measures shall be collected and filed in tabular (spreadsheets) and graphic format. Anomalies in trend or significant displacement and movements registered shall be reported. Iif necessary, slope stabilization measures reconsidered (see **NOTES**)
4	Floating Barrier (if present)	Damages of buoys. Rusting or damage of anchorage and steel components.	every 5 years, or in case of major flood events.	Dismantling of the floating barrier, and repair/substitution of damaged parts. Activity to be carried out with skilled people. Barge or boat required for re-installation at the end of the reparation process. Minor repairs can be conducted, if possible and convenient, without dismantling the floating barrier, directly from a boat within the reservoir.
5	Floating Barrier (if present)	Accumulation of debris or other floating elements.	First year after impounding completion: 3 months. Then every year, at the end of rainy season, or in case of major flood events.	cleaning of floating barrier by the trunks, debris or other floating elements that could be accumulate with the time. By means of small boats and racking devices accessing from dam crest or reservoir shoreline near dam (dam abutments yards)
6	Reservoir Water Cleaning	In the proximity of the spillway gates, along the dam crest, presence of trunks, debris or other floating elements that could be accumulate with the time.	First year after impounding completion: 2 months. from the following years: every year, at the end of rainy season, or in case of major flood events.	cleaning of superficial waters by the trunks, debris or other floating elements that could be accumulate with the time. By means of small boats and racking devices accessing from dam crest or reservoir shoreline near dam (dam abutments yards). Do not throw any trunk or debris through the spillway.

NOTES:
In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management Structure direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
All operations shall be done by skilled personnel, instructed and authorised by the Plant Owner(s) for the operation required.

Table 12 - Principal aspects and actions required for the Reservoir maintenance plan

D.3.2 DAM CIVIL WORKS MAINTENANCE

Here below are resumed the guidelines and actions required for the maintenance plan relevant to the **DAM.**

Monitoring of all instruments inside the dam are integral part of the dam monitoring and maintenance system, but they not included here, being already described in other section of the report to which reference shall be made.

The following table is mainly focused on the civil works.
What follows is indicative and preliminary, to be detailed and updated according to the detailed design and construction process, when it will be also available a list of detailed design or as built drawings to which reference be made for each item of the table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Instruments monitoring	The dam instruments monitoring is described in other section of this report, to which reference shall be made. In addition ordinary inspection and maintenance of the instruments (including the meteo station) is required: check of proper functioning of each installed instruments (lubrication, cleaning, greasing, software updating, connections, data acquisition and transmission)	1 month	Ordinary maintenance (lubrication, cleaning, greasing, software updating, check of connections) to be carried out according to the relevant maintenance manuals provided with each instrument by the supplier. Defect, malfunction or rupture of any instrument shall be recorded and appropriate action taken (see NOTES).
2	Dam drain system pumps control	Check of proper functioning of the pumps located in the downstream pits (**) check of proper functioning of pumps (lubrication, cleaning, power and control cables, start-stop signal system functions) and cleanliness of the output pipes	First two years: 1 month. in case of absence of problems, from the third year: every six months, or in case of major flood or earthquake events.	At each control of the pumps an operation of start and stop of each pump shall be done. The cleanliness of the output pipes shall be checked and eventually restored. (**) A part the ordinary cleaning, in case of any problem observed, follow the pumps maintenance manuals. Defect, malfunction or rupture of any pump shall be recorded and appropriate action urgently taken (see NOTES).
3	Galleries drain ditches Cleaning	The drain ditches shall be checked to be free from obstructions or mud or debris that can be obstacle to the flowing of the water. (**) This check applies also for pits at the side of each downstream entrance to the galleries, and for the pumps pits	First year after impounding completion: 2 months. from the following years: every year.	The drain ditches shall be always clean and free from obstructions or mud or debris that can be obstacle to the flowing of the water. As far as necessary they shall be cleaned by hand or mechanical tools (the same for the pits). (**)
4	Drains	The drains inside the dam shall be checked to be free from obstructions or calcifications that can be obstacle to the flowing of the water.	Inspection and single drain maintenance: every year.	The single drains obstructed shall be cleaned by mechanical means or high pressure water jets.

		A systematic periodic cleaning is suggested	Systematic cleaning: 10 yeas	Long term periodic washing of all the drain is suggested to contrast progressive expected occlusion.
5	Illumination	Visual control and inspection of lamps and cables functioning for both external (light posts) and internal (lamps inside galleries and control buildings) illumination systems	1 year	Ordinary maintenance of all illumination system and electrical parts shall be done, as needed.
6	Concrete surfaces	Visual control and inspection of the status of all concrete surfaces. In particular it shall be checked: - Presence of cracks - Water percolations - Possible exposed reinforcement In particular, as far as dam is concerned, this check shall be carried out inside the galleries, on dam downstream face and, as far as possible on the upstream face). Special attention shall be paid to the crest spillway surface. Analogue prescription applies for all the civil structures of the project, not only to the dam.	1 month. In any case always after exceptional flood or earthquake event.	Observed anomalies, if any shall be recorded, monitored and appropriate actions taken (see NOTES). If it is ascertained, by the Plant Management direction, that the defects registered do not involve problems for the stability and safety of the structure, ordinary maintenance activities can be carried out to repair such defect. On the contrary case, actions shall be defined on case by case basis consulting a specialist. Whenever reinforcement appears exposed, following measures shall be taken: - concrete shall be locally demolished, - reinforcement brushed and cleaned from oxidations and dusts, - reinforcement protected against corrosion, - completely saturate with water the zone to be reconstructed, waiting evaporation of water in excess, -prepare a grout with water+ high resistance cement+ selected inert+ synthetic fibres admixtures gently mixing to incorporate air also, - apply no shrinkage grout, for thickness of no more than 3cm per layer, than finishing of the surface.
7	Control building, access buildings civil works finishing	Visual control and inspection of the status of all concrete or metal surfaces, structures and finishing pertaining to the buildings and civil works structures. In particular it shall be checked: - Presence of cracks in the concrete - Water percolations - Possible exposed reinforcement - leaks from the roofs - finishing deterioration - paintings deterioration - damages to tiles, if present - functioning of doors and windows - rusting of metal structures - status of steel girders, guardrails, parapets, lamp posts, stairs, ladders - status of the gutters and drains, that shall be free from obstructions. For the dam this check includes the Dam Control Building, Diesel Generator	6 months In any case always after exceptional rainstorm or earthquake event.	Ordinary maintenance of all concrete surfaces, metal works and finishing shall be done, as needed. Steel girders must be repainted when rust will appear. Repair of exposed concrete can be conducted as described at point 6 above). If it is ascertained, by the Plant Management direction, that the defects registered involve problems for the stability and safety of the structure, actions shall be defined on case by case basis consulting a specialist.

		Building, Cable shaft access Room on dam crest, Spillway gates servomotors rooms on dam piers, and other access structures also on dam crest). Similar prescription applies for all the civil structures of the project.		
8	Lift inside cable duct (if present)	Check of lift functioning. Check of proper lubrication of the mechanism, according to the supplier maintenance manual	1 year In any case always after exceptional earthquake event.	Ordinary maintenance according to the supplier maintenance manual. Repair in case of rupture, as far as to maintain it available for access inside the dam at any moment.
9	Lifting structure for access/repairs of pumps, MLO gates, and ancillary works on dam downstream face	Visual control of the status of metal structure and its anchorage Check of functioning of lifting device.	1 year, and in any case always after exceptional earthquake event. Every 10 years the test of lifting device shall be done with a load equivalent to the pump weight.	Ordinary maintenance of metal works and finishing shall be done, as needed. Any damage to the lifting device shall be reported to the Plant Management direction for action of repair.
10	Fences and Gates	Visual control and inspection of the status of fences and gates In particular it shall be checked: - rusting of metal structures - painting deteriorations - damages to fences or their anchorage - functioning of locking of galleries doors - functioning and status of restricted areas gates	1 year In any case always after exceptional rainstorm or earthquake event.	Ordinary maintenance of all metal works and finishing shall be done, as needed, to maintain them and to allow full access to authorized people inside the restricted areas.
11	Dam access roads	The efficiency and cleaning of dam access roads (including the dam crest road) and their drain ditches shall be checked.	Six months In any case always after exceptional rainstorm or earthquake event.	Ordinary maintenance and cleaning of all roads pavement and deep cleaning of all the drain system is required to maintain the functionality of the roads, metal works and finishing shall be done. Local repair of any damages is required, as needed.
12	Protection of the slopes at yards and access roads	It shall be checked the efficiency and status of the support and protection system of the slopes around the dam (in particular the excavated slopes around the abutments yard and of the access roads). In particular it shall be checked: - Defective anchors - Break of rockfall protection nets or barriers - Filling of debris of rockfall protection nets or barriers (if present) - cracks or damages to the shotcrete - Important or extended leaks from drains. - sing of movements of the excavated front - rockfalling or slides events.	Six months In any case always after exceptional rainstorm or earthquake event. Periodic cleaning of the rockfall protection nets or barriers required.	Any observed damage or anomaly shall be measured, documented and reported in all details. In case of instable wedges to be scaled, this shall be done by skilled people. Extended areas of damaged shotcrete shall be cleaned and repaired. Damaged bolts shall be replaced. In case of continuous important or extended flow of water is observed coming out from drainage holes, the flow shall be monitored (quantifying the flow and reporting it on a spreadsheet). Than a specialist designer shall be consulted. Defect, malfunction or rupture of any anchoring or protection system, as well as any sign of excavated front movement, shall be recorded and appropriate action taken (see NOTES).

				Periodic cleaning of the rockfall protection nets or barriers (where present) required.
13	Dam crest road bridges beams and spillway main crane railways beams.	All steel parts (if any) of the main deck structure shall be periodically inspected by skilled personnel. Special attention shall be paid in checking the bolted and welded junctions, and the integrity of the superstructures as well as presence of rust or paint damages.	First visit 1 year after construction than frequency of controls to be defined, in any case no more than every 5 years	Eventual anomalies or damages in steel structure and junctions shall be documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see NOTES).
14	Dam crest shock absorbers (if present)	1. Visual control of the general status of the device. 2. Control on the compatibility of the stroke or the rotations occurred with the ones foreseen by the device. 3. Control of the bolts tightening and of the connections. 4. Control of any oil leakage. 5. Check of external cleaning and possible presence of rust. 6. Control that the sliding systems are not seized-up or ruined 7. Verify the integrity and efficiency of stem protection.	First control (only check indicators 1,2 and 3) after six months from the installation. Then full check (7 check indicators) every 2 years or in case of seismic event.	Eliminate possible dust and/or encrustation. Remove and restore possible rusted points. Contact the supplying firm in case of: - Oil leakage - the sliding systems are not seized-up or are ruined - presence of rust in unaccessible zones. Every 10 years it is suitable a verification at the workshop, by removing a number equal to 5% of the devices installed, with a minimum of one.
15	Crest road bridges bearings and spillway main crane railways beams bearings (as far as present and applicable) periodic check	Bearings shall be checked periodically, in order to verify: - Correct positioning of the structures and status of bearing bed and anchorage. - Absence of movement or anomalous deformations Capacity of the bearing to assure the consented movement of the structure, verifying the displacement of the bearings mobile parts during different seasons. - Absence of ruptures - The good conservation of the devices foreseen against corrosion and against dust - The uniformity of the contact, as foreseen in the project. - The maintain of the designed geometry (parallelism and planarity of contact surfaces) - Eventual anomalies or cracks in structures near the bearings, that could be induced by a problem to the bearing.	2 years	Eventual anomalies in the bearings or cracks in the concrete structure near the bearings shall be monitored, documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see NOTES) Bearings must be checked and, when necessary replaced with new ones. For frequency of controls, maintenance operations and all details for replacing see relevant maintenance manual provided by the bearing supplier. For maintenance or replacing of part or all the bearing, the relevant bridge deck shall be lifted for this operation. The jacks for lifting operation shall be inserted in dedicated holes and shall have the design load and characteristics given in design drawings.

Table 13 - Principal aspects and actions required for the Dam civil works maintenance plan

(**) The following shall be considered in organizing such maintenance operation:

- Consideration should be given to monitoring the depth and type of sediment at the gallery weirs before each gutter cleaning, rather than just removing and discarding it. This should be done on a regularly scheduled basis (say every 2 weeks during reservoir impounding).
  Samples of the sediment should be analysed on occasion for grain size, plasticity, pH, and composition. This information can be very useful if any piping or erosion starts in any of the foundation drains. The pH can be used to indicate if some of the seepage is coming from internal drainage of the dam itself, picking up calcium hydroxide (basic) on the way. Consideration should also be given to using a hand held "pistol" type temperature indicator to check the temperature of water coming from foundation drains. It is recommended to also keep simple method of documentation for easier consultation, just writing the date and temperature on the wall next to the drain with a pencil. If the temperature changes, the date and new temperature should be noted. This could, for example, indicate that water from the reservoir is migrating to a hot spring area if the temperature of water from those drains decreases as the reservoir is raised.

- Consideration should be given to recording the volume of water pumped per week or month from the gallery sumps. Seepage flows are measured using weirs in the gallery gutters, but the pump records can be used as a check or verification.

D.3.3 MIDDLE OUTLETS MAINTENANCE

Here below are resumed the guidelines and actions required for the maintenance plan relevant to the **MIDDLE OUTLETS.**

As far as the prescriptions for the civil works regarding the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported again in the following table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Middle Level Outlets Drains	Any specific drains running around the middle outlet steel lining, exit in nearest the dam gallery, in correspondence of the two middle outlets. The water venues through these drains shall be monitored as prescribed and done for the other drains of the dam. The drains shall be checked to be free from obstructions or calcifications that can be obstacle to the flowing of the water.	Inspection and single drain maintenance: every year. Systematic cleaning: 10 years	Anomalous records shall be reported to PMS. The single drains obstructed shall be cleaned by mechanical means or high pressure water jets. Long term periodic washing of all the drain is suggested to contrast progressive expected occlusion.
2	Gates maintenance platform	Maintenance platforms and devices envisaged on the dam, outdoor, shall be checked. Check of good status of the steel, check of possible presence of rusting is required. Periodic test of platform opening and closing mechanism (as far as present and applicable) is required.	Every year.	The platform/device shall be maintained efficient by means of ordinary maintenance activity (including mechanism greasing as necessary) and periodic testing of functioning.
3	Steel lining	Check of alignment, status of weldings and joints, cavitation effects	Every 5 years, or in any case of emergency or prolonged use of MLO.	Empting the MLO conduit by closing the upstream bulkhead is required for this operation. Any anomaly shall be duly recorded and signalled (see NOTES).
4	Recess for d/s gate servomotors pumps	From dam d/s berm it is possible to get access to the chamber housing the servomotors for d/s gate operation. Check of good status and functionality of the chambers structure, gates, drains and relevant accessibility is required. Check shall be extended to the cables corridors.	Every year.	Servomotors shall be used and maintained as prescribed by the specific gates operation and maintenance manual. Accessibility to their chambers shall be maintained efficient by means of ordinary maintenance activity.
5	Sand disposal valves, by-pass valves, other auxiliary hydraulic devices.	Check of good status of the valves and hydraulic devices, of their functioning and of the accessibility to their chambers is required.	Every year.	Valves shall be used, during or after any use of middle outlet, as prescribed by the specific gates operation and maintenance manual. Accessibility and functioning of the valves shall be maintained efficient by means of ordinary maintenance activity and periodic testing of the valves functioning.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 and Pr.7 in table reported in chapter D.3.2 shall be applied.

Table 14 - Principal aspects and actions required for the Middle Outlets maintenance plan

D.3.4 SPILLWAY MAINTENANCE

Here below are resumed the guidelines and actions required for the maintenance plan relevant to the **SPILLWAY.**

The following table is mainly focused on the civil works (Gates and other EM and HSS equipment Operation and Maintenance manuals are issued separately).

As far as the prescriptions for the civil works regarding the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported again in the following table.

The prescriptions about civil work regarding the beams, bearings and shock transmitter units possibly present on the top of the spillway piers are provided in Pr.13 "Dam crest shock absorbers", Pr.14 "Crest road bridges bearings and spillway main crane railways beams bearings periodic check" and Pr.15 "Dam crest road bridges steel beams and spillway main crane railways beams" in table reported in chapter D.3.2, to which reference shall be made (they are not reported again here).

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Spillway radial gates tendons	Spillway radial gates piers have tendons in their body. They do not require in principle any special maintenance, being fully greased and vipled as protection against corrosion and inserted in a sleeve pipe fully embedded in concrete. However the space between tendon and sleeve pipe is not grout injected, and this allows possible intervention for possible re-tensioning operations. It is therefore recommended, within the ordinary inspections to the civil works, to carry out specific visual check of: - possible presence of cracks or sign of deformation that might appear on the piers. - Misalignment of the radial gate in respect to its lateral guides. - Malfunctioning on opening or closure operation of the radial gate.	Ordinary inspections on monthly basis, or after any relevant flood event. Direct measures of tendons tension is recommended to be carried out 1 year after initial pulling, then 5 years after initial pulling, then every 10 years. In any case after any flood or earthquake event.	In case signs of piers deformation are detected or possible gates mulfanctioning indicating possible tendons detensioning, they shell be duly reported to PMS and, upon consultation of expert, possible intervention of re-tensioning of one or more tendons can be organized and implemented (see NOTES). In such case the following aspects are to be considered: Wether access to the tendons heads is possible from a dedicated shaft located inside the pier The head of the tendons are typically protected with tixotropic gel (that shall be restored at the end of any intervention). Tensioning shall be carried out by adequate jack controlled by a standard multi-cables control system. A regulating ring nut can be foreseen on the head of the tendon anchor, allowing an easy intervention with the jack

				for tensioning and de-tensioning operation. This special maintenance operation, as well as other possible ordinary maintenance operations (lubrication, cleaning, greasing, software updating, check of connections) are to be carried out according to the relevant maintenance manuals provided by the tendons supplier.
2	Spillway drains	The drains pipes of the drain system laying under the spillway chutes shall be checked to be free from obstructions or calcifications that can be obstacle to the flowing of the water.	Inspection and single drain maintenance: every year or after important or prolonged flows passing through the spillway. Systematic cleaning: 10 years	The single drains obstructed shall be cleaned by mechanical means or high pressure water jets. Long term periodic washing of all the drain is suggested possible occlusion.
3	Lateral walls ceiling and aerators ducts	Visual check of good status and possible movement of the structures	Every 5 years or after important or prolonged flows passing through the spillway.	Damaged or moved elements shall be replaced and/or properly fixed. Aerator conduits if obstructed or damaged shall be cleaned or repared as needed.
4	Chute finishing	Visual check of good status of the spillway chutes slabs, including check of: • Presence of fissures or cracks; • Detachment of finishing concrete layer at the contact with lateral walls and a the chute slabs extremities • Damages (erosion, cavitation effects) on concrete surfaces	For first two years every year, then every 5 years, or in any case after important or prolonged flows passing through the spillway.	Any anomaly shall be duly recorded and signalled, possibly associated with measures of spillway discharge, meteo conditions, spillway drains outflows (see NOTES). Repairing intervention, if needed shall be properly designed (for instance making use of suitable products to repair damages induced by water passing at very high speed). and conducted by skilled people, in safe conditions.
5	Radial gates lateral sealing	Visual check of possible leaks on the radial gates sides when gates are closed and reservoir is at maximum operating level.	For first two years every year, then every 5 years, or in after important or prolonged flows through the spillway.	Any anomaly shall be duly recorded and signalled (see NOTES). Deeper checks (such piers alignment, water discharge and possible dependence from meteo conditions) to be prescribed on case by case basis.
6	Piers upstream face, stoplogs grooves and chute warterways	Visual check of presence of trunks and debris transported by the water near the gates and stoplogs grooves when gates are closed. Visual check of possible damages to the concrete or presence of trunks along the chutes after flood passage through the spillway.	Every 5 years, or in any case after important or prolonged flows passing through the spillway.	Any anomaly shall be duly recorded and signalled (see NOTES). Ordinary maintenance of civil works is required. Debris or trunks invading the stoplogs grooves or the chutes shall be immediately removed.

7	Piers joints.	Visual check of presence of infilling or debris within the joints. Upstream of the water-stop alignment, the water shall be free to enter within the space of the vertical joints.	Every year, or in any case after important or prolonged flows passing through the spillway.	Any anomaly shall be duly recorded and signalled (see NOTES). Ordinary maintenance of civil works is required. Debris or trunks obstructing the joints upstream of the water-stops alignment shall be cleaned/removed.
8	Radial gates servomotors pumps rooms	From dam crest it is possible to get access to the chambers housing the servomotors for radial gates operation. It is required a periodic visual check of the good status and functionality of the chambers and cable bridge structures and their accessibility.	Every year.	Servomotors shall be used and maintained as prescribed by the specific gates operation and maintenance manual. Accessibility to their chambers and to the cable bridge shall be maintained efficient by means of ordinary maintenance activity.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.
4) For shock transmitters units and bearings on beams located on the top of the spillway piers, see specific prescriptions provided in table reported in chapter D.3.2.

Table 15 - Principal aspects and actions required for the Spillway maintenance plan

D.3.5 PLUNGE POOL MAINTENANCE

The pool is designed to safely withstand floods events.

The pool, and the concrete structures protecting the dam downstream toe are conceived as sacrificial barriers and are not meant to be fully stable and not subject to erosion or scouring in the long term. They are conceived as first line of defense to protect from scouring the permanent works such the dam and the power house.

A part the ordinary maintenance of the abutments slope stability supports, important to guarantee in the long term the accessibility to the dam (see prescriptions on relevant DAM chapter), the plunge pool area doesn't require specific operation and maintenance actions.

At this level of the design, no specific actions are therefore foreseen in the submerged portion of the pool during the normal operation of the plant.

Some scouring is expected to occur within the pool, and material (rock blocks) to remain in its bottom.

It has to be reminded that most of the pool will be permanently under water, and inspection and possible maintenance actions implies the use of a barge or its dewatering by means of pumps. This means that such actions shall be programmed and planned in advance and in any case shall be carried out only when strictly necessary.

It is however recommended to check its behavior and stability in the case of specific exceptional flood or extraordinary spillway discharge event, especially as far as the aspects affecting the proper functioning of the permanent structures of the plant (Power House and Dam). Such checks are described in the following table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Slopes stability	Visual check of: • status of shotcrete, bolts, drainages and drain ditches foreseen on benches • potential instable wedges. • Signal of movement or slides of slopes. • Debris accumulation on benches. • Check of possible crack openings or fissures or deterioration of concrete surfaces. The visual check will be ordinarily conducted on the accessible portions of the excavations (upper portion of the excavated fronts), as far as possible extending the observation to the submerged parts (for instance during dry season or possible stop of the plant).	After first spillway operation. After first Middle Outlets operation. Then yearly, preferably at the end of rainy season. Additionally in case of an exceptional flood event.	Any anomaly shall be duly recorded and signalled. Deeper checks (and check of possible dependence from meteo conditions) to be prescribed on case by case basis. If sliding phenomena or cracks opening are observed, they shall be monitored and, if necessary, slope stabilization measures reconsidered (see NOTES). Accumulation of debris on accessible benches shall be removed.
2	Upstream concrete structures (dam d/s toe protection structures)	Visual control and inspection of all concrete surface, as far as visible.	After first spillway operation. After first Middle Outlets operation. Then only in case of an exceptional flood event.	Any anomaly shall be duly recorded and signalled, possibly associated with measures of spillway or MLO discharge and meteo conditions (see NOTES). Repairing intervention, if needed shall be properly designed and conducted by skilled people, in safe conditions.
3	Excavation profile	It shall be checked the profile of the pool bottom, with the aim to check if there is no risk of damages for the permanent civil works (PH and DAM) and that it is not compromised the plant energy production. This check can be done firstly visually, checking if there is accumulation of eroded material out of the pool. In this case, and in any case on 10 years period basis, a bathymetric survey is required.	After first spillway operation. After first Middle Outlets operation. In any case of an exceptional flood event ($Q>6500m^3/s$). Recommended in any case every 5-10 years (depending on Spillway and middle outlets use).	Any anomaly shall be duly recorded and signalled, possibly associated with measures of spillway or MLO discharge and meteo conditions (see NOTES). Repairing intervention, if needed shall be properly designed and conducted by skilled people, in safe conditions.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.

Table 16 - Principal aspects and actions required for the Plunge Pool maintenance plan

For the check of concrete surfaces reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported again in the previous table.

D.3.6 INTAKE GATES STRUCTURE and relevant upper yard MAINTENANCE

What follows is referred to one structure but applies for both left and right Power Waterways.

As far as the prescriptions for the civil works regarding the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported again in the following table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Yard slopes protection devices	Visual check of the visible (not submerged) portions, in particular check of: • status of shotcrete, bolts, drainages and drain ditches foreseen on benches • potential instable wedges. • Signal of movement or slides of slopes. • Debris accumulation on benches. • Check of possible crack openings or fissures or deterioration of concrete surfaces. In case of continuous flow of water is observed coming out from drainage holes, the flow shall be monitored (quantifying the flow and reporting it on a spreadsheet).	After first Power waterways operation. Then yearly, preferably at the end of rainy season. Additionally in case of an exceptional heavy rain or earthquake event , or Power Waterways dewatering.	Any anomaly shall be duly recorded and signalled. Deeper checks (and check of possible dependence from meteo conditions) to be prescribed on case by case basis. If sliding phenomena or cracks opening are observed, they shall be monitored and, if necessary, slope stabilization measures reconsidered (see NOTES). In case of instable wedges to be scaled, the scaling shall be done by skilled people. Extended areas of damaged shotcrete shall be cleaned and repaired. Damaged bolts shall be replaced. Accumulation of debris on accessible benches or any obstruction of drain ditches or pipes shall be removed. Than a specialist designer shall be consulted. Ordinary maintenance and cleaning of the drain ditches, as needed.
2	Finishing of the tunnel lining downstream of the gates	Visual check of good status of the concrete surface, including check of: • Presence of fissures or cracks; • Detachment of finishing concrete layer at the contact with lateral walls and along the transition downstream and upstream of the gates. • Damages (erosion, cavitation effects) on concrete surfaces or near joints	In case of Power Waterways dewatering.	Any anomaly shall be duly recorded and signalled, possibly associated with measures of spillway or MLO discharge and meteo conditions (see NOTES). Repairing intervention, if needed (for instance making use of suitable products to repair damages induced by water passing at very high speed) shall be properly designed and conducted by skilled people, in safe conditions.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.

Table 17 - Principal aspects and actions required for the Intake gate structure maintenance plan

The above applies for gate shafts concrete structures (yard, exposed structure and upper control building). Other prescriptions for maintenance inspection and operation of such structures are provided in the table here below. For the maintenance of gates and all EM and HSS equipment, see relevant section.
Of course, for this structure, the portion that during normal operation of the plant is under water can be inspected only in the case of exceptional dewatering of the Power Waterways, that, unless for other exceptional needs, is recommended to be carried out every 10 years.
During first impounding it is recommended to either clean the trash racks when water is raising at intake towers levels and trunks might obstruct them, or protect them by floating barrier temporary installed in front of them.

D.3.7 POWER TUNNEL MAINTENANCE

What follows is referred to one structure but applies for both left and right Power Waterways.

During the operation of the plant the tunnel is not accessible. No special operation and maintenance needs are foreseen for the civil works of the tunnel.

Power waterways can be inspected by dewatering the tunnels (by closing the intake gates).
The power waterways dewatering (and subsequent filling) procedures are described in relevant paragraph of operation manual section, to which reference is made.

Such operation can be decided in case of need of inspection of the tunnel (for instance decided in case of important leakages detected in the drain, or in any case recommended after 10 years of tunnels operation), instructed and authorized by the Plant Owner consulted by design specialist.

The inspection of the tunnel, shall be programmed in advance to allow to manage the consequences of a long period of plant stop and long period of water discharge through the spillway/middle outlet.
It shall be carried out by skilled personnel only, **instructed and authorized by the Plant owner for the operation required, consulting a design specialist.**

In case of such extraordinary event of inspection, the following operations can be envisaged as far as the civil works are concerned:

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Main Tunnel lining check	Complete dewatering of the tunnel, then visual check of cast concrete: • status of lining (aging, cracks, roughness, local defects check); • Joints check; • External waterstops (alignment, fixing elements, possible detachments, possible water percolations around the waterstops) • Eventual presence of water percolations; • record and check of settlements or displacement movements. • comparison of the values measured during previous inspections. At the first inspection the comparison shall be made with the records made at the date of completion of the tunnel construction. • Presence of materials and debris inside the tunnel shallbe checked. Possible correlation with defects detected during the tunnel concrete lining inspection shall be carried out.	10 years, or in any case of abnormal water leaking record in the drain tunnels or surrounding rockmass. On the upstream portion only in case of need.	In case of observed damage to extended areas of lining a monitoring and mapping shall be performed by skilled people (see NOTES). In any case all anomalies, instable phenomena and presence of water percolation shall be recorded and appropriate actions taken (see NOTES)), to be defined on case by case basis. In case of presence of debris they shall be removed. The material found shall be analysed to identify its provenience (if it comes from rock , from river or from concrete lining elements). Than possible appropriate actions taken (see NOTES).
2	Steel lining check (For any portion of the tunnel lined with steel)	Whenever the waterway is emptied, check of the integrity and alignment of the welded junctions, and check of possible presence of cavitation zones, rust or paint damages on the steel lining. Check of integrity at intersection with concrete section. Check of circularity and good alignment of the steel lining sections. Such checks shall be done visually in any case, and with the aid of instruments as far as necessary to acquire all the information.	Whenever tunnel is emptied.	Eventual anomalies or damages in steel structure and junctions shall be documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see NOTES), to be defined on case by case basis.
3	Access tunnels supports check	Visual check of: • status of lining (shotcrete and or bolts or ribs); • eventual presence of accumulated debris along the tunnel, as consequence of failure of potential instable wedges; • Eventual presence of water percolations	Every six months (at the end of dry and wet seasons) during impounding, than every 1 year.	In case of observed damage to extended areas of lining a monitoring and mapping shall be performed by skilled people (see NOTES). Than the area shall be scaled and cleaned and shotcrete or bolts applied again. In any case all anomalies, extended instable phenomena and presence of water percolation shall be recorded and appropriate actions taken (see NOTES).
4	Access tunnels portals and relevant gates.	Visual control and inspection of steel and concrete surface. Gates lock opening and closure test shall be done every year.	Every six months (at the end of dry and wet seasons) during impounding, than every 1 year. After 5 years, every 5 years.	In case of corrosion or damage to steel gate painting against corrosion shall be done, if possible, or alternatively the part shall be substituted. For actions on concrete structures, see NOTE 3. Ordinary maintenance of all concrete surfaces, metal works and finishing shall be done, as needed.

NOTES: 1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted. 2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required. 3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.				

Table 18 - Principal aspects and actions required for the Power Tunnel maintenance plan

Operation and maintenance of valves, gates, grids, relevant cranes and other HSS and EM equipment and instruments, located along the power waterways, are described in relevant section.

D.3.8 SURGE SHAFT MAINTENANCE

What follows is referred to one structure but applies for both left and right Surge shafts.

As far as the prescriptions for the civil works regarding the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported again in the following table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Surge shafts yard slopes protection devices	Visual check of the visible (not submerged) portions, in particular check of: • status of shotcrete, bolts, drainages and drain ditches foreseen on benches • potential instable wedges. • Signal of movement or slides of slopes. • Debris accumulation on benches. • Check of possible crack openings or fissures or deterioration of concrete surfaces. In case of continuous flow of water is observed coming out from drainage holes, the flow shall be monitored (quantifying the flow and reporting it on a spreadsheet).	After first Power waterways operation. Then yearly, preferably at the end of rainy season. Additionally in case of an exceptional heavy rain or earthquake event , or Power Waterways dewatering.	Any anomaly shall be duly recorded and signalled. Deeper checks (and check of possible dependence from meteo conditions) to be prescribed on case by case basis. If sliding phenomena or cracks opening are observed, they shall be monitored and, if necessary, slope stabilization measures reconsidered (see **NOTES**). In case of instable wedges to be scaled, the work shall be done by skilled people. Extended areas of damaged shotcrete shall be cleaned and repaired. Damaged bolts shall be replaced. Accumulation of debris on accessible benches or any obstruction of drain ditches or pipes shall be removed. Than a specialist designer shall be consulted. Ordinary maintenance and cleaning of the drain ditches shall be done, as needed.
2	Steel parts	The external steel ladder and fences shall be periodically inspected by skilled personnel.	First visit 1 year after construction than	Eventual anomalies or damages in steel structure and junctions shall be documented and reported in all details, where possible quantifying the

		Special attention shall be paid in checking the bolted and welded junctions, and the integrity of the superstructures as well as presence of rust or paint damages.	frequency of controls to be defined, in any case no more than every 10 years	extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos, than appropriate actions taken (see NOTES). Ordinary maintenance of all steel parts shall be done, as needed.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.

Table 19 - Principal aspects and actions required for the Surge Shaft maintenance plan

The above applies for surge shafts concrete structures (yard, shafts below and above ground), other prescriptions for maintenance inspection and operation of such structures are provided in the table here below. For the maintenance of gates and all EM and HSS equipment, see relevant section.

Of course, for this structure, the portion that during normal operation of the plant is under water can be inspected only in the case of exceptional dewatering of the Power Waterways, that, unless for other exceptional needs, is recommended to be carried out every 10 years.

D.3.9 PENSTOCKS MAINTENANCE

What follows is referred to one structure but applies for both left and right Penstocks.

No specific maintenance is foreseen for Manifold and Penstocks steel lined conduits, being inside the rock and embedded in concrete.
Whenever for an exceptional event one or both the power waterways are emptied (see also prescriptions reported in the operation manual section), the general check of the integrity and alignment of the bolted and welded junctions, and the check of possible presence of cavitation zones, rust or paint damages can be conducted, as shown in the following table.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Steel parts	Whenever one or both the power waterways are emptied, check of the integrity and alignment of the bolted and welded junctions, and check of possible presence of cavitation zones, rust or paint damages on the steel lining.	Whenever tunnel is emptied.	Eventual anomalies or damages in steel structure and junctions shall be documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see NOTES).
NOTES: 1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted. 2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.				

Table 20 - Principal aspects and actions required for the Penstock maintenance plan

D.3.10POWER HOUSE MAINTENANCE

What follows is referred to one structure but applies for both left and right Power Plants.

The general rules for the Power House civil works maintenance are resumed in the following table.
IMPORTANT REMARKS FOR STRUCTURE MONITORING:

A) Usual ordinary maintenance and cleaning of civil works and architectural components is required for the functionality and durability of the Power House, as well as for all the other civil works structure, and it shall be therefore considered and planned as a part of the plant operation program.
B) Another aspect important to be periodically monitored is the bathymetry of the Tailrace Hole.
   Whenever in this stretch of the river important sedimentation or rock elements accumulation would occur, this might have possible negative consequences for the energy production.
   On the contrary, local deep erosion and scouring at the base of the Power House structure might compromise its stability.
   In principle scouring is not expected here, and also sedimentation should not occur during the normal operation of the plant. Very exceptional floods discharged through the spillway might imply some transfer of material from plunge pool to tailrace hole.
C) Any restrictions for the loads on civil structures, as well prescription for loading areas, indicated in the detailed design shall be considered when programming maintenance operations.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	All reinforced concrete structures	Visual control and inspection of concrete surfaces of all structures (included upper and lower tank and diesel and GCB buildings)	Every year, or in case of exceptional flood, heavy rain or earthquake event	See NOTE 3). The first prescription about civil work regards the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, for which it shall be applied the prescriptions that are provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter 0 " DAM CIVIL WORKS", to which reference shall be made (they are not reported again here).
2	Steel parts	All steel parts shall be periodically inspected by skilled personnel. Special attention shall be paid in checking the bolted and welded junctions, and the integrity of the superstructures as well as presence of rust or paint damages.	First visit 1 year after construction , than frequency of controls to be defined, in any case no more than every 10 years	Eventual anomalies or damages in steel structure and junctions shall be documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see Notes).
3	Control building and yard area finishing and architecture	Visual inspection of all the architectural and finishing elements inside and outside the Power House, such as: fence, illumination posts, illumination system and lamps, windows, doors, pavements, paintings, access roads, external yard finishing, pedestrian walks, gutters, ditches, cable trenches, handrails, steel ladders and platforms, ancillary works. The inspection shall be carried out by skilled people, able to identify possible defects that may require ordinary or extraordinary maintenance works.	Every year, or in case of exceptional flood, heavy rain or earthquake event	See NOTE 3). Possible wearing out, damages or defects on architectural elements shall be recorded and appropriate actions prospected to the Plant Owner for his action (see NOTES). Ordinary cleaning and maintenance of fence, roads, illumination system, frames, steel works, platforms, ancillary works and furniture shall be done, as needed. All sliding and rolling elements shall be maintained suitably lubricated (for instance the wheels of the cover structure on the erection bay roof opening).
4	Joints	Visual check of the good status of the joints and joints cover, inside and outside (on the roof) of the Power House.	Every year, or in case of exceptional flood, heavy rain or earthquake event	Eventual anomalies or damages of the joints shall be documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see Notes)
5	Water system and fire fighting system	Visual inspection of all the water system (tanks, pipes, pipelines, valves, roof gutters, taps and all fittings) inside and outside the Power House building. Water system is described in relevant report. Test of functioning of all pumps located in the lower tank chamber.	1 year Differently only in case specific defects or leaks on the hydraulic system are observed,	Eventual filtration, damages or cracks on tank structure shall be recorded and appropriate actions taken (see Note). Exposed reinforcement bars shall be treated as indicated at point 1. On off and functioning tests on all pumps, according to the relevant supplier operation and maintenance manual.

		Test of fire fighting system as specified in EM operation and maintenance manual. Check of potabilizer.	or in case of fire event.	Every year lamps of UV potabilizer device and filters must be changed. Ordinary maintenance and cleaning of pipes, pipelines, valves, roof gutters, taps and all fittings to be done periodically, as needed.
6	External drainage system	All around the Power House area (on yards, road and slopes) visual check of: - Drainage pits - Ditches - Pipes Ordinary maintenance and cleaning of ditches and gutters shall be carried out, especially during the rainy seasons.	1 year Always after very heavy rainfall event occurred.	In case of big damages to any drainage structure is observed, it shall be documented and reported in all details, where possible quantifying the extension of the damage in a spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see Note); for damages to reinforced concrete see relevant point 1. Eventual obstructions (mud, debris, grass) of ditches, pits, pipes and discharging structures shall be removed by a periodic cleaning.
7	Transformers oil/water system	See detailed description at next paragraph TRANSFORMER OIL WATER RECOLLECTION SYSTEM DESCRIPTION	5 years Always after every firefigthing event.	See detailed description provided in next paragraph TRANSFORMER OIL WATER RECOLLECTION SYSTEM DESCRIPTION
8	Sewage system	Sewage treatment and septic tank. In the bottom of the septic tank, the solid particles will sedimentate. When the level of the solids reaches half height of the tank, typically the solids must be pumped out. Following the first emptying, it is possible to define better the required emptying time, according to the supplier operation manual. Periodical visual inspection of the tank level is therefore required.	In the first year: every three months. After the first year, to be defined according to the results of the first inspections	Pumping out of the solids by means of portable pump.
9	Power House slopes protection devices	Visual check of: status of barriers and rock-fall nets and protection barriers (if present) foreseen on benches above the yard; accumulation of debris behind protection net; potential instable wedges. Possible crack opening on the shotcrete or rock of the exposed front of excavation. Shotcrete and bolts where foreseen. Drainage water percolation.	1 year Always after very heavy rainfall event occurred.	Possible problems observed shall be measured, documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by photos. Than appropriate actions taken (see NOTES). In case of corrosion or damage to steel parts (ropes, pillars, junctions, meshes,..) painting against corrosion shall be done, if possible, or alternatively the part shall be substituted. In any case all anomalies shall be recorded and appropriate actions taken (see Note). Excessive accumulation of debris behind protection net (if present) shall be removed by skilled people. Scaling of instable wedges shall be done by skilled people. Extended areas of damaged shotcrete shall be cleaned and repaired. Damaged bolts shall be replaced.

				In case of continuous flow of water is observed coming out from drainage holes, the flow shall be monitored (quantifying the flow and reporting it on a spreadsheet). Than a specialist designer shall be consulted. Ordinary maintenance of all steel and concrete parts shall be done, as needed.
10	Submergible parts of the structure	In case of flood event all submerged structures shall be than inspected and visual check of all part shall be made.	Always after flood event	Ordinary cleaning and drying of all floors below level of the river, inside Power House, taking water for cleaning from nearest available water taps.
11	400kV line anchorage	Visual check of status of 400kV line anchors and anchorage devices behind Power House	2 years	In case of corrosion or damage to steel parts (ropes, rings, junctions) painting against corrosion shall be done, if possible, or alternatively the part shall be substituted. In any case all anomalies or movements shall be recorded and appropriate actions taken (see Note). Ordinary maintenance of all steel parts shall be done, as needed.
12	Yard and access roads	Visual check of status of the access road and relevant cut or embankments. Visual check of status of the yard and relevant works (gates, nets, protection walls, barriers, architectural elements)	Every year, preferably after rainy season Always after very heavy rainfall or flood or earthquake event occurred.	In case of major instability phenomena are observed, they shall be monitored, documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see Note). Along the road eventual obstructions of ditches, pits, pipes shall be removed by a periodic cleaning. On roads and yards ordinary maintenance of all steel and concrete parts (gates, nets, protection walls, barriers) shall be done, as needed, and repaired if and when necessary.
13	Tailrace Hole	It is requested, in dry season, the visual check of status of the tailrace hole (for the portion outside the water) and relevant sustaining structures (walls, supports, etc.). It is recommended a check of the bathymetry along the tailrace hole in front of the draft tube. This check is to be done preferably in dry season and preferably in the moment of turbines stop.	First time 1 wet season after Plant commissioning, than every 2 years. After 5 years, every five years. Always after very heavy rainfall or flood event occurred.	In case of major instability phenomena are observed, they shall be monitored, documented and reported in all details, where possible quantifying the extension of the damage in a dedicated spreadsheet, in relevant drawings and by a set of photos. Than appropriate actions taken (see Note). Damages to the protections shall be repaired as soon as possible. The bathymetry shall be compared with the tailrace hole geometry indicated in design drawings and in as built drawings. In case of significant (more than 1m in elevation) end extended differences in respect to the design profile, or in case of obstruction of the draft tube outlet, the actual profile shall be duly recorded and reported, quantifying the extension of the damage in

				relevant drawings and by a set of photos if possible. Than appropriate actions taken (see Notes).

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.

Table 21 - Principal aspects and actions required for the Power House maintenance plan

D.3.11SWITCHYARD MAINTENANCE

What follows is referred to one yard but applies for both left and right Power Plants.

The general rules for maintenance needed for the CIVIL WORKS at Switchyard are resumed in the following table.

As far as the prescriptions for the civil works regarding the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported again in the following table.

Operation and maintenance of electromechanical equipment and of all towers are described in relevant EM equipment operation manuals.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Concrete structures	Visual control and inspection of exposed concrete surfaces, relevant to: • EM equipment foundation blocks, • Cable trenches • control building • Water tank • Drain system structures (pits, ditches, dissipating structures)	Every year	See NOTE 3). The first prescription about civil work regards the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, for which it shall be applied the prescriptions that are provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter 0 " DAM CIVIL WORKS", to which reference shall be made (they are not reported again here).

2	Control building and switchyard area finishing and architecture	Visual inspection of all the architectural and finishing elements of the building and of the yard, such as: Fence, illumination posts, illumination system and lamps, windows, doors, pavements, paintings, access roads, external yard finishing, pedestrian walks, gutters, guardian box, fountain. The inspection shall be carried out by skilled people, able to identify possible defects that may require ordinary or extraordinary maintenance works.	First time, 1 year after impounding, then every 5 years	See NOTE 3). Possible wearing out, damages or defects on architectural elements shall be recorded and appropriate actions prospected to the Plant Owner for his action (see Note). Ordinary maintenance of fence, roads, illumination system and ancillary works shall be done, as needed.
3	Sewage system	Sewage treatment is made in the septic tank, located near the control building. In the bottom of the septic tank, the solid particles will sedimentate. When the level of the solids reaches half height of the tank, the solids must be pumped out. Following the first emptying, it is possible to define better the required emptying time, according to the supplier operation manual. Periodical visual inspection of the tank level is therefore required.	In the first year: every three months. After the first year, to be defined according to the results of the first inspections.	Pumping out of the solids by means of portable pump.
4	Control building water system	Visual inspection of all the water system (tanks, pipes, pipelines, valves, roof gutters, taps and all fittings) inside and outside the Switchyard building. Water system is described in relevant report. Test of functioning of all pumps located in the lower tank chamber. Check of potabilizer. Check of the air chamber of the pump inside the tank, according to the operation manual of the pump supplier. All these checks shall be of visual type, made by a qualified plumber.	1 year, preferably after the rainy season Differently only in case specific defects or leaks on the hydraulic system are observed.	Possible filtration, damages or cracks on tank structure shall be recorded and appropriate actions taken (see Note and see operation 1 above). Exposed reinforcement bars shall be treated as indicated at point 1. On off and functioning tests on all pumps, according to the relevant supplier operation and maintenance manual. Every year lamps of UV potabilizer device (if present) and filters must be changed. Ordinary maintenance and cleaning of pipes, pipelines, valves, roof gutters, taps and all fittings to be done periodically, as needed.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.

Table 22 - Principal aspects and actions required for the Switchyard maintenance plan

D.3.12ACCESS ROADS MAINTENANCE

Here below are resumed the main guidelines and actions required for the maintenance plan relevant to the ACCESS ROADS pertaining to the site of Batoka.

For the main (asphalted or paved) roads reaching the site, the maintenance and operation activities shall be undertaken by the national roads authorities (by Zambia and Zimbabwe, as far as their territory of competence) in the frame of their regulations and procedures.

Pr	Civil Feature	Description of check of performance indicators	frequency	Maintenance Actions - Remarks
1	Site access roads stability	Visual check of: • status of shotcrete, bolts, drainages and drain ditches foreseen on benches • potential instable wedges. • Signal of movement or slides of slopes. • Debris accumulation on benches or drain ditches. • Check of possible crack openings or fissures or deterioration of concrete surfaces. In case of continuous flow of water is observed coming out from drainage holes, the flow shall be monitored (quantifying the flow and reporting it on a spreadsheet).	Yearly, preferably at the end of rainy season. Additionally in case of an exceptional heavy rain or earthquake event.	Any anomaly shall be duly recorded and signalled. Deeper checks (and check of possible dependence from meteo conditions) to be prescribed on case by case basis. If sliding phenomena or cracks opening are observed, they shall be monitored and, if necessary, slope stabilization measures reconsidered (see NOTES). In case of instable wedges to be scaled, the scaling shall be done by skilled people. Extended areas of damaged shotcrete shall be cleaned and repaired. Damaged bolts shall be replaced. Accumulation of debris on roads or accessible benches or any obstruction of drain ditches or pipes shall be removed. Than a specialist designer shall be consulted. Ordinary maintenance and cleaning of the drain ditches, as needed.
3	Kerb, parapets, masonry protection walls, retaining walls, concrete paving or ramps	Visual check of good status of the concrete surface, including check of: • Presence of fissures or cracks; • Detachment of finishing concrete layers • Damages (erosion, holes, cracks) on concrete surfaces	In case of Power Waterways dewatering.	See NOTE 3). Any anomaly shall be duly recorded and signalled, possibly associated with measures of meteo conditions (see NOTES). Repairing intervention, if needed shall be properly designed and conducted by skilled people, in safe conditions.

NOTES:
1) In case of results or controls evidenced anomalies or problems, the measures shall be repeated for check, and then, if confirmed, the Plant Management direction shall be immediately informed and Direction involved in the dam safety consulted. According to the case the designer or a specialist consultant shall be consulted.
2) All operations shall be done by skilled personnel, instructed and authorised by the Plant owner for the operation required.
3) For check of concrete surfaces and of the status of the building and their finishing, the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing" in table reported in chapter D.3.2 shall be applied.

Table 23 - Principal aspects and actions required for the Access Roads maintenance plan

The ordinary frequent maintenance operation is essential to maintain functional the access to the site.

This continuous maintenance operation shall be not neglected or considered as secondary, to maintain efficient the roads, and resources and planning for such activity shall be organized by the PMS.

D.3.13PERMANENT CAMP

What follows is referred to one camp but applies for both left and right Power Plants.

For the PERMANENT CAMPS maintenance, the following general instructions apply.

As far as the prescriptions for the civil works regarding the check of concrete surfaces, of the reinforced concrete structures and of the status of the building and their finishing, reference should be made to the prescriptions provided in Pr.6 "Concrete surfaces" and Pr.7 "Control building, access buildings civil works and dam crest finishing " in table reported in chapter D.3.2, which are not reported here again.

General prescriptions for roads maintenance described in previous chapter D.3.12 "ACCESS ROADS" are valid.

General prescriptions for maintenance of excavation fronts and local supports of excavation and backfilled areas as described at point 9 of table reported in chapter D.3.10 are valid.

The size of the camp, its facilities and schemes of its services (water and power supply) are described in relevant drawings of Feasibility Design, and are assumed will be detailed in further steps of the design.

For the detailed instructions of operation and maintenance of the houses, the services systems (water, sewage, electric, ventilations or air conditioning, fire-fighting systems) pertaining to the houses and to the common spaces (canteen, pool, guardian room, etc.) dedicated specific manuals or instructions will be provided out of this report for the perusal of the staff charged to conduct and maintain the camp, when the detailed design will be produced.

It remains a key and essential factor for the proper use and long life of the permanent camp, the ordinary frequent maintenance operation of indoor and outdoor spaces (included the green areas).

This continuous maintenance and ordinary curing operation shall be not neglected or considered as secondary, to maintain efficient the camp, and resources and planning for such activity shall be organized by the PMS.

D.3.14HYDRAULIC DEVICES AND MAIN CONTROL EQUIPMENT MAINTENANCE

GENERAL

The operations and maintenance manuals relevant to the Electro mechanical (EM) and Hydraulic steel structure (HSS) equipment will be provided by the EM and HSS equipment suppliers.

Mechanical and electrical equipment require appropriate maintenance and testing. Gates, lifting equipment and power supplies should be continuously maintained during frequent inspections and minor maintenance works.
The ultimate aim of the maintenance activities is to ensure that the plant is capable of reliably performing its operational functions with no forced outages and at the minimum maintenance cost. The equipment must always be in good working order and be capable of both normal and emergency operation.

In this chapter guidelines for mechanical and electrical equipment main testing and maintenance operation are provided because they are of utmost importance being most of these equipments essential for the safe operation of the plant.

The maintenance of all such equipment shall be carried out in any case according to the detailed instruction provided in their relevant manuals that will prevail in case of conflict with the general instructions here reported.

What follows can be adjusted or modified or updated as needed with the development of the detailed design and of the construction.

TIME BASED TESTING, INSPECTION AND MAINTENANCE

Here below there is provided a table indicating the type and frequency of tests that are envisaged to be conducted for all the important equipment of the plant, in order to be sure that they function properly when their use is needed.
It is essential to document thoroughly the measured results and to identify any declining trend of any component of the plant.

The guidelines provided in the table are grouped where possible for the following Type of Equipment:

A) EMERGENCY POWER SUPPLY SYSTEM

- ✓ Diesel generators for Emergency Power Supply

B) HYDRAULIC GATES

- ✓ Spillway radial gates (with oleo-dynamic unit)
- ✓ Middle Outlet downstream gates (with oleo-dynamic unit)
- ✓ Power House draft tube gates (with oleo-dynamic unit)
- ✓ Middle Outlet upstream gates

- ✓ Power Tunnel upstream gates

C) STOPLOGS

- ✓ Spillway stoplogs
- ✓ Power House draft tube stoplogs

D) VALVES

- ✓ Power House Main Inlet Valves
- ✓ Power House ecological discharge pipe guard valves
- ✓ Power House ecological discharge valve
- ✓ Power House hydraulic system pipes and tanks valves
- ✓ Transformers oil-water discharge system pipes and tanks valves

E) CRANES

- ✓ Dam crest crane (for Spillway and Middle Outlet upstream gate)
- ✓ Power Waterways Intake Gates monorail crane
- ✓ Power House main crane
- ✓ Power House auxiliary crane
- ✓ Power House Erection Bay gantry crane
- ✓ Power House stoplogs gantry crane
- ✓ Power House internal monorail crane (for draft tube gates lifting)

F) HOISTS

- ✓ Power House drain system pumps hoists
- ✓ Power House diesel generator building hoist (for transformers)
- ✓ Power Waterways Intake Gates hoists
- ✓ Power Waterways Intake Gates control room hoist (for pumps)
- ✓ Dam Pumping system pits hoists
- ✓ Dam diesel generator building hoist (for transformers)
- ✓ Switchyard control building hoist (for transformers)
- ✓ Penstocks man-hole chambers hoist

G) LIFTS

- ✓ Power House lifts
- ✓ Dam cable duct lift

H) PUMPS

- ✓ Dam drainage pumping system
- ✓ Power House drainage pumping system
- ✓ Power House fire fighting and service water system pumps

HYDRAULIC DEVICES AND MAIN CONTROL EQUIPMENT MAINTENANCE				
Maintenance Category	**Type of Equipment**	**Check Activity**	**Frequency (*)**	**Description of the tasks**
Testing (*)	EMERGENCY POWER SUPPLY SYSTEM	Start, Load, Stop	Monthly	Verify start reliability of diesel generator on loss of normal power supply and lubrication oil pressure, generating set vibration, fire valve status. Ensure batteries are fully charged. After use check and refill if necessary gasoil in the tanks.
	HYDRAULIC GATES (with their Hoisting devices)	Opening/ Closing fully Partial in case of drought	Yearly	Test operate gates and record motor currents, gate positions and time during gate operation. Use normal and emergency power supply. Record power absorbed by relevant motor and lifting/closing times. Check gate and valve operation throughout the full gate and valve opening and closing stroke. If necessary gate position re-calibration and testing. Check for foreign noises and smells from motors and control equipment.
	HYDRAULIC GATES (with their Hoisting devices)	Non-destructive testing of gate hoists	5 yearly	Testing of ropes, equipment attachment points
Testing (continue)	STOPLOGS	Opening/ Closing fully	2 yearly	Test operate stoplogs, gate positions and time for their installation. Use normal and emergency power supply for their lifting. Record power absorbed by electric motor and lifting/closing times.
	VALVES	Opening/ Closing fully Partial in case of drought	Yearly	Use normal and emergency power supply. Record pressure of hydraulic servomotors, or power absorbed by electric motors and opening/closing times. Check setting of hydraulic set relief valve. Check possible leakage of water through the closed valve.

	CRANES and LIFTS	Non-destructive testing	5 yearly	Testing of ropes, equipment attachment points. Test the movement of the main crane and its hoist for all possible configuration and extension, with and without applied loads. Test operate crane or lifts and record motor currents, positions and time during operation. Use normal and emergency power supply. Record power absorbed by relevant motor and lifting/closing times. If necessary crane rail alignment re-calibration and testing. Check for foreign noises and smells from motors and control equipment.
	HOISTS	Non-destructive testing	5 yearly	Testing of ropes, equipment attachment points. Test the movement of the monorail crane and its hoist for all possible configuration and extension, with and without applied maximum nominal load.
	PUMPS	Start, Load, Stop	2 monthly	Verify start reliability and functionality for the set levels of functioning, check proper functioning in relation of relevant control and floating system in the pits.
	General (as far as applicable to all type of equipment)	Opening/ Closing fully	Yearly	Inspect controls indications, sirens and warning lights as applicable. Water level sensor re-calibration and testing.
Inspection	General (as far as applicable to all type of equipment)	Visual inspections and Checks	Monthly	Check for any anomalies, hazards or security risks. Check all lubrication and top-up lubricants as required. Check gates and valves hydraulic system oil levels.
	EMERGENCY POWER SUPPLY	Close examination of diesel generator set conditions, replace air and oil filters	Six monthly	Verify coolant, motor heating, fuel supply, battery charge. Check tension of driving belts. Check electrical auxiliaries. Check all alarms and shutdown switches.
	HYDRAULIC GATES (with their Hoisting devices)	Visual examination of gates, seals, guide pads, steel ropes, screws, winch, brakes, contactors.	Six monthly	Check any wear and tear; measure vibration, motor electric insulation resistance. Examine ropes for broken strands, crushing, kinking. Examine gear train. Inspect paint and check any corrosion. Check gearbox oil level. Check brakes lining. Check gate lifting limit switches.

	VALVES and their Actuators	Visual examination of valve seal, sliding guides, leakage.	Six monthly	Check wear and tear, paint, and water leakage. Check hydraulic set leakages and re-pumping time. Verify accuracy of their position indication instruments.
	CRANES	Visual examination of wheels, guide pads, steel ropes, screws, winch, brakes, contactors.	Six monthly	Verify mechanisms, check tension of driving belts. Check electrical auxiliaries. Check brakes and control devices. Check all alarms and shutdown switches.
	STOPLOGS	Visual examination of seals and sliding guides	5 yearly	Check wear and tear and paint. Check status of sealing elements.
	PUMPS	Visual examination of pumps and relevant guides and pipes	5 yearly	Check wear and tear and paint. Check status of sealing elements, check status of anchorage and bolts.
Maintenance	EMERGENCY POWER SUPPLY SYSTEM (**), GATES, VALVES, CRANES, HOISTS, LIFTS, PUMPS	General maintenance	Monthly/ Annually	As per supplier's O&M recommendations (Grease bearings, check for hydraulic system oil leaks, motor contactors, brake solenoid, brake pads, gate seals, gate guide pads and all other recommended tasks). Re-order any spares. (**)
	CRANES, HOISTS and LIFTS	Check lubrication of moving parts of hoists and winch units	Monthly	Grease moving parts as required. Other actions as per supplier's O&M recommendations
	General (as far as applicable)	General safety checks	5 yearly	Check condition of all handrails, ladders and other equipment critical for personnel safety
	General	Updating of documentation	Annually	Ensure operating procedures, emergency planning and contact documentation and other relevant reference documentation is up to date.

Table 24 - Hydraulic devices and main control equipment maintenance

(*) At Batoka it is likely that some valves or gates or cranes will be frequently operated under flow, in which case the corresponding formal tests may not be required. However, it needs to be ensured that the observation and data recording requirements described in the table above are met, and that at least some of these valve operations are carried out via the emergency diesel power supply.

(**) Maintenance tasks and frequency for the emergency diesel generator should be based on the diesel generator supplier's O&M manuals. As a minimum the following checks and appropriate follow-up actions would be expected:

- Walk around visual inspection;
- Check engine oil and coolant levels;
- Check fuel level;
- Check fan belt tensions;
- Check hoses for loose connections or deterioration;
- Check battery connections for corrosion and check battery electrolyte;
- Check dust and oil build-up, oil leaks and fuel leaks;
- Check and empty bunding;
- Check all system protection by simulating a fault;
- Check all battery caps as applicable;
- Tighten all electrical connections and exhaust connections;
- Change oil and filters;
- Start the diesel motor and check gauges and meters are working correctly;
- Run on load bank for 30 minutes.

GENERAL GUIDELINES FOR EQUIPMENT CONDITION MONITORING

Condition assessment of equipment and condition-based maintenance are the two fundamental aspects of predictive maintenance which is aimed at carrying out maintenance activities only when the decline of equipment performance reaches a predefined level, thereby minimizing both the predictive maintenance and the occurrence of equipment malfunction.

Condition monitoring and condition-based maintenance guidelines are described below.

- TESTING OF ELECTRIC MOTORS AND DATA LOGGING

  The following data should be recorded during all testing of electric motors:
  - Date and time;
  - Name of operator carrying out the test;
  - Gate position;
  - Motor current and voltage.

  All test data should be analysed by suitably qualified personnel and compared against previous results to check for any changes in performance. The results shall be reported appropriately and any necessary corrective maintenance actions shall be undertaken.

- INSPECTION AND DATA-LOGGING OF GATE, VALVE AND LIFTING EQUIPMENT OPERATION

  It is essential that from time to time gate, penstock inlet valve and lifting equipment operation is recorded and observed by suitably qualified and experienced personnel. In addition to an assessment of gate and valve opening and closing times, the observations should include gate sealing and seating characteristics, gate vibration, noise or any other signs of distress.

- INSPECTION OF COATING SYSTEMS

  The life of hydraulic gates, bulkheads and associated lifting equipment can be extended significantly if their coating systems are monitored and maintained in good condition. Generally coating systems for such applications have a life expectancy of 20 to 40 years, depending on coating technique and quality of the paint system. In addition, life expectancy largely depends on environmental factors and the life may be significantly reduced in presence of sand erosion that cannot be excluded at Batoka Dam site. Frequent repairs to the coating systems are likely to be required to prevent corrosion from affecting the structural integrity of the gates.

- MAJOR REFURBISHMENT OR REPLACEMENT

  End-of-life is considered to be the point at which either major component replacement or refurbishment is required. Typically gate refurbishment will involve gate removal, sand-blasting and re-painting, seal replacement, repair or replacement of gate rollers and/or gate roller bushes and repair work to the embedded steel work in the gate slot. Repair or replacement of components of the lifting system will be carried out as required at the same time.

D.4 TYPICAL FORMAT FOR INSPECTION CHECK SHEET

Hereinafter is provided the typical format for inspection check sheet.

BATOKA PLANT - ISPECTION CHECKLIST

Inspection	Comment
Inspector (name)	
Date and Timing	Date: Inspection start time: Inspection finish time:
Reservoir (or river (1)) Level	_____m a.s.l.
Flow discharged (1)	_____m^3/s
Conditions	Sunny / Overcast / Raining / Windy / Storm / Flood / Earthquake
Rainfall over past week	High / medium / low _____mm (if available)

(1) = only if applicable, depending on where the inspection is conducted.

Checklist n. / (a)	**WORK:** (b)					
Operation /Civil Feature	Aspect inspected / Performance Indicator	Observed		Significance (f)		
		Yes	No	Minor	Moderate	High
(c)	(d)	(e)		(f)		
Comments	(e)					
(c)	(d)	(e)		(f)		
Comments	(e)					

(a) = insert the progressive number and date
(b) = insert the part of the work checked (for instance "BRIDGE")
(c) = insert the civil feature/operation, taking the description from the table reported in this report at the chapter corresponding to the work under check (for instance "Bearings periodic check", or adding other description as far as needed or appropriate.
(d) = insert the description of the performance indicator or the aspect inspected (one per line), taking the description from the corresponding column in the table reported in this report at the chapter corresponding to the work under check (for instance "Absence of movement or anomalous deformations"), or adding other description as far as needed or appropriate.
(e) = insert the observation of presence or not of the performance indicator (Place a ✓ in the appropriate box), and/or if necessary qualifying the observation in the box of the comments. Add if necessary comments on any abnormal or changed conditions.
(f) = qualify the performance indicator as follows:
Minor = The performance indicator observed but does not require maintenance.
Moderate = The performance indicator observed and requires action to remediate.
High = Prompt action should be taken to address the issue

Signature: _____ Date:_____

(Inspector)

Other lines can be added to this format as far as needed.

PART E - EMERGENCY PREPAREDNESS PLAN (Framework Plan)

E.1 INTRODUCTION

E.1.1 CONTENT AND STRUCTURE OF THIS PART

This is the **PART E "EMERGENCY PREPAREDNESS PLAN (Framework Plan)"** of the Batoka Dam Safety Plan. This part contains the Batoka Emergency Preparedness Plan (Framework Plan) that includes:

- description of types of emergencies and how to identify them,
- actions to take in an emergency.
- preparedness and Emergency Response
- Dam Break analysis

Based on this framework, the Emergency Preparedness Plan will be prepared during implementation of the project, in compliance with WB guidelines (OP 4.37), not later than one year before the initial filling of the reservoir.

This part of the report is divided in the following chapters:

1) FOREWORD
   Describes the content of the report and its structure.

2) STRUCTURE AND REVIEW OF THE PLAN
   It outlines the structure and the purpose of the plan, the needs for its review and for its implementation in details, and the principles on which is based.

3) EMERGENCY CASES
   This chapter provides a synthetic description of the type of emergencies.

4) INITIATION OF THE EMERGENCY ACTION PLAN
   This chapter describes how to identify and evaluate an emergency case.

5) EMERGENCY RESPONSE AND ACTION PLANS
   This chapter provides a description of the initial response and emergency inspections to be carried out in case of need, and the typical emergency action plans identified for this project.

6) EMERGENCY PREPAREDNESS PLAN
   This chapter provides the plan and procedure for emergency preparedness.

7) CONTINGENCY PLAN

This chapter illustrates how to manage exceptional cases having impact on the safety of the people and of the structures, and relevant alarms triggering.

8) DAM BREAK ANALYSIS

This chapter illustrates the results of the hydraulic calculation to identify the flooded areas in case of dam break. The evaluated scenario foresees the incoming of an extreme climate event meteorological event, which causes dam overtopping and presents the study of the flood propagation for a river stretch of approximately 120 km length, along the Zambezi river, from the Batoka dam up to the Lake Kariba.

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E.2 STRUCTURE AND REVIEW OF THE PLAN

E.2.1 GENERAL

This Emergency Preparedness Plan (Framework Plan) for Batoka Plant has the purpose to limit possible damage to the dam and appurtenant structures and also areas downstream and prevent loss of life by guiding personnel on what to do, when and how.

This document sets out the guidelines to:

- define, identify and evaluate events with the potential to compromise the dam and appurtenant structure safety.
- Establish procedures for declaring an event as a dam safety emergency.
- Detail actions to be taken in response to the dam safety emergency (through Emergency Action Plans (EAP).
- Establish communications to minimise the consequences of the dam safety emergency.

It shall be integrated and detailed by the PMS that will be in charge to organize and implement it.

This document presents procedures for Emergency Action Plans (EAP) for the dam site.
Response plans for areas outside Batoka site will be developed separately by the Local Authorities.

This plan must be completed to reflect final design, actual conditions on site, and afterwards shall be reviewed and updated:

- on completion of the Plant Construction
- During operation:
    - When any significant change to the scheme occurs, including any changes to the operating rules of the Plant.
    - At intervals of 5 years.
    - Following any ownership change.

E.2.2 PRINCIPLES

The following principles underlie the emergency actions for all dam safety emergencies:

- **PERSONNEL SAFETY** must be considered **FIRST** at all times;
- The primary defence if a dam failure scenario is developing or if the dam is seriously damaged, is to **LOWER THE RESERVOIR LEVEL**. This is achieved by opening outflow controls;
- If a serious leak occurs in the Power Waterways or Power House, or they are seriously damaged, then **CLOSE THE POWER WATERWAYS GATES** to stop the water source.

This EPP assumes that the Plant is manned full time, 24 hours a day, 7 day a week, and that the dam site is occupied and managed by a full time PMS Operator working and connected with the Owner(s) of the Plant.

It is assumed that for the life of the dam the PMS/Owner(s) is responsible for ensuring that appropriate measures are taken and sufficient resources provided for the safety of the dam.

E.3 EMERGENCY CASES

E.3.1 TYPE OF EMERGENCIES and RESPONSE LEVEL MATRIX

A Dam Safety Emergency is an event that has the potential of endangering the integrity of the dam or appurtenant structures, and therefore requires immediate action.

The hazard events identified at Batoka Plant and the associated response levels are described in the following table that shall be used to initiate emergency action plan.

Some further clarifications and descriptions are given in next paragraphs, in sake of completeness.

RESPONSE LEVEL	TYPE OF EVENT								
	1a	1b	2	3	4	5	6	7	8
	Excessive leakage through dam	**Excessive uplift pressures or excessive seepage/piping through dam foundations**	**Excessive leakage through power waterways or abutments**	**Earthquake**	**Structural failure of devices for water control (Middle Level Outlet, Spillway, Power Waterways, Power Houses, River diversion plug)**	**Gate failure/ power loss/ equipment failure/ fire**	**Excessive plunge pool scouring endangering dam foundations**	**Extreme weather warning**	**Sabotage/ accident**
Internal Alert Situation can be managed internally. Outside notification NOT required	Excessive leaks through dam. Movement of a portion of dam body along horizontal RCC surface detected through monitoring of pendula, deformometers or joint meters. Dam drains and/or piezometers or displacements monitoring passes from "routine" to "alert" criteria.	Excessive leaks recorded through dam drains intercepting foundations. Movement or displacements of a portion of dam body detected through monitoring of pendula, deformometers or joint meters. Ground aquifer level and/or flow trend start to raise independently from reservoir fluctuations. Dam foundation drains and/or piezometers monitoring passes from "routine" to "alert" criteria.	Excessive leaks through power waterways drainage system. Dam drains and/or piezometers or displacements monitoring passes from "routine" to "alert" criteria.	Earthquake less than OBE recorded through dedicated instruments.	Excessive leaks detected through available drains (MLO drains, Spillway underdrain drains, Power Waterways drain system, Power Houses drain pumping system). Local drains monitoring system passing from "routine" to "alert" conditions.	Failure of spillway gates or MLO gates, or Power Waterways gates or Power House gates, or relevant power/control systems.	Anomalous scouring recorded through specific bathimetric check after exceptional flood event or after exceptionally prolonged use of spillway/middle Level outlets. Movement or displacements of a portion of dam body detected through monitoring of pendula, deformometers or joint meters. Dam foundation drains and/or piezometers monitoring passes from "routine" to "alert" criteria.	Heavy rain forcast. Reservoir level records above Maximum Operating Level. Reservoir levels monitoring passes from "routine" to "alert" criteria.	Any incident of threat of attack
Response Level I Conditions might lead to downstream flooding. Outside notification required	Increasing rate of excessive leaks. Increasing rate of dam displacements or movements. Visible cracks in dam galleries or dam body.	Increasing rate of excessive leaks through foundation drains. Heavy seepage carrying fines detected through piezometers and dam foundation drains. Ground aquifer level and/or flow trend raising independently from reservoir fluctuations. Visible movements or cracks in the dam body. Anomalous displacements recorded through invert pendula or dam deformometers.	Increasing rate of excessive leaks through left abutment drain system. Seepage carrying fines detected through left abutment piezometers and drains. Groundwater level and/or drain flow trend raising independently from reservoir fluctuations. Visible incipient movements or cracks development in the dam abutments. Abrupt change in Power House(s) generating units performance independently from the operator of the plant (like about reduction of turbined flow, turbine stop, energy production abrupt decrease)	Earthquake greater than OBE recorded through dedicated instruments. Felt by all. People and animals are alarmed, and many run outside. Furniture moves, and objects fall from walls and shelves. Damage to buildings.	Increasing rate of excessive leaks through local drain system. Seepage carrying fines detected through drains. Visible incipient movements or cracks development in visible portions of the works (Visible signs of structural failures of Intake Tower, or Middle Level Outlet, or gate shaft, surge shaft, spillway piers or chute). Abrupt change in hydraulic device performance independently from the operator of the plant (like about reduction or variation of discharged flow) Excessive leaks through river diversion tunnels (through visual detection, if possible, considering they will be often submerged).	Spillway or MLO or Power Waterways gates unable to work in conjunction with possible flood events. Reservoir level trend raising above the maximum Operating Level.	Scouring in the plunge pool attaining dam downstream toe exceeding depth corresponding to dam foundation bottom gallery level (not instrument available, specific monitoring check to be conducted if necessary). Visible movements or cracks in the dam body. Anomalous or abrupt displacements recorded through invert pendula or dam deformometers.	Heavy rain forcast. Reservoir level records above Maximum Operating Level, but below dam crest level. Reservoir level trend raising. Spillway and Middle Level Outlets already fully opened or out of operation.	Attack that threatens the integrity of the dam or spillway or Power Waterways
Response Level II Prepare for evacuation	Drained flow in lower galleries approaches the pumps capacity limits . Leaks appears on dam downstream face through RCC horizontal lifts joints. Uncontrolled movements of portions of dam	Dam foundation subject to uncontrolled seepage or piping or displacements along main joints of the rock develops a major uncontrolled outflow or source of evident movements of the dam (or of a portion of it)	Abutment(s) rock subject to uncontrolled leaks, developing major uncontrolled outflow or source of evident movements of the rock wedges, power tunnel lining or dam body (or of a portion of it)	Instability of dam resulting from earthquake (centrifugal abrupt displacements or movements recorded through pendula, deformometers and joint meters. Visible Cracks on dam body, strong increase of leaks through dam drains)	Left or right abutments subject to uncontrolled leaks, developing major uncontrolled outflow or source of evident movements of the rock wedges, power tunnels linings or dam body (or of a portion of it). Middle Level Outlet structures subject to uncontrolled leaks or movements. Spillway structure subject to uncontrolled leaks or movements affecting the dam crest and/or its retention capacity Reservoir level trend raising, predicted to exceed dam crest level.	Spillway or MLO or Power Waterways gates unable to work in conjunction with possible flood events. Reservoir level trend raising, predicted to exceed dam crest level.	Dam foundation at downstream toe subject to uncontrolled scouring or displacements along main joints of the rock developing a major uncontrolled source of evident movements of the dam (or of a portion of it)	Reservoir level trend raising, predicted to exceed dam crest level.	As above
Response Level III Evacuation is necessary	Dam collapse imminent	Dam collapse imminent	Dam or power waterways or abutments rock collapse imminent	Integrity of dam visibly jeopardized by earthquake	Dam or power waterways or abutments rock collapse imminent. River diversion plugs failure imminent. Dam overtopping imminent.	Dam overtopping imminent	Dam collapse imminent	Dam overtopping imminent	As above

Table 25 – Response Level matrix

E.3.2 TYPE OF EMERGENCIES

A Dam Safety Emergency is an event that has the potential of endangering the integrity of the dam or appurtenant structures, and therefore requires immediate action.

A national civil emergency is an event that has been declared either a state of local emergency or a state of national emergency by one of these institutions:

- ZRA,
- a Zambian Provincial Authority
- a Zambian Government Minister
- a Zimbabwean Provincial Authority
- a Zimbabwean Government Minister

A national civil emergency may occur due to an extreme flood which the Batoka Dam Project passes without incident.

There are substantially three categories of Dam Safety Emergencies:

- Internal Emergencies:
- Developing Emergencies:
- Imminent Emergencies.

Internal Emergency is when there is no danger of a dam failure, but flooding is expected to occur downstream. It can be dealt with internally by the operators of the PMS at Batoka Plant and no outside notifications are required.
The response level for this category of emergency is called "Internal Alert".
Developing Emergency is used when a potential dam failure situation is developing. It occurs only when there is some time still available for further analysis/decision s or corrective measures before uncontrolled release of water. The dam condition may be deteriorating but it is not judged likely to fail within hours. Notification to third parties is required.
The response level for this category of emergency is called "Response Level I".
Imminent Emergency is used when failure of the dam is considered imminent or has occurred.
It is when "time has run out" - a failure has either occurred is occurring or about to occur. This condition is declared when there is no longer any time available to attempt corrective measures to prevent failure. The dam has or is in the process of failing or is expected to fail within hours rather than days. Immediate notification to third parties is required.
Within this category of emergency falls the "Response Level II", for the evacuation preparation, and the "Response Level III" for evacuation.

The response levels for the hazard events identified (also described in next chapter) at Batoka Plant are described in the Response Level Matrix above.

E.4 INITIATION OF THE EMERGENCY ACTION PLANS

E.4.1 HAZARD CONTEXT

A dam hazard is an issue or event that has the potential to impact on the safety of the dam and the consequences downstream that the dam might influence. A hazard may be a natural event such as an earthquake, a structural problem, or an operational issue such as sudden changes of water discharge.

The hazard events relevant to Batoka are identified as follows:

- Important leakages through dam and its foundations
- Important leakages through power waterways
- Earthquake event
- Water control devices structural failure
- Gate malfunction, equipment failure, loss of power supply, fire
- Excessive plunge pool scouring endangering dam foundations
- Extreme weather warning (Rainfall / major flood event)
- sabotage

Events that would initiate the emergency action plan are summarised in *Table 25 – Response Level matrix*.

E.3.1 EMERGENCY IDENTIFICATION AND EVALUATION

Emergencies that may develop into a Dam Safety Emergency are by nature unpredictable.
This means that the response to incidents cannot be prescribed in detail. However, once an incident has occurred it can be assessed and actions taken to control and mitigate consequences by following pre-established procedures.

The initial notification of an incident that may develop into a Dam Safety Emergency may come from a number of sources:

- Regional event (e.g. earthquake, flood) recorded by national or local authorities,
- Observation by a Batoka Plant PMS staff member on site,
- Values read from monitoring site instruments by Batoka PMS staff.
- Observations by PMS operators.

In all cases actions should be based on:

1. Secure your own safety.
2. Alert others in the immediate area.

3. Notify the PMS and the Owner(s), if the case, and advise location, seriousness and nature of emergency event.

On receiving notification of an incident, the PMS Operator assesses the seriousness of the incident. If the incident qualifies as an emergency, the PMS Operator will contact the PMS structure and the Owner(s) structure to cooperate in emergency management.

The PMS shall identify clearly the roles and responsibilities of those involved in emergency management. Some emergency events may require national government resources for assistance.
Contacts for notifications shall be reported in the formats provided at the end of this report, that shall be duly filled and always be updated by the PMS since the beginning of his work.

The PMS shall then develop, within its structure and the Plant Owner structure, specific flow charts for the notification process for the different cases of Imminent Emergencies notification and Developing Emergencies notification, as well as for the internal notifications applicable to an Internal Emergency.

In the redaction of such flow charts, the following general progressive steps (as far as necessary) shall be followed:

1) Check threshold for emergency: *Table 25*.
2) Document the emergency (circumstantiating at least the type and the location).
3) Notify to PMS and Owner(s) deputed structures. Only in the case of an internal emergency that are unlikely to have an impact on the downstream areas, the notification to the local authorities can be omitted.
4) The appropriate PMS personnel shall provide advice and support, and implement, if the case, the relevant Action Plan.
5) Consult external advice and support, if the case.
   Whenever the emergency implies evaluations and actions out of the technical, political or decisional competence of the PMS personnel, external advice is required. As far as technical or dam safety matters are concerned, consultancy of qualified engineering advice shall be seek.

As far as the particular case of the seismic event, it is here recalled that the structure is located in a seismic region.
The Seismic Hazard assessment at feasibility design level is presented in dedicated report "320 SEI R SP 001 C - Seismic Hazard Assessment, February 2016", to which reference is made, from which the following PGA values have been retained for the design:

– 0.23 g		SEE (Safety Evaluation Earthquake)
– 0.08 g	RP = 475	DEAS (Design Earthquake for Appurtenant Structures)
– 0.05 g	RP = 145 y	OBE (Operating Basis Earthquake)

This assessment is assumed will be refined during the development of detailed design.

E.5 EMERGENCY RESPONSE AND ACTION PLANS

E.5.1 INITIAL RESPONSE AND EMERGENCY INSPECTIONS

The initial response by the PMS or Owner(s) departments that will be deputed to receive the notifications of the PMS staff operating on site, in the case of a notification of an emergency event, is to assess and confirm the extent of the emergency event to enable an appropriate course of action to be implemented.

The initial response may be a decision to immediately begin lowering the reservoir level.

If failure of the dam is considered not imminent, then the initial response will involve checking operational conditions. The Director of PMS will make immediate arrangements for site inspections to be carried out.

The purpose of the Emergency Inspection is to:

- Detect physical indicators of failure modes (Imminent or Potential Dam Failure):
- Detect physical indicators limiting/preventing drawdown functionality and capability.

Emergency Inspections shall be undertaken by Surveillance Inspectors in accordance with the appropriate Emergency Inspection Checklists reported in the next paragraph. The checklists define the observations to be made and reported to the Director of the PMS structure. The list provided for the checklists is a reference format that can be integrated by the PMS staff according to the need.

Despite the emergency inspection checklists is foreseen to be carried out as routine activity, it is illustrated below for sake of completeness. The observations gathered by the instruments monitoring and provided in the foreseen inspection reports shall be combined and correlated with the visual observations and records gathered by the emergency inspection.

E.3.2 EMERGENCY INSPECTIONS CHECKLISTS

The following pages provide the inspection checklists of the main works of the Plant. They can be integrated as appropriate by the PMS.

The observations of this check shall be always correlated and integrated with the check and data available from the dam instruments.

Dam (Sheet 1 of 2)			
Emergency Inspection Checklist			
Go to **Main Dam Left and Right Abutments** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Landslides in reservoir surrounds	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Dam upstream face	Damages or cracks in the visible part of dam u/s face	Y/N	
	Damages at Dam-rock contact	Y/N	
	Any **right** abutment damage, slides, sink holes, depressions, erosion etc.	Y/N	
	Any **left** abutment damage, slides, sink holes, depressions, erosion, etc	Y/N	
	Leaks inside dam galleries	Y/N	
	Leaks from Waterstop drains	Y/N	
	Is water line against upstream face a straight line?	Y/N	
Dam Crest	Any damage, cracks, depressions etc	Y/N	
Dam bottom	Leaks inside dam galleries and possible foundations seepage	Y/N	
Insert as far as of interest photographs of upstream area, right abutment and left abutment. The observations of this check shall be integrated with the check and data available from the dam instruments.			

Table 26 – EMERGENCY CHECKLIST 1 sheet 1 of 2 - Dam

Dam (Sheet 2 of 2)			
Emergency Inspection Checklist			
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Dam downstream face	Leaks through RCC	Y/N	
	Cracks on dam d/s face	Y/N	
	Damage or sign of movements or cracks at Dam- rock contact	Y/N	
	Any **right** abutment damage, slides, sink holes, depressions, erosion, water venues, signs of movements, etc.	Y/N	
	Any **left** abutment damage, slides, sink holes, depressions, erosion, water venues, signs of movements, etc.	Y/N	
	Seepage	Y/N	
Insert photo showing right abutment downstream detail	Insert photo showing downstream toe detail	Insert photo showing left abutment downstream detail	
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 27 – EMERGENCY CHECKLIST 1 sheet 2 of 2 - Dam

Spillway			
Emergency Inspection Checklist			
Go to **Spillway** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Landslides in the reservoir	Y/N	
	Clogging of spillway gates by trunks	Y/N	
	Recent floods occurred	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Spillway gates	Visible damages or blockage of gate/s	Y/N	
	Any damage or leaks or wetting in the gates concrete piers	Y/N	
	Any visible movement of a gate concrete pier	Y/N	
	Leaks from gate itself or evident damages to the oleodynamic unit	Y/N	
Spillway chutes	Damages or cracks or cavitation in the visible part of concrete	Y/N	
	Aerators clogged or damaged	Y/N	
Spillway drains	Any unusual or important leakages	Y/N	
Insert as far as of interest photographs. The observations of this check shall be integrated with the check and data available from the dam instruments.			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 28 – EMERGENCY CHECKLIST 2 - Spillway

Power Waterways (applicable for each power waterway)			
Emergency Inspection Checklist			
Go to **Power Waterways Drain Tunnels** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Landslides or instable wedges on left abutment downstream of dam	Y/N	
	Recent floods occurred	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Shotcrete Lining	Damages or cracks in the visible part of lining	Y/N	
	Any abutment damage, slides, sink holes, depressions, erosion, etc	Y/N	
	Leaks through fissures in rock or shotcrete (not from drain holes)	Y/N	
	Leaks from Watertight doors	Y/N	
Drains	Any unusual or important leakages	Y/N	
	Any drains obstruction or clogging	Y/N	
Insert as far as of interest photographs. The observations of this check shall be integrated with the check and data available from the dam instruments.			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 29 – EMERGENCY CHECKLIST 3 – Power Waterways

Gate Shafts Intakes (applicable for each power waterway)			
Emergency Inspection Checklist			
Go to **Gates shafts** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Landslides or instable wedges on left abutment downstream of dam	Y/N	
	Recent floods occurred	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Gate shaft	Visible damages or cracks or movement of the visible part of lining, including upper room	Y/N	
	Any abutment damage, slides, sink holes, depressions, erosion, etc	Y/N	
	Leaks through fissures in the shaft	Y/N	
Gates	Visible damages or blockage of gate/s	Y/N	
	Any blockage or problem to lifting devices	Y/N	
Insert as far as of interest photographs.			
The observations of this check shall be integrated with the check and data available from the dam instruments			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 30 – EMERGENCY CHECKLIST 4 – Gate Shafts (Intake)

Surge Shafts (applicable for each power waterway)			
Emergency Inspection Checklist			
Go to **Surge shafts** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Landslides or instable wedges on left abutment downstream of dam	Y/N	
	Recent floods occurred	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Surge shaft	Visible damages or cracks or movement of the visible part of lining, including upper structure	Y/N	
	Any abutment damage, slides, sink holes, depressions, erosion, instable wedges, leaks, etc	Y/N	
	Leaks through fissures in the shaft	Y/N	
	Any anomaly in functioning of turbines operation	Y/N	
Drains	Any unusual or important leakages through fissures in the surrounding rock or in drains	Y/N	
	Any drains obstruction or clogging	Y/N	
Insert as far as of interest photographs. The observations of this check shall be integrated with the check and data available from the dam instruments			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 31 – EMERGENCY CHECKLIST 5 – Surge Shafts

MIDDLE LEVEL OUTLETS and PLUNGE POOL			
Emergency Inspection Checklist			
Go to **MLOs and PLUNGE POOL** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Recent floods occurred	Y/N	
Plunge Pool	Landslides or instable wedges on plunge pool abutments	Y/N	
Middle Level Outlets	Odd or exceptional MLO operation event	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Plunge Pool	Visible damages or cracks or movement of the visible part of left abutment deflecting wall.	Y/N	
	Any front of excavation visible damages, slides, sink holes, erosion, instable wedges, leaks, shotcrete cracks, etc	Y/N	
	Scoured material invading and obstructing the PH tailrace	Y/N	
MLO	Blockage or serious visible damage of: Upstream gate Downstream gate Steel lining Downstream concrete block structure Protection slab at dam downstream toe Control room	Y/N	
	Visible damages to Control units or control cables of hydraulic devices	Y/N	
Insert as far as of interest photographs. The observations of this check shall be integrated with the check and data available from the dam instruments.			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 32 – EMERGENCY CHECKLIST 6 – MLO and Plunge Pool

Power House (applicable to each power house)			
Emergency Inspection Checklist			
Go to **Power House** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Recent floods occurred	Y/N	
Power House	Landslides or instable wedges on power house excavation front	Y/N	
	Odd or exceptional units operation	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Power House	Visible damages or cracks or movement of the visible part of structure, including external buildings	Y/N	
	Any front of excavation damage, slides, sink holes, erosion, instable wedges, leaks, etc	Y/N	
	Leaks through PH structure concrete	Y/N	
Hydraulic or control devices	Blockage or serious damage of: Generation unit Transformers MIVs Ecological Valves Draft tube gates Drain pumps Control room	Y/N	
	Visible damages to OHL transmission lines	Y/N	
Insert as far as of interest photographs. The observations of this check shall be integrated with the check and data available from the dam instruments.			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 33 – EMERGENCY CHECKLIST 7 – Power House

Instrumentation (applicable to each instrument)			
Emergency Inspection Checklist			
Go to **Power House** and compare condition with photographs			
Check		**Change Yes/No**	**Comments**
Reservoir	Reservoir level steady	Y/N	
	Unusual flow patterns	Y/N	
	Recent floods occurred	Y/N	
Power House	Landslides or instable wedges on power house excavation front	Y/N	
	Odd or exceptional units operation	Y/N	
Insert photograph of reservoir in normal condition			
Check		**Change Yes/No**	**Comments**
Power House	Visible damages or cracks or movement of the visible part of structure, including external buildings	Y/N	
	Any front of excavation damage, slides, sink holes, erosion, instable wedges, leaks, etc	Y/N	
	Leaks through PH structure concrete	Y/N	
Hydraulic or control devices	Blockage or serious damage of: Generation unit Transformers MIVs Ecological Valves Draft tube gates Drain pumps Control room	Y/N	
	Visible damages to OHL transmission lines	Y/N	
Insert as far as of interest photographs. The observations of this check shall be integrated with the check and data available from the dam instruments.			
Report to PMS general condition of dam and toe.			
Time and date of inspection:			
Inspector name:			
Received by PMS (date and time):		Operator Name:	
Notified to:	in date:	by:	

Table 34 – EMERGENCY CHECKLIST 8 – Instrumenation

E.5.2 EMERGENCY ACTION PLANS

The following principles underlie the emergency actions for all dam safety emergencies.

- **PERSONNEL SAFETY** must be considered **FIRST** at all times.

- The primary defence if failure of the Batoka Dam is developing or if the dam is seriously damaged, is to **LOWER THE RESERVOIR**. This is achieved by means of Spillway and/or Middle Level Outlet devices, conjunctively with the Powerhouses units if available, as described in the next chapters of this part. The extent to which it should be lowered depends on the reason for the emergency. Advice should be taken from an experienced dam safety engineer in the Hydropower Development and Dam administration directorate.

- However, if the emergency is related to damage to the Power Waterways downstream of the Gate shafts, then this action should not be forcedly taken and the **GATES SHOULD BE CLOSED** in order to isolate the damaged area. The same in case of damage to Middle Level Outlets, relevant gates shall be closed to isolate the problem.

Emergency Action Plans shall be developed to cover the situations that could lead to the development of failure modes for the dam and the associated critical structures relevant to initiating events reported in table *Table 25* and recalled in the following table.

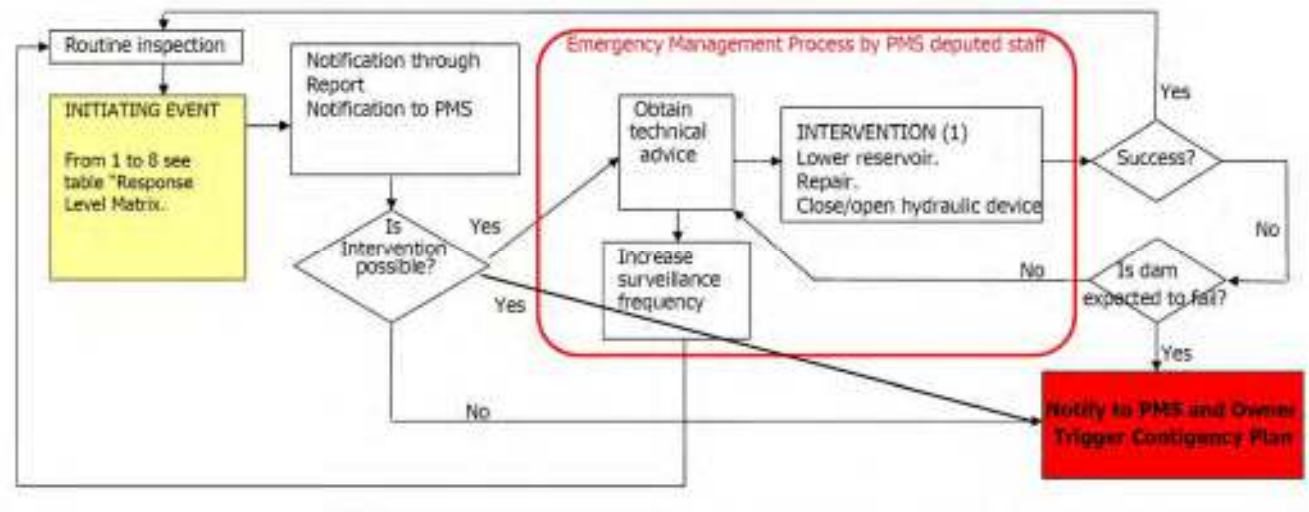
The plan shall be developed in order to foresee the implementation of a stepped notification procedure, following the above principles and the guidelines of table *Table 25*, to be applied on case by case basis to the emergency.

A typical Action Plan is reported in next figure. Emergency Action Plans have been developed to cover the situations that could lead to the development of failure modes for the dam and the associated critical structures diagrammatically one by one in the subsequent figures.

INITIATING EVENT (ref. table at par. E.3.1)	**Failure Mode**	**Description** of failure mode
1a Excessive leakage through dam	FM 1a	Drained flow in lower galleries approaches the pumps capacity limits. Leaks appears on dam downstream face through RCC horizontal lifts joints. Uncontrolled movements of portions of dam
1b Excessive uplift pressures or excessive seepage/piping through dam foundations	FM 1b	Dam foundation subject to uncontrolled seepage or piping or displacements along main joints of the rock develops a major uncontrolled outflow or source of evident movements of the dam (or of a portion of it)
2 Excessive leakage through power waterways or left or right abutment	FM 2	Leaks of Power Waterways Left abutment subject to uncontrolled leaks, developing major uncontrolled outflow or source of evident movements of the rock wedges, power tunnel lining or dam body (or of a portion of it)
3 Earthquake	FM 3	Loss of freeboard or impairment of integrity of dam crest and spillway structure due to earthquake shaking
4 Structural failure of devices for water control (Middle Level Outlets, Spillway, Power Waterways, Power Houses, River diversion plug)	FM 4	Left or right abutments subject to uncontrolled leaks, developing major uncontrolled outflow or source of evident movements of the rock wedges, power or diversion tunnel linings or dam body (or of a portion of it). Middle Level Outlets structures subject to uncontrolled leaks or movements. Spillway structure subject to uncontrolled leaks or movements affecting the dam crest and/or its retention capacity. Reservoir level trend raising, predicted to exceed dam crest level. Structural failure of Intake tower(s). Blockage of power tunnel intake(s) opening, Obstruction of Power Waterways intake(s).
5 Gate failure/ power loss/ equipment failure/ fire	FM 5	Spillway or MLOs or Power Waterways gates unable to work in conjunction with possible flood events. Reservoir level trend raising, predicted to exceed dam crest level.
6 Excessive plunge pool scouring endangering dam foundations	FM 6	Dam foundation at downstream toe subject to uncontrolled scouring or displacements along main joints of the rock developing a major uncontrolled source of evident movements of the dam (or of a portion of it).
7 Extreme weather warning	FM 7	Reservoir level trend raising, predicted to exceed dam crest level.
8 Sabotage/ accident	FM 8	Attack that threatens the integrity of the dam or spillway or Power Waterways

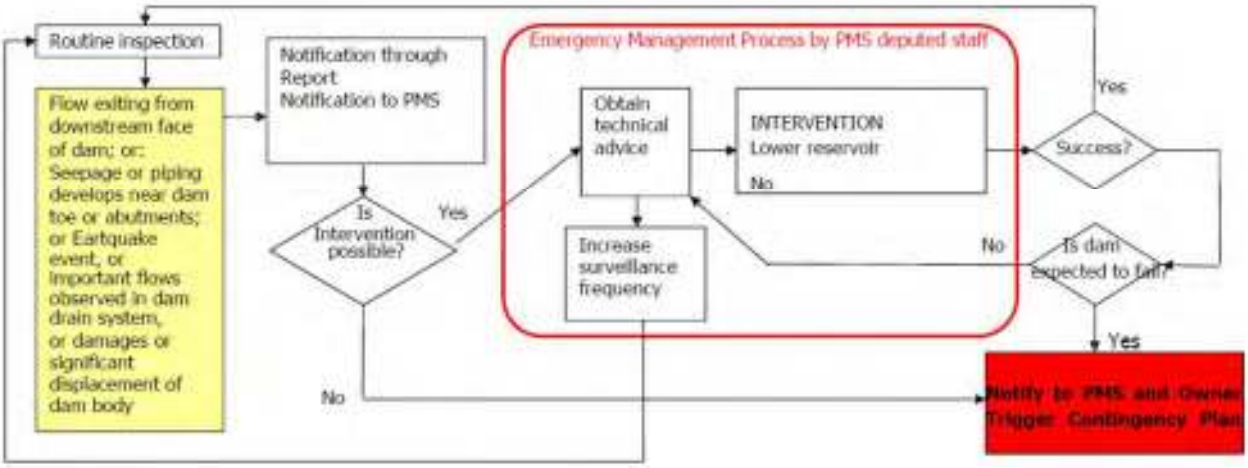
Table 35 – Failure modes for Action Plans

ACTION PLAN TYPICAL GRAPH

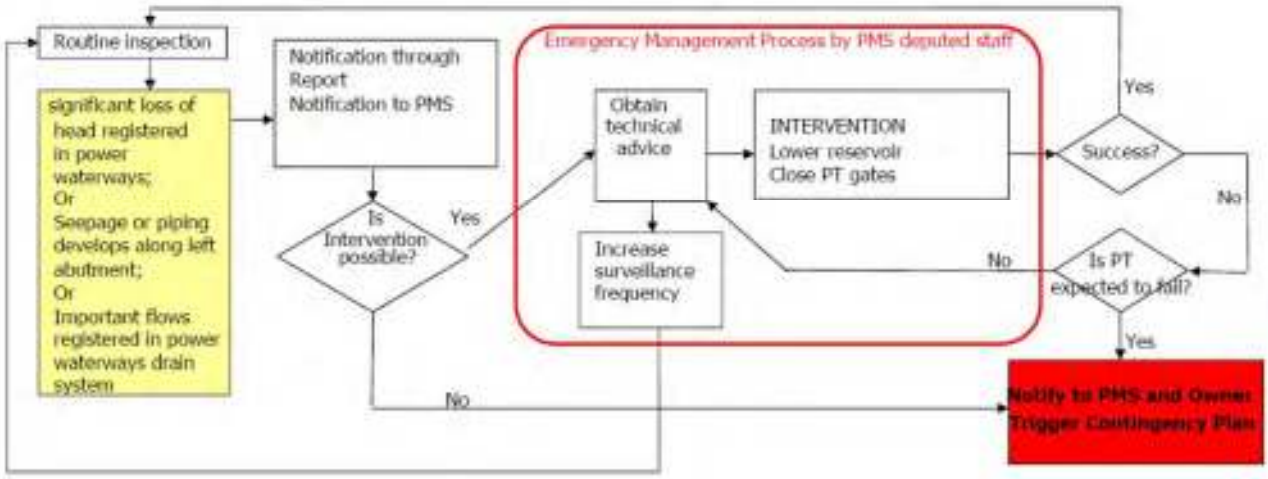


(1) The type and extent of the intervention shall be identified according to the case, taking into account the principles above indicated and in any case through the advice taken from an experienced dam safety engineer. In the next graphs the interventions for the main initiating events are shown. For Power Waterways and power house they are referred to the left abutment, but shall be considered as typical for both power plants.

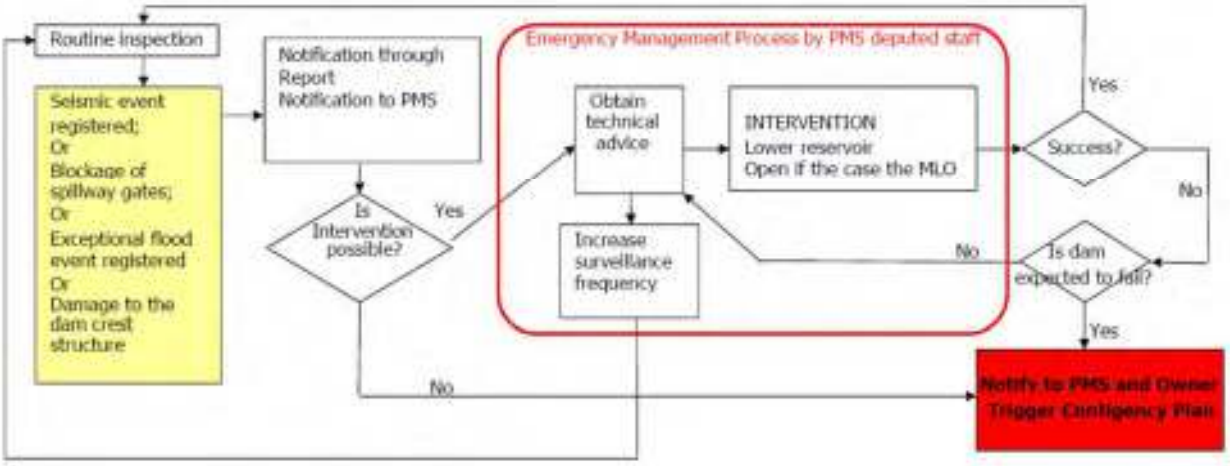
Action Plan 1 – Leaks or seepage through Dams, Foundations or Abutments



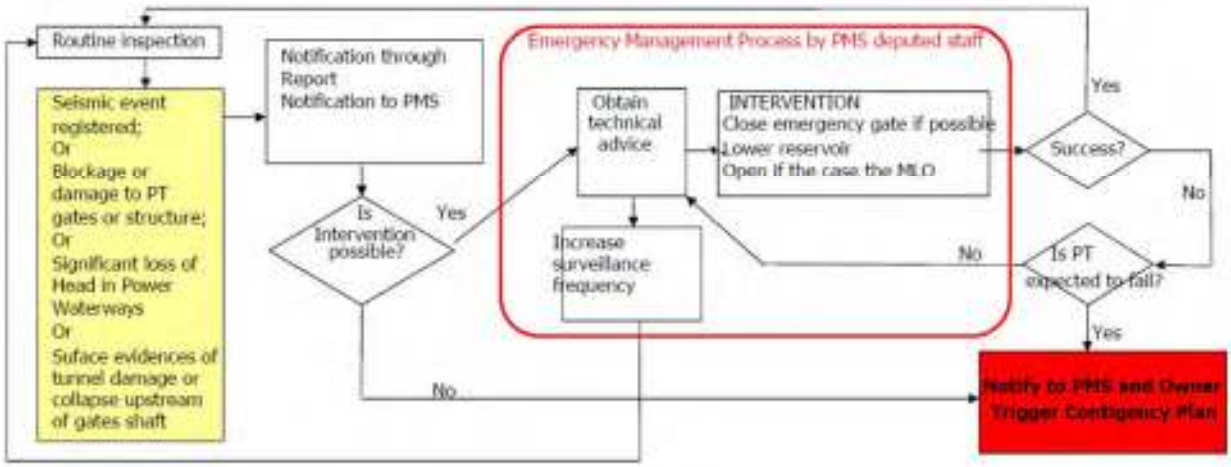
Action Plan 2 – Leaks of Power Waterways or seepage through left abutments

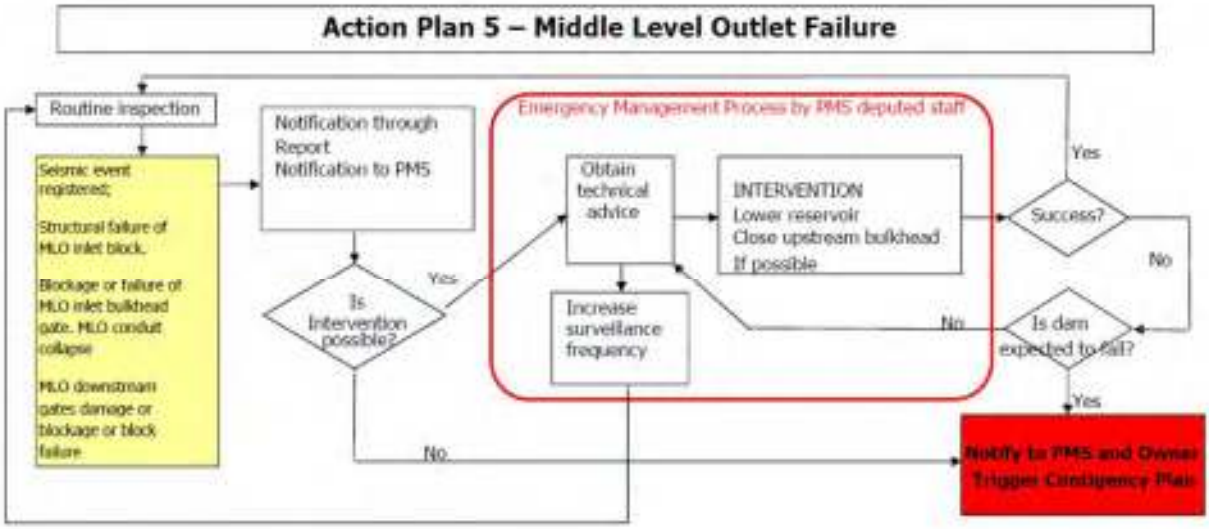


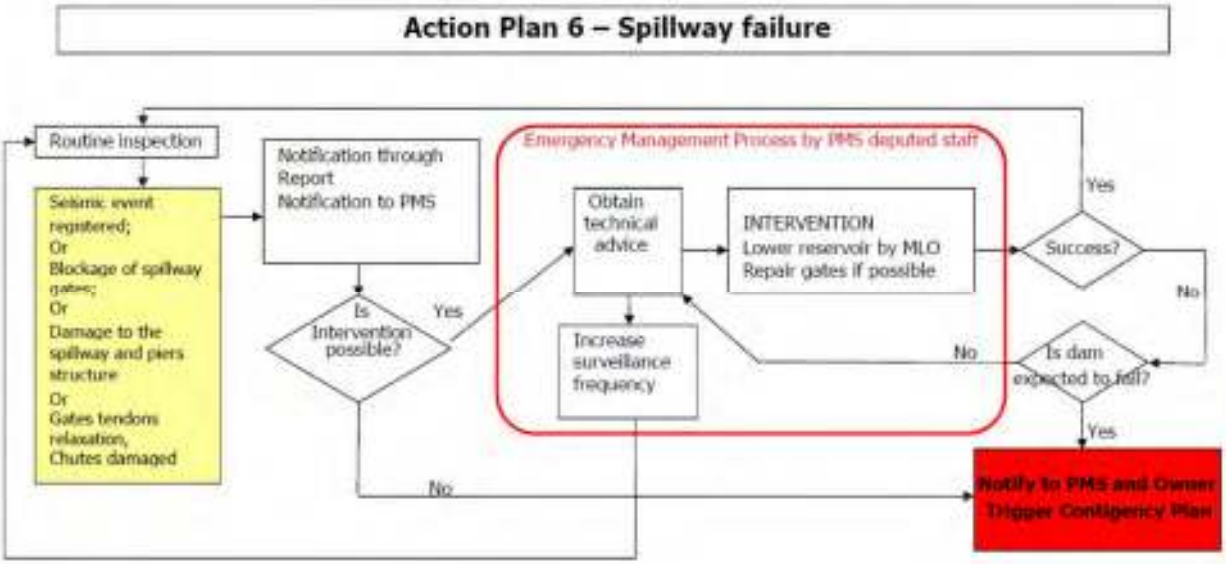
Action Plan 3 – Dam overtopping



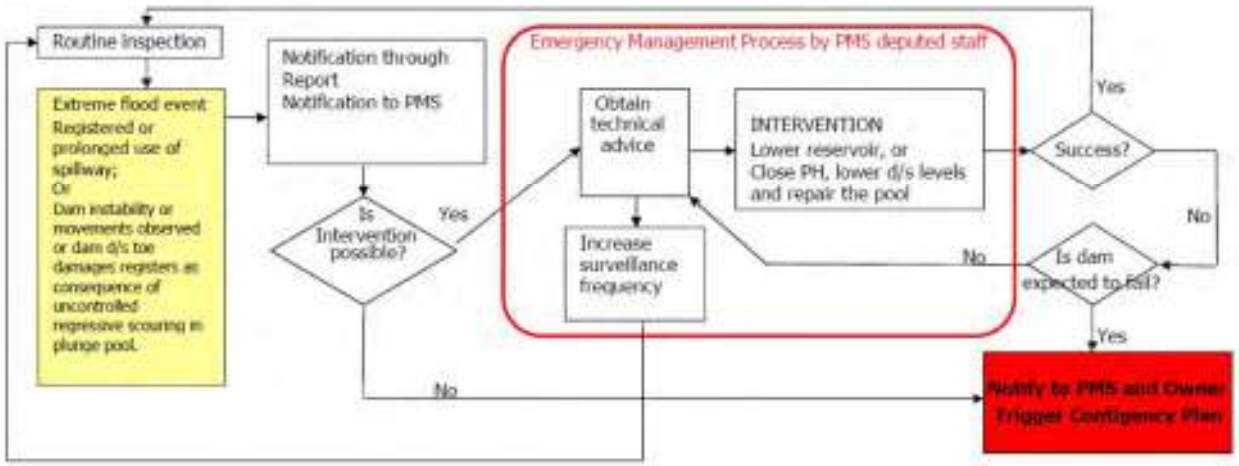
Action Plan 4 – Power Waterways inlet failure



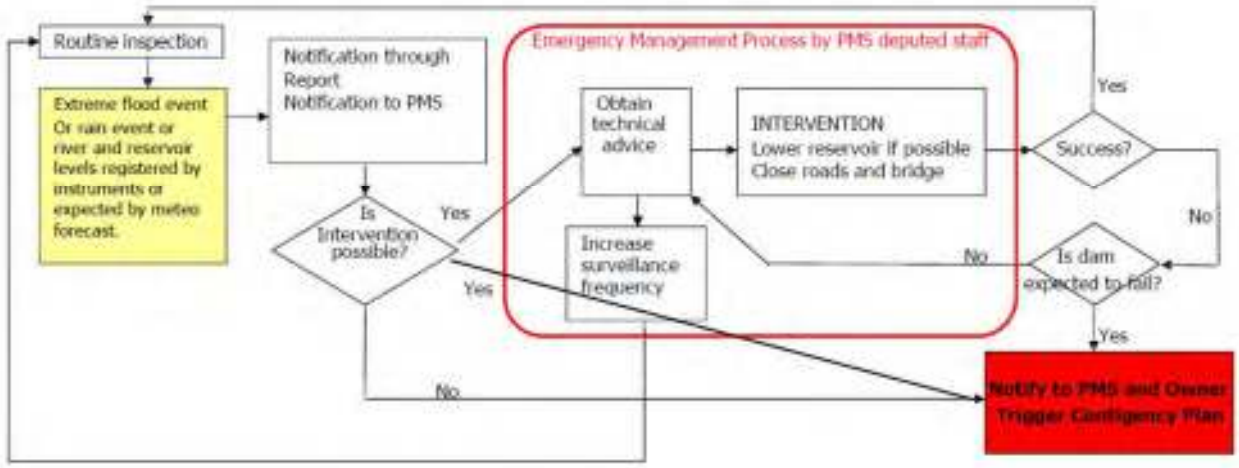

Action Plan 5 – Middle Level Outlet Failure
Routine inspection
Seismic event registered;
Structural failure of MLO inlet block.
Blockage or failure of MLO inlet bulkhead gate. MLO conduit collapse
MLO downstream gates damage or blockage or block failure
Notification through Report
Notification to PMS
Is Intervention possible?
Yes
No
Emergency Management Process by PMS deputed staff
Obtain techeical advice
INTERVENTION
Lower reservoir
Close upstream bulkhead
If possible
Increase surveillance frequency
Success?
Yes
No
Is dam expected to fail?
Yes
No
Notify to PMS and Owner
Trigger Contigency Plan


Action Plan 6 – Spillway failure
Routine inspection
Seismic event registered;
Or
Blockage of spillway gates;
Or
Damage to the spillway and piers structure
Or
Gates tendons relaxation,
Chutes damaged
Notification through Report
Notification to PMS
Is Intervention possible?
Yes
No
Emergency Management Process by PMS deputed staff
Obtain technical advice
INTERVENTION
Lower reservoir by MLO
Repair gates if possible
Increase surveillance frequency
Success?
Yes
No
Is dam expected to fail?
Yes
No
Notify to PMS and Owner
Trigger Contigency Plan

Action Plan 7 – Plunge pool



Action Plan 8 – Extreme weather warning

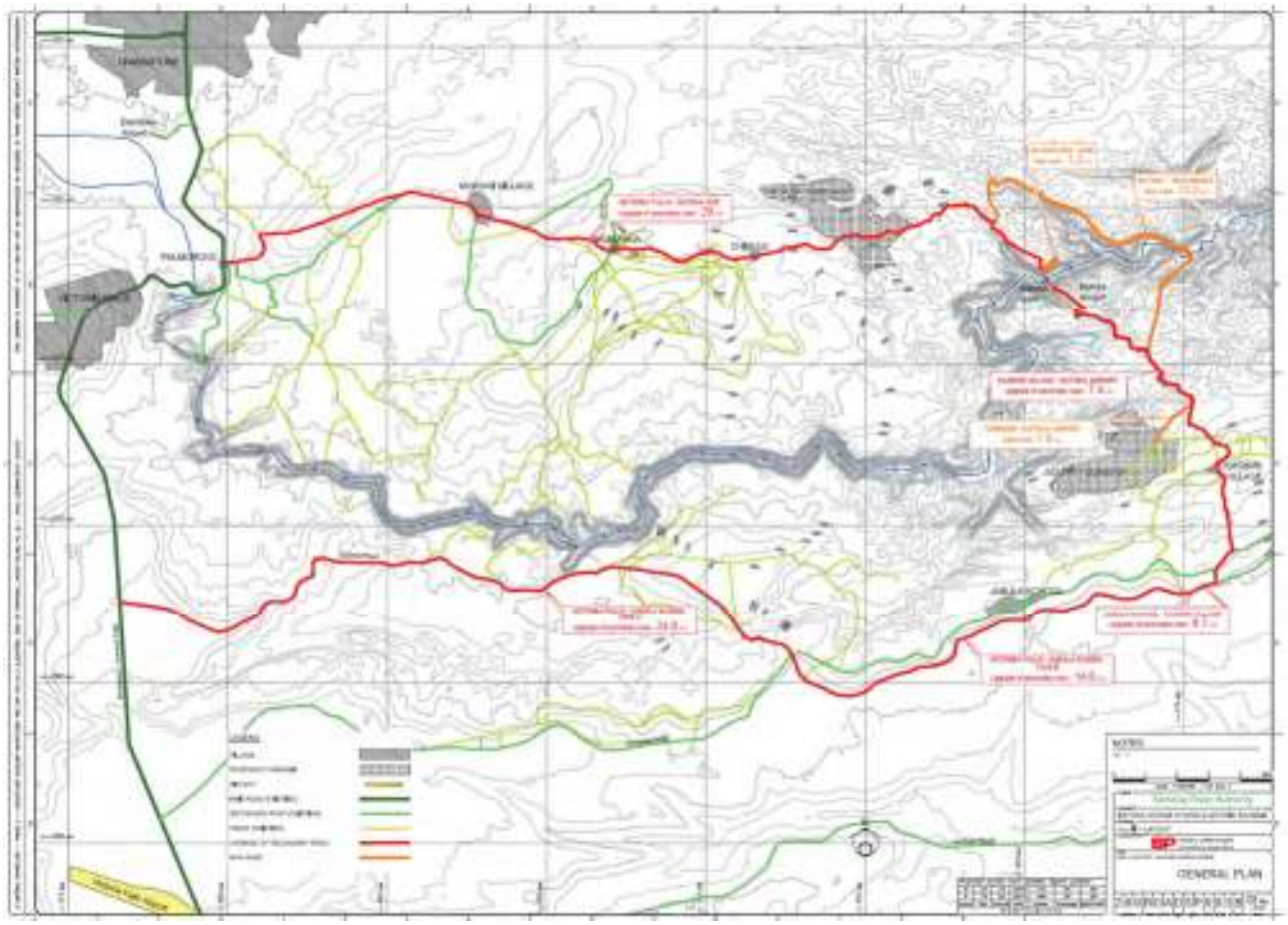


E.6 PREPAREDNESS PLAN IMPLEMENTATION

E.6.1 ACCESS ROUTES – PRIMARY AND SECONDARY

Direct access roads to the Batoka dam and power houses are designed, at feasibility design level, coming from the nearest available roads and villages, as indicated in relevant drawings of the Feasibility Design (from which the next figure is extracted).

They are assumed to be developed and finalized at further detailed design stage.



A site map showing the location and main access routes to the dam, control buildings, Power House and other site structures shall be kept updated and attached to this RPP.

Access using bike or motorbike, or on foot, may be required under emergency circumstances if roads are impassable in usual vehicles. Access difficulties are likely if roads are damaged by earthquake or flood.

E.6.2 PUBLIC SAFETY

Public access to Batoka site (dam, power houses, switchyards) is assumed will be restricted using gates and fences as appropriate.
Access to the dam crest, intake tower and outlet areas will be restricted using gates and fences as appropriate.

E.6.3 SITE SECURITY

A security plan for the dam should be prepared and implemented by the PMS, considering the following aspects: dam size, location, hazard classification, importance to the economy, national defence and local public order.
In this regard, for the case of Batoka Plant, it shall be considered that:

- the dam size is very big,
- the location is impervious, but not extremely emote in respect to the main towns and roads of the country,
- the region downstream Batoka Plant is not uninhabited, but along the river it is not occupied by major townships,
- the plant is of great importance for the economy of the country.
- the plant has an international interest, being of transboundary nature and inserted in the network of neighbour countries.
- The plant is not far from Victoria Cascades, that is an international site attracting international visitors every year.

The plan shall identify the roles and responsibilities for site security and management of the reservoir area.

The following site areas should be in principle restricted and fenced off:

- Dam
- Dam abutments yard (in a zone of at least 100m beyond the abutments)
- Gate shafts intakes and relevant accesses
- Plunge Pool and relevant abutments, for a stretch of the river of at least 1km downstream.
- Surge shafts and relevant yards
- Accesses to access tunnels along the Power Waterways
- Power Houses (double fence shall be foreseen in the energized area of the HV transformers)
- Switchyards
- Control buildings and diesel generator buildings,
- River diversion (as far as applicable in consideration of the temporary nature of such work).

E.6.4 ON SITE RESOURCES

A security plan for the dam should be prepared and implemented by the PMS, considering the following aspects.
It is important to maintain sufficient resources on the site in order to swiftly handle emergencies if access to the dam is restricted. It is assumed that Batoka dam is continuously manned and that there are sufficient numbers of people living near the site to assist in carrying out emergency repairs.

Every incident is different and it is not possible to provide resources for every eventuality. The items listed in Table here below (that is indicative and can be integrated by PMS according to the need) are the basic resources that should be available to allow repairs to be carried out for the most likely incidents.

Early detection of emergencies can often restrict the emergency to an Internal Emergency and prevent it progressing to a Developing or Imminent Emergency. Therefore it is important to carry out routine dam safety surveillance by Batoka Project inspectors based at the dam.

Resources	*Location*
IMPORTANT EMERGENCY TOOLS	
Emergency communication system (such portable phones or radio)	
equipment Back-up power supplies	
Earthmoving equipment	
Drilling device for emergency small drain holes need	
Mobile crane	
Boat with engine	
BASIC EMERGENCY TOOLS	
Mobile floodlights and Torches	
First aid kit	
Welding Equipment	
Products for concrete crack sealing	

This list does not include ordinary spare parts assumed to be already available in the plant according to the project design.

Table 36 – Available emergency tools

E.6.5 CONTROLLED DRAWDOWN PROCEDURE

If deemed necessary, according to the analysis of the results of observations carried out during the surveillance inspections (as described in Operation and Maintenance Manual), the Controlled Drawdown Procedure or the Emergency Drawdown Procedure will be activated.

The Controlled Drawdown Procedure (CDP) is finalized to lowering the reservoir level without causing damages to the outlet structures such as Spillway, Power Waterways and Middle Outlets.

If according to the results of observations carried out during the Alert Procedure, an emergency state is triggered but any impending failure is excluded, the Controlled Drawdown Procedure will be activated to perform inspections and repair works on the submerged structures as necessary and as possible (no dewatering is physically possible below the operating range of the MLOs once reservoir is impounded).

This is of course valid only for impounding reservoir water levels above the operating range of the MLOs, and with the limits depending on the capacity of the available discharging devices versus the incoming flows (therefore also depending on the season and on the duration of the emergency state).

The reservoir drawdown is foreseen to inspect lower portions of dam upstream face, or the first portion of Power Tunnels upstream of the gate shafts.

The reservoir drawdown operations shall be carried out according to specific procedures that will be defined during the frame of the detailed design of the hydraulic structures.

The reservoir will be lowered, according to the water levels available in the reservoir within the minimum and maximum operating levels and to the Plant Operator choice, by means of:

- the Powerhouses units in operation (if at least one is maintained in operation 24 hours per day),
- the Ecological Discharge Device.
- the Spillway,
- the Middle Outlets.

E.6.6 EMERGENCY DRAWDOWN PROCEDURE

If the results of observations highlight an impending hazard for the dam safety, the Emergency Drawdown Procedure will be carried out in accordance to the instructions of the Contingency Plan described in the next chapter.

E.6.7 INFORMATION TO THE PEOPLE LIVING IN THE RESERVOIR AREA

- The population living in the zone of the impounding and downstream of the dam shall be informed about the reservoir regulation procedure, and in particular about the expected reservoir levels during normal and exceptional scenarios of operation (not only during the impounding period).

- Reservoir shore line will be marked on the ground in correspondence of roads, villages and other significant accessible points, with clear benchmarks or other evident signals on the shore line corresponding to the Maximum Operating Level, in order to give to the Owner(s) of the Plants and local Authorities a clear reference along the shoreline of the reservoir, for the operations of information and management of the ground that the Owner(s) will conduct.

- A program shall be implemented and provided by the PMS defining time and procedures required to inform the populations downstream of the Batoka dam of the artificial floods release whenever they are released from Middle Outlets and or from Spillway gates. This program will remain valid to be used during the current operation of the Plant, and updated in case it will be changed.
  Downstream areas shall be informed also in case of any sudden release of water is decided through the operation of the Batoka Hydraulic devices (Middle Outlets, Spillway, Power Waterways), and they shall be coordinated with the downstream plant of Kariba.

E.7 CONTINGENCY PLAN

E.7.1 INTRODUCTION

For the RCC dam the risk of failure is extremely unlikely. At the same time, sudden release of stored water is a risk that can occur for exceptional flood events or accidental manoeuvre of hydraulic devices (Spillway, Power Tunnels and MLOs gates).

E.7.2 IMPENDING FAILURE OR FAILURE

IMPENDING FAILURE

If, during the period of the impounding or during the operation of the plant, there is a suspect of impending failure, or phenomena that can compromise the safety of the main structures (Dam, Power Waterways and relevant Shafts, Power Houses or other main structures) or adjacent natural or excavated slopes, the following procedures must immediately be initiated:

1 Contact and inform the Project Head Offices.
Contacts are reported in the forms at the end of this Part. They shall be filled and maintained updated by the PMS.

2 Inspect and monitor the dam (or other interested) structure and hydraulic steel structures.

3 Determine additional immediate actions in accordance with the Project Management Structure offices to be taken to reduce the risk of failure and any other necessary further actions.

4 In case it is decided to proceed with the partial drawdown of the reservoir, and if and if there are not the conditions to implement a controlled drawdown procedure described in this report at par. E.6.5 CONTROLLED DRAWDOWN PROCEDURE, coordinate efforts with the Owner and the Local Authorities in alerting all downstream areas of the rapid increase of releases (procedures for Large or sudden releases downstream of the dam).

FAILURE

If the Dam, or part of it, is failing, notice shall be immediately given by radio or by phone to the Owner(s) Head Office (see contacts at the end of this report), and simultaneously to Local Authorities (local police and municipalities, emergency evacuation units or mobile alarm team to be sent on the critical zones) that will take actions to trigger alarm and evacuation plans on the downstream areas, considering the areas susceptible of inundations as individuated in Dam Break Analysis document (see following chapter), whose final version is

assumed will be prepared in detailed design stage and relevant maps included in this volume for easy of consultation.

The detailed procedure for implementation of this notice shall be developed by the PMS. It shall be developed considering the transboundary nature of the Project, the structure of Ownership and Operation that will have this plant, as well as the need to coordinate any important decision about water management with the downstream plant of Kariba.

E.7.3 LARGE OR SUDDEN RELEASE DOWNSTREAM OF THE DAM

EMERGENCY DRAWDOWN

In case a large water release downstream of the dam is imminent due to the actuation of the Emergency Drawdown of the reservoir the following procedure shall be followed:

1. the people working on site (if any) shall be immediately informed, and the working areas downstream of the dam close to the river evacuated;
2. trigger the "Large water release" alarm;
3. Employer and Local Authorities that control the critical zones shall be immediately contacted (see contacts at the end of this report) and informed.

ACCIDENTAL MANOEUVRE OF THE OUTLET GATES

In case of large and sudden water releases due to an accidental manoeuvre of the radial gates of the spillway, which cannot be closed within 15 minutes, the "Large water release" alarm shall be triggered and the Operator and Owner's Head Office informed (see contacts in the last paragraph of this report).

"LARGE WATER RELEASE" ALARM

The alarm is used in case of:

- Opening of the radial outlet gate during exceptional flooding.
- Opening of the Spillway and Middle Outlet gates for Reservoir Emergency Drawdown.
- Accidental opening of the spillway gates (according to procedure in previous paragraph).
- Impending danger of overtopping: the alarm is risen on the basis of the water elevation in the reservoir. Such event is extremely unlikely..

The alarm shall be triggered in order to assure at least 6 hour for the evacuation of the people working on site.

The alarm is given through notice the PMS and Owner Head Offices (see contacts reported in last paragraph of this report), that in turn will contact the Local Authorities (local police and municipalities, emergency evacuation units or mobile alarm team to be sent on the critical zones) to take immediate action in alerting populations and managing the emergency in the critical zones.

E.7.4 CONTACTS FOR EMERGENCY or ALARM CASES

In case of need to trigger an ALARM condition, or in case of need to implement an exceptional operation described in this part of the report, the addresses reported here below shall be immediately contacted:

Plant Management Structure				
Name	Position	Telephone	E-mail	Mail address

Local/Governmental Authorities				
Name	Position	Telephone	E-mail	Mail address

Table 37 – Contacts for Emergency or Alarm cases

E.8 DAM BREAK ANALYSIS

E.8.1 INTRODUCTION

The present chapter describes the results of the hydraulic calculations carried out to identify the flooded areas in case of emergency.

The Terms of Reference of the assignment at paragraph A.3.3.2 states that:
The Consultant shall carry out one-dimensional dam-break analysis and assess the downstream impact of such failure. The results of the dambreak analysis will be used to prepare inundation maps …".

Purpose of this chapter is to provide the inundation maps as a result of the hydraulic calculation carried out for the dam break analysis.

In detail, the evaluation of the flooded areas located downstream of the Batoka dam has been carried out accordingly to the following scenario:

- DAM BREAK - Incoming of an extreme climate event meteorological event, which causes dam overtopping. This scenario has been evaluated on the base of the following foresees assumptions:
    - incoming of the PMF hydrograph while the reservoir is at full supply level (w.l. = 757 m asl);
    - flap gates blocked in the closed position (i.e. raised and retaining the upstream reservoir at OL max);
    - raising of the reservoir up to overtopping of the dam crest (crest level = 762 m asl);
    - almost instantaneous breach formation with consequent break of the entire dam.

This scenario assumes catastrophic characteristics and, as it will be further explained, capable of producing a flood event with peak discharge equal to approximately 803'870 m3/s.

Hydraulic analysis, which has been carried out using the HEC-RAS program, allowed to identify areas subject to flooding and to determine the hydraulic levels reached in the downstream areas of the project, the average speed of the water as well as the travel time of flood peak.

The study of the flood propagation has been analyzed for a river stretch of approximately 120 km length, along the Zambezi river, from the Batoka dam to the Lake Kariba.

The inundation maps that show the results of the dam break analysis are illustrated in the following annexed drawings:

- 346 DBK D SP 001 Inundation area, General, 300k
- 346 DBK D SP 002 Inundation area, Key map, 300k

- 346 DBK D SP 003 Inundation area, plan 100k , sheet 1 of 4
- 346 DBK D SP 004 Inundation area, plan 100k , sheet 2 of 4
- 346 DBK D SP 005 Inundation area, plan 100k , sheet 3 of 4
- 346 DBK D SP 006 Inundation area, plan 100k , sheet 4 of 4

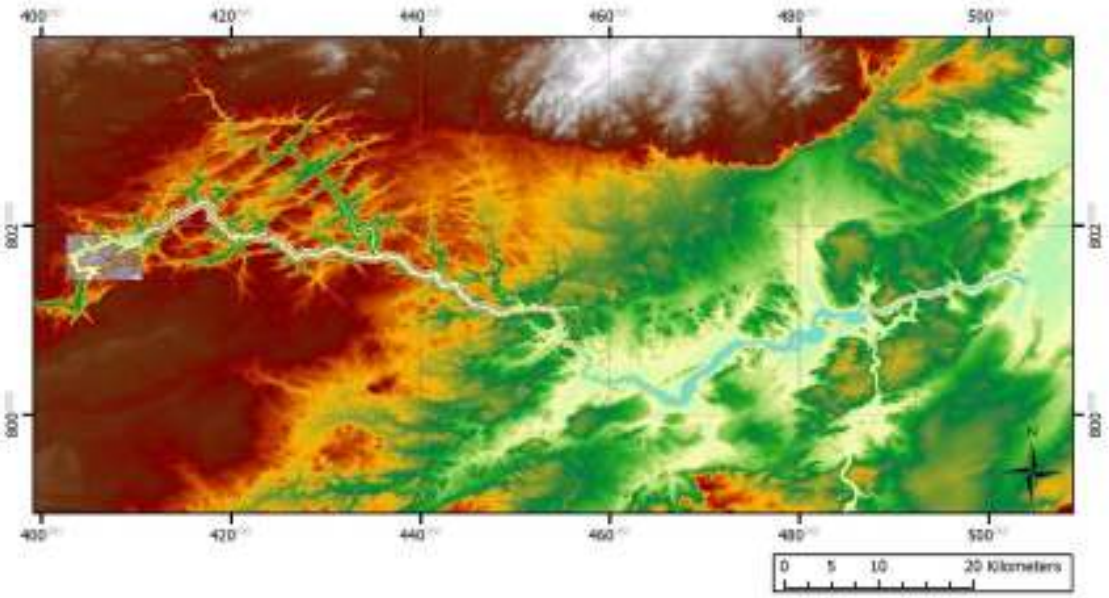
E.8.2 TOPOGRAPHIC DATA

Modeling of water propagation over complex topographical surfaces for floodway delineation requires an accurate and reliable topographical database; for this report's aim, the following digital elevation models of the terrain were used:

- LIDAR (LASER SCANNING) with an resolution of 0.3 m;
- SRTM (Shuttle Radar Topography Mission) with an resolution of 30 m;

The LIDAR DTM is the most accurate among the two adopted digital models, and covers the main Zambezi river channel and close surroundings. In order to allow a complete floodplain delineation the LIDAR has been joined with the SRTM DEM, following the FEMA guidelines.

The following figure show the topographic database used for the hydraulic calculations:



DIGITAL ELEVATION MODEL (WGS 84/UTM zone 35S)

E.8.3 VALLEY MORPHOLOGY AND HYDRAULIC CHARACTERISTICS OF STREAMFLOW

The study of the flood propagation has been analyzed for a river stretch of approximately 120 km length, along the Zambezi river, from the Batoka dam to the Lake Kariba

Downstream of the dam, the river valley is particularly engraved, with both side of the valley very steep.
The entire river presents a pronounced slope, in particular the river longitudinal slope can be summarized as follows:

- 0.35 % from 0 to about 8.2 km ds of the dam;
- 0.17 % from 8.2 km to about 35 km ds of the dam;
- 0.1 % from 35 km to about 76 km ds of the dam;
- 0.006 % from 76 km to about 120 km ds of the dam.

E.8.4 FLOOD ROUTING MODEL - HEC RAS version 5.05 (2D)

Dam Break modelling consists in:

- Prediction of the outflow hydrograph at the dam due dam breach;
- Routing of hydrograph through downstream valley in order to obtain the maximum water level and discharge, along with the time of travel at different locations of the river downstream of the dam.

The HEC-RAS program, developed by the US Army Corps of Engineers (USACE) was used for dynamic flood routing and dam safety analysis. The HECRAS software is based upon a highly optimized version of the National Weather Service (NWS) 1988 dam-break flood forecasting program DAMBREAK.
HEC-RAS is used to hydraulically route the flood through the river and downstream valley.

The two dimensional (2D) model is considered more suitable than the one dimensional or quasi two dimensional model to analyze the routing of the flood wave generates due to dam failure.
Indeed, when a flood wave enters an unconfined floodplain, a two dimensional model is appropriate to simulate the behavior of the flow and to simulate the propagation of the wave since floodwater generally presents frequent divergence of flow in the plain.

The governing equation of the model is the two-dimensional flow de Saint Venant's equations, referred also as Shallow Water equations.
The Swallow Water Equations are adopted when:

- The horizontal scale lengths are much larger than the vertical scale lengths ; and
- Vertical pressure gradient is almost hydrostatic.

In case of propagation of the wave in an unconfined floodplain, the flow is shallow enough and since the vertical accelerations can be neglected, then it can be shown that a good approximation to the flow is to

replace all flow variables by their averages in vertical direction. The resulting, depth-averaged, three-dimensional equations of motion then become a two-dimensional representation in the horizontal plane.

In particular, the unsteady differential form of the Mass Conservation (continuity) and Momentum Conservation, considering the hypothesis of the shallow water, recalled above, are shown below:

$$\frac{\partial H}{\partial t} + \frac{\partial (uh)}{\partial x} + \frac{\partial (vh)}{\partial y} + q = 0$$

$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} = -g\frac{\partial H}{\partial x} + v_t\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right) - c_f u + fv$$

$$\frac{\partial v}{\partial t} + v\frac{\partial v}{\partial x} + v\frac{\partial v}{\partial y} = -g\frac{\partial H}{\partial y} + v_t\left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2}\right) - c_f v + fu$$

Where t is time, H is a water surface elevation, h is the water depth, q is a source or sink term, u and v are the velocity components in the X and Y direction, g is the gravitational acceleration, vt is the horizontal eddy viscosity coefficient, cf is the bottom friction coefficient and f is the Coriolis parameter. (Chaudhry, 2008, Brunner, 2016).
The first term in the moment equation represents the local acceleration, the second term is the convective acceleration, and the further terms describe the forcing from gravity, eddy viscosity, bed friction, and Coriolis force. Using the Manning's formula, the friction coefficient cf can be expressed as following (in the x-direction):

$$c_f = \frac{n^2 g|u|}{R^{4/3}}$$

Where n is Manning's coefficient, g the gravitational constant, u the velocity in the x-direction and R the hydraulic radius.

The HEC RAS solver uses, for the 2D unsteady flow equation, an Implicit Finite Volume algorithm which provides an increment of improved stability and robustness over traditional finite difference and finite element techniques. With this kind of algorithm, Hec-Ras can handle a completely dry 2D element during a sudden rush of water, which is typical in a dam break analysis; furthermore the algorithm can perform subcritical, supercritical and mixed flow regimes.

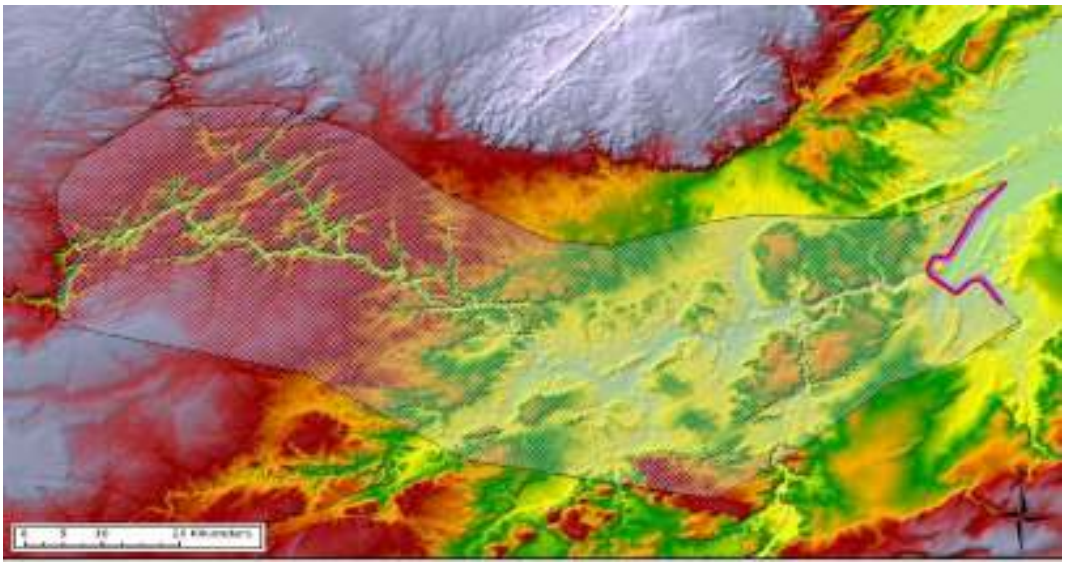
In order to implement the numerical model the following steps were to:

- develop the geometry and therefore the computational mesh.;
- define the roughness coefficient based on the land cover map;
- evaluate boundary and initial condition.

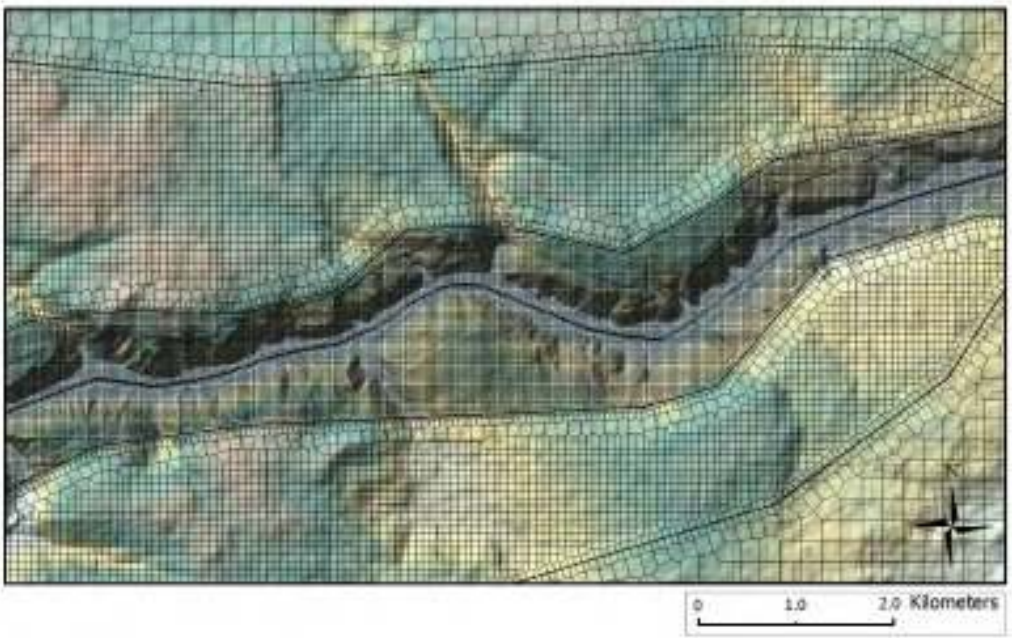
E.8.5 MODEL GEOMETRY – COMPUTATION MESH

A georeferenced HEC-RAS computation model was prepared, by taking advantage of the HEC-RAS mapper utility.
The model consists in an unstructured computational mesh spreading from the dam toe to the Kariba Lake.

The main river and creek paths were used as break lines in order to align the mesh faces to water courses. In the same way, any kind of barriers to the flow were highlighted and introduced in the construction of the computational mesh by use of break lines.



EXTENSION OF THE COMPUTATION DOMAIN



DETAIL OF COMPUTATIONAL MESCH

Considering a square geometry of the cells, the main characteristics of the domain geometry for this analysis are listed below:

- Minimum cell size 10x30 m (in correspondence of the river bed)

- Maximum cell size 200x200 m (external of the inundation area)
- Total cell numbers 634'000

The cells' dimensions are smaller where needed, for example along the path of the watercourses, in order to correctly describe the thalweg, or where the slope of the terrain is higher.
The size of the grid cells defines the resolution of the model and model results. For this reason, a sensitivity analysis was carried out in order to define the optimum mesh size to be used for these preliminary simulations. Identifying the optimal mesh size is an important activity for a successful numerical modelling. This is a key parameter since a smaller mesh requires a higher computational running time, on the other hand, a larger mesh might reduce the accuracy and/or the stability of the model

E.8.6 LAND COVER and MANNING'S COEFFICIENTS

The Manning n flow resistance figures for the riverbed and banks, have been determined using the VEN TE CHOW method, as quoted in OPEN CHANNEL HYDRAULICS (1959). In applying the above method, a morphological/vegetation observed on the site survey, has been correlated to the reference table.

Considering that the n value of the flood plain is generally larger than that of the channel, SP has assumed two different value for Manning's coefficient, in particular:

- Major stream (regular section with no boulders or brush) $n = 0.025$;
- Flood plain (scattered brush, heavy weeds) $n = 0.05$

E.8.7 BREACH HYDROGRAPH PREDICTION AND BOUNDARY CONDITIONS

Two boundary conditions were applied, geographically defined by 2 ESRI shape files;

- Upstream condition;
  - Breach hydrograph with a flow peak equal to 803'870 m^3/s
- Downstream condition
  - full supply level at Kariba Lake, equal to 488.5 m asl

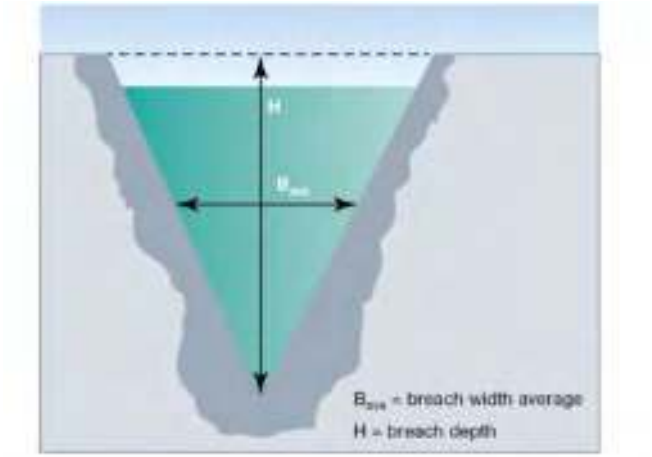
The inflow condition was applied at the upstream limit of the mesh (in correspondence of the dam toe) and the downstream boundary condition was applied in correspondence of the Kariba Lake.

The upstream condition is a critical point in the dam break analysis. Predicting the outflow hydrograph is strongly related to the prediction the breach characteristics, which include the parameters needed to physically describe the breach (breach depth, breach width, and side slope angles) as well as parameters that define the time required for breach initiation and development.

According the FEMA guideline, for concrete arch dam, the breach widths range from 80 percentage of the entire length of the dam to the entire length of the dam and the breach side slope is assumed to range from

vertical to the slope of the valley wall. The breach formation time for modelling purposes ranges from instantaneous to 0.1 hours (USACE, 1980 and 2007; FERC, 1988; Fread, 2006).

The following imagine illustrates the schematic breach of the concrete arch dam



Schematic breach geometry progression of a concrete arch dam

Following the FEMA guidelines, for sake safety, SP has assumed an almost instantaneous removal of entire dam (0.1 h time is the time of fully breach formation).

In this case, the peak breach hydrograph has been computed used the Ritter's formula which represent a simplified of the De Saint Venant equation (USACE, 97)

$$Q_p = B_{ave} * \frac{8}{27} h_0 \sqrt{g h_0}$$

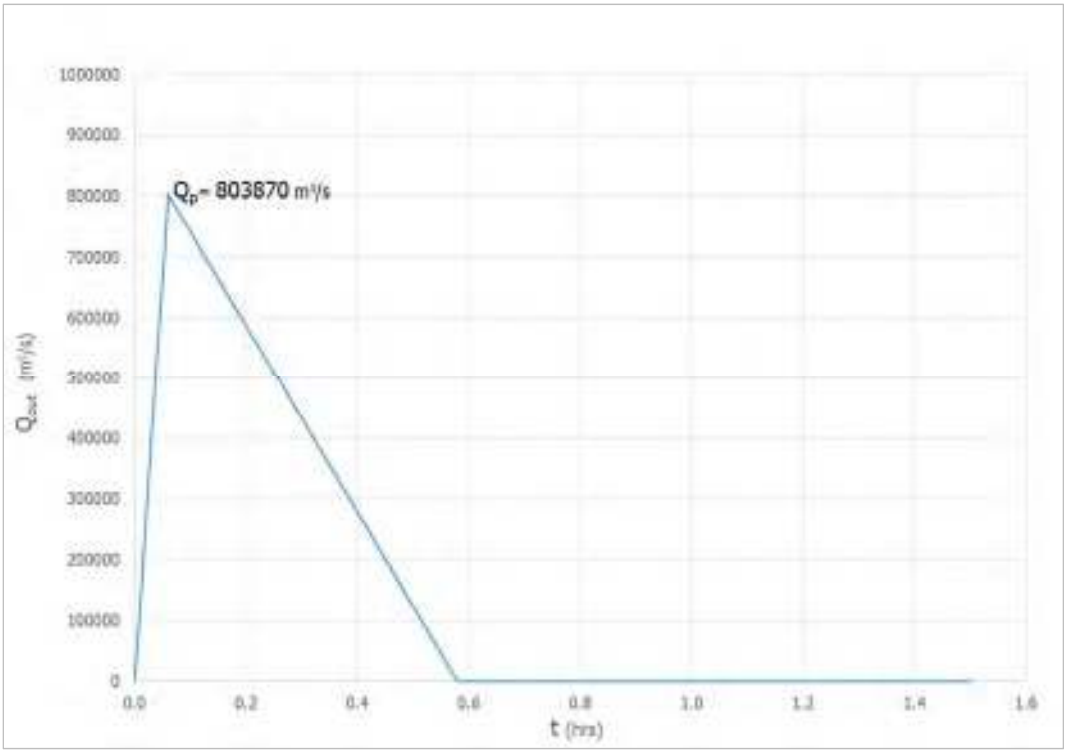
Where:

- Q_p is the peak breach flood;
- B_{ave} is the average width of the breach, which correspond with the average length of the entire dam;
- h_0 is the initial water depth at the dam, which is assumed equal to the dam height;
- g is the acceleration of gravity

The following data has been considered:

- Dam height = 160 m
- B_{ave} = 428 m
- Peak flow = 803'870 m^3/s

The beach hydrograph, illustrated in the graph below, has been obtained considering the fully emptying of the reservoir after the failure of the entire dam due the overtopping.



Dam Break hydrograph – Upstream boundary condition

The downstream boundary condition has been set as a constant stage hydrograph equal to 488.5 m asl, corresponded at the Full supply level of the Kariba Lake.

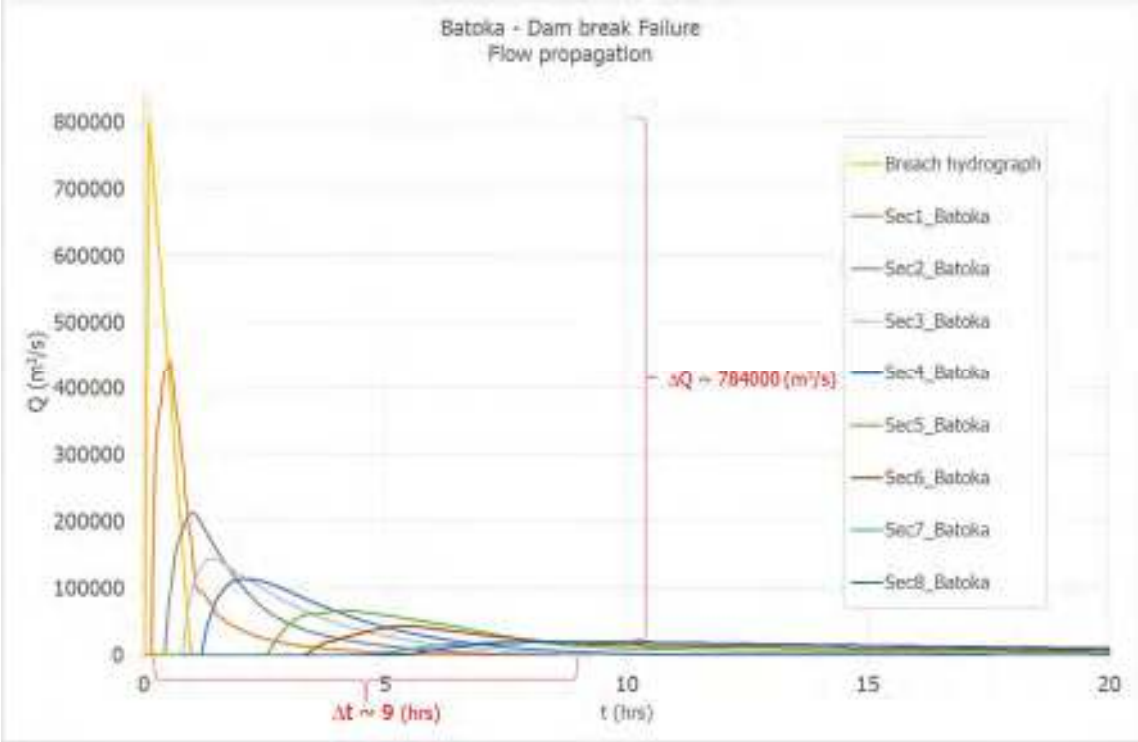
E.8.8 RESULTS

The main results of the hydraulic model for the dam break of the Batoka dam due overtopping re detailed in the following enclosed drawings:

- 346 DBK D SP 001 Inundation Area, General Plan, 300 k
- 346 DBK D SP 002 Inundation Area, Key Map, 300 k
- 346 DBK D SP 003 Inundation area, plan, 100 k, sheet 1 of 4
- 346 DBK D SP 004 Inundation area, plan, 100 k, sheet 2 of 4
- 346 DBK D SP 005 Inundation area, plan, 100 k, sheet 3 of 4
- 346 DBK D SP 006 Inundation area, plan, 100 k, sheet 4 of 4

The graphs below illustrate:

- The discharge's trend in the time for different section downstream of the Batoka dam;
- Inflow to the Kariba Lake;
- The maximum flow at each section with relative arrival time.



Dam Break hydrograph propagation

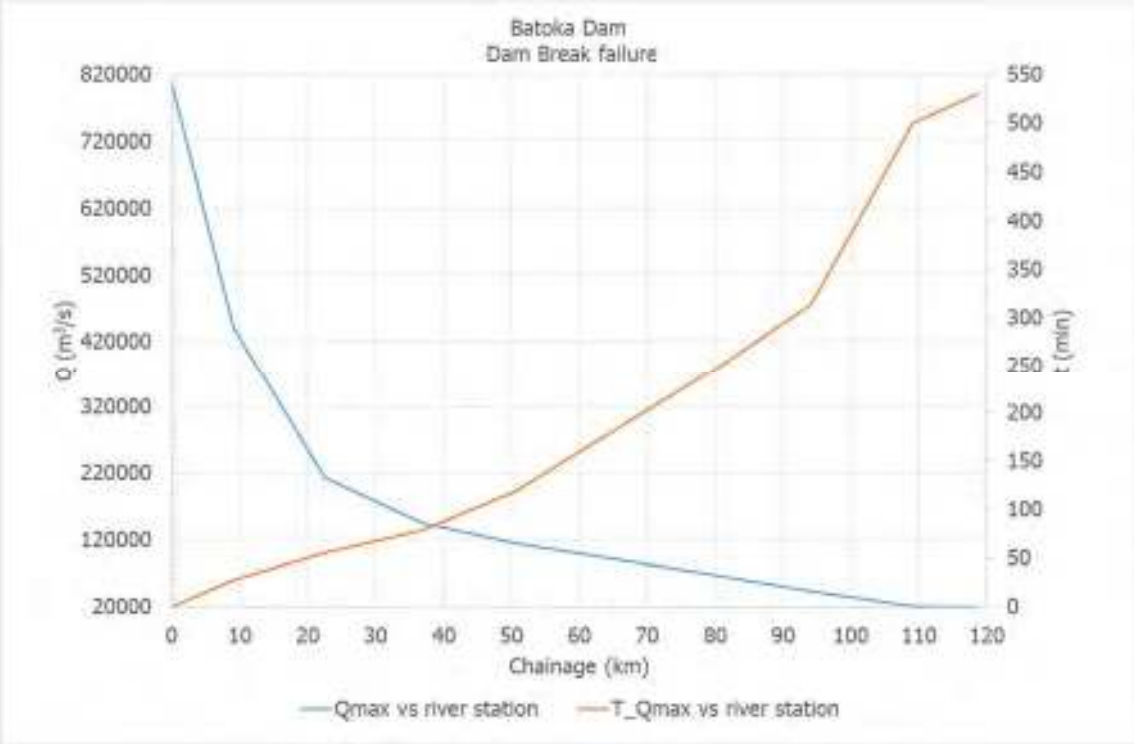
As far as the flow propagation is concerned, the peak of flow goes from 803'870 m^3/s at the dam toe, to 20'000 m^3/s at the last cross section before Kariba reservoir (sec 8), with a total reduction of 784'000 m^3/s.

Downstream of Batoka Reservoir, along the Zambezi River, the flow reaches Kariba reservoir, whose capacity is way larger than the one of Batoka reservoir, which is approximately equal to 1'400 Mm^3 at dam crest. Indeed, according the data recalled in the Main Report of Sinohydro (2005), the volume of the Kariba reservoir is approximately:

- 54 Mm^3 at 475.5 m asl (corresponding with the minimum reservoir level);
- 64'798 Mm^3 at 488.5 m asl (corresponding with the maximum reservoir level);

Being very large than upstream reservoir, Kariba reservoir allows the full attenuation the incoming flood.

The arrival time of the peak, which is the difference in time of the peak at the dam toe and the peak of the flow hydrograph simulated in the last downstream cross section, is about 9 hours.



Propagation of the peak flow

Annex P

Project Resettlement Policy Frameworks

Resettlement Policy Framework (RPF) – Zimbabwe

Resettlement Policy Framework (RPF) – Zambia

Resettlement Policy Framework (RPF) - Zimbabwe

Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

Zambezi River Authority (ZRA)

26 February 2019

Project No.: 0239269

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ERM

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Signature Page

26 February 2019

Resettlement Policy Framework (RPF) - Zimbabwe

Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

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DEFINITIONS

Affected Persons: Any individual, persons, family, household, group, or collective body that is affected by either physical or economic displacement and are deemed eligible to resettlement assistance and/or compensation under this RPF.

Asset Inventory: The investigation and measuring of all land, interest on and rights to that land, as well as any assets and unexhausted improvements on that land. The Asset Inventory forms of the basis for the determination of resettlement assistance and/or compensation to be granted to Affected Persons.

Allowances: Cash compensation provided into addition to any resettlement assistance and/or compensation provided for the loss of assets, and generally provide transitional support while Affected Persons restore their living conditions and livelihoods after resettlement.

Communal Land: Communal land is land owned by the State, the management of which is seconded to the local rural authorities

Compensation: The forms or combination of cash or in-kind replacement assets to be provided to Affected Persons to compensate for the acquisition of land or the loss of assets. In most cases, compensation denotes cash only.

Cut-off Date: The date which establishes the deadlines for entitlement to Compensation and/ or Entitlements in respect of Eligible Land, Crops, Trees and Structures. Persons occupying the project footprint after the cut-off date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the cut-off date (usually the date of completion of the assets inventory, or an alternative mutually agreed on date), will not be compensated.

Economic Displacement: The loss of assets or access to assets that leads to loss of income sources or livelihoods but does NOT necessarily result in the direct loss of a place of residence.

Eligible Persons: See Affected Persons

Entitlement Framework: A framework that establishes the specific entitlements (i.e. forms of compensation) granted to Affected Persons who will lose affected assets, as determined during the Asset Inventory.

Household Census: The registration of Affected Persons and the collection of their details, which forms the basis for the confirmation of eligibility to resettlement entitlements.

Improvements: Anything resulting from expenditure of capital or labour - including carrying out of any building, engineering, clearing, improvement, or other operations - in, on, over, or under land, or the making of any material change in the use of any building or land and charges for services provided and other expenses incurred in the development or towards the development of land.

Livelihood Restoration: A range of measure and programmes that ensure that the existing livelihoods of Project-affected persons is restored, or ideally improved, during and after the land acquisition and/or resettlement process.

Livelihood Restoration Plan: A plan that establishes the entitlements (e.g., compensation, other assistance) of affected persons and/or communities economically displaced (no physical displacement) by a Project, in order to provide them with adequate opportunity to re-establish their livelihoods**.**

Livelihoods Restoration and Improvement Plan: A detailed plan which is developed with the goal of restoring and where possible improving previous levels of income, employment, and food security for Project-Affected Persons through provision of economic opportunities and income generating activities (i.e. agricultural production and processing, employment promotion, and enterprise development).

Physical Displacement: The displacement, loss, or destruction of the place of residence as a direct result of the development of the Project.

Resettlement assistance: Support provided to people who are physically displaced by a Project. Assistance may include transportation, food, shelter, and social services that are provided to affected people during their relocation. Assistance may also include cash allowances that compensate affected people for the inconvenience associated with resettlement and defray the expense of transition to a new locale, such as moving expenses and lost work days.

Replacement cost: The rate of compensation for lost assets calculated at full replacement value, that is, the market value of the assets (i.e. land, crops, structures) plus transaction costs (i.e. any registration costs, transfer taxes).

Resettlement Policy Framework: A framework document that defines the principles and steps to be adopted in the development of a Resettlement Action Plan. The framework is a precursor to the Resettlement Action Plan and does not replace it.

Resettlement Action Plan: is a plan prepared by the sponsor or other parties responsible for resettlement (such as government agencies), specifying the procedures it will follow and the actions it will take to properly resettle and compensate people and communities physically displaced by a Project.

Specially Gazetted Land: This is agricultural land, which has been identified for compulsory acquisition and has been gazetted for such acquisition.

State Land: This refers to any Land not deeded and land belonging to the State.

Wayleave: A right of way over another's ground or property usually associated with power lines.

ACRONYMS

Abbreviation	Full Definition
BGHES	Batoka Gorge-Hydro Electric Scheme
CAI	Census and Asset Inventory (CAS Census and Asset Survey)
CFF	Community Feedback Forums
FPIC	Free, Prior, and Informed Consent
GO	Grievance Officer
ICP	Informed Consultation and Participation
ICT	Information and Communication Technology
IDP	Internally Displaced Persons
IFC	International Finance Corporation
IFC PS	IFC Performance Standards
IP	Indigenous People
KPI	Key Performance Indicator
LRP	Livelihood Restoration Plan
LRIP	Livelihood Restoration and Improvement Plan
M&E	Monitoring and Evaluation
NLC	National Land Commission
PAH	Project-Affected Household
PAP	Project-Affected Person
RAP	Resettlement Action Plan
ROW	Right-of-way
RPF	Resettlement Policy Framework
RSC	Resettlement Steering Committee
RSLF	Resettlement Stakeholder Leadership Forum
SEP	Stakeholder Engagement Plan
VSP	Vulnerable Support Plan
ZRA	Zambezi River Authority

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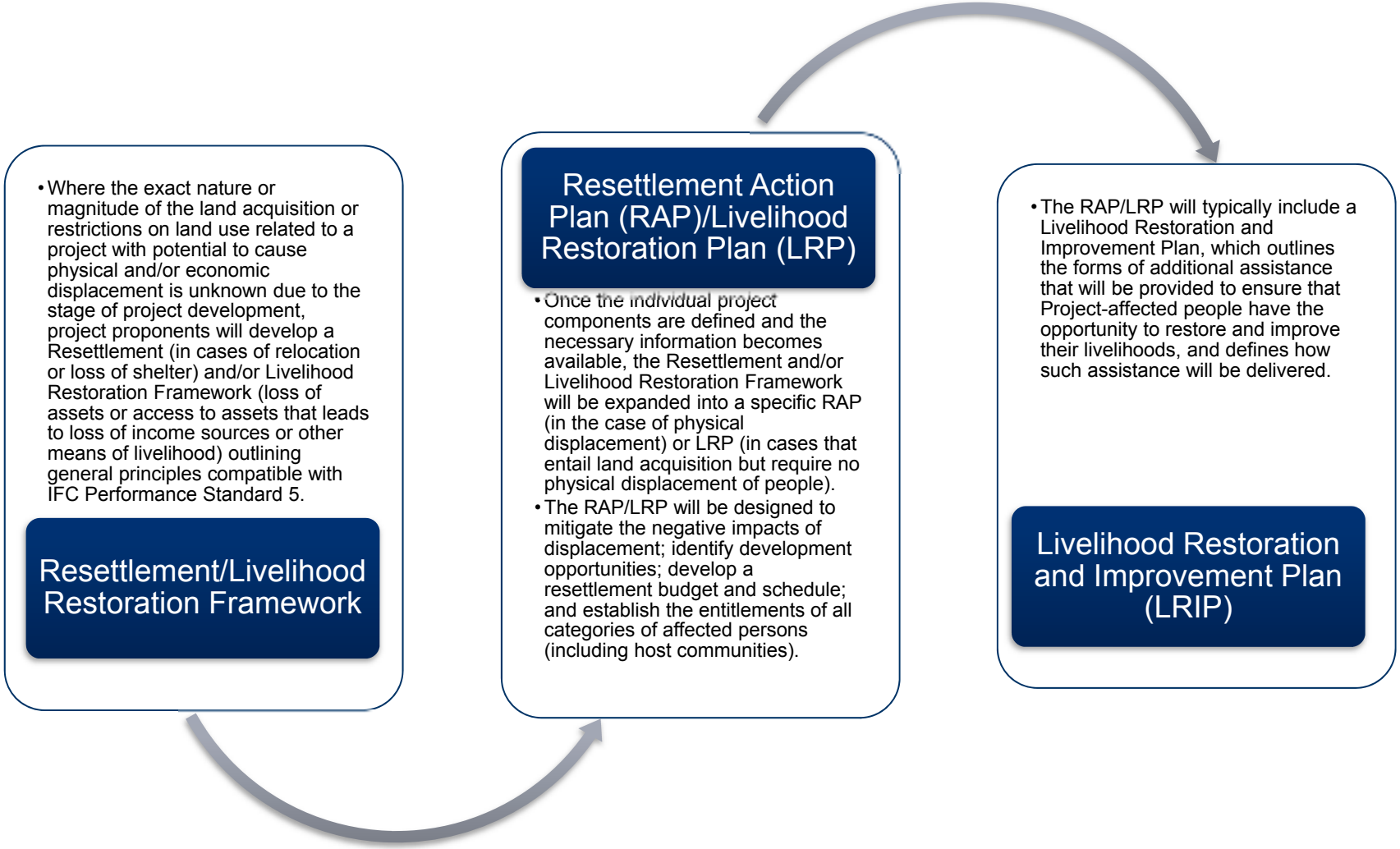
1. INTRODUCTION

This Resettlement Policy Framework (RPF) sets out the guiding principles and procedures that will be followed in managing the impacts of acquiring land for the Batoka Gorge-Hydro Electric Scheme (BGHES) in Zimbabwe. It will guide the compensation of losses and mitigation of potentially adverse Project effects experienced by persons and/or communities through the construction and operation of all components of the hydropower project in this country. Following RPF approval, a detailed Resettlement Action Plan (RAP) or Livelihood Restoration Plan (LRP)[1] will be prepared that covers all project components following finalization of their specific location, boundaries and land area requirements. In the event that Project components will be developed in phases, separate RAPs/LRPs will be prepared.

As illustrated in **Figure 1**, a Resettlement Policy Framework is prepared when the exact nature and magnitude of the land acquisition is unknown. Once individual project components are fully defined, and necessary information becomes available, then Resettlement Action Plan(s) can be prepared. Chapter 12 Implementation Arrangements outlines the detailed tasks and resources required to move from a Resettlement Policy Framework to an endorsed RAP(s).

[1] For projects involving economic displacement only, Livelihood Restoration Plans are required; those which involve **both** physical and economic displacement require a Resettlement Action Plan

Figure 1 Resettlement Policy Frameworks and Action Plans



As the Project straddles the international boundary between Zambia and Zimbabwe, with hydropower infrastructure components requiring access to land in both countries, two RPFs have been prepared. The principles and approach are similar; however, there are differences in the community context and legal framework governing land allocation and access in each country. This RPF focuses on land-related Project displacement impacts within Zimbabwe and aligns with both national laws and international standards governing involuntary land acquisition and resettlement.

1.1 Project Description

Geological investigations into a hydropower scheme on the Zambezi River first began in the early 1900s. In 1972, additional studies concluded that Batoka Gorge represents the best site for the development of a hydropower scheme. Further investigations conducted in 1981/82, 1983 and 1989 identified a specific site within the Batoka Gorge suitable for such a project, prompting a full feasibility study in 1993.

In 2014, the Zambezi River Authority (ZRA) appointed Studio Pietrangeli (SP) Consulting Engineers to update the engineering feasibility study for the scheme, and in parallel engaged Environmental Resources Management (ERM) South Africa to undertake an Environmental and Social Impact Assessment (ESIA), including the development of RPFs for each country.

The Project Proponent is the ZRA, a corporation jointly and equally owned by the governments of Zambia and Zimbabwe. The ZRA is governed by a four-person council, two of whom are Ministers in the Government of the Republic of Zambia and two of whom are Ministers in the Government of the Republic of Zimbabwe. Its primary responsibilities are the operation and maintenance of the Kariba Dam Complex, investigation and development of new dam sites on the Zambezi River and analysing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba.

The BGHES will be located in the central portion of the Zambezi river basin, upstream of the existing Kariba Dam and approximately 47 km downstream of Victoria Falls.

The Project includes the following components, as illustrated in **Figure 2**:

- Dam wall and impoundment, including spillway;
- Outdoor power houses, one on each side of the river;
- Transmission lines comprising of two 70 km 400 kV lines, running in parallel, and sharing a common right-of-way, to the existing Hwange substation. Each with a way-leave of 60 m;
- Access roads totally 63.5 km (of which 3.6 is new and 59.9 upgrades to existing roads);
- Project township/staff housing to accommodate workers and their families during construction and operations; and
- Quarry.

1.2 Land Acquisition and Resettlement Context

Involuntary resettlement processes present a high level of risk for both project proponents and for the people and communities being displaced.[2] For project proponents, resettlement can be controversial, costly and time-consuming, and if mismanaged can cause social unrest, delays to project development, and can damage the proponent's reputation and social license to operate. For displaced people and communities, resettlement processes can be confusing, stressful, and if mismanaged can result in long-term impoverishment. International experience indicates that the main characteristics of resettlement-induced impoverishment are:

- Landlessness: loss of land assets, including common property;
- Joblessness: loss of workplaces and markets;
- Homelessness: loss of shelter;
- General economic set-back or marginalisation;
- Social disorganisation: increased rates of crime, reduced influence of traditional leaders, loss of culture and negative social behaviour; and
- Impacts to health and safety: disease, mortality, food insecurity and malnutrition.

Displacement poses particular risks for people who may already be marginalized because of socio-economic status, gender, health/ability, ethnicity and/or age. However, when involuntary land acquisition and resettlement is well planned, properly managed, and carried out in conjunction with impacted persons and communities, the risks can be minimised and mitigated and the process can be used to create positive outcomes for project proponents and for local people, including the most vulnerable.

The risks identified above are particularly relevant in the context of this Project as the legacy of the Kariba Dam displacement in the late 1950's persists. Although the Kariba resettlement was undertaken in a very different time, when current governments were not in power and the Zambezi River Authority did not exist, some stakeholders in the Project area continue to raise their concerns that the mistakes of the past will be repeated. In an effort to understand and honour these concerns, it is useful to draw on the research undertaken by the World Commission on Dams.

In an effort to contribute to the global debate around the development effectiveness of large dams ongoing in the 1980/90's, the World Commission on Dams included the Kariba Dam as one of seven case studies worldwide. Close to 60,000 Tonga who inhabited both banks of the Zambezi Valley in 1957 were reported to have been forcibly moved, sparking resistance and violent confrontation causing eight deaths and numerous injuries.[3]

In their assessment of the dam's social impacts, particularly related to resettlement, the WCD found that affected people were neither adequately informed nor consulted:

> *Most of the new land (to which people were resettled) was of poor quality and easily erodible. In addition, as no recession agriculture was possible due to the far distance to the river, only one crop per year could be produced. Resettling too many people to areas too small aggravated the problem. It is therefore not surprising that food production decreased and famine occurred in the first years after resettlement…..There are a few things which are certainly better than in pre-Kariba times, such as the access roads to the area, schools and*

[2] Resettlement is involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement.

3 https://cpb-us-e1.wpmucdn.com/share.nanjingschool.com/dist/1/43/files/2013/05/World_Commission_on_Dams_2000_Case_Study_Kariba_Dam_Final_Report_November_2000-2etc5lv.pdf accessed 26_11_2018 page xi

> *medical facilities. But not all promises made during the resettlement campaign have been met. Most villages are still without electricity.*[4]

It is these experiences and the lessons emanating from them that inform current national and international standards guiding land acquisition and resettlement, including International Finance Corporation (IFC) Performance Standard 5 (2013) and the World Bank Environmental and Social Framework (2016). And, it is these standards which will guide any physical and economic displacement as a result of the Batoka Gorge-Hydro Electric Scheme.

The objective of this document is to outline a framework for resettlement that seeks to avoid, and where avoidance is not possible mitigate the risks posed by displacement, through sound planning and resettlement implementation, and adherence to national laws and international standards of good practice. This document will guide all future land acquisition associated with the Project, and is grounded in the following principles:

- Avoid and minimise physical and economic displacement by exploring alternative project designs;
- Mitigate and compensate adverse impacts from land acquisition or restrictions;
- Improve, or at least restore, pre-Project livelihoods and standards of living for all Project-affected persons (PAPs);
- Improve the living conditions of physically displaced households through the provision of adequate housing with security of tenure and the provision of basic infrastructure and amenities;
- Establish standards of compensation that are transparent, consistent, and reflect the full replacement value of all impacted assets eligible for compensation;
- Guide the design of the resettlement process through free, open, transparent and informed engagement with PAPs;
- Establish grievance and conflict resolution mechanisms to address any grievances raised by PAPs or other stakeholders;
- Identify and bridge gaps between Zimbabwe legal requirements and the requirements of the World Bank Environment and Social Framework (2016);
- Give particular attention to vulnerable groups and if necessary implement measures to ensure that vulnerable groups have equitable access to opportunities and benefits; and
- Promote gender equity in all compensation, allowances and livelihood restoration measures.

1.3 Scope and Structure of the RPF

This Framework covers the full scope of the Project's planned land acquisition based on available information current to December 2018, and is organised as follows:

- **Chapter 1 Introduction**: provides an overall introduction, Project description and context for the Framework.
- **Chapter 2 Legal & Institutional Framework:** describes the institutional and legal framework that has guided the preparation of the Framework.

[4] https://cpb-us-e1.wpmucdn.com/share.nanjing-school.com/dist/1/43/files/2013/05/World_Commission_on_Dams_2000_Case_Study_Kariba_Dam_Final_Report_November_2000-2etc5lv.pdf accessed 26_11_2018 page xii

- **Chapter 3 Overview of Project-affected Population:** presents the Project understanding of existing socio-economic conditions of the Project-affected persons and communities, based on available information.
- **Chapter 4 Stakeholder Engagement:** describes stakeholder participation and planned consultation activities throughout the resettlement planning process.
- **Chapter 5 Project Impacts**: provides an overview of impacts on Project-affected persons, households, and communities.
- **Chapter 6 Compensation Principles & Entitlements:** presents the policies guiding resettlement compensation and outlines the Project's strategy for compensation for all forms of ownership or use rights affected by the Project.
- **Chapter 7 Replacement Assets:** outlines the process for defining the replacement assets that will form part of the entitlements for PAPs.
- **Chapter 8 Livelihood Restoration & Improvement:** defines the planning process for livelihood restoration and enhancement initiatives to help Project-affected households re-establish existing livelihoods or develop new ones.
- **Chapter 9 Vulnerable Support:** describes the measures to be adopted by the Project to ensure that Vulnerable Persons are not disadvantaged in the resettlement process.
- **Chapter 10 Grievance Management**: describes the mechanisms available to Project-affected people for the processing and resolution of grievances or claims related to the Project's land acquisition process.
- **Chapter 11 Implementation Arrangements:** provides an overview of the implementation arrangements and the actions required to develop a detailed RAP(s), once the location of all components is known.
- **Chapter 12 Monitoring & Evaluation**: describes the monitoring and evaluation procedures required to ensure that proposed principles and objectives are met.

2. LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter provides an overview of the legal and institutional framework guiding the preparation of this Resettlement Policy Framework. It provides a summary of international resettlement standards, and compares Zimbabwe national legislative requirements with those of the World Bank's Environmental and Social Framework (2016).

2.1 Procedure for Acquiring Land and Compensation for Land

The principle legislation setting out the procedure for the acquisition of land by the State in Zimbabwe, and for compensation for such land can be found in four Acts. They are listed below and described in subsequent sections:

- The Constitution of Zimbabwe Amendment Act (No.20) Act 1 of 2013;
- The Land Acquisition Act (Chapter 20:10) for agricultural land, rural land and other private land;
- The Communal Lands Act (Chapter 20:04) for communally held land; and,
- The Parks and Wildlife Act (Chapter 20:14),

There are three main types of land tenure in Zimbabwe; privately owned land (registered with the Deeds Registry), communal land (which local authorities and traditional leaders manage on behalf of the State) and State owned land.

The Communal Lands were borne from the Communal Land Act of 1981, formerly the Tribal Trust Lands and prior to that the Native Reserve Areas. Communal Lands are vested in the President of Zimbabwe who grants land use rights to the inhabitants of the Communal Lands in the form of a permit, consent or as prescribed by the Communal Lands Act. The President and the State hold Communal Lands in trust, and the Minister of Local Government or Rural and Urban Development or the Minister assigned, are in charge of delegating the traditional leaders working in tandem with the local authorities Rural District Councils (RDCs) on administering and use of land in accordance with the terms stipulated in the act.

The Communal Land Act grants authority to both the traditional leadership such as the chiefs, headman or village heads and to local authorities from the RDCs. The President or Minister can revoke or constrain the land rights of the users if there is a violation in relation to the terms specified by the permit or in accordance with the act. In the Communal Lands, the community allocates land amongst themselves for cultivation and grazing; and woodlands, rivers etc. are commonly owned and the traditional leadership via the community takes decisions regarding management and control of shared areas and resources.5

2.2 The Constitution of Zimbabwe Amendment (no. 20) Act 1 of 2013

Section 71(3) of the Constitution prohibits both compulsory deprivation and compulsory acquisition without compensation.

Section 71(3) sets the standards that a law of general application permitting compulsory deprivation of property must meet. Briefly, the requirements include that: the deprivation be inter alia in the interests of the community; the acquiring authority gives reasonable notice of intention to acquire; acquiring authority pays fair and adequate compensation; a court of law has jurisdiction in the event of dispute, etc.

Section 72(2) of the Constitution also specifically provides for the compulsory acquisition of agricultural land (especially Gazetted Land). In terms of the Constitution, agricultural land can be compulsorily acquired for any of the following purposes;

[5] Communal Land Act Chapter 20:04

i. Settlement for agricultural or other purposes;

ii. Land re-organization, forestry, environmental conservation or the utilization of wild life or other natural resources; or

iii. The relocation of persons dispossessed as a result of the utilization of land for (i) and (ii).

The Constitution provides that once such agricultural land identified for acquisition is Gazetted, it will be vested in the State from the date of the publication of such a notice in the Government Gazette.

It should also be noted that the Constitution further provides that there is no compensation for the compulsory acquisition of agricultural land save for improvements made on the land before its acquisition. The Act further restricts any court from entertaining any dispute regarding compensation for agricultural land acquired, save for improvements thereon.

2.3 The Land Acquisition Act

The Land Acquisition Act discussed below provides a more detailed procedure for the acquisition of Agricultural Land (Specially Gazetted Land). This Act also provides a detailed procedure for compensation for such land. Although the Constitution and Land Acquisition Act regarding the procedure for acquisition and compensation of agricultural land conflict in places, the provisions of the Land Acquisitions Act provides a more detailed (and comparatively fairer) procedure for compensation and acquisition of agricultural land.

2.4 Land Acquisition Procedure in terms of the Land Acquisition Act (Chapter 20:10)

As stated above, the provisions of the Land Acquisition Act will be considered when the State seeks to acquire agricultural land, rural land and other privately owned land. It is important to note that the Act provides not only the procedure for the acquisition of land by the State for purposes that are in the interests and benefit to the public, but also provides for the acquisition of land for resettlement purposes. The salient provisions having regard to the acquisition procedure are summarized below.

Section 5. Preliminary Notice of Compulsory Acquisition.

When land for acquisition is identified, and agreement for its acquisition cannot be reached with the holder of such land, a preliminary notice must be given.

The preliminary notice must be published in the Government Gazette. It must also be published for two consecutive weeks in a newspaper circulating in the area where the land that is being acquired is located, the first publication being the same day as the publication of the notice in the Government Gazette.

The preliminary notice should contain the following information:

- Nature and extent of the land, stating that a plan or map of such land is available for inspection at a specified place and at specified times;
- Set out the purpose for which the land is to be acquired for and;
- Calling upon the owner or occupier or any other person having an interest in the land who-
    - Wishes to contest the acquisition of the land, to lodge a written objection within thirty (30) days from the date of publication of the notice in the Gazette; or
    - Wishes to claim compensation to submit a claim within sixty (60) days of publication of the notice in the Gazette.

In addition to the Gazetted publication and the publications in the local newspaper, the Act also requires that a notice in writing be served personally to the owner or occupier of the property, if possible after investigation.

In respect of Specially Gazetted Land, there is no need for personal service -- the publication in the Government Gazette and local newspaper is deemed sufficient. Once a preliminary notice is published the owner of such land is restricted from dealing freely with such land, which includes disposing of the land or making permanent improvements on the land.

A preliminary notice will remain in force for a period of two years from the date of its publication in the Government Gazette. This period will however be interrupted pending any proceedings in a court regarding the acquisition of the land. In short, the period for which the matter is pending in any court will not be counted as part of the two year period.

A preliminary notice must be lodged with the registrar of deeds to prevent anyone from transferring the land to another party pending acquisition.

A preliminary notice may be withdrawn at any time. Any withdrawal must be published in the Government Gazette and served on the affected persons. The notice may at any time after withdrawal, be reissued.

If the preliminary notice lapses before the land is acquired (i.e. on the expiration of the two year period) the notice can only be reissued following a one year period from the date of the notice lapsing or at an earlier time with the agreement of the occupier.

Section 6. Owner may demand acquisition of whole property

This section stipulates that, if a portion of the owner's property is Gazetted in the preliminary notice, the owner may demand for the acquisition of the whole of his property if he believes that the acquisition of the portion will render the remainder of the property unsuitable for the purposes which it was being used.

If such a demand is made the acquiring authority may agree to the acquisition; however, if it rejects the demand then the matter will be referred to the administrative court for determination.

Section 6B of the Act further states that the owner may also request for subdivision of his property if the acquiring authority has sought to acquire the whole property. In requesting subdivision, the owner can agree to the acquisition of a portion of his property as opposed to the whole.

Section 7. Application for an order authorizing or confirming an acquisition following a Preliminary Notice, in cases where the acquisition is contested.

As stated the holder of property being acquired, may object to the preliminary notice within 30 days of the preliminary notice being Gazetted. If such an objection is made, the acquiring authority cannot acquire the property following the 30-day period, but must make an application to the Administrative Court for an order authorizing the acquisition.

The Act provides that once such an application is made the acquiring authority must give notice of the application personally to the holder of land. Although the period for serving such a notice is not stipulated, the Act does state that such notice must be served (personally) within a reasonable time. A reasonable time can be seen as any time before the Administrative Court sits to hear the application, unfortunately a period for when the hearing should take place is also not stipulated.

With respect to agricultural land required for resettlement purposes, the Act provides that notice of the said application in the Government Gazette is sufficient notice.

When determining whether to confirm or authorise the acquisition of land following an objection by the owner of such land the Administrative Court will consider the following;

- That the acquisition of the land is reasonably necessary in the interests of defence, public safety, public order, public morality, public health, town and country planning or the utilization of that or any other property for a purpose beneficial to the public generally or to any section of the public; or

- Where the acquisition relates to rural land, that the acquisition is reasonably necessary for the utilization of that or any other land—or settlement for agricultural or other purposes; or
    - For purposes of land reorganization, forestry, environmental conservation or the utilization of wild life or other natural resources; or
    - For the relocation of persons dispossessed in consequence of the utilization of land for the above-mentioned purposes.
- Where the acquisition relates to only part of a piece of land, that the acquisition will not render the remainder of that piece of land unsuitable for the purpose for which it was being used or was bona fide intended to be used immediately before the acquisition.
- The Administrative Court may after considering the application grant an order confirming or authorising the acquisition. The Administrative Court may also refuse to confirm or authorise the acquisition in which case the preliminary notice must be withdrawn by notice in the Government Gazette.

Section 8. Vesting of land

Subject to any opposition to the acquisition of land by the holder of land, the acquiring authority may acquire the land in question by a written order not less than thirty days after the Gazetting of the preliminary notice.

An order for the acquisition of land must be served on the holder personally, however if this is not possible this must be done by way of notice in the Government Gazette.

Section 9. Eviction of the Owner or Occupier

Absent landholder opposition to the acquisition of the land, the Act provides that the owner will have three months written notice to vacate the property. This only applies to the owner of non-agricultural land required for resettlement purposes, as there is no need for persons occupying land for resettlement purposes to move.

Should the holder fail to vacate the property at the expiration of said period, the acquiring authority may obtain an order from the High Court of Zimbabwe for their eviction.

The Act further imposes a criminal penalty of a fine and/or imprisonment for a period not exceeding two years for a holder who after ninety days (three months) from service of the order of acquisition, refuses to vacate his living quarters.

2.5 Compensation for Land as per the Land Acquisition Act (Chapter 20:10)

Compensation for land in terms of the Land Acquisition Act can be categorized as follows;

- Compensation for Specially Gazetted Land
- Compensation for Land Excluding Specially Gazetted Land

Compensation for Specially Gazetted Land

Compensation for Specially Gazetted Land is dealt with in Part VA of the Act.

The Act establishes a Compensation Committee to deal with compensation for Specially Gazetted Land.

The procedure for the assessment of compensation for Specially Gazetted Land can be summarized as follows;

- As soon as possible after any agricultural land has been specially Gazetted, a designated valuation officer will prepare a preliminary estimate of the compensation payable for improvements or the land. The designated valuation officer must then transmit his preliminary assessment to the Compensation Committee.

- On receiving the preliminary estimate of compensation payable the Committee will conduct its own investigation and prepare its own estimate of compensation payable.
- Notice will then be sent to the claimant/ affected person advising them of the estimate for compensation, and inviting the claimant/ affected person who has a dispute with the Committee's estimate to provide a counter estimate.
- After receiving the counter estimate, the Committee will fix the compensation to be paid for the land and or improvements on the land and inform the claimant.

Section 29C of the Act provides that compensation for Specially Gazetted Land will be paid for improvements to or on the land. The section also provides that compensation for the land itself will only be paid on the establishment of an adequate fund for the purpose.

The Act provides detailed principles for the assessment of compensation for Specially Gazetted Land (see Annexure A of the Act) and principles for the assessment of compensation for improvements to or on the land.

The Act further sets out the minimum threshold of compensation to be paid out for Gazetted Land at any particular time as follows;

- At least ¼ of the compensation payable shall be paid at the time the land concerned is acquired, or within a reasonable time thereafter; and
- A further ¼ of the compensation payable shall be paid within 2 years after the land concerned was acquired; and
- The balance of the compensation payable shall be paid within 5 years after the land concerned was acquired.

Note that payment for Gazetted Land (excluding improvements to land) will be dependent on the availability of the fund government has in place for payment of compensation for land. This leaves uncertainty as to when compensation for Gazetted Land will be given.

Lastly the Act provides that compensation shall not extend to any inconveniences or losses suffered by the landowner in the process of the acquisition process. In other words, compensation will exclusively be for improvements to or on the land and if possible (dependent on the availability of funds) the land itself.

Compensation for Land Excluding Specially Gazetted Land

Compensation for Land Excluding Specially Gazetted Land is dealt with in Part V of the Act. The procedure for making such compensation can be summarized as follows;

Any person who wishes to claim compensation for land (excluding Specially Gazetted Land) must submit a written claim for compensation specifying in detail—

- The nature of his loss or deprivation of rights; and
- The amount of compensation claimed by him and the basis on which he has calculated that amount and any actual expense or loss which has been or may reasonably be incurred or suffered directly as a result of the action taken by the acquiring authority.

It can be noted that there is no exact formula for doing so; thus, the claimant must quantify his loss which the acquiring authority can accept or reject.

The claimant must submit a written claim for compensation to the acquiring authority within at least 60 days of Gazetting of the preliminary notice in the Government Gazette.

Any disputes regarding compensation must be referred to the Administrative Court for determination only after a period of thirty days after an order is made regarding the acquisition of the land.

The Administrative Court is authorized to make a determination of fair compensation if there is a dispute.

The Act provides that where land that is not Specially Gazetted Land is acquired temporarily, compensation shall be assessed in terms of the rental value of the land.

Where only a portion of the land, other than Specially Gazetted Land, has been acquired, compensation for that part shall be assessed as the difference between the price or value of the whole piece of land, and the price or value so determined of the remainder of that piece of land.

If immediately before the date of publication of the preliminary notice in the Gazette, land that is not Specially Gazetted Land was used for a special purpose and adapted for that purpose in such a way that there is no general demand or market for the land, then compensation would include the cost of adapting replacement land. The goal being to ensure the claimant is restored as closely as possible to the position in which they were immediately prior to that date, or on any other basis that is considered fair.

2.6 Communal Lands Act (Chapter 20:04)

This Act provides the procedure for the compulsory acquisition of communal land. Having regard to this Act, there are three ways communal land can be acquired, these can be summarized as follows.

Section 6. Additions to or subtractions from Communal Land

This section authorizes the President after consultation with the rural district council under which the communal land falls to declare by way of a statutory instrument, that such land ceases to be communal land.

When the president takes such action, the land ceases to be communal land and becomes state land until it is sold or otherwise disposed of. This section is gives the President very wide reaching powers as it does not provide opportunity for challenge by an affected party to the President's decision, nor does it oblige that he gives of a specific reason for the subtraction of such land from communal land.

Section 10. Setting aside of Land for Communal Purposes

This section authorizes the Minister of Local Government, Rural and Urban Development after consultation with the rural district council established for the area, to set aside any communal land for any purpose for which he considers in the interests of the people of that area or in the public interest.

In acquiring such land (setting aside such land) the Minister publishes a statutory instrument describing the land, the purpose for which the land is being set aside for, specifying the date on which the land will be set aside and ordering all persons occupying such land to permanently vacate the land with their belongings.

Section 11.Servitudes relating to water rights over communal land

In terms of this section the Administrative Court in terms of the provisions of the Water Act (Chapter 20:24) may grant a servitude over communal land, which servitude could lead to the inundation of an area of communal land. Such a servitude could result in the loss of land by certain occupants of the affected area. This section accordingly can also be seen as a way in which land can be acquired. This section does not provide any specific procedure as to procedure in relocation of affected persons. It furthermore does not provide an internal remedy for recourse against such a decision granting a servitude that would result in the inundation of communal land.

It is worth noting that the Communal Land Act of 1981 does not clearly detail the roles of the traditional leadership and the local authorities. Consequently, disputes may arise because of a lack of clarification on the roles and responsibilities of both parties in administering the communal areas. In some instances, the Rural District Councils (RDCs) may implement decisions based on strategic planning, whereas the traditional leadership claims ancestral rights as custodians of the land.

In essence, the communities residing on Communal Land are governed by their permit or the Act and thus lack formal documentation and land tenure. Misuse of the permit or violations of terms stipulated in the act can lead to the land use rights being revoked, thus leaving the inhabitants without a residential or arable plot.

The RDCs derive their roles and responsibilities from the Rural District Councils Act (Chapter 29:13). RDCs and traditional leaders work together to administer the communal lands. It is worth noting that the local authorities can, and in most cases do, override the functions and authority of the traditional leaders.

2.7 Compensation for Land as per the Communal Lands Act (Chapter 20:04)

In terms of this Act the primary relief for an affected person is, if possible, alternative land for use. If alternative land is not available and no agreement is reached with the affected persons the Act advises that the provisions of the Land Acquisition Act regarding compensation will apply. This however is vague as question arises around whether the procedure put in place for Specially Gazetted Land (agricultural land) will be used or whether the procedure relating to any other land will be used. Noting this vagueness, it will be the responsibility of the occupier of communal land to quantify his loss and submit the claim to the acquiring authority for payment. The Administrative Court will be the deciding body should there be a dispute.

The Act also provides that compensation will be made from the Consolidated Revenue Fund, presuming sufficient funds exist to provide the appropriate amount of compensation in a timely fashion.

2.8 The Parks and Wildlife Act (Chapter 20:24)

In light of BGHES being located within a national parks area, consideration must be given to the provisions of the Parks and Wildlife Act (Chapter 20:04). As stated the provisions regarding acquisition are generally aligned with the Land Acquisition Act and the Communal Lands Act, however there is a notification process to inform the Ministry of Environment and Tourism.

The procedure can be summarised as follows.

Section 117. Compulsory acquisition of land, etc., in national parks, etc

In terms of the Act where any person who is authorized in terms of any law (for instance the Land Acquisition Act or Communal lands Act) to acquire compulsorily land which may lie within a National Park, such authority must give the Minster of Environment and Tourism not less than thirty days' notice of the intention to exercise those rights.

Accordingly, if such acquisition is in terms of the Land Acquisition Act, it is the President or any Minister authorised by the President to acquire the land who must give the Minister of Environment and Tourism the 30 days' Notice. If such acquisition is in terms of the Communal Lands Act it is the Minister of Local Government, Rural and Urban Development or whichever Ministry the president may assign to administer the Act, that must give thirty days' notice to the Minister of Environment and Tourism.

The Act provides that the acquiring authority should also specify the date on which the acquisition will take place.

The Minister of Environment and Tourism is permitted to refer the matter to the President for determination before the proposed acquisition if he believes that the acquisition of such land will interfere with the purposes for which the National Park is constituted.

Where the President considers that, it is in the public interest for land within a National Park to be acquired he may assent to the proposed acquisition, despite the fact that the exercise will unduly

interfere with the purposes for which the National Park was constituted. In so doing, he may fix terms and conditions as necessary or desirable.

In the event that an acquisition is deemed unfair, a grievance can be lodged with the Administrative Court. The Administrative Court is also empowered to determine grievances where compensation is concerned. The Administrative Court is an organ for ensuring administrative actions and decisions are lawful, reasonable and procedurally fair.

2.9 Use of Land Affected by Transmission Lines

In Zimbabwe, Section 9(1) of The Electricity (Public Safety) Regulations 2018, Statutory Instrument 177 of 2018, prohibits any person from carrying on any business or activity, farming or erecting any structure within a prescribed wayleave distance (the area beneath the power line). The Act provides for a penalty for contravention in the form of a fine and/or imprisonment for a period lasting no less than six months.

Table 1 presents the wayleave distances prescribed by the regulations.

Table 1 Wayleave Clearances [6]

Voltage Level	Wayleave Clearance (M) Either Side from the Outer Most Conductor
11kV	5
33kV	5
66kV	7.5
88kV	15
132kV	15
330kV	30
400kV	30

As the Project transmission lines will have a voltage level of 400 kV, the wayleave clearance will be 30 m either side from the outermost conductor.

2.10 International Resettlement Standards

The World Bank policy on involuntary resettlement is established under Operational Policy and Bank Practice 4.12 on Involuntary Resettlement (OP/BP 4.12), which is further defined through the Bank's Safeguard Policies. These policies were reviewed and updated, and the new Environmental and Social Framework (ESF) published in 2016.[7]

ESF's Environmental and Social Standard 5 (ESS5): Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (see Annex 1) establishes the following objectives:

- To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives.
- To avoid forced eviction.
- To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a) providing timely compensation for loss of assets at replacement cost and (b) assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

[6] Copied from Electricity Regulations Fourth Schedule (Section 9(1))

[7] https://www.worldbank.org/en/projects-operations/environmental-and-social-framework accessed 05_12_2018

- To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure.
- To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant.
- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.[8]

Two principles of particular relevance to this Project are "replacement cost" and 'security of tenure'.[9]

"Replacement cost" is defined by ESS5 as the method of valuation yielding compensation sufficient to replace assets, plus necessary transaction costs associated with asset replacement. Where functioning markets exist, replacement cost is the market value as established through independent and competent real estate valuation, plus transaction costs. Where functioning markets do not exist, replacement cost may be determined through alternative means, such as calculation of output value for land or productive assets, or the un-depreciated value of replacement material and labor for construction of structures or other fixed assets, plus transaction costs.

In all instances where physical displacement results in loss of shelter, replacement cost must at least be sufficient to enable purchase or construction of housing that meets acceptable minimum community standards of quality and safety. The valuation method for determining replacement cost should be documented and included in relevant resettlement planning documents. Transaction costs include administrative charges, registration or title fees, reasonable moving expenses, and any similar costs imposed on affected persons. To ensure compensation at replacement cost, existing (or planned) compensation rates may require updating in project areas where inflation is high or the period of time between calculation of compensation rates and delivery of compensation is extensive.

"Security of tenure" means resettled individuals or communities are resettled to a site that they can legally occupy, where they are protected from the risk of eviction and where the tenure rights provided to them are socially and culturally appropriate. In no event will resettled persons be provided tenure rights that are in effect weaker than the rights they had to the land or assets from which they have been displaced.

Other pertinent points in ESS5 include:

- The proponent will engage directly with affected communities and persons through a process of stakeholder engagement through the planning, implementation, monitoring, and evaluation of the resettlement process.
- The proponent will establish a grievance mechanism to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion.
- In the development of the RAP or LRP, the proponent will be required to conduct a census to determine eligible peoples and an inventory of their assets as a basis of determining their asset holdings. Both will be linked to a suitable development moratorium (i.e. eligibility cut-off date).
- Where affected persons are required to be relocated, the proponent will offer feasible resettlement options, including adequate replacement housing or cash compensation where appropriate.

[8] Guidance Note – ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement page 1

[9] Guidance Note – ESS5 page 2/3

- Documentation of ownership or occupancy and compensation payments should be issued in the names of both spouses or single heads of households, and other resettlement assistance, such as skills training, access to credit, and job opportunities, should be equally available to women and adapted to their needs. Where national law and tenure systems do not recognize the rights of women to hold or contract in property, measures should be considered to provide women as much protection as possible with the objective to achieve equity with men".[10]
- The mitigation of economic displacement will be considered complete when the completion audit concludes the affected persons or communities have received all of the assistance for which they are eligible, and have been provided with adequate opportunity to re-establish their livelihoods.[11]

Critical to the above requirements is the recognition of affected persons with different land tenure status. Displaced persons, under the World Bank include persons:

1) With formal legal rights to the land or assets they occupy or use;
2) With no formal legal rights to land or assets but have a claim to land that is recognized or recognizable under national customary law; or
3) With no recognizable legal right or claim to the land or assets they occupy or use.

Affected persons who fall into the third category are considered eligible for compensation for any lost assets other than land (such as crops, irrigation infrastructure and other improvements to the land) at replacement cost. ESS5 also stipulates that the Borrower provide assistance in 'lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere'.[12]

2.11 Governance and Administrative Structure

The Government of Zimbabwe works as a Presidential Republic. Administratively, the country is divided into 10 provinces, with presidentially appointed provincial ministers administering each province assisted by district administrators. The provinces are further divided into 59 districts and then 1200 wards. The nation's parliament holds legislative and rule-making power. Additionally, the country has a judicial branch for matters of the court.

Zimbabwe adopted a new constitution in 2013 (Constitution of Zimbabwe) which, among other things recognises the role of the institution of traditional leadership. They operate alongside modern state structures. In parts of the country where the State has a limited presence, traditional leaders deliver various government responsibilities. Their legitimacy, control and influence in rural areas remain widespread.[13] **Figure 3** illustrates the existing political and traditional governance structure within Zimbabwe.

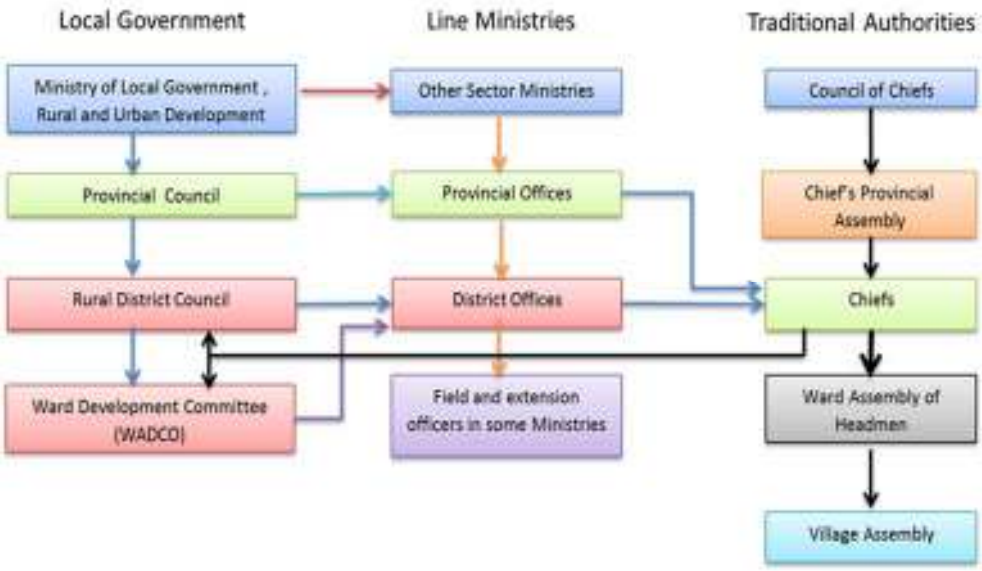
[10] Environmental and Social Framework (2016) page 57

[11] Ibid page 59

[12] Ibid page 59

[13] http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2077-49072016000100003 accessed 03_12_2018

Figure 3 Governance Structure



There are three main bodies with responsibility for the development and implementation of the RAP(s): the ZRA; local government and traditional leaders in the Project area; and the Government of Zimbabwe.

The ZRA will be the primary responsible party in terms of adherence to this RPF, and the development and implementation of the RAP(s), consistent with its legal obligations under current environmental regulations. This will include the management and financing of all required studies, negotiation on entitlements, stakeholder engagement, provision of resettlement assistance, and payment of compensation.

The financing for the Project and the resettlement will however be sourced from a range of international private and public financiers (i.e. World Bank, African Development Bank). The conditions for securing international financing includes ensuring that the resettlement process conforms to international good practice (as framed in the World Bank Environmental and Social Standards, 2016).

2.12 Gaps Analysis between National Laws and International Standards

Table 1 compares national laws in Zimbabwe with World Bank standards pertinent to land acquisition and resettlement. The compensation entitlements, livelihood restoration and vulnerable support measures outlined in further chapters of this RFP are designed to address the gaps between international standards and regulations governing land acquisition and distribution in Zimbabwe.

Table 2 Comparison between National and International Standards Related to Land Acquisition and Resettlement

Project impact/component	Zimbabwe Legislation	World Bank Environmental and Social Standard 5	Measures to address gaps
Compensation for 'squatters'	No mention in national legislation of 'squatters' being eligible for compensation	Affected persons include those with no recognizable legal right or claim to the land or assets they occupy or use; they will be compensated for assets other than land (such as crops, irrigation infrastructure and other improvements made to the land) at replacement cost. Additionally, they will be provided with assistance in lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere. (Note: people who encroach on the project area after the cut-off date for eligibility are not entitled to compensation or assistance)	See Chapter 6 Compensation Principles; Table 7 Eligible Persons includes de-facto occupant or user
Compensation rates	Land Acquisition Act establishes a Compensation Committee (made up of key government officials) to deal with compensation for Specially Gazetted Land. It includes retaining a designated valuation officer to prepare an estimate of compensation. The Act also sets out the minimum threshold of compensation to be paid out in specific instalments. Land Acquisition Act provides that compensation will not extend to any 'inconveniences or losses' suffered by the land owner in the process of the acquisition. Compensation is for improvements to or on the land, and **if possible**, the land itself.	Affected persons are entitled to compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or livelihoods Land will be accessed only after compensation in accordance with Environmental Social Standard 5 has been made available, and where applicable, displaced people have been resettled and moving allowances have been provided to the displaced persons, in addition to compensation.	See Chapter 6 Compensation Principles Table 8 Entitlement Matrix

Project impact/component	Zimbabwe Legislation	World Bank Environmental and Social Standard 5	Measures to address gaps
Compensation for agricultural land	S72 of the Constitution of Zimbabwe Amendment (no. 20) Act 1 (2013) provides that there is no compensation for agricultural land, except for improvements effected on it before its acquisition. Land Acquisition Act stipulates that payment for Gazetted Land will be dependent on the availability of the Fund government have in place for payment of compensation for land.	When land acquisition or restriction on land use (whether permanent or temporary) cannot be avoided, affected persons will be offered compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or livelihood	See Chapter 6 Compensation Principles Table 8 Entitlement Matrix
Compensation for communal land	S12 (1) of the Communal Lands Act (Chapter 20:14) provides for provision of alternative land for communal use. If alternative land is not available the provisions of the Land Acquisition Act regarding compensation to apply (i.e. land occupiers to give quantification for loss suffered and expert valuation to be undertaken)	In cases where affecting persons with legal rights or claims to land that are recognized or recognizable under national law, replacement property (e.g. agricultural or commercial sites) of equal or greater value will be provided, or where appropriate, cash compensation at replacement cost Economically displaced persons who are without legally recognisable claims to land will be compensated for lost assets other than land (i.e. crops, irrigation infrastructure and improvements to land) at replacement cost. Additionally, the borrower will provide assistance in lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere.	See Chapter 6 Compensation Principles Table 8 Entitlement Matrix
Livelihood restoration	No specific provisions for forms of additional livelihood assistance beyond compensation.	Economically displaced persons will be provided with opportunities to improve (or at least restore) their means of income-earning capacity, production levels, and standards of living. Recommends provision of support to displaced persons for a transition period.	Chapter 8 Livelihood Restoration and Improvement outlines approach and possible program types

Project impact/component	Zimbabwe Legislation	World Bank Environmental and Social Standard 5	Measures to address gaps
Valuation methods	Asset valuation practice does not make mention of depreciation, but does indicate that compensation does not extend to any 'inconveniences or losses', although the nature of these is not clarified.	Full replacement cost does not take depreciation into consideration.	See Chapter 6 Compensation Principles Table 8 Entitlement Matrix
Stakeholder engagement and consultation	Reference to gazetting and notification, but no specific provisions for stakeholder engagement and consultation.	Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected	Chapter 4 outlines the Project approach to stakeholder engagement and participation
Vulnerable groups	No specific provisions for vulnerable groups	Where the environmental and social assessment of the project identifies specific individuals or groups as disadvantaged or vulnerable[14], the borrower will propose and implement differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing any development benefits and opportunities resulting from the project.	Chapter 9 outlines the Project approach to identifying and providing support to PAP deemed 'vulnerable'

[14] Disadvantaged or vulnerable refers to those who may be more likely to be adversely affected by the project impacts and/or more limited than others in their ability to take advantage of a project's benefits. Such an individual/group is also more likely to be excluded from/unable to participate fully in the mainstream consultation process and as such may require specific measures and/or assistance to do so. This will take into account considerations relating to age, including the elderly and minors, and including in circumstances where they may be separated from their family, the community or other individuals upon which they depend.

3. OVERVIEW OF PROJECT-AFFECTED POPULATION

This chapter provides an overview of the baseline socio-economic conditions in those communities that will be affected by the Project's requirement to access land. Information was drawn primarily from household survey and qualitative data gathered in the Project area for the updated ESIA (2016). Preparation of the RAP(s) will require a full census and asset inventory of all affected households and collection of up to date socio-economic data to establish a baseline for outcome monitoring, and to inform livelihood restoration programming and support for affected households deemed vulnerable.

The BGHES falls into the province of Matabeleland North in Western Zimbabwe close to the borders of Botswana and the Republic of Zambia. It is the country's second least populous province, and home to the famous Victoria Falls and Hwange National Park. All Project components will be located within Hwange district.

3.1 Governance Structure of the Project-impacted Area

Land required for the development of the Project is located in the following nine wards: Matetsi, Chidobe, Katchecheti, Nemanhanga, Mbizha, Jambezi, Sidinda, Mashala and Chinkandukubi. The affected chiefdoms are Hwange, Mvutu and Shana. The Ministry of Local Government, Rural and Urban Development (MLGRUD) oversees local government in Zimbabwe, administered through urban and rural district councils. The role of the rural district councils includes planning and implementing local development; providing and managing basic services, including health, education, social welfare, refuse removal, water, roads and sanitation.

Policymaking in rural areas takes place in village and ward assemblies, and the full District Council in ascending order. The Ward Assembly is composed of all headmen, village heads within that particular ward, and the elected councillor for that area. Wards are further divided into villages, each of which has a Village Development Committee chaired by the Village Head.

The Traditional Leadership Act (1998) provides for the appointment and duties of Chiefs, headmen and village heads. Each plays an important role at the grassroots level in both the distribution and documentation of land access and the resolution of land related disputes. The President appoints chiefs to preside over communities inhabiting communal land and resettlement areas. Their responsibilities include:

- Promoting and upholding cultural values among members of the community under his jurisdiction, particularly the preservation of the extended family and the promotion of traditional family life;
- Supervising headmen and village heads in the performance of their duties; and discharging any functions conferred upon him in terms of the Customary Law and Local Courts Act;
- Overseeing the collection of levies, taxes, rates and charges payable in terms of the Rural District Councils Act by village heads;
- Ensuring that Communal Land is allocated in accordance to the Communal Land Act;
- Ensuring that the land and its natural resources are used and exploited within legal boundaries;
- Protection of public infrastructure and services;
- Adjudicating in and resolving disputes related to land in his area; and,
- Maintaining up-to-date registers with all villages' names, their inhabitants and copies of land certificates.

The Chief nominates a person to serve as Headman, who presides over the ward council. Key responsibilities of the Headman include assisting in the maintenance of law and order; overseeing the disposal of settlement rights in Communal Land and the admission of new settlers in the area;

mediating local disputes over customary law; and keeping up-to-date village records. Village heads assist the Headman in the administration of their duties, and are nominated by the Headmen with approval from the area Chief and the Secretary of the Minister of Local Government.

The Hwange Rural District Council (HRDC) is responsible for setting development priorities in the district and outlining budgets and approaches to meeting set targets. It is the HRDC, through the District Administrator's office and in collaboration with the Ministry of Lands, who will identify suitable resettlement land for those displaced by the BGHES, and assist in resettlement planning and implementation.

3.2 Demographics

As part of the ESIA undertaken in 2016, primary and secondary data was collected in order to establish an updated social baseline for the Project as a whole. It involved identifying the geographic area of influence for the Project; see **Figure 4 Social Area of Influence**. It also included a household survey involving a sample of 1000 households drawn randomly from all villages within the Project-affected area.

Based on this data, the following sections provide insight into the population of people whose land and livelihood will be affected by the development of the Project.

3.2.1 *Population Size*

Hwange Rural District, which incorporates Hwange Urban and Hwange Rural, as well as the town of Victoria Falls, has the largest land area in comparison to other districts in the province and has a total population of 62,670 (or 14,893 households). The population density in the district is 2.3 people per km², with an average household size of 4.2 persons.[1] The ESIA household survey indicated that the household size in the Project-affected area is closer to 5 persons.

Migration patterns in most countries tends to be associated with economic opportunities, which has been particularly challenging in Zimbabwe over the past two decades in light of the country's economic crisis. It is estimated between three and four million Zimbabweans left the country between 2000 and 2009. [2]

Similarly, Hwange Rural District experienced a wave of urban to rural migration in part attributed to the demise of the Hwange Colliery Company, which retrenched thousands of workers in 2002. [15] In the Project area, most village heads report that there were population increases in previous years. The reasons include increasing birth rates, a decrease in mortality rates and people moving to villages as a result of retirements and retrenchments. The village head in Chisuma reported that since 2008, many companies that were based in the regional economic capital Bulawayo were closed. As a result, retrenched employees who had rural homes in Hwange Rural District, or who could not afford to sustain urban lifestyles, moved to the rural communities. The village heads of Jambezi and Sizinda noted that portions of their village had left to move to identified 'resettlement' areas in Kasibo and Matetsi where land was more available and fertile.

[3] http://www.radiodialogue.com/urban-rural-migration-increases-zimbabwe/. Accessed 02.12.2014

3.2.2 *Ethnicity, Religion and Language*

Zimbabwe has three official languages: English, Ndebele, and Shona, which are also the most commonly spoken languages in the country. In the Project area, the household survey found Ndebele the predominant ethnicity, accounting for 41 % of households, followed by Nambiyas (31 %) and Tongas (17 %). Primary languages spoken by surveyed households align with the ethnic distribution; 42 % speak Ndebele, 33 % Naymba and 17 % Tonga. The majority (92 %) of household survey respondents identify as Christian, 7 % follow 'traditional religion' and 1 % Islam.

3.3 Gender Roles

Zimbabwean society continues to have clearly defined gender roles in domestic, productive, and community settings. Women and girls fetch water, cook, clean and take care of children, the sick and elderly. Men tend to dominate both household and community decision-making.

With respect to the Gender Inequality Index (GII), which reflects gender-based inequalities in reproductive health, empowerment, and economic activity, Zimbabwe ranks 116 out of 148 countries. Women hold only 18% of the seats in parliament, and have lower labour force participation rates compared to men. Health facilities report higher rates of women with HIV/AIDS compared with men.[16]

In 2005, Zimbabwe established the Ministry of Women Affairs, Gender and Community Development with the goal of spearheading women's empowerment and gender equality. The ministry has established co-ordinators and development officers at the ward, district and provincial levels throughout the country.

In the Project area, men are generally responsible for the more demanding physical labour associated with farming (i.e. ploughing), whereas women plant, weed, water and harvest crops. Men also fish and carve curios for sale to tourists. Although women do not carve the curios, they help with the polishing so that they are more presentable for sale. Women are also engaged in trading activities. During the baseline study focus groups, women reported playing a limited role in community decision-making, local leadership and politics with men generally controlling income from the sale of any crops and/or curios.

3.4 Land Tenure | Land Reform

As indicated in Chapter 2, the Land Reform Programme in Zimbabwe was part of a government initiative to promote more equitable access to land for all Zimbabweans. After independence in 1980, over 40% of land was owned by white farmers who constituted just 3% of the national population. Land redistribution commenced in the early 1980s, where a "willing seller – willing buyer" approach was initially enacted, but from 2000 to 2002, the fast track land distribution was applied, which saw many white commercial farmers being forcibly removed from their farms and land being transferred to over 160,000 households.

In the Project area, Matetsi Ward land was acquired by the State as part of the land reform programme. Resettled farmers allocated land by the State enter into agreements with the government that stipulates that they can own the land for 99 years. In practice, communal land is regarded as belonging to an individual after they have used it for many years however there are no formal contracts or deeds. Communal land can be inherited by a male or female heir, but cannot be sold. Land seekers in communal areas go through chiefs and headmen for a plot allocation. A senior headman in the study area at the time noted that informal land transfer arrangements and the sale of land between village heads and beneficiaries is rampant in Chidobe Ward. The baseline household survey found that the vast majority of households live on communal land; only one household reported to have title to the land that they occupy.

[16] Zimbabwe Statistics (Zimstat), 2011 Zimbabwe Demographic and Health Survey 2010-11, Zimstat, Harare, Zimbabwe

3.5 Livelihoods and Local Economy

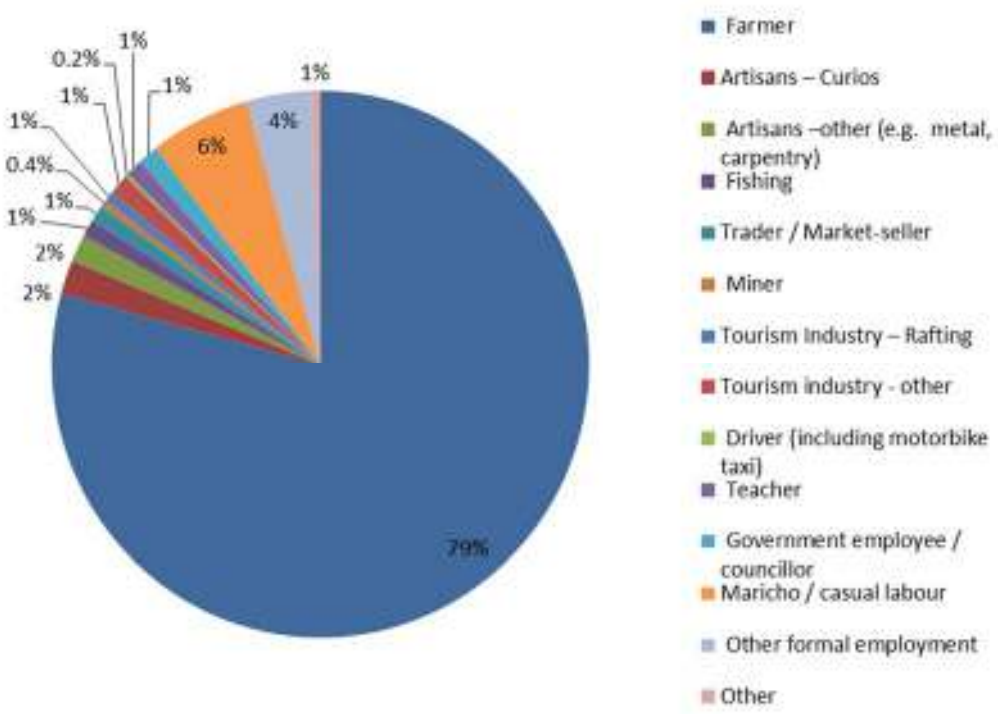
As a province, tourism and mining (coal) are important contributors to the economy of Matabeleland North. The tourist sector relies heavily on the presence of Victoria Falls, the Zambezi River and Hwange National Park. The World Travel and Tourism Council (WTTC) estimate that Zimbabwe's Travel and Tourism trade contribute US$ 87.9 million or 11.4 % of the country's GDP.

The Zimbabwe Vulnerability Assessment Committee (ZIMVAC) 2014 Rural Livelihoods Assessment Results indicates that for the country as a whole, the poverty incidence rate is 62.6 %. In spite of the wealth generated by mining and tourism in the province, Matabeleland North has the highest poverty incidence rate of 81.7 % against the lowest rate of 34.5 % for Bulawayo.[17]

3.5.1 *Agriculture*

As with much of the broader region, and similar to communities on the Zambian side of the riverbank, there is a high reliance in the Project area on agriculture and animal husbandry. Farming as a primary livelihood was reported by 79% of those surveyed during the ESIA baseline study (see **Figure 5**). The highest percentage of farmers was reported in Kasibo (Mashala Ward), undertaken by 90 % of households, and the lowest in Jambezi, at 65 %. The main crops grown include sorgum, millet and maize and an assortment of vegetables, nuts and fruits.

Figure 5 Livelihoods in the Project-affected Area



Although the size of land holdings was not captured during the household survey, key informants reported during a fieldwork exercise undertaken in November 2018, that in traditional rural communities, households generally farm plots of approximately 6 hectares.

[17] ZimVac (2014). Zimbabwe Vulnerability Assessment Committee, 201 4 Rural Livelihoods Report, Harare, Zimbabwe

3.5.2 *Livestock Rearing*

Livestock rearing represents an important component of peoples' livelihood. More than 90% of surveyed households report rearing livestock. The majority (90%) raise poultry, followed by goats (65%), cattle (62%) and pigs (11%). The average number of poultry a household owns is 17, while for goats it is eight and cattle seven.

Livestock is primarily reared for household consumption, particularly poultry. Owning cattle however represents a sign of wealth. Cattle is typically used as a form of savings, sold during times of drought when harvests have been poor or to help pay for education fees or a marriage dowry. They are also used for ploughing and by-products (i.e. manure and milk). Stakeholders described growing concern with cattle rustling, from people illegally crossing the border via the Zambezi River, which they believe may only increase with a possible rise in water levels as a result of BGHES.

3.5.3 *Trading (Curios)*

Trading contributes to the livelihoods of 10% of surveyed households. Goods traded include clothing, goods made from thatch (i.e. baskets and mats) and curios. Curios include intricately carved wooden animals, bowls, utensils, baskets and jewellery. Traders undertake their business within the local communities and report generating a monthly income of on average US$ 125.

Although curio trading was reported as a primary livelihood by only 2% of all surveyed households, it was cited as one of the most important livelihoods activities for men during focus groups in Katchecheti Ward. Additionally, 10% of people in Simakade and 8% in Jabula identify curio carving as their primary livelihood activity. Informal conversations with local wildlife experts revealed that the cutting of trees to make curios poses a serious threat to the forest areas. Trees cut tend to be hardwood varieties, such as Zimbabwean / Zambia teak; known locally as mukusi (Baikiaea plurijuga), mopane; known locally also as mopane or mopani (Colophospermum mopane) and afrormosia; known locally as mubanga (Pericopsis angolensis). These trees take a long time to grow (about 100 years) and as a result, some species are now under threat. Markets for the sale of curios are found in key tourist areas, like Victoria Falls.

3.5.4 *Fishing and Hunting*

Fishing in the Zambezi River is a supplementary livelihood activity undertaken by just over 12% of surveyed households. It is a male dominated activity with the majority of the catch used for household consumption. Average monthly incomes from the sale of the remaining fish amount to approximately US$50, though some households reported incomes as high as US$100. Types of fish caught include tiger fish, bream, salmon, chaser, pink lad and conject. Women typically process the fish, either via drying, frying or salting.

In Hwange Rural District big game trophy hunting generates significant income for the area, although revenues (like the species hunted) are on the decline. Key species hunted include elephant, buffalo, lion and leopard. It provides some employment opportunities for local people and game meat, with revenue generated split into dividends for each ward.

3.5.5 *Tourism*

As noted in **Figure 5**, approximately 5% of households surveyed reported being formally employed and receiving cash incomes from their job in the tourist industry (i.e. drivers, guides, or casual labourers with safari or white water rafting companies, as caterers or house cleaners at hotels and lodges or, as staff at retail outlets). In Chisuma, it is considered an important livelihood amongst male youth, and in Chisuma, Dibu Dibu and Sizinda, the impact of BGHES to the white water rafting trade was expressed as a key concern in their communities.

Community members reported that their engagement in the rafting industry was predominately as casual labourers tasked with carrying rafting equipment from the riverbed to the top of the canyon. As

rafting is seasonal, average earnings during peak seasons was reported to be approximately US$50 per month.

Other activities in the gorge with the potential of being impacted by the Project include birding, angling, hiking and Jet Extreme Boating. Although these activities employ fewer people than the rafting industry, they are nonetheless very popular activities amongst nature- and adventure-based tourists that are visiting the area specifically for a high quality birding, angling or hiking experience and contribute to direct tourism expenditure.[18]

The impacts of BGHES on the tourist industry on both sides of the Zambezi River, including up and downstream from the location of the dam has been examined in great detail as part of a specialist economic assessment study for the ESIA. The findings and their implications are being addressed separate from this RPF.

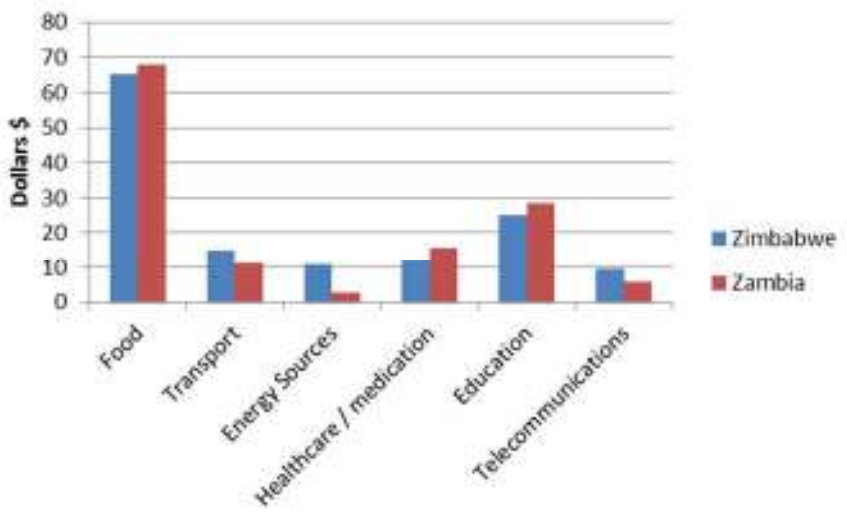
3.6 Household Income and Expenditure

As previous sections suggest, people in the Project-affected area are principally subsistence farmers, selling what additional crops they produce to generate limited cash income. There is also an active market in curios and trading of forest products (i.e. firewood, grass and forest fruits). Livestock is reared for household consumption and sold, when necessary.

Establishing an accurate picture of household income and expenditure is a challenging task. Less than 10% of the households surveyed in 2016 reported a monthly income figure. From those who did, figures ranged from less than US$10/month to $600/month. The average amount reported amounted to US $2/day.

Figure 6 illustrates the monthly household expenditure reported by survey respondents. Food accounts for between 48 - 52 % of the monthly household spend (or US$67.78). Items purchased are typically that which cannot be produced or grown by the household (e.g. salt, sugar and oil) however maize is also purchased when harvests have been depleted.

Figure 6 Household Expenditures



[18] Batoka Gorge Hydro-Electric Scheme; Economic Assessment Specialist Report, Anchor Environmental

3.7 Housing and Infrastructure

In light of the fact that some households will be physically displaced, particularly within the transmission line route, it is important to understand current housing and infrastructure services. Once specific boundaries of land take and the land use restrictions within the required area are known, affected structures and facilities and their owners/users will be inventoried and valued as part of the RAP census and asset inventory.

3.7.1 *Housing*

Housing in rural settlements on both sides of the Zambezi River is typically constructed using local materials (i.e. mud walls and grass thatched roofing). A few brick houses with asbestos roofs were observed, typically located close to the chief's residences. Headmen reported that most households own three to five structures, including a main house for sleeping, a kitchen for preparing food and storing cooking utensils, a grain store and a kraal for livestock.

Housing constructed with local materials requires regular maintenance and periodic replacement as they are subject to inclement weather and termites, This requires labour and access to resources. Health representatives indicate that much of the local housing is of poor quality with inadequate ventilation, and generally overcrowded conditions, contributing to health problems, such as tuberculosis.

3.7.2 *Water*

The majority (90%) of households obtain water for their drinking, cooking and washing purposes from wells with pumps/boreholes. A small number (3%) use water sourced from rivers and streams and approximately four percent of households, most of whom are located in Sizinda, use piped water. In Kasikiri and Dibu Dibi it was reported that some households also use water sourced from unprotected wells. Livestock rely on water from rivers.

Boreholes in the Project area have been constructed by non-profit organizations and also by local government when they are able to access the District Development Fund (DDF). DDF is located within the Ministry of Rural Resources and Water Development and tasked with the responsibility of providing and maintaining rural infrastructure. With the exception of the village of Mununa where water from hand pumps/boreholes was reported to be salty, the quality of water in the Project area is considered satisfactory. The quantity of water available however varies in the dry season and in a number of villages (eg Mununa, Kasibo, Borehole 126 and Chisuma), survey respondents reported boreholes being unevenly distributed in the area, requiring longer travel distances for some households, and susceptible to breakdowns (i.e. Borehole 126).

3.7.3 *Sources of Power*

Firewood is a popular source of energy for cooking and used by most households. The majority collect it from the areas surrounding the villages. Households often use more than one energy source, with paraffin being the most common secondary source for cooking. Increasingly households report using solar panels to generate power for lighting, radios, televisions and charging mobile phones.

3.7.4 *Sanitation*

Over half the household survey respondents noted that they had access to a latrine: 43 % to a built latrine and 15 % to an improved latrine. However, village heads reported that few households actually have their own toilets and it is still common practice to defecate in the bush. In Dibu Dibu and in Borehole 126, Mvuramanzi, an NGO has donated bags of cement for the construction of toilets. NGOs helping other villages in this regard include DANIDA and CADEC.

3.7.5 *Waste Removal*

The majority of surveyed households (97 %) bury their waste in a pit, with a very small percentage (2 %) who reported burning waste.

3.7.6 *Telecommunications*

The majority of households (82 %) own at least one mobile phone; however, telephone reception is poor in all Project-area communities.

3.8 Education

UNESCO indicated that in 2015 the literacy rate in Zimbabwe for those 15 years of age and older, was 89%.[19] Literacy amongst Project-affected households surveyed is significantly lower at 76%. Almost half of households surveyed report receiving a secondary school education; however, 8% lack any formal education and just 1% have had tertiary level education.

School facilities in the Project area are scattered across a wide geography, and include Jabula Primary School, Jabula Secondary School (which is still undergoing construction), Kasibo Primary School, Mununa Primary School, Simakade Primary School, Sizinda Secondary School and the Sacred Heart Mission School. There is also Vhulindlela Secondary school, located 7 km from Borehole 126, under construction. There are no vocation centres in the area. On average, children walk 5 to 10 km to reach a primary school and up to 20 km to access a secondary school. Focus group participants in the village of Kasibo reported that the 25 km distance to the nearest secondary school presents a major barrier to school attendance. In an effort to address this issue, Lubancho (an NGO) provided bicycles to 563 schoolchildren.

3.9 Health

The World Health Organization (WHO) reports that life expectancy in Zimbabwe is significantly lower (61 years of age) than the global average of 70 years.[20] The healthcare sector was severely affected by the economic crisis and associated high levels of inflation that afflicted the country throughout early 2000. During this time, public spending on healthcare was dramatically reduced, with limited funds to purchase medication and equipment, pay for wages, and support other activities that would allow for better health service provision. Per capita spending on healthcare in 2010 was US$ 9, more than four times below the recommended amount of US34 by the WHO.[21]

There are four hospitals that serve Hwange Rural District, including the hospital in Victoria Falls and a private hospital located at Hwange Colliery. Most surveyed households (98 %) report accessing community health posts for their health needs; however the distance they travel is at least an hour by foot.

Matabeleland North has the second highest rate of HIV/AIDS in the country (20% for females and 18% for males). The existence of major tourist attractions coupled with active mining areas in the province are contributing factors. Health workers in the Project area report that diarrhoea, respiratory infections, skin disease and HIV/AIDS are the most common health issues, with HIV/AIDS and diarrhoea cited as the most common cause of death. The household survey suggest that 8% of households in the Project area have a least one household member testing positive for HIV/AIDS.

3.10 Vulnerable People

Vulnerable groups includes people who, by virtue of gender, sexuality, ethnicity, age, physical or mental disability, economic disadvantage or social status may be more adversely affected by a project

[19] http://uis.unesco.org/country/ZW accessed 29_11_2018
[20] ibid
[21] http://www.unicef.org/esaro/5440_investment_in_health.html. Accessed 12.12.2014.

than others, and who may be limited in their ability to take advantage of a project's development benefits.

In reviewing data collected as part of the baseline household survey, the groups below were identified as being at a higher risk of experiencing hardship as a result of the land access requirements of the Project. Their needs will be considered in resettlement planning and implementation, and an assessment made regarding additional forms of support they may require.

Chapter 9 describes how vulnerable groups listed below will be identified from amongst the Project-affected population and assessed**.**

- **Elderly:** The elderly within a village, particularly those who may be frail, have physical disabilities and/or chronic illnesses, and/or are socially isolated, or with limited family support.
- **Female headed-households**: Due to the nature of domestic relations and traditional practices, women's control over resources (physical and financial) is more restricted. Female-headed households may be particularly vulnerable as they face reduced access to income generating opportunities and typically suffer from higher levels of food insecurity. The household survey results indicate that 41 % households in the Project area are female-headed. There is also a higher rate of HIV/AIDS reported amongst women, which has the potential of posing further hardship for a female-headed household.
- **Households with a high number of dependants (i.e. caring for orphaned children)**: Households with a high number of dependent children and/or elderly members may be less able to adapt to change associated with land acquisition and displacement.
- **Households with members who have physical / mental health disabilities, who suffer from a chronic disease and/or have tested positive for HIV/AIDS:** People that lack physical mobility or who have mental health issues are less likely to adapt to changes within their environment. They may not be able to contribute to the financial well-being of the household, and may be reliant on others to care for them straining a household's resources. More than 6% of households surveyed in the Project area report having a household member who suffers from a physical or mental disability. Households with members who have HIV/AIDS are also particularly vulnerable; they may be socially isolated/stigmatized and lack a support system and resources. Those household with heads who have tested positive for HIV/AIDS are at an even higher risk..

4. STAKEHOLDER ENGAGEMENT

This Chapter describes stakeholder engagement activities planned for the BGHES. It highlights the Project's approach to ensuring free, prior and informed consultation of stakeholders and their representative institutions in Project planning and implementation as it pertains to land acquisition and resettlement. The Chapter is divided into three sections:

- **Stakeholder Engagement Approach**: Description of the overall approach to stakeholder engagement, and the specific goals and objectives of the engagement strategy.
- **Stakeholder Identification and Engagement Methods**: Identification of key stakeholder groups and individuals at the affected community, local, district and provincial level, and how they will be involved in resettlement discussions and planning.
- **Future Engagement Activities:** Description of planned engagement strategies moving forward.

4.1 Stakeholder Engagement Approach

The Project's Environmental and Social Impact Assessment (ESIA) team established a Project stakeholder database, which identifies and registers all interested and affected individuals, groups and organizations. General information about the Project generated by the ESIA process has been widely distributed to stakeholders in person, by regular mail and where feasible, via email. In 2016, notices were published in newspapers with a wide readership in Matabeleland North, and information meetings were held with traditional leaders, including headman and village heads, to further encourage the involvement of stakeholders in Project impact discussions. Through recent field visits to the area, stakeholders expressed concern with the lack of information on the status and timeline of the Project and the anxiety this has generated amongst communities within the Project area.

Resettlement stakeholder engagement is the broad, inclusive, and continuous process of relationship building between a Project proponent and its resettlement stakeholders.

The objectives of the land acquisition and resettlement engagement strategy include the following:

- Establish and maintain a constructive, ongoing relationship with those to be displaced, as well as other resettlement stakeholders, based on mutual understanding, respect and trust;
- Ensure that engagement activities are undertaken in a manner that is inclusive, culturally appropriate, and tailored to the language preferences and decision-making processes of those displaced, and the needs of vulnerable groups therein;
- Engage with those displaced as a group – via an informed, structured consultation and participation process – to establish the general terms and conditions that will guide the resettlement and livelihood restoration process;
- Undertake good faith negotiations with individual affected households on the basis of the general terms and conditions established through the group engagement described above;
- Mitigate the risks of asymmetry of information and bargaining power in the engagement / negotiations process through effective disclosure of timely, relevant and understandable, information, capacity building, and third party appointments;
- Ensure that all engagement activities are free of intimidation or coercion, and all participants are fully aware of their rights according to national law and international standards;
- Work towards creating broad community support for the resettlement and Project as a whole.

Land acquisition and resettlement typically involves collective negotiations with key stakeholders and/or their representatives to determine compensation entitlements and eligibility, and plan for resettlement. Once all necessary data is collected and analysed, and each component of the resettlement process is fully discussed and agreed upon with affected people, their leadership and

other relevant government bodies, the Project prepares for resettlement implementation. This includes the individual household sign-off process, where each directly affected household reviews and signs off on the compensation entitlements they are eligible to receive, including any specific forms of livelihood restoration support.

The specific individuals and groups affected by Project access to land, and how they will be engaged in resettlement planning is described in the next section.

4.2 Stakeholder Identification

Resettlement stakeholders are those individuals, groups and organizations with a legitimate interest in the resettlement and livelihood restoration processes, and in particular those people and households that experience displacement impacts directly.

For this Project, stakeholders fall into one of the following categories:

- Government officials and bodies at the national, provincial, district and ward level; relevant to where land will be acquired and households resettled;
- Traditional leaders, including chiefs, headmen and village heads of those respective areas;
- Elected officials responsible for the Project area (i.e. ward councillors);
- Individuals/households living on and/or living from the land required to construct and operate BGHES and any associated infrastructure;
- Communities hosting Project displaced households;
- Community based organizations active in the Project area; and
- National and international interest groups/NGOs.

Table 3 lists the main resettlement stakeholders identified to date.

Table 3 Project Resettlement Stakeholders

Stakeholder Category	Key Stakeholders
Government officials - National	Ministry of Energy and Power Development; Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, in particular the Agritex Department; Ministry of Environment, Tourism and Hospitality; Ministry of Local Government, Public Works and National Housing; Forestry Commission, Ministry of Women Affairs, Community, Small and Medium Enterprises Developments, Zimbabwe Tourism Authority, Minister of State for Matabeleland North; ZimParks; Ministry of Finance and Economic Development; Zambezi Water Commission; Zimbabwe Power Company; Parliamentary Portfolio Committee on Mines and Energy
Government officials – Provincial/District	Hwange Rural District Council, Environmental Management Agency; Lands Commission; Department of Veterinary Services, District Administrator, District Development Fund, Department of Physical Planning; Ward Development Committee
Traditional leadership	Bishop Matata Sibanda; Chief Hwange; Chief Shana; Headmen of the affected wards, and affected Village Heads
Elected officials	Project-affected Ward Councillors, Member of Parliament

Stakeholder Category	Key Stakeholders
Wards/Villages/settlements with residents whose land is affected land (PAPs)	Villages: Kasikili, Skumbi Village 134, Skumbi Village 1, Kwalala Village 2, Makuni Village 2, Makuni Village 3, Makuni Village 1, Village 5 Zhulandangariro, Village 3 Zhulandangariro, Village D, Village B, Village 3 Tamuka Wards: Jambezi, Nemangana, Kattchecheti, Chidobe, Chikandukubi, Matetsi, Mbhizi, Sidinda and Mashala
Communities Hosting Displaced HH	To be decided.
Community-based organizations	CAMPFIRE Project; Chisuma Clinic; Rose of Charity; Intengwe; Catholic Development Commission / Caritas, and faith-based organizations
National and international groups/ENGOs	Bird Life Zimbabwe; Environment Africa; Green Fund; KAZA (Kavango-Zambezi Transfrontier Conservation Area); The Victoria Falls Wildlife Trust; Victoria Falls Anti-Poaching Unit; Zambezi River Society; Zambezi Society; Zimbabwe Conservation Task Force.International Rivers; Man & the Biosphere (MAB); South African Development Committee (SADC); UNESCO; UNICEF; United Nationals Development Programme; University of California; WWF; Gayathi Paper; Department of Environmental Sciences, Unisa

4.3 Engagement Methods

The methods for engaging stakeholders will continue to include informal engagement and information sharing (including the use of social media) and formal notifications, as required by national legislation governing land acquisition. To align more closely with international standards around land acquisition and resettlement, the Project will adopt a three-tiered stakeholder engagement approach to reach collective agreement on key aspects of land acquisition and resettlement, and to steer resettlement planning and implementation going forward.

The three tiers include a high-level Resettlement Steering Committee (RSC) composed mainly of representatives from the ZRA, key government ministries and departments with responsibility for land acquisition and resettlement as identified in **Table 3**. This body will certainly include the District Administrator's office, officials from the Department of Agritex and the Hwange Rural District Council who play a key role in land distribution and resettlement planning.

The second tier will consist of a Resettlement Stakeholder Leadership Forum (RSLF) aimed at involving traditional leadership and local representatives in the planning process. The third tier will involve Community Feedback Forums (CFF) in affected communities, which will facilitate the flow of information and meaningful involvement of those households who will be directly affected (physically and/or economically).

The following sections outline each of the three tiers illustrated in **Figure 7.**

4.3.1 *Resettlement Steering Committee*

At the State level, a government RSC will be established to oversee the resettlement planning and implementation process. It will be comprised of representatives of the ZRA; Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, specifically the Department of Agritex; Ministry of Local Government, Public Works and National Housing; Environmental Protection Agency; Hwange

Rural District Council; and the Lands Commission. Membership of this committee and the other forums will be finalized as part of the first steps in preparation of the Resettlement Action Plan.

The role of the RSC will be to ensure resettlement planning and implementation in both Zimbabwe and Zambia reflects the common principles and procedures outlined in the Resettlement Policy Frameworks, and subsequent RAP(s). The RSC will also facilitate necessary government approvals and cooperation. This body will ensure entitlements and resettlement-planning measures adhere to national laws and government policies and practices around land acquisition, compensation and resettlement and are aligned with international resettlement standards. They will identify available replacement land suitable for displaced households, and, participate in stakeholder leadership meetings as required, to confirm the government's support of the Project and resettlement planning process. The Project RAP Implementation Team (described further in Chapter 12) will engage regularly with senior officials within the various departments as required to, progress planning and to ensure key individuals are continuously briefed on Project progress.

4.3.2 *Resettlement Stakeholder Leadership Forum (RSLF)*

The role of the RSLF will be to involve local government, traditional rulers and leaders from each affected community in resettlement planning and implementation. The RSLF will review and confirm RAP eligibility & entitlements; assist the RSC with identification of replacement land for displaced communities; identify project 'red flag' issues; and support the resettlement planning and implementation process by facilitating the flow of information to and from the Project-affected people they represent.

4.3.3 *Affected Community Feedback Forums (CFF)*

At the village level, regular forums will be held in communities to support the efforts of members of the Resettlement Stakeholder Leadership Forum and Resettlement Steering Committee in ensuing all affected households are fully informed of project progress and issues being discussed within the other tiers.

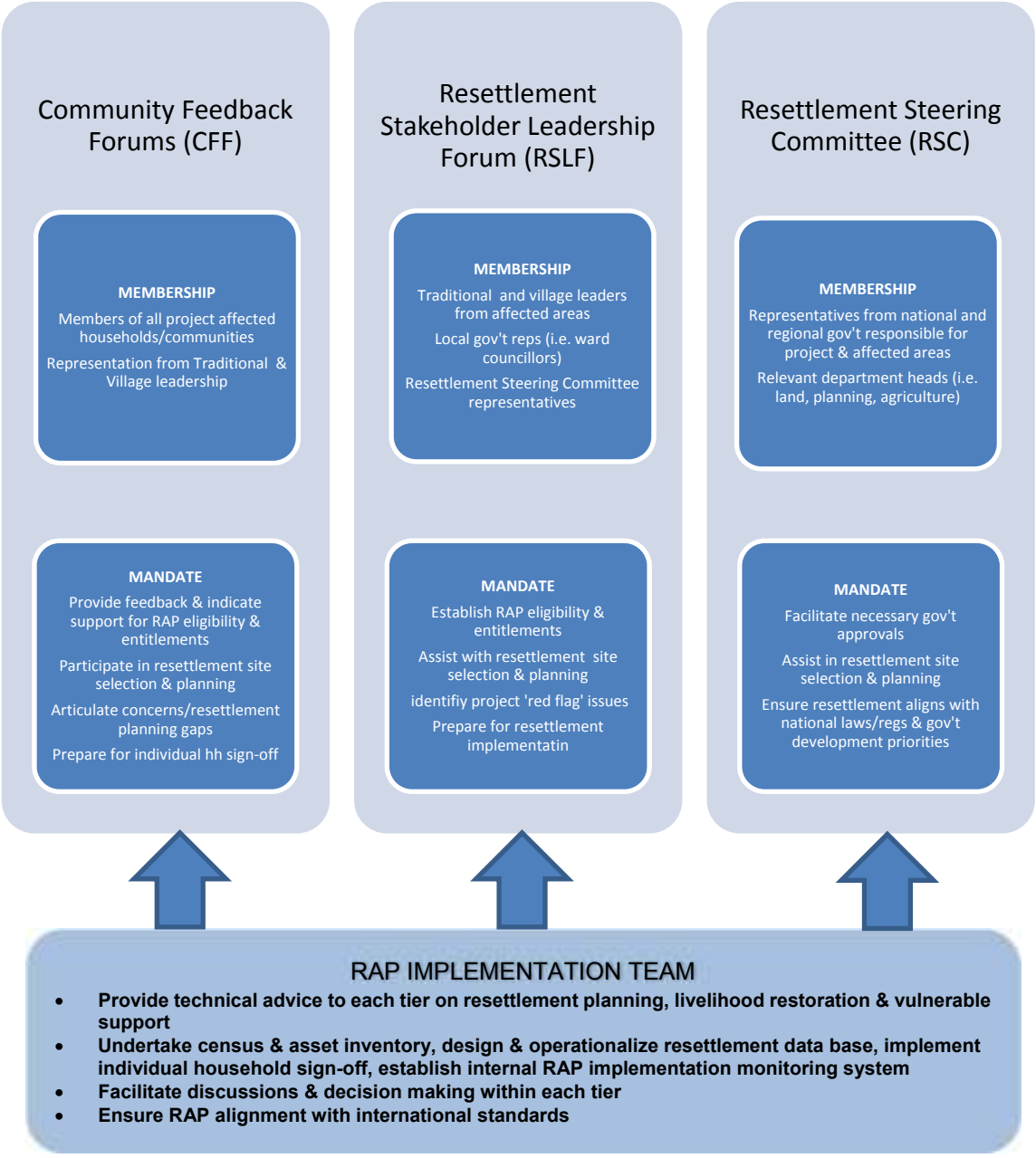
The CCFs will also provide directly affected people with the opportunity to participate more fully in the resettlement planning process and the decisions that will affect them. **Table 4** presents the villages that will be affected and the ward, chiefdom and district they fall into.

Table 4: Villages Affected by Project Land Take

Affected Villages	Ward	Chiefdom	District
Kasikili	Nemanhanga	Shana	Hwange Rural
Kwalala Village 2	Mbiza	Hwange	Hwange Rural
Makuni Village 2	Mbiza	Hwange	Hwange Rural
Makuni Village 3	Mbiza	Hwange	Hwange Rural
Makuni Village 1	Mbiza	Hwange	Hwange Rural
Village 5 Zhulandangariro	Jambezi	Shana	Hwange Rural
Village 3 Zhulandangariro	Jambezi	Shana	Hwange Rural
Village D	Jambezi	Shana	Hwange Rural
Village B	Jambezi	Shana	Hwange Rural
Village 3 Tamuka	Jambezi	Shana	Hwange Rural
Hwange	Mbiza	Hwange	Hwange Urban

The figure below illustrates the three-tiered approach, the anticipated membership of each tier and their mandate.

Figure 7 RAP Engagement Approach



The RAP Implementation Team provides technical advice and support to each tier. This team undertakes the work sanctioned by Project stakeholders and ensures resettlement planning and implementation aligns with this Resettlement Policy Framework, and the commitments made in the RAP(s).

Key issues requiring stakeholder approval that will inform the sequence of discussions within all three tiers include:

- Preparing for the demarcation on the ground of Project land requirements, and mapping of the land area required by the Project;

- Undertaking the census and asset inventory of affected land and establishing the Project cut-off date for eligibly and entitlement;
- Finalizing the criteria for Project eligibility and all components of the entitlement matrix (including disclosure of valuation of assets);
- Confirming the approach and specific plans for physical resettlement (i.e. assisted self-resettlement option in the case of limited physical displacement or construction of new settlement areas, further described in Chapter 7);
- Preparing for the individual affected household sign-off on compensation and resettlement;
- Confirmation of support programs that will be provided (i.e. additional livelihood restoration assistance and vulnerable support) and their method of delivery;
- Management of land acquisition and resettlement related grievances;
- Resettlement monitoring and evaluation; and
- Formally approving and publically disclosing the finalized RAP.

4.4 Future Engagement Activities

Disclosure of the RPF will follow the three tiered approach outlined in this Chapter, setting the stage for fully operationalizing this model of engagement for the more detailed resettlement planning and preparation of the RAP(s).

The full RPF will be distributed to key stakeholders within government who will participate in the Resettlement Steering Committee. It will also be available on the Project website. A summary of the RPF, in the appropriate local language will be prepared and distributed to traditional leaders and local government within Tier 2. They will be encouraged to post the summary in affected communities and provided with Project support in sharing its content in meetings with their constituents.

As part of preparing the RAP, a detailed Resettlement Stakeholder Engagement Plan (SEP) will also be developed. It will outline roles and responsibilities for keeping all stakeholders appropriately informed of Project progress, and involved in resettlement planning and implementation. It will identify and map all Project stakeholders with an interest, or ability to influence the land acquisition and resettlement process, and assist with finalizing the membership of the RSLF and CCFs.

The SEP will confirm the specific membership, terms of reference and meeting schedule (including sequence of discussion topics and milestone decisions) for each of the three bodies: RSC, RSLF and CFF.

5. PROJECT IMPACTS

This Chapter presents the scope of displacement related to land requirements for the development of the BGHES, based on the current Project design. It describes efforts taken to minimize displacement and how finalizing the design and location of the remaining Project components will further these efforts.

5.1 Efforts to Minimize Displacement

The construction of the dam wall and impoundment, including spillway and outdoor powerhouses will not have any physical or economic impacts on people and/or communities. This land lines the banks of the Zambezi River and is not habitable.

The main Project components requiring land with displacement impacts include the Project access roads, transmission lines, staff township and quarries. Design considerations for each of these components are more fully described in the ESIA and summarized below.

5.1.1 *Access Roads*

The upgrading of existing roads and construction of new roads to access each bank from the main roads linking Livingstone to Lusaka (Zambia) and Victoria Falls to Bulawayo (Zimbabwe) is required.

In Zimbabwe, the Sizinda Road will bring vehicles 5 km East of the Jabula School (Victoria Falls - Jabula School, Trunk A and Trunk B), where an existing secondary road leads firstly to Kasikiri Village (Jabula School – Kasikiri Village), secondly to Batoka Airport and, thereafter, to the Batoka dam site (Kasikiri Village – Batoka Airport). The full track will cover a strip of about 54 km.

Two alternatives were examined for the connection between Jabula School and Batoka Airport, however after careful analysis; a third option has been proposed which involves upgrading the existing Sizinda road to the dam site. It takes into consideration a variety of social impacts including minimizing both physical and economic displacement:

- Construction of the Jabula - Batoka Airport Trunk A and B will result in physical displacement. Kaskiri village would be most affected by this road; estimated to be made up of 32 households. The need to develop this road is questionable when the existing road could be utilised.
- The construction of new roads (with the exception of the Batoka Site – Dam and Batoka – New Bridge road) will cause economic displacement (most notably due to disruption of crop cultivation) as a result of land take. The degree of economic displacement will be most significant for the Jabula - Batoka Airport Trunk A and B and Jabula School Trunk B roads as these areas are more populated and households' use the surrounding land for crop cultivation and grazing of livestock.
- There would be serious community health and safety implications with the development of the Victoria Falls - Jabula School Trunk B; the road would pass through the grounds of Jabula School. Communities also use the area for grazing of livestock; thus vehicle collisions with animals could also occur. Issues of dust and diesel pollution may also impact on the health of those living in the surrounding areas.

The full road alignment will require 3.6 km of new road access to the Batoka Dam Wall and associated infrastructure, and 59.9 km of upgrades to existing roads from the main A8 highway. As **Table 5** indicates, with minor adjustments to the design of existing road upgrades, physical displacement can be minimized. The 3.6 km of new road will not result in physical displacement and is expected to have limited economic impact (i.e. grazing areas).

5.1.2 *Project Staff Township*

Project Staff Townships are planned for both countries. During the construction phase in each country, an initial labour force of at least 500 workers is required. Following completion of the access roads and Project infrastructure, this number is expected to increase to 3,000 people, this includes security and support staff. They will be required for the remainder of the construction phase expected to last up to seven years.

During operation of the dam, the construction staff will be replaced (or overlap) with operational staff (i.e. maintenance, security, customs services, government officials), with numbers expected to increase upwards to 9,000 in total.

Townships will be located on each side of the river, in close proximity to the dam. They will include housing and requisite infrastructure (i.e. health, education, social and recreation facilities) to accommodate staff and their families. Three alternative locations in each country were initially explored taking into consideration both social and environmental impacts.

Locating the Project Township at its current location avoids physical displacement completely, with minimal economic displacement confined mostly to grazing areas. However, further investigation is required to assess the area's appropriateness from a technical (engineering/construction) perspective. Consideration will be given to options for building onto existing communities in reasonable proximity to the dam to facilitate the sharing of Project benefits more widely with existing settlement areas.

5.1.3 *Transmission Lines*

In Zimbabwe, the transmission lines comprise two 70 km 400 kV lines running in parallel, and sharing a common right-of-way to the existing Hwange substation. The transmission lines will each have a way-leave of 60 m (30 m on either side of the centre line), as stipulated by national regulations. An alternative route was identified to take advantage of the existing A8 national road for the future construction and maintenance of the line infrastructure. In view of this, the alternative deviates approximately 30 km from the starting point towards the A8 motorway, and increases the route length by approximately 20 km.

The current route design is challenging from a land access perspective as it affects a number of settlement areas with medium to high population density, particularly settlement areas near Sidakeni and Kasikiri, and just south of that area (see **Figure 8**). Some of the marked areas have both traditional and more formal, higher quality housing, with formal shops, police station, clinic, schools, bus stops and the Chief's palace. With the current route, an estimated 250 households are at risk of being physically displaced.

Shifting the transmission line routing approximately five kilometres east would avoid most of the physical displacement. Opportunities to avoid these settlements will be explored in finalizing design of the transmission line route. Consideration will also be given to impacts to households in the southern portion (i.e. township of Hwange) should the lines enter the town from the west, and proximity of the line to the open pit mine located close to the Hwange substation.

Figure 8 Settlement Areas within Transmission Line Route

5.1.4 *Quarry*

The quarry will be located just south of the dam wall, and will require 40.70 hectares of land. The area chosen is challenging terrain that is neither inhabited, nor particularly fertile. Any impacts in the acquisition of this land would be economic in nature (i.e. grazing).

5.2 Project Displacement Impacts

Despite the Project's ongoing efforts to minimise impacts, the construction and operation of the Project will nonetheless result in the displacement of some people/households and their livelihoods. These displacement impacts can be characterised in terms of the immovable assets that will be affected, including possible structures, agricultural land, crops and trees, community infrastructure and public facilities. The loss of these immoveable assets will impact the people, households and communities that own or use these assets.

Specifically, people and households will be:

- Physically displaced, if they lose their residence and related assets; and/or
- Economically displaced, if they lose income streams or access to the means of livelihood.

Using these definitions, the Project will identify and classify the types of Project-affected persons and households in the subsequent RAP(s).

The current transmission line route is expected to have the greatest displacement impacts, due to the land use and building restrictions within the 60-meter exclusion zone (30 meters on either side). As indicated in the previous section the transmission line could displace up to 300 households in at least

10 villages in three different wards. Depending on the final routing, additional villages in two other wards (i.e. Sindinda and Mashala) may also be affected.

Table 4 identifies known villages and the number of households within each, as reported by the Village Head. The census and asset inventory undertaken as part of preparing the RAP(s), will confirm which households within each village will be affected and the nature of that impact.

Table 5 Project Impacts

Affected Villages	Ward	Total Estimated Households	Project Component with the potential to impact land used by the village
Kasikili	Nemanhanga	23	Dam flood area and transmission line
Kwalala Village 2	Mbiza	25	Transmission line
Makuni Village 2	Mbiza	30	Transmission line
Makuni Village 3	Mbiza	33	Transmission line
Makuni Village 1	Mbiza	34	Transmission line
Village 5 Zhulandangariro	Jambezi	33	Road access & transmission line
Village 3 Zhulandangariro	Jambezi	29	Transmission line
Village D	Jambezi	24	Transmission line
Village B	Jambezi	32	Transmission line
Village 3 Tamuka	Jambezi	24	Transmission line

5.3 Scope of Displacement

A comprehensive Census and Asset Inventory (CAI) in the areas where land will be required will determine the precise level of displacement both to people and their assets and confirm the identify of those households directly affected. The CAI data will be used to determine the total number of households that will be displaced, classified into physically displaced households and economically displaced households. It will also quantify affected assets for each of the following categories:

- Impacts to land area according to land type:
  - Agriculture land cultivated;
  - Agricultural land fallow;
  - Grazing land;
  - Residential land.
- Impacts to crops and trees:
  - Square meter areas cultivated and the type of cultivation (i.e. sorghum, millet, maize);
  - Number, type and maturity of trees, including fruit and other economic trees.
- Impacts to public facilities and infrastructure:
  - Number and precise location of affected wells/boreholes;
  - Any affected education and health facilities;
  - Other facilities.
- Impacts to graves, shrines and other areas where cultural heritage exists;
- Impacts to social cohesion
- Impacts to host communities.

Table 6 indicates the current understanding of the land area required for each Project component, based on existing designs.

Table 6 Land Areas Required for Project Components

Project Component	Land Area Required	Anticipated Nature of Displacement
Dam wall, impoundment including spillway	Land is located immediately along the banks of the river within the Gorge	No displacement impacts anticipated
Staff Township Area	706 hectares	Economic displacement only
Transmission lines	700 hectares (70km length X100 m width)	Depending on line routing, both physical and economic displacements of an estimated 300 households
Road access	3.6 km of new access roads; land area req'd= 4.86 hectares 59.9 km of existing access roads to be upgraded, land area req'd=: 60 ha	Predominantly economic impacts; Minor route adjustments will avoid physical displacement
Quarry	40.70 ha	Limited economic displacement
Host communities	Currently unknown	Depends on level of physical displacement and the approach to resettlement (i.e. supervised self-resettlement option described in Chapter 7, or design and construction of new communities or add onto existing villages)

The current estimate of the total land areas required for the Project is just under 1,600 hectares of land, the majority of which is not inhabited. Based on an average traditional farm plot size of 6 hectares and assuming all land areas is being used for some form of economic activity, a maximum number of households who may rely on this land (i.e. for farming or grazing) is estimated to be less than 300 households.

6. COMPENSATION PRINCIPLES

This chapter describes the general principles and policies that the Project proposes to apply to determine eligibility and define entitlements for compensation resulting from the acquisition of land required for the BGHES.

The two main objectives of the compensation framework include:

- Provide transparent, fair and timely (prior to displacement) compensation for displacement impacts to all PAPs in accordance with Zimbabwean law and World Bank Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.
- Compensate for lost assets at agreed replacement rates to give Project-affected people the opportunity to at least restore, if not improve, their standard of living and livelihoods.

6.1 Eligibility

Eligible persons include all persons with a formal interest on the land required by the Project – in the form of propriety ownership, co-proprietary, tenants, or any persons with other limited interests. The term is further expanded to include affected persons – persons whom gain a benefit or utilise the land or improvements made on that land irrespective of their legal standing.

The term Affected Persons is more comprehensive and includes those with:

- Formal or legal rights to land and assets consistent with national law;
- Legitimate and verifiable interest in the land and assets.

As outlined in Chapter 2, three forms of land ownership exist in Zimbabwe: privately owned, communal and state owned land. Commercial farming entities and commercial or residential properties occupying private land and are defined by title deeds. Communal land is held under the custodianship of the state and is managed under both local and decentralised government arrangements, as well as traditional leadership of chiefs, headmen and village heads.

6.1.1 *Immovable Assets*

The immovable assets generally considered eligible for compensation include the following:

- Land, including cultivated and fallow land, forest, and residential plots;
- Crops, both annual and perennial (including economic trees);
- Common property resources, including wild plants and animals, fuel wood and timber;
- Structures, including houses, annexes and derelict buildings, along with fences and other built improvements;
- Other infrastructure, either communal infrastructure or private, including wells, roads, and irrigation infrastructure;
    - Businesses;
    - Public access, including informal roads and footpaths and navigable waterways; and,
    - Cultural heritage, including sacred sites, graves and cemeteries.

The above immoveable assets are typically held under three types of tenure arrangements:

- Registered ownership, through possession of formal title deeds that are registered;
- Communal ownership, where by the State has authorized local government authorities or traditional leaders to manage the asset on their behalf, which may or may not be formally documented. Individuals, families, clans or villages, or even some combination of these may use communal assets; and

- State owned.

Table 7 outlines the persons eligible for compensation based on the types of assets that the Project may affect, which will be inventoried during the census and asset survey.

Table 7 Types of Loss and Eligibility for Compensation

Type of Loss	Eligible Persons	Description
Private Land	Land owner	The person, family, or collective entity with exclusive rights to the land, secured through registered deed
	Tenant	Tenants recognized by the Land-Owner that actively farm or utilize portion of the land separately or jointly (sharecropping) with the Land-Owner, but do not have any claim to the land itself. They have personal rights in terms of a lease agreement but not real rights in terms of a title deed registered in the deeds registry
	De-facto Occupant or User	Any person, family, or collective entity that utilizes land without any form of secure tenure but are tolerated by the Land-Owner. These may be statutory tenants (a person who had a lease agreement that expired but continues to live on the land meeting their obligations as a tenant) or illegal occupiers, persons who never had any personal rights in the form of a lease over the land.
Residential Structures	Structure-Owner	The person, family, or collective entity with uncontested ownership of any residential structures, irrespective of their tenure status to the land on which the structure is built.
	Tenant	Tenants that occupy a residential structure via a written or verbal agreement with the Structure-Owner, but do not have any ownership claims to the structure itself.
	De-Facto Occupant or User	Any person, family, or collective entity that occupies a structure without any form of secure tenure. These may be statutory tenants (a person who had a lease agreement that expired but continues to live on land meeting their obligations as a tenant) or illegal occupiers persons who never had any personal rights in the form of a lease over the land.
Secondary Structures & Other fixed assets	Asset-Owner	The person, family, or collective entity with uncontested ownership of any secondary structures or other fixed assets, irrespective of their tenure status to the land on which the structures or fixed assets are built.
Crops and Trees	Crop-Owner	The person, family, or collective entity that solely tends annual and perennial crops on land, irrespective of the type of tenure on that land.
	Sharecroppers	The person, family, or collective entity that tends annual and perennial crops on land jointly with the

Type of Loss	Eligible Persons	Description
		landowner, irrespective of the type of tenure on that land.
Community/ Institutional Structures	Affected Community	Any community or institution that are the owners or custodians of any structures, infrastructure or immobile fixtures used for the collective benefit of the community. Such structures will usually be under the authority and management of a rural district counsel and in an urban area an urban counsel (local government).
Communal Land	Local government/ traditional leaders	Land managed by local government or traditional leadership, on behalf of the State. It is common for these entities to give permission for use to people/communities/tribes.
	Land users, authorized by local gov't/ traditional leaders	
State Land	State	Land that is not deeded to any individual/entity nor under the authority of a local government or traditional leader.
Cultural heritage (i.e. Graves/Shrines)	Owners	Any person, family or collective entity that are the legitimate owners/caretakers of a particular grave or shrine.

6.2 Entitlement Framework

The Entitlement Framework defines the types of compensation or resettlement assistance to be provided to eligible persons based on the type of asset that will be lost. The framework also establishes the conditions under which eligible persons are granted allowances or access to livelihood restoration programmes. Where possible and reasonable, a range of livelihood assistance options will be provided allowing households to select the type of compensation that best suits their unique conditions.

Entitlement policies define the specific type of compensation to be made available to those affected by specific displacement impacts. Entitlements vary by interest and by severity of impact, but generally fall into the following categories:

- In-kind compensation, which involves the planning, design and development of replacement assets and livelihood activities to compensate for those lost to the Project.
- Cash compensation, which involves the payment of cash to compensate for assets, lost to the Project, at agreed replacement rates of the lost asset.

In accordance with international standards (and the Communal Lands Act of Zimbabwe), the Project will favour the provision of in-kind compensation over cash compensation wherever feasible, as it represents a reduced risk – for both the Project and those affected – of entitlement mismanagement, inequitable distribution, and long-term impoverishment. Cash compensation will only be provided under certain circumstances, for specific types of impacts, and under carefully controlled conditions.

In general, the legitimate owner of a particular asset – whether it be land, structures or crops – will be compensated for its loss in full, whereas users will be compensated for the loss of their specific interest in that asset for a period of time and assisted in their re-establishment.

All compensation rates will be established using a registered valuation officer to provide affected people/entities with compensation equal to or greater than full replacement value, with no deduction for depreciation. An independent and specialised valuation expert will be contracted to undertake a comprehensive analysis of the market value of affected land, crops and structures in the Project Area.

In addition to compensation for impacts on immoveable assets, those displaced will also be eligible for the following, depending on their specific circumstances and type and level of displacement impacts:

- Participation in a Livelihood Restoration and Improvement Program.
- Participation in a Vulnerable Support Program.
- For physically displaced, receipt of a mobilisation and re-establishment allowance to cover some of the costs associated with mobilisation (e.g., packing, salvaging, etc.) and re-establishment (e.g., unpacking, building, clearing, etc.).
- For physically displaced, receipt of a transportation allowance to move belongings and moveable assets to a new location.
- Right of salvage to provide opportunity to salvage immoveable assets, prior to destruction, to the extent practical. This may include individual property, for example building materials, or common property.

The preliminary entitlement matrix outlined in **Table 8** is based on World Bank standards and requirements stipulated by Zimbabwean law. It will be presented together with the eligibility criteria to each of the three tiers of stakeholders described in **Chapter 4.** Based on these discussions, any necessary adjustments will be made and a final version included in the RAP(s). A key consideration in finalizing the resettlement assistance and livelihood restoration programs to be implemented, and how they will be delivered, is the extent to which they adhere to agreed upon principles of sustainability.

Table 8 Entitlement Matrix

Project Impact	Category of Project-affected Entity	Mitigation Measures
Loss of Land		
Residential land	Owner currently residing	Replacement residential plot, ideally area for area, with access to services and infrastructure comparable to that of affected plot *plus* Cash compensation at agreed replacement rates for any area not replaced *or* In exceptional circumstances[22], cash compensation at agreed replacement rates
	Owner not currently residing	Cash compensation at agreed replacement rates
Institutional land	Owner	Replacement plot, ideally area for area, suitable for original purpose with access to services and infrastructure comparable to that of lost plot *plus* Cash compensation at agreed replacement rates for any area not replaced
Agricultural land (privately owned)	Owner currently farming	Replacement agricultural lands of equal or greater potential productivity and locational advantages, and assistance in re-establishment, including preparation of new land to comparable condition to affected land *or* In exceptional circumstances, cash compensation at agreed replacement rates
	Tenant currently farming	Support securing suitable replacement agricultural land to rent *plus* Assistance in reestablishment
	Owner currently not-farming (landlord)	Cash compensation at agreed replacement rates

[22] During preparation of the RAP, conditions under which 'exceptional circumstances' apply will be detailed, based on asset inventory results and collective negotiations with stakeholders

Project Impact	Category of Project-affected Entity	Mitigation Measures
Communal Agricultural Land	Local government / traditional leaders with management rights, sanctioned by the State	Access to equivalent area of equal or greater potential productivity (or grazing capacity) and locational advantages *or* Alternative investments of a communal nature *or* In exceptional circumstances, cash compensation at agreed replacement rates
Communal Agricultural land	People with permission from local gov't/traditional leaders to use/farm land	Access to equivalent land area of equal or greater potential productivity (or grazing capacity) and locational advantages *or* In exceptional circumstances, cash compensation at agreed replacement rates
Loss of Structures		
Residential structures	Owner currently residing	In-kind replacement house of modern materials at settlement scheme [23], with at least as many rooms as the original house and sanitation facilities (latrine/ shower) *or* Cash compensation at agreed replacement rates (including construction supervision as part of the self-resettlement option see **Section 7.6**) *plus* Right to salvage materials, transportation allowance, and mobilisation and re-establishment allowance
	Owner not currently residing	Cash compensation at agreed replacement rate *plus* Right to salvage materials, transportation allowance, and mobilisation and re-establishment allowance

23 The exact details of replacement assets, including structures, will be determined in detail in the RAP.

Project Impact	Category of Project-affected Entity	Mitigation Measures
	Renter / occupier	Replacement tenancy agreement in replacement house of current landlord or in another house, and assistance in reestablishment. *or* Provision of a rental allowance for a fixed term and assistance in reestablishment.
Other including seasonal, annex, incomplete, ruins, uninhabitable structures and fences	Owner	Cash compensation at agreed replacement rates *plus* Right to salvage materials
Institutional	Communities / government / religious groups	In-kind replacement facilities of suitable capacity for settlement scheme *or* Cash compensation at agreed replacement rates
Infrastructure	Communities / government	In-kind replacement facilities of suitable capacity for settlement scheme
Loss of Crops & Economic Trees		
Crops and trees	Crop or tree owner	Cash compensation at agreed replacement rates or government rate, whichever is higher [24] *plus* Right to harvest existing crops

24 Full replacement value for agricultural assets must reflect the time required to bring replacement crops or trees to the maturity of the assets that were lost.

Project Impact	Category of Project-affected Entity	Mitigation Measures
Loss of Business		
Businesses	Registered or community owner	Cash compensation for agreed lost net income during a transition period and assistance with re-establishment. *or* Where reestablishment not possible, support for establishment of alternative livelihood, and if necessary transitional income support
Employees	Employee of affected business	Replacement employment agreement with affected businesses and compensation for agreed lost income. *or* Where replacement of employment not possible, support for establishment of alternative livelihood, and if necessary transitional income support
Loss of Cultural Heritage		
Shrines, graves and sacred sites	Affected household / community	Relocation or removal in collaboration with traditional cultural / religious leaders, with necessary expenses covered by the Project in accordance with Government rates
Other heritage	Customary owner of asset	Appropriate management to be determined in collaboration with local authorities, spiritual leaders and others as appropriate.

6.3 Eligibility Cut-off Date

The commencement date of the census and asset inventory typically represents the cut-off date for compensation eligibility. This date is used to define the assets eligible for compensation and to provide an empirical baseline to limit opportunistic activity (i.e., to prove ineligibility, and limit the potential for speculation). Up to and including that date, immoveable assets will be considered eligible for entitlement compensation. Immoveable assets established after the cut-off date will not be considered eligible nor will persons occupying the project area after the cut-off date be eligible for compensation/resettlement assistance.

Prior to the cut-off date and the commencement of survey activities, engagement will be conducted with those affected to explain the survey process, and the cut-off date and its implications. As noted above, assets established within the Project Footprint after the cut-off date are not eligible for compensation and/or resettlement assistance.

Following the cut-off date, the Project footprint will be monitored by community leaders (and by Project staff) so that people remain informed of the cut-off date and its implications. Any new in-migrants will be informed of the moratorium on establishment of new assets. Where new assets do appear, they will not be considered eligible for compensation. The owner will be given reasonable notice to remove or salvage the asset, and if they do not, the asset will be removed by Project staff.

6.3.1 *Survey Implementation*

On the agreed upon cut-off date, survey teams commence a comprehensive census of 100% of affected households, regardless of their tenure status; a socio-economic survey of the same; and an immovable asset inventory.

The surveys will have the following objectives:

- Construct a detailed demographic and socio-economic profile of each affected household;
- Identify the specific impacts of land acquisition on each household, including a detailed, legal description of affected immoveable assets;
- Cap beneficiaries and entitlements;
- Inform entitlement planning;
- Provide a baseline for monitoring and evaluation; and
- Serve as the basis for individual agreements.

Survey teams will administer the census and socio-economic survey to the asset owner(s) / household head(s), or his/her designated representative, and will undertake the immoveable asset inventory in his/her presence, as well as that of adjacent property holders wherever possible and appropriate.

In accordance with standard practice, registered surveyors and valuers will be responsible for ensuring that:

- Every crop survey is confirmed by the responsible farmer, or his/her designate and documented by the survey team with support from agronomists and other professionals.
- Every land survey is witnessed and confirmed by the responsible landholder, or his/her designate and documented by the survey team with support from accredited land surveyors.
- Every structure survey is confirmed by the responsible owner, or his/her designate

The asset survey will provide a detailed inventory of all immovable assets and will form the basis for the valuation of assets.

6.4 Loss of Land

6.4.1 *Residential Land*

For impacts to residential land, the Project will provide either:

- Replacement residential plot, ideally area for area, with access to services and infrastructure comparable to that of the lost plot plus cash compensation at agreed replacement rates for any area not replaced; or
- In exceptional circumstances, cash compensation at agreed replacement rates for all structures.

If in-kind replacement plots are smaller than the original residential plots, households will receive cash compensation for the difference. The assets survey process will identify the landowner as the primary impacted person and the land user(s) if different from the owner will be identified for the assets they own on the said piece of land.

For non-resident owners, including landlords, land will be compensated in cash.

6.4.2 *Institutional Land*

For impacts to institutional land, the Project will allocate in-kind replacement land in accordance with the relevant planning standards; this may be at a resettlement site, or within an existing community.

In the case where an entire community is physically displaced, land will be designated for schools, health facilities and other social facilities and infrastructure of sufficient size to meet the needs of the resettled population and nearby host populations. All land for public infrastructure and communal facilities will be provided in accordance with relevant planning standards.

6.4.3 *Agricultural Land*

The Project will provide access to agricultural land (both privately and communally owned/managed) either through replacement land, or in exceptional circumstances, through cash compensation at agreed replacement rates. Consideration will be given to the productivity and locational advantages of replacement agricultural lands. Where adequate access, quantity, or quality of replacement agricultural land cannot be secured, the Project will assist farmers through livelihoods restoration programs which could include measures to make existing agricultural lands (including grazing land) more productive, or measures to transition PAPs to alternative livelihoods.

6.4.4 *Communal Land*

The design of new settlement schemes will incorporate areas to compensate for the loss of communal land. These could include communal grazing land, forest, and other natural areas that provide benefit to communities. The siting of new settlement schemes could take advantage of existing communal areas, in which case access to these areas would have to be negotiated and secured through engagement with host communities. Alternatively, the designs of new settlement schemes will be developed to provide access to new communal land. In some cases, this might require sustainable improvements to other resource lands to increase production of key commodities, alternative investments of a communal nature, or in exceptional circumstances, cash compensation for lost communal land at agreed replacement rates.

6.5 Loss of Structures

6.5.1 *Residential Structures*

For impacts to owner-occupied residential structures, the Project will provide either:

- In-kind replacement house of modern materials at a settlement scheme , with at least as many rooms as the original house and sanitation facilities (latrine/ shower); or
- In exceptional circumstances, cash compensation at agreed replacement rates

Where a cash compensation option is offered, eligible households will be required to prove that they have an alternative residence, either currently owned, proposed for purchase, or under construction. Specifically, to be eligible for cash compensation PAHs must provide documents establishing at least one of the following:

- Ownership of an alternative residence of acceptable quality;
- Access to an alternative residence of acceptable quality available for purchase; or
- Proof of ownership or access to a lot where a residence will be built.

When alternative residences do not meet all of these requirements, compensation payments must be used to bring the quality of the residence up to standard. Consideration will be given to a supervised self-build option, once all land requirements have been finalised and the number of physically displaced households has been confirmed. This will be captured in the RAP(s).

An independent valuation expert will be contracted to undertake a comprehensive analysis of full replacement value of any affected structures.

6.5.2 *Other Structures*

All other structures will be compensated in cash at agreed replacement rates. This includes (but is not limited to) rental structures, seasonal structures, secondary residential structures, unoccupied structures, annexes, incomplete structures, ruins, animal enclosures, fences and walls, and food storage. The expectation is that PAHs will rebuild these structures on their own.

6.5.3 *Institutional Structures*

The Project will provide new social facilities for any existing facilities that are impacted. Depending on the final resettlement site locations and the proximity to, and size of, any host population, these facilities may also be designed for use by the adjacent host populations. Alternatively, where host communities have existing facilities, the Project may increase the capacity in terms of size and quality to mitigate for increasing demand resulting from the resettlement process. Input from local government will be required prior to the design of institutional assets, as these entities will be assuming responsibility for the management of these facilities.

For privately owned institutional structures, such as places of worship, private schools, private clinics, and others, the Project may provide either in-kind replacement assets or cash compensation for the lost assets. In addition, privately owned institutions may be considered as a source of income for some individuals, and as such will be eligible for compensation as a business.

6.5.4 *Infrastructure*

Infrastructure will be replaced through the development of new settlement schemes, which will include all basic utilities (roads, water, and sanitation) as well as any additional infrastructure that was impacted. Replacement infrastructure will be of equal or greater quality than the infrastructure lost. Input from local government will be required prior to the design of institutional assets, as these entities will be assuming responsibility for the management of these facilities.

For privately owned infrastructure, such as private wells, latrines, shower facilities, power supply, telecommunications, and others, the Project may provide either in-kind replacement assets or cash compensation for the lost assets. In addition, privately owned infrastructure may be considered as a source of income for some individuals, and as such will be eligible for compensation as a business.

6.6 Loss of Crops and Economic Trees

The Project will compensate for all eligible crops enumerated in the asset survey. Compensation payments for crops, trees and other agricultural assets will be awarded according to official government rates, or based on full replacement value, whichever rate is higher and in line with applicable law.

An independent valuation expert will be contracted to undertake a comprehensive analysis of the market value of enumerated crops and economic trees and set the Project's rate at replacement value. Importantly, the value of perennial crops and economic trees will include compensation for production lost during the transition period: the time it will take for replacement crops and trees to reach the same maturity / productivity level as the plants being lost.

The Census and Asset Survey will be designed to identify the different crop categories and crop owners, and to ensure that compensation is calculated in accordance with agreed upon rates for compensation of crops and economic trees.

6.7 Loss of Businesses

Impacted businesses may be entitled to compensation for the loss of revenues that result due to the resettlement process. This may include the loss of rental income for rental structures and rental rooms; interruptions to businesses such as restaurants and commercial enterprises; loss of tuition or medical fees for private institutions; loss of revenue for infrastructure services such as water and power; and any other loss of income.

6.7.1 *Loss of Revenue*

Compensation for lost revenue will be calculated by determining the average monthly revenue for an impacted business, and multiplying this rate by the duration of time that the business will be impacted. If accurate records of revenue are not available, the Project may define a set minimum rate to be applied.

6.7.2 *Loss of Employment Income*

For the employees of impacted businesses, an allowance for lost income may be applied to cover the period of unemployment that will result from disturbances to businesses.

6.8 Loss of Cultural Heritage

6.8.1 *Transfer of Shrines, Graves and Sacred Sites*

In the event that the Project impacts any cultural heritage areas/sites, the Project will discuss with each affected community, the relocation process and the required ceremonies and will determine the cost of moving each existing grave or shrine to a site preferred by the owner. The compensation will be agreed with the individual or entity that owns the grave or shrine and they will be responsible for the relocation of the graves or shrines.

7. REPLACEMENT ASSETS

This Chapter presents the objectives that will guide the replacement of assets forming part of the entitlements for PAPs. Replacement assets may include the construction of new housing for physically displaced households, as well as the possible development of new settlement schemes (resettlement sites) for physically displaced communities and larger groups of affected people.

As the precise location and extent of impact of all Project components has not yet been finalized, the specific facilities to be affected and the extent of physical displacement is not known. Further discussions are required in order to determine whether (and what type of) resettlement schemes would be appropriate for this Project.

This chapter describes the replacement options, and the resettlement planning required in the event that a community, or significant portion of a community is affected. This includes site planning, parcelling plans, and the design of infrastructure and social facilities (including management, governance and handover plans), that would be further detailed in the RAP(s).

In-kind compensation is the preferred option for replacement of primary dwellings and for groups of households living close together as a community who wish to maintain their community structure.

7.1 Objectives

Replacement assets will be designed to meet or exceed in-country regulations and standards, while also representing an improvement over the assets lost by households as a result of Project land acquisition. The design of replacement assets will reflect the feedback of stakeholders who will be engaged in the design process through the tiered engagement model described in Chapter 4.

The design of replacement assets will be guided by the following high-level objectives:

Reflect Community Input: Engage impacted communities and households in the design of all replacement assets, providing meaningful opportunity for PAPs to provide commentary and feedback on all designs, and how social cohesion can best be maintained.

Provide Choice: PAHs should have a choice of housing designs that are appropriate both culturally and geographically. Impacted communities should have choice of where to re-establish themselves (site selection) and should have the option to be resettled together as a community. Similarly, individual households that want to be resettled on their own should have this option. Where possible, PAPs should have the option of being compensated in cash or in-kind.

Provide Flexibility: Replacement assets should be designed to accommodate a diversity of uses and needs that may change over time. Replacement assets including housing, infrastructure, social facilities, and communities should be expandable in order to accommodate growth over time.

Improve the Standard of Living for PAHs: All replacement assets should be built with high quality, durable materials and should reflect an improvement over existing conditions.

Improve Infrastructure and Access to Services: Resettlement sites should provide improved access to essential services, including access to potable water, sanitation, health-care, and education.

Reflect Local Conditions and Increase Sustainability: Designs should consider the maintenance, operation and upkeep requirements of replacement assets to ensure that PAHs and communities are able to take ownership of the assets and care for them over time.

7.2 Resettlement Scheme

In the event that a settlement scheme is required to accommodate physically displaced communities, possibly as part of planning for Project staff housing, the following components will be considered.

7.2.1 *Site Selection*

The site selection process requires community consultation. The criteria for selecting settlement schemes generally include:

- Proximity to the current area occupied;
- Proximity to the preferred areas indicated by the affected community;
- Sufficient and suitable land available for the building of replacement assets;
- Sufficient and suitable land available for replacement agricultural land and livelihoods;
- Accessibility to existing transport network;
- Maintaining social support networks;
- Consideration for access to schools, infrastructure and other essential services;
- Currently uninhabited or sparsely inhabited; and
- Currently not in use for agricultural plantations.

Results of the Census and Asset Survey will provide information on the population and area of the community, which may then be used to calculate area requirements for the settlement scheme in conjunction with existing planning regulations and available land areas. The settlement schemes will comprise of residential plots, commercial plots, community facility plots, infrastructure, buffer zones and natural areas based on the number of households being physically displaced.

7.2.2 *Site Planning*

Preliminary physical plans for new settlement schemes will be developed, indicating land use, basic plot sizes, topography, and interconnectivity to adjoining settlements. A Technical Planning Report will be developed, and submitted for approval alongside the physical plans to the appropriate ministry. An assessment will be made as to whether an Environmental Impact Assessment for the resettlement schemes is required.

Resettlement site planning will also require a final Plan of Subdivision, which will be developed in consultation with PAHs and relevant government bodies.

7.3 Housing

The design of all replacement housing will be prepared in consultation with impacted households in order to increase buy-in and create ownership for the final designs. The construction process will seek to maximise local employment through the contracting of local construction companies and the hiring of PAPs to work on the construction of all replacement housing, to the extent possible.

7.4 Institutions

Schools and health facilities at settlement schemes will be built in collaboration with local authorities, and compliance with applicable service standards. In constructing these facilities consideration will be given to whether or not existing neighbouring schools or health centres can absorb the additional population moving into the neighbourhood as a result of the resettlement.

The Project may alternatively plan to enhance the capacity of existing facilities rather than creating new ones. New facilities are planned through consultations with community members and local government, in order to meet the needs and development objectives of the community. The ultimate goal is to ensure that PAHs have equal or improved access to public services, and that relevant service standards are met.

7.5 Infrastructure

Infrastructure at settlement schemes should at a minimum include roads and drainage, water supply, electricity, and solid waste disposal. It may also include power, telecommunications and other infrastructure that existing communities currently have access to. The details of existing infrastructure and access to services will be specified in the baseline census and surveys.

All replacement infrastructure should be built in collaboration with local authorities in compliance with applicable standards and laws. In some cases, the Project may opt to improve and upgrade existing facilities rather than construct new infrastructure. All settlement schemes will have an equal or improved level of services, compared to the communities impacted.

7.5.1 *Roads and Drainage*

Access roads should be built (or existing roads upgraded) as necessary to connect new settlement schemes to surrounding communities while on-site roads will provide circulation within the settlement schemes. All roads should be designed and constructed in accordance with existing standards.

7.5.2 *Water Supply*

An adequate potable water supply should be established in all settlement schemes, based on either a piped scheme with central water points, or drilled boreholes with hand or solar pumps. Water access points should be located within a practical distance from the houses they serve. Consideration should be given to the following in designing water supply systems:

- Outcomes of community consultation processes;
- Service at original site;
- Population and consumption requirements of the community;
- Availability of ground water of potable quality at resettlement sites;
- Future growth of the community; and
- Surrounding communities.

Once water infrastructure is in place, resettled PAPs will have to cover the cost of operating and maintaining these facilities as per local standards. This message will be disseminated clearly from the very beginning of the resettlement process so that communities can organise themselves in this regard. This organisation is usually best done through the establishment of a Water Users' Committee, which is the formal custodian of the facility on behalf of its owner, the community as a whole.

7.5.3 *Electricity*

Where the existing communities affected by the Project are connected to the electrical grid, then they will be reconnected to the grid in the new locations. If the host communities are connected to the grid then new in-fill replacement houses will be connected. House connections will be provided if grid power is available.

The details of what level of service and design of replacement assets to be provided should a resettlement scheme be necessary will be detailed in the RAP.

7.6 Assisted Self-Resettlement Option

As noted in the Entitlement Matrix, physically displaced PAP will be offered a cash compensation option sufficient to rebuild their residence in a location of their choosing. In addition to the cash compensation they will be provided with technical assistance and construction oversight from qualified personnel. Compensation will be paid in instalments based on achieving particular milestones. These include:

- Upfront cash instalment upon signing onto the program;
- Second instalment when access to appropriate replacement land is confirmed;
- Third instalment once house design is finalized, and foundations completed;
- Final instalment once construction is completed and inspected by the Construction Supervision Team.

The RAP Implementation Team will regularly monitor the progress of all participants, to ensure that the replacement housing is of an acceptable quality and meets certain minimum standards.

8. LIVELIHOOD RESTORATION AND IMPROVEMENT

International standards define 'livelihoods' as referring to the full range of activities that individuals, families, and communities engage in to make a living. It includes wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

This Chapter describes the livelihood characteristics of affected households based on the ESIA baseline data, and outlines the approach to preparing a detailed livelihood restoration and improvement program as part of the RAP(s). It also describes the types of programs that will be offered.

Preparation of a RAP generally includes a Livelihood Restoration and Improvement Plan (LRIP) developed with input from displaced persons and affected communities through participatory assessments and working group activities. The LRIP outlines the Project's strategy to support physically and economically displaced households, Project-affected communities, and host communities so that they are able to demonstrate a continuous and sustainable improvement in their economic activities following displacement.

Livelihood programs evolve over time as additional feedback is received from various stakeholders and as the Project gains experience through implementation of livelihood restoration programs and RAP. Implementation of the LRIP will continue until all PAP have restored their livelihoods, or have been given sufficient opportunity to do so.

In the event that land acquisition involves displacement of communities and construction of resettlement sites, livelihood programs will be based on the characteristics of the sites selected for the new settlement schemes.

8.1 Livelihood Characteristics of Affected Population

8.1.1 *Livelihood Roles*

In the different communities within the Project footprint men, women, and youth tend to engage in different livelihood strategies. In summary, common roles are that:

- Men are the holders of fixed assets (land, houses, etc.) and are the main producers of food. Where large livestock exist, they are primarily controlled by men.
- Women are the caregivers, the producers of supplementary food, tending market gardens or owning small livestock. Women also engage in food processing and trade food products at local markets.
- Youth are mainly a source of labour, and are not considered to own any of the production they facilitate within their household. Young men may also work independently as wage labourers. Female youth are more likely to continue supporting household activities, particularly around child rearing and food processing.

8.1.2 *Wealth and Livelihood Types*

Livelihood activities within a community show distinctions between households of different relative wealth within a community. In this case, the classification of 'wealthy', 'average', and 'worse off' are relative classifications within a community that are based on self-identification during consultations.

- Wealthy households tend to be older families and have large landholdings, where they will hire paid labourers to work. They may also let other households farm on their landholdings, normally for a token gift or share of the produce. Wealthy households are also more likely to engage in small and medium-size business, such as running local shops.

- Average households are generally comprised of an established family with usage rights over a smaller plot of agricultural land. These households usually farm, fish and market garden, as well as providing agricultural labour for wealthier families.
- Worse-off households have small landholdings in areas that are not ideal for farming. They may have a large number of dependants within the household, some of whom are frail elderly, chronically ill and/or disabled and limited assets. These households primarily engage in wage labour activities with some harvesting of natural resources and whenever possible, small trading to earn income.

8.2 Impacts on Livelihoods

This Section summarises how resettlement impacts to livelihoods align with the five 'livelihood capitals' - financial, social, human, physical and natural. These five capitals form part of the Sustainable Livelihood Approaches (SLA) utilized by a number of international development agencies in understanding community resilience and addressing poverty and food insecurity. [25] It considers both the context in which people live and how it is shaped by different constraints and opportunities; and how people draw on various livelihood assets or capitals, in different combinations. It is useful in understanding people's economic wellbeing prior to Project-related displacement, and informing the most suitable programs to restore and where possible, strengthen livelihoods.

8.2.1 *Impacts to Financial Capital*

The resettlement process is expected to have both negative and positive impacts on the availability of financial capital in the Project area and to host communities.

In the short-term, access to financial resources will increase significantly as compensation is disbursed. Opportunities for local employment and procurement with the Project, as well as indirect opportunities created by the Project's presence, will increase access to financial resources.

In the long term, there will be increased risk of inflation (and therefore the erosion of savings) and the potential for irresponsible use of compensation amounts leading to impoverishment.

The LRIP will include measures to mitigate these negative risks, including:

- Prioritise PAHs for local employment and local procurement opportunities with the Project and Project contractors (in line with the employment strategy developed for the Project);
- Stagger cash compensation payments to limit large cash infusions into the local economy;
- Account for access impacts to familiar markets, traders, and suppliers;
- Use formal financial services (such as recognised banks) to deliver and manage cash compensation and train households in establishing budgets and saving strategies; and
- Supporting the establishment of microfinance banks and strengthen existing village saving and loans associations.

8.2.2 *Impacts to Social Capital*

Social relationships allow for the transfer of information, materials, and goods and services within households, between households, and between communities. Existing livelihood strategies rely on strong intra-household bonds of mutual support.

The resettlement process is not expected to have significant impacts on social capital. The Project will seek to avoid the most common risk to social capital, loss of support networks. This will be accomplished by avoiding physical resettlement completely; resettling impacted households to a new location within their community; or by resettling affected communities as a whole (i.e. moving all

[25] http://www.glopp.ch/B7/en/multimedia/B7_1_pdf2.pdf accessed 03/01/2019

community members who wish to remain with their community of origin to the same resettlement site). The most significant residual risk to social capital that remains is the potential for intra- and inter-household conflict around how cash compensation is spent.

To mitigate for this residual risk and to provide protections for social capital in general, the following activities are proposed:

- Ensure that all 'primary adults' (i.e. the head of household and all spouses) have equitable access to compensation;
- Train affected households on compensation management and financial planning;
- Strengthen community associations through direct support and/or by relying on them for the implementation of RAP/LRP activities; and
- Provide adequate support for vulnerable households to enjoy the same benefits that other PAHs are able to capture from the resettlement process.

8.2.3 *Impacts to Human Capital*

Displacement may impact negatively on the health of affected persons as a result of the stress associated with change and resettlement. This can be mitigated to some degree by keeping people informed of project developments and offering opportunities for them to participate in the decisions that will impact their lives. With respect to education, the Project may have a slightly positive impact, incentivising area households to value education in light of the semi-skilled and skilled wage employment opportunities that become available.

However, to leverage Project presence to improve human capital, the following activities are proposed:

- Support for local community health providers and outreach associations;
- Outreach to local schools; and
- Provision of training and vocation opportunities for adult and young adult PAH members, preferably aligned with and in advance of Project construction.

8.2.4 *Impacts to Physical Capital*

Project impacts to physical capital, particularly to infrastructure, are expected to be positive, including construction of new roads and the improvement of existing road infrastructure, clearance of transmission line areas that can be cultivated following the completion of construction, and the provision of staff housing, Project employment and associated health and education facilities for those employed by the Project.

A detailed Project employment strategy will be required, which outlines how local communities will be able to access opportunities with the Project in a way that is seen as transparent and fair, based on the labour skills required and available local capacity. The employment levels anticipated also suggest that the risk of an influx of outsiders and opportunists to the Project area is high. Project planning will need to include discussions with community leadership and other stakeholders around the management of influx and minimizing pressure to existing area infrastructure.

Over the longer term, positive impacts will include increased access to electricity generated by the dam.

8.2.5 *Impacts to Natural Capital*

Negative impacts associated with physical capital include the impact of the dam on river flows essential for particular tourist activities (i.e. rafting and jet boating) and the longer-term impact on wildlife and fisheries in addition to possible flooding. The impacts and mitigation measures to address these impacts is being considered in separate plans.

8.3 Livelihood Restoration and Improvement Plan

As noted above, the detailed RAP(s) will include a livelihood program that will expand upon the Compensation Framework and detail how the compensation provided will be supported through programming in order to achieve sustainable livelihood restoration and potential improvement. The LRIP will consist of tailored programs based on the existing livelihood activities of the affected population.

The Project will assume responsibility for implementing the livelihood restoration program. To ensure its sustainability, the livelihood program will prioritise strengthening partnerships with governmental and civil society organisations that operate in the Project area.

Livelihood restoration activities will begin prior to displacement so that households have the opportunity to learn new skills and to familiarise themselves with new techniques. Pre-displacement activities will focus on training and will establish the effective support structures necessary, while post-displacement activities will focus on the provision of direct support.

The livelihood program will detail the specific programs and activities that will be delivered, how they will be delivered and when, and eligibility for participation.

8.3.1 *Goals and Objectives*

The goal of the LRIP will be to help restore, and potentially improve, the livelihoods and living standards of physically and economically displaced PAH and host communities. The livelihood program will assist men, women, youth, and communities in re-establishing and strengthening current livelihood practices in the short and medium term, and develop transferable skills and engender self-reliance in the long term.

The specific objectives of the LRIP include:

- Provide extensive support so that the abilities, resources, and assets of PAHs are effectively deployed in meaningful livelihood initiatives;
- Enable PAHs to benefit from multiple sustainable livelihood activities within the Project area;
- Meet the compensation commitments – as agreed with PAHs – such that compensation and other displacement related assistance is effectively and sustainably managed by PAHs;
- Support the improvement of commercial skill-based livelihoods to create opportunities for PAHs to benefit from a skills-based economy;
- Deliver training, and provide people with work experience and transferable skills that will help them compete for Project-related jobs and future opportunities; and
- Provide support so that PAHs and communities are able to maintain equal access to broader community, district, and regional development programs (i.e. government programs, Project community development activities, etc.).

8.3.2 *Principles*

The following principles will be applied in the design and implementation of the LRIP:

Identify Livelihood Impacts Systematically – Livelihood impacts on local people will be determined systematically through detailed surveys and engagement with those affected. To the extent possible, such impacts will be quantified and the affected people identified individually. Impacts will be considered even if the affected people are not resident in the area, do not own the land, or do not have legal title or access to the resources.

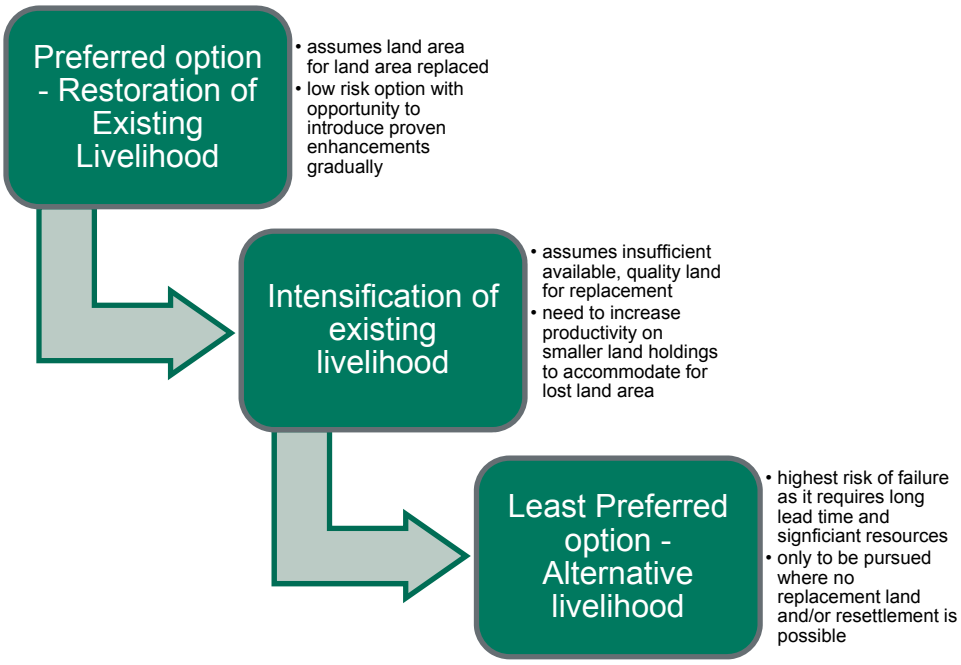
Recognise Advantages of Location as an Asset – Replacement land for habitation, farming or other activities should have advantages of location at least equivalent to their existing land. If this is

not possible, any loss of advantage of location will be considered as an additional impact requiring mitigation.

Plan and Negotiate Appropriate Measures with Affected People – The planning of livelihoods restoration / improvement is not a purely technical exercise, but requires a high level of interaction with the affected people in order to develop the most feasible and desirable mitigation measures. The agreed measures, in the form of compensation entitlement, will be incorporated into formal collective and/or individual agreements. All three tiers of stakeholders described in Chapter 4 will provide input and approve the LRIP.

Give Preference to Replacement of Existing Livelihood Activities – Livelihood restoration / improvement measures will be planned according to the hierarchy illustrated in **Figure 9.**

Figure 9 Livelihood Restoration Hierarchy



8.3.3 *Eligibility & Target Groups*

The LRIP will develop different levels of intervention for physically displaced households, economically displaced and host communities, as required. Eligibility for programs developed will relate to the scale and type of impact experienced by the household. Program development will consider the livelihood support needs of women and youth, and any marginalized and vulnerable groups at an elevated risk of experiencing hardship as a result of being displaced.

8.4 Livelihood Restoration and Improvement Program Types

As part of developing the RAP(s) and associated LRIP, an inventory of government, donor and not-for-profit services and programs (both existing and planned) relevant to the Project area will be undertaken. Additionally, an assessment of possible implementing partners will be conducted with a view to identifying those with expertise in the following types of programs:

- Agricultural improvement through hands on farmer-field schools which support farmers (both men and women) on their farms, and identify and train local mentors in improved farming and animal husbandry practices;
- Increasing access to improved seeds, fertilizer, veterinary services and other agricultural inputs;

- Improved crop processing options and storage facilities;
- Facilitating access to markets and the buying of local crops and produce by regional buyers;
- Mechanisms for improving access to capital; and
- Entrepreneurial training and access to credit for traders and small business owners.

9. VULNERABLE SUPPORT

This Chapter outlines the general approach that will be taken in identifying and providing support to vulnerable households. It will be further detailed in the Resettlement Action Plan(s) based on more in-depth information gathered from surveys of affected households.

Vulnerable persons are defined by the World Bank as those who, "by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status, may be more adversely affected by resettlement than others, and who may be limited in their ability to claim or take advantage of resettlement assistance and related development benefits." These standards require that particular attention be paid to the needs of the poor and vulnerable in resettlement planning.

For this Project, vulnerability will be considered on a household basis rather than at an individual level. The rationale is that where potentially vulnerable (e.g. frail elderly) people are present within a household with people who are not vulnerable (e.g. adult children), then vulnerable members have sources of support and avenues for being represented in resettlement planning and implementation.

Household vulnerability may be either:

- Pre-existing: present in a Project area prior to the start of Project activities; or
- Project-induced: a result of Project activities.

As a principle, the Project will seek to ensure PAHs identified with pre-existing vulnerability have equal access to the benefits of RAP/LRP activities, and take steps to avoid or mitigate any instances of Project-induced vulnerability.

To minimise risks, and mitigate impacts to vulnerable households, the Project will detail in the RAP the specific approach to identifying, assessing and where necessary accommodating households with pre-existing vulnerable status, and those whose vulnerable status is project-induced.

9.1 Vulnerable Support Program (VSP)

The RAP(s) will include details of the Vulnerable Support Program (VSP) that includes three main components:

- Continuous monitoring, identification, tracking, and follow-up of all PAHs to ensure they have access to, and benefit from, RAP/LRP activities and Project interventions. This may include special accommodations in the resettlement process (i.e. additional individual meetings to ensure they are fully informed, provision of special assistance in relocating their home). In addition to physically and economically displaced persons, the vulnerable support program will monitor Project-affected communities and host communities to ensure that residents will not be made vulnerable by the Project.
- Established interventions to ensure that the execution of RAP/LRP activities minimises Project-induced vulnerability while accommodating PAHs with pre-existing vulnerability.
- Referral of vulnerable households to existing reputable community service providers (or provision of assistance to access these services) when RAP/LRP activities are unable to sufficiently address pre-existing and/or Project-induced vulnerability.

9.1.1 *Vulnerable Support Program (VSP) Goals and Objectives*

The VSP will focus primarily on monitoring, follow-up, and referral of vulnerable households to the RAP implementation team and / or existing community service providers.

The goal of the VSP is to identify, assess, support, and provide remedial assistance and follow-up for affected households experiencing severe transitional hardship as a result of Project impacts. The specific program objectives include:

- Ensure that PAHs are provided with supplementary support or assistance so they can participate and benefit from RAP programs, particularly the LRIP;
- Identify PAHs who may potentially be vulnerable and ensure that they are able to participate in all aspects of the planning, implementation, and monitoring of the RAP(s);
- Strengthen individual, household, and community support services.

9.1.2 *Identification of Vulnerable Persons*

Any PAHs displaced by Project activities, as well as those households from host communities that exhibit markers of vulnerability will be eligible to participate in the support programming outlined in the VSP. A three-stage process will be used to monitor, identify, and track vulnerability.

- Inclusion in the Project's Vulnerable Watch List using proxy vulnerability benchmarks;
- Verification through discussion with leaders or through a Vulnerable Assessment Home Visit;
- Approval of eligibility and referral to appropriate assistance and service providers.

9.1.2.1 Vulnerable Watch List

A Vulnerable Watch List will be used to identify potentially vulnerable PAHs using broad proxy vulnerability benchmarks. The main function of the Vulnerable Watch List is to highlight households that may be vulnerable for closer monitoring and support. As such, the Vulnerable Watch List serves as an "early warning system" to identify potential issues with RAP implementation that may result in vulnerability. (While some RAP processes may be changed to accommodate individuals on the Vulnerable Watch List, no direct assistance or benefits will be provided, solely on the basis that a PAH is on the Watch List).

The markers (proxy benchmarks) of potential vulnerability include at least the following, a list that may be expanded as the primary data from RAP surveying is analysed. Proxy benchmarks should align with – but not be limited to – community and government conceptions of vulnerability. As such, these proxy benchmarks will be reviewed and revised by Project-affected communities, their leaders, and local health care workers and teachers.

- Elderly people (including widows) lacking adequate extended family support who do not own means of production;
- Single and adolescent mothers (or soon to be mothers) lacking adequate extended family support and/or means of production;
- Persons with HIV/AIDS or other chronic illnesses or disabilities who are unable to regularly engage in income generating activities;
- Households with limited means of production but a high number of dependants (i.e. orphans).

9.1.2.2 Confirmation of Vulnerability

PAHs on the Vulnerable Watch List will be considered for a home visit to determine if they require referral for supplementary assistance. Survey data will be reviewed and leaders consulted regarding whether the PAH may indeed be vulnerable. If they may be, a home visit will be conducted. As a better understanding of vulnerability emerges, appropriate adjustments will be made to the execution of RAP activities to reflect this – i.e. to promote the participation of vulnerable households in the RAP process and support them in accessing RAP benefits equally.

Where home visits are appropriate, they will be conducted by a representative from the Project, local health care professionals, and any relevant community support organisations. Appropriate, sustainable, support will be designed based on the causes of the PAH's vulnerability, most likely referring them to appropriate community and government care providers. In exceptional cases,

supplementary assistance could be provided through the resettlement implementation process, which could include:

- Adjustment of house designs to accommodate mobility challenged persons;
- Allocation of resettlement houses near caregivers and near central locations for elderly persons and those with mobility challenges;
- Additional training and mentorship during the provision of RAP entitlements including livelihood restoration support;
- Exceptional assistance as deemed necessary by the RAP implementation team.

10. GRIEVANCE MECHANISM

This chapter describes the grievance mechanism that will be available for the submission and resolution of grievances (complaints or claims) related to the Project's land acquisition and resettlement processes. Notably, the grievance management process is not meant to address the collection and collation (reporting on) of stakeholder feedback that does not require an individual response. Other avenues (i.e. Project Offices and Community Liaison Officers) will be available to address general comments or requests for information.

10.1 Objectives

Objectives of the grievance redress process are:

- To provide PAPs with accessible procedures for resolving perceived or actual harm done to their well-being or their belongings as a result of Project activities, and for the settlement of disputes, including the possibility of third-party adjudication
- To identify and implement appropriate and mutually acceptable corrective actions to address complaints.
- To avoid, wherever possible, the need to resort to judicial proceedings.

10.2 Types of Grievances and Disputes

The following types of grievances are most common in resettlement planning and implementation:

Planning:

- Complaints about survey activities
- Complaints about scope / lack of information provided by the Project
- Claims of unfair exclusion from engagement activities

Entitlement processing:

- Misidentification of owner / occupier of eligible property assets
- Errors in counting or measuring crops and/or other property assets
- Complaints about compensation entitlement rates
- Complaints about the entitlement policy

Livelihood restoration

- Complaints about allocation of livelihood opportunities
- Complaints about training, employment and recruitment procedures

10.3 Grievance Management Process & Resolution Mechanisms

A dedicated Grievance Officer (GO) will be appointed to coordinate the grievance resolution process. The GO will address and track grievances as they emerge and prepare relevant reports. The grievance process and how to access it will be widely communicated to Project-affected communities.

Experience demonstrates that anyone involved in Project development should be prepared to receive grievances from affected stakeholders, either in person or through correspondence. All personnel (Project or contractor staff, local government representatives who are known to be in contact with Project staff, etc.) involved in any public aspect of the Project where they may interact with local stakeholders will receive training on how to deal with grievances. Most often the appropriate response

will be to direct the complainant to the GO so that they can relay their grievance in person. This means that personnel will always have the contact details of the GO.

Where language or other barriers to submitting a grievance directly exist, the person receiving the grievance may pass it on themselves, along with the contact information for the original complainant.

If the person lodging the grievance is unable to write, the grievance and relevant personal information will be recorded on their behalf and read back to the claimant for their approval. Once the description of the grievance has been approved by the claimant, they will mark the document with their thumbprint.

Upon receipt of a grievance (see Annex 1 General Project Grievance Form), the GO will confer with the complainant to verify that this is the first time that this particular grievance has been submitted by this complainant. If the grievance is related to a previous submission, the GO will inform the complainant of the status of that grievance and record that the grievance has been re-submitted.

Grievances will be tracked in a Resettlement Grievance Database. It will constitute a register of all grievances submitted, identifying who received the grievance, and the status of the grievance. If the grievance is new, the GO 'opens the grievance' by beginning to fill in a grievance form, and creating an entry in the Grievance Database. This form will track how the grievance is dealt with from submission through to resolution.

Open grievances will be reviewed weekly. Those that are not being resolved in a timely fashion, or have been assessed at a higher level of severity, will be referred to management, as described in **Table 9**. People who submit grievances retain their rights to, at any point in the grievance resolution process, refer their grievance to the court system as a formal judicial action.

10.3.1 *Grievance Process*

When somebody asks to submit a grievance or upon receipt of a grievance (i.e. by mail or email), the GO opens the case and begins the preliminary investigation. This may begin immediately if the grievance is submitted in person, or may require the GO to locate the claimant. As above, the name of the complainant and their contact details are recorded, as well as the details of the grievance. Complainants will be presented with a standardized written acknowledgment that the grievance has been received. Once the grievance is logged and acknowledged, the significance is assessed, based on the criteria described in **Table 9**. For second, third and fourth level grievances, higher levels of management will need to be informed and involved in the grievance process.

Table 9 Grievance Significance Level

Significance Level	Type of Grievance	Responsibilities
Level 1	A grievance that is isolated or 'one-off' and essentially local in nature and restricted to one complainant. Note: Some one-off grievances may be significant enough to be assessed as a Level 4 grievance e.g. when a national or international law is broken (see Level 4 below)	Grievance Officer
Level 2	A grievance that extends to the local community or region and has occurred more than once, which is judged to have the potential to cause disruption to ZRA operations or to generate negative comment from local media or other local stakeholders	Grievance Officer & Stakeholder Engagement Manager
Level 3	A grievance which is widespread and repeated or has resulted in long term damage and/or has led to negative comment from local media, or is judged to have the potential to generate negative media and local stakeholder comments (e.g. damage to a sacred site or flooding of local school)	Stakeholder Engagement Manager & Resettlement Manger
Level 4	A one-off complaint, or one which is widespread or repeated and , **in addition,** has resulted in a serious breach of ZRA policies, Zambian or Zimbabwean or International Law and/or has led to negative national/international media attention, or is judged to have the potential to generate negative comment from the media or other key stakeholders (e.g. failure to pay compensation where appropriate, e.g resettlement)	Resettlement Manager & Project CEO

The process and timeframe for resolving grievances is depicted in **Figure 10**. The Project commits to recording, assessing and acknowledging receipt of the grievance, within seven days. All grievances submitted will be investigated fully, and will involve other departments, contractors and senior management as required in order to fully understand the circumstances that led to the grievance being raised. The grievance process ill aim to resolve any grievances within 30 days from the date that it was initially received. This timeframe can be extended to 60 days for more complex grievances (i.e. level 3 or 4 grievances), if required.

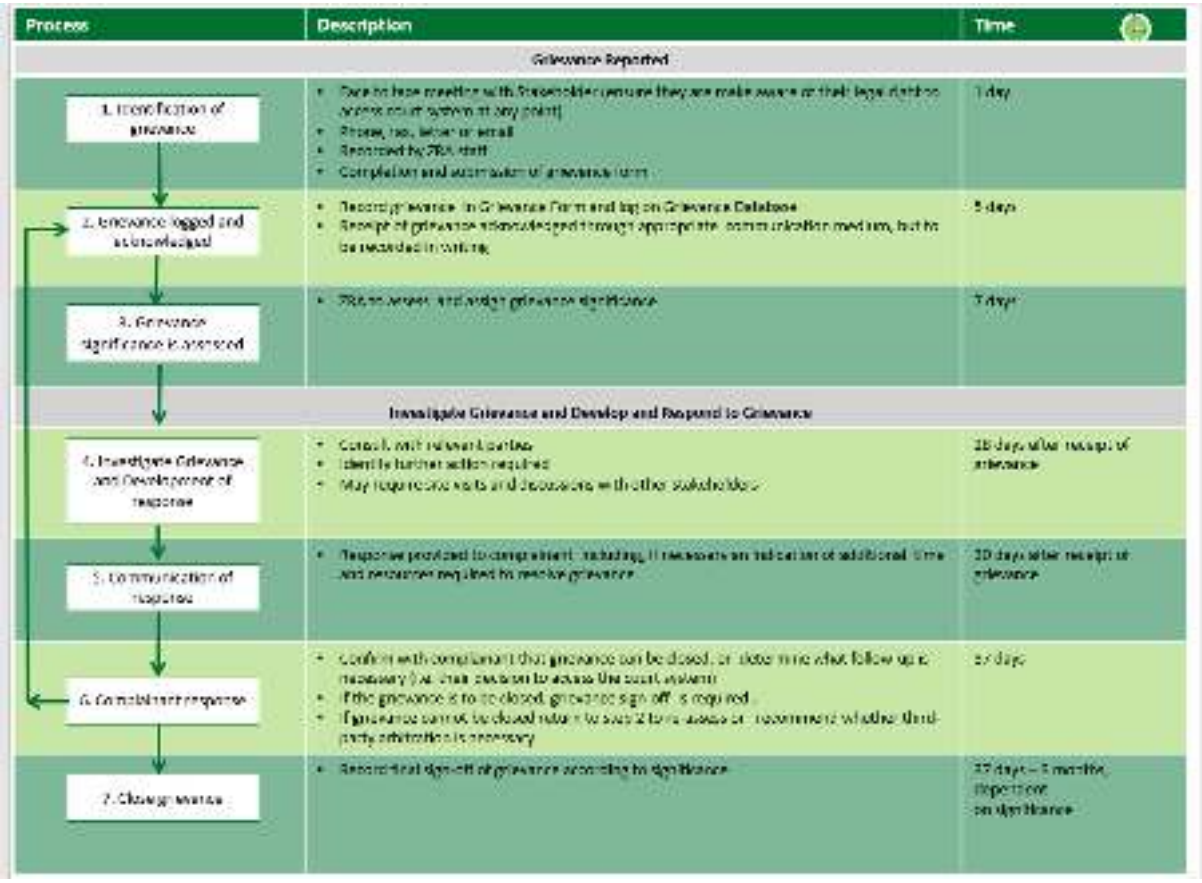
The grievance resolution process includes the following steps:

- Obtain as much information as possible from the person who received the complaint, as well as from the complainant to gain a first-hand understanding of the grievance.
- Undertake a site visit, if required, to clarify the parties and issues involved. Gather the views of other stakeholders including ZRA employees, if necessary and identify initial options for settlement that parties have considered.
- Determine whether the grievance is eligible (i.e. relates directly or indirectly to BGHES), and if ineligible, determine the more appropriate vehicle for addressing the issue, a full explanation as to the reasons for its ineligibility will be given to the complainant and recorded in the Grievance Database.
- If the grievance is eligible, determine its severity level using the significance criteria in Table 9. This will help to determine whether the grievance can be resolved immediately or requires

further investigation and whether senior management will need to be informed of the grievance and who specifically.

- If the grievance concerns physical damage, (e.g. crop, house, community asset) take a photograph of the damage and record the exact location as accurately as possible.
- Inform the complainant of the expected timeframe for resolution of the grievance.
- Enter the findings of the investigation in the Grievance Database.

Figure 10 Grievance Management



10.3.2 *Grievance Settlement and Resolution Approach*

All grievances shall be dealt with on a case by case basis. Where possible, they will be addressed directly by the GO. The resolution proposal shall be respectful and considered, including the rationale and any data used in developing the proposed resolution. If wider consultation is necessary, grievances will be forwarded to a neutral, external third party.

The third party could be an existing body or one established for this purpose (i.e. grievance review committee). It would need to be well-respected, and agreed upon by both Project management and the affected parties. It could include public defenders, legal advisors, local or international NGOs, or technical experts. In cases where further arbitration is necessary, appropriate government involvement will be requested.

10.3.3 *Monitoring and Reporting*

Grievances will be monitored routinely as part of the broader management of the Project. This entails good record keeping of complaints raised throughout the life of the construction and operation of the

Project. On receipt of grievances, electronic notification to management must be distributed. Grievance records must be made available to management at all times, and the appropriate protocols established and followed for high level grievances.

Monthly internal reports will be compiled by the Grievance Officer and distributed to the management team. These grievance reports will include:

- The number of grievances logged in the proceeding period by level and type.
- The number of stakeholders that have come back after 30 days stating they are not satisfied with the resolution.
- The number of grievances unresolved after 60 days by level and type.
- The number of grievances resolved between ZRA and complainant, without accessing legal or third party mediators, by level and type
- The number of grievances of the same or similar issue
- ZRAs' responses to the concerns raised by the various stakeholders.
- The measures taken to incorporate these responses into project design and implementation.
- These reports and other records will be made available for external review if required.

An appropriate grievance report will be included in ZRA's annual reporting. Annual reports will be made available to the public. A hard copy will be located at the ZRA offices, and an electronic copy will be made available online.

The grievance database will allow for the relative success of the grievance resolution process outlined above to be regularly monitored and evaluated. Internally, grievance resolution timeframes will be monitored through weekly meetings between the GO and Resettlement Manager. Open grievances will be reviewed, and emergent and recurring issues discussed. Where grievances remain open beyond the established timeframe, the GO will be responsible for providing the given claimants with an explanation and an assurance that their grievance has not been lost or forgotten.

Lastly, reporting on grievances will be provided to external auditors as a component of the regular evaluations that will be conducted for the resettlement process overall.

10.3.4 *Recourse to the Judicial System*

Although it is hoped that all grievances will be resolved internally and through the aforementioned process, it will be communicated to stakeholders that at any time during the grievance resolution process, they retain their rights to refer their grievance to the appropriate arbitrative or legal body within the Zimbabwean judicial system.

In the event that a grievance becomes a case presented by the claimant's legal counsel, the Project's Legal Advisor will be directly responsible for responding to the claim.

11. IMPLEMENTATION ARRANGEMENTS

This chapter describes the organisational arrangements and work plan required for the resettlement planning and collective negotiation phase resulting in an endorsed RAP(s).

There are four phases that guide land acquisition and the management of related displacement impacts enabling the Project to move from a RPF to a fully endorsed RAP and through RAP implementation to Project completion.

- **Phase 1**: Development of a bridging strategy outlining how the RPF will be expanded into a detailed RAP(s) endorsed by Project stakeholders;
- **Phase 2**: Survey execution and collective engagement, resulting in a final, approved and fully costed RAP(s) and LRIP(s);
- **Phase 3**: RAP/LRP Implementation and individual household sign-off; and
- **Phase 4**: Delivery of supportive programs.

11.1 Phase 1: Resettlement Bridging Strategy

The resettlement bridging strategy details how the Resettlement Policy Framework will be expanded into a detailed RAP(s). It will frame the entire resettlement and livelihood restoration process from beginning to end. As a “plan for a plan”, it will set the stage for subsequent planning and engagement activities.

The objectives of the Strategy include:

- To develop and agree to a RAP/LRP completion strategy and schedule based on this RPF, to determine the most appropriate and efficient deployment of resources, confirm the approach to stakeholder engagement and to develop a schedule that indicates how timelines available for Project deliverables (mainly the RAP) will be met;
- To confirm the resettlement stakeholder engagement program as outlined in the RPF and based on that, provide a detailed Resettlement Stakeholder Engagement Plan;
- To confirm the organisational arrangements that will carry out planning and implementation of land access and resettlement, and livelihood restoration activities and resources (i.e. budget) required.

11.2 Phase 2: Planning and Collective Negotiations

This phase comprises technical planning activities and engagement activities designed to verify and quantify displacement impacts, and confirm the general terms and conditions that will guide land acquisition and resettlement. It includes the declaration of a cut-off date, planning and implementation of a comprehensive census and asset survey. Based on the principles and procedures outlined in this RPF, phase 2 results in a RAP/LRP that confirms the location of all Project components and quantifies the impacts (i.e. number of households physically and/or economically displaced). It will further specify the procedures that the Project will follow and the actions that it will take to mitigate and redress adverse effects, including compensate for losses, physically resettle affected households, provide access to Project development benefits, and otherwise manage the displacement impacts of the Project.

The RAP/LRP will outline the impacts of land acquisition as well as the required compensation and mitigations measures, based on this RPF the quantification of impacts will be accompanied by a first order estimate of costs and a schedule for resettlement.

The content of the RAP/LRP will build on the Resettlement Policy Framework with significantly more detail regarding compensation eligibility and entitlements (i.e. specific crop compensation rates),

supportive programs (i.e. detailed livelihood restoration and improvement assistance measures), and implementation procedures. The RAP/LRP will follow the outline below:

- Include (and where necessary update) the introduction section of the RPF, that describes the Project setting, measures taken to avoid or reduce the scope of displacement, the need for resettlement, and the overall approach to and principles guiding resettlement planning and implementation.
- Characterise baseline conditions among those directly affected by Project land-take, building on information collected as part of the ESIA baseline and presented in the RPF, with information collected through the census and asset inventory.
- Quantify impacts of land acquisition (i.e. number of affected properties, plots, people, crops).
- Identify and analyse resettlement stakeholders and describe the engagement activities that have been undertaken as part of RAP/LRP preparation, including the identification of vulnerable people and groups, and the mobilisation and ongoing management of the Resettlement Steering Committee and various forums.
- Confirm eligibility and entitlement policies as described in the RPF, and finalise entitlement matrix.
- Define cash compensation policies, rates, and related procedures, and demonstrate how the rates meet the definition of “full replacement value”.
- Describe the resettlement assets to be delivered, including details of the Assisted Self-resettlement Program, and/or the final resettlement site(s), as well as conceptual plans of communities and house designs, if required.
- Describe the livelihood restoration and vulnerable support program, and the specific implementation partners and model of program delivery.
- Summarize grievances received to date and their status.
- Confirm details of the internal monitoring and evaluation program to ensure that the objectives of the resettlement process are met.
- Confirm the organisational arrangements for implementation of the RAP/LRP, including work plan, schedule and budget estimated for implementation.

11.3 Phase 3: Implementation and Individual Sign-off

Phase 3 results in individual household agreements that reflect (a) the general terms and conditions documented in the RAP/LRP and (b) the results of the census and asset survey exercise. The resulting agreement should specify all compensation due to the individual household and will be signed by the affected household’s representative, the Project representative, and potentially observers (i.e. village representative). By the end of this phase, the Project secures access to the land that it requires to develop the Project, and those affected receive all their entitlements and those physically displaced are relocated, in accordance with the terms and conditions outlined in the RAP/LRP.

11.4 Phase 4: Delivery of Support Programs

This phase includes implementation of agreed livelihood restoration, assistance for vulnerable groups and ongoing monitoring. All of which continue until those affected have been able to restore their livelihood and establish an improved quality of life, confirmed through a completion audit undertaken by an external third party.

11.5 Organizational Arrangements

Figure 11 presents the resources required to develop the RAP and LRIP; as noted above the team structure will be confirmed as part of the bridging strategy discussions in Phase 1. The team resources will be adjusted as necessary for Phases 3 and 4.

The role of the RAP Planning and Implementation Team, made up of a mix of ZRA staff, government staff and third party service providers, is to lead the stakeholder engagement process, undertake technical work in support of the resettlement process, check that international standards are met, and prepare the RAP and LRIP. Proposed roles and responsibilities are outlined in the following sections.

11.5.1 *Management*

Resettlement Manager will manage the Resettlement team's activities, guiding the engagement process and technical work streams and overseeing preparation of the RAP/LRP documents. The Resettlement Manager will be a member of the Resettlement Steering Committee.

11.5.2 *Survey and Data Management Groups*

- Data Management Coordinator and GIS Specialist, who will be responsible for managing the database / GIS, reporting on surveyed data, and supporting the engagement and negotiations process.
- Survey Management Coordinator, who will plan and administer the census, livelihood survey, and immoveable asset inventory in accordance with international and national standards, and oversee the QA/QC process.
- Social Surveyors, who will administer the census and livelihood surveys to all displaced households.
- Asset Surveyors, who will administer the immoveable asset inventory (lands, crops / trees, buildings, other built improvements) to all displaced households, together with the valuers.
- Data Entry Clerks, who will enter gathered data into the database / GIS.

11.5.3 *Stakeholder Engagement Group*

Engagement Coordinator, who will manage the RSC, the leadership forum and community feedback forums, and administer the grievance management system.

Community Liaison Officers, who will support the Engagement Coordinator in the above.

Grievance Officer, who will manage the grievance management system.

11.5.4 *Physical Resettlement Planning and Design Support Group*

This assumes that physical resettlement is limited and an assisted self-resettlement option is the most appropriate for the Project. In this group, a construction supervisor and assistants will oversee the self-build program. If a full resettlement is required, a larger team of planning, design and engineering specialists will be essential.

11.5.5 *Livelihood & Vulnerable Support Group*

Livelihood Restoration Coordinator, who will assist the Resettlement Manager in coordinating the Team's activities and in documenting and reporting on the process.

Sector Specialists (e.g. agricultural and livestock specialists), who will support the Livelihood Restoration Coordinator in planning appropriate programs and activities in support of land-based livelihoods as per the RAP/LRP.

Vulnerable Support Officer, who will lead delivery of Project vulnerable support and monitoring measures.

11.5.6 *Financial Management Group*

A Finance Manager will be responsible for ensuring a reliable system of calculating and processing cash compensation payments is established and appropriate checks and balances are in place.

11.6 Work Plan

Table 9 presents an indicative work plan for completing the first two phases within a 10-month period, the outcome of which will be a finalized RAP(s) endorsed by Project stakeholders and completed preparations for an individual household sign-off to secure required land.

Figure 11 RAP Planning and Implementation Team

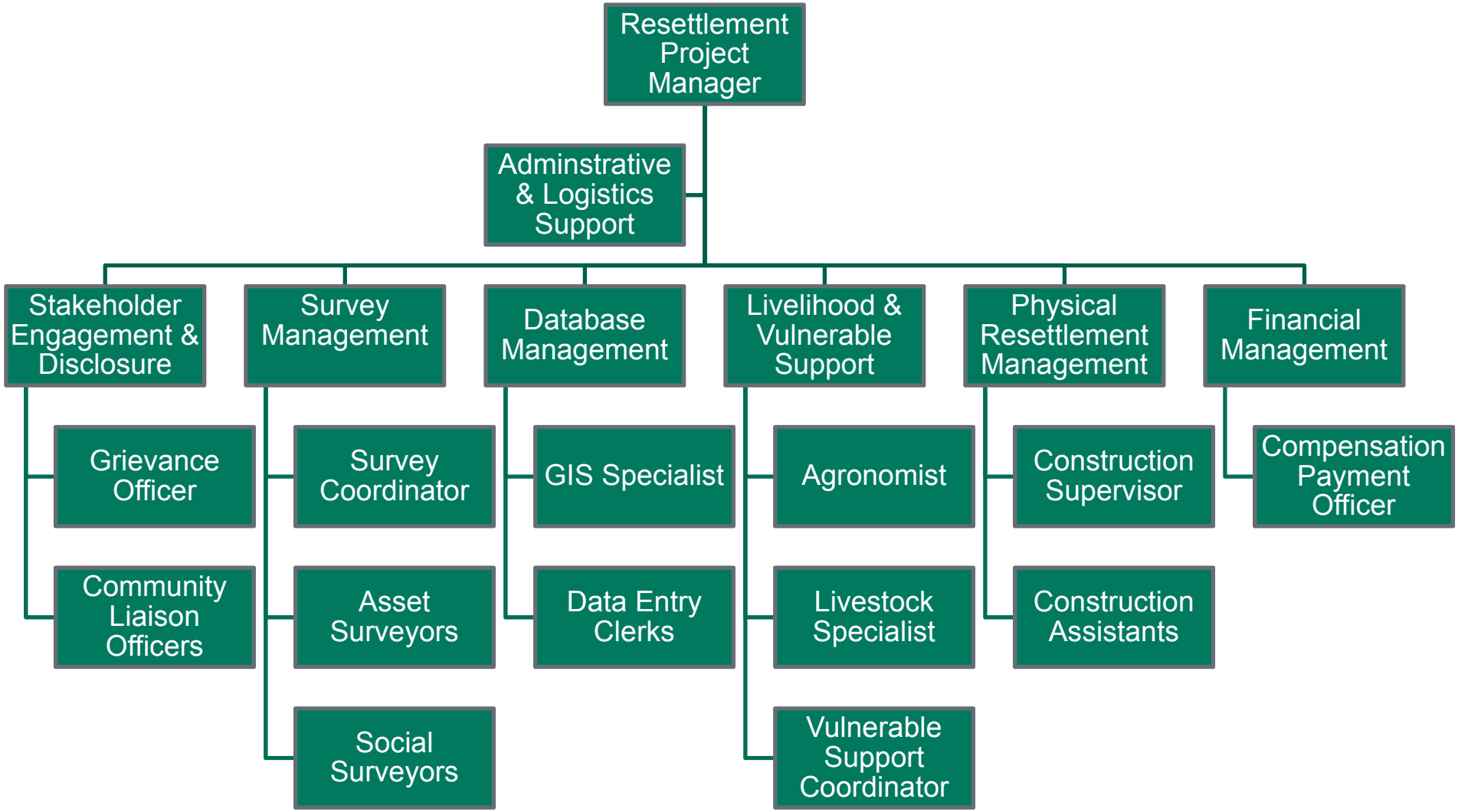


Table 10 Indicative Work Schedule

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10
PHASE 1 BRIDGING STRATEGY											
1.0	Develop Land Acquisition & Resettlement Bridging Strategy										
	Prepare & Update Project work plan and schedule										
	Present Strategy & Secure Approval from ZRA										
PHASE 2 PLANNING AND COLLECTIVE NEGOTIATIONS											
1.0	**MANAGEMENT**										
1.1	Mobilize Resettlement Planning Team										
1.2	Establish & Manage Resettlement Planning Process										
1.3	Detail Stakeholder Engagement Program (SEP) for Phase 2										
2.0	**STAKEHOLDER ENGAGEMENT**										
2.1	Mobilize and Manage Resettlement Steering Committee										
2.2	Establish and Operationalize Leadership & Community Forums										
2.3	Operationalize Grievance Management System										
3.0	**TECHNICAL WORK STREAMS**										
3.1	Confirm Project Description and Displacement Impacts										
3.2	Design census and asset survey instrument, methodology and database / GIS										
3.3	Mobilize and train survey teams and observers										
3.4	Issue cut off date										
3.5	Implement surveys enter data and check										
3.6	Confirm Eligibility and Entitlement Policies & Packages										
3.7	Engage valuers to investigate compensation rates										
3.8	Finalize compensation rates and define related processes (i.e. payment process)										
3.9	Define In Kind Entitlements										
3.10	Select and secure resettlement sites, if required										
3.11	Undertake conceptual planning and design of replacement assets, if required										
3.12	Define in-kind entitlements for supervised self-build option, if required										
3.13	Undertake conceptual planning and design of replacement assets										
3.14	Plan permitting, approvals, design, tendering, construction, and handover process										
3.15	Finalize details of Assisted Self-build Resettlement Option										
3.16	Undertake inventory of gov't programs/services; NGO's; donors for LRP/VSP										
3.17	Assess potential implementing partners for LRP/VSP										
3.18	Detail Supportive Programs & Method of Delivery										
3.2	Confirm RAP implementation costing										
4.0	**FINALIZE RAP/LRP**										
4.1	Present RAP/LRP to RSC, RSLP & CCF										
4.2	Finalize RAP & LRP in light of any comments received								*		
PHASE 3: IMPLEMENTATION AND INDIVIDUAL HOUSEHOLD SIGN-OFF											
1.1	Re-Tool Team & Prepare for Phase 3 Implementation										

12. MONITORING AND EVALUATION

Monitoring and Evaluation (M&E) of resettlement activities is carried out to ensure commitments made in the RPF and subsequent RAP are met and implemented in accordance with Project objectives, Zimbabwean Law, and international resettlement standards. M&E provides Project management, lenders and other key stakeholders with timely, concise, indicative information on whether resettlement and land acquisition initiatives are on schedule, as well as on track to achieve sustainable restoration of livelihoods and living conditions, or if adjustments are required.

M&E is firmly rooted in a participatory approach that involves the direct and active participation of displaced persons and stakeholders, and the incorporation of their feedback into the Project's land acquisition and resettlement activities. The tiered engagement and consultation approach described in **Chapter 4** has been designed to facilitate community participation in the planning and implementation of the overall compensation and resettlement process, including monitoring and evaluation activities to define what is tracked and monitored and how success will be defined.

Monitoring of resettlement and compensation activities is conducted both internally within the Project and the implementation team, and by external third parties. Internal monitoring focuses on inputs and outputs, observing the short-term changes in different indicators. External evaluation focuses on processes and outcomes, using the findings of internal monitoring, as well as investigations completed by external, third party organisations.

M&E activities continue until it can be demonstrated that displaced persons have successfully re-established their livelihoods and restored their quality of life. This is confirmed through a completion audit.

12.1 Internal Monitoring

An internal performance and impact monitoring system will be developed to regularly track and report on the following:

- Progress against the detailed implementation schedule such as:
  - Number of individual household sign-offs completed
  - Number of affected households receiving full cash compensation entitlements
  - Number of replacement land plots acquired and physically displaced people adequately re-housed
  - Livelihood restoration measures initiated and completed
- Alignment with overall Project schedule and budget;
- Verification that vulnerable households have received agreed additional assistance;
- Review of grievances submitted including analysis of trends which may require program adjustments; and
- Stakeholder engagement milestones achieved (i.e. signing off on collective agreements with the RSC, RSLF and CFFs).

Internal progress monitoring reports will be prepared at regular intervals (e.g. monthly, quarterly and annually) beginning with the commencement of implementation activities. The frequency of reporting will depend on the stage of the implementation of the RAP(s), with more frequent reporting likely during the earlier phases to ensure implementation is on track.

Outcome monitoring assesses the effectiveness of the RAP and associated programs in supporting Project-affected people in re-establishing their livelihood. It requires a different approach, typically involving surveys of affected households and focus groups to collect information, which can be compared with baseline data prior to resettlement in order to better understand:

- Changes in quality and quantity of agricultural production, access to grazing areas, compared with pre-Project levels;
- Changes in household income levels;
- Changes in household expenditure patterns;
- Changes in asset ownership / quality / size;
- Changes in disease incidence; or
- Satisfaction of affected communities with the resettlement initiatives.

The timing of the outcome monitoring takes into consideration the implementation schedule, and assists the Project RAP Implementation Team in making program adjustments and preparing for external evaluations.

12.1.1 *Monitoring of Physically Displaced Households*

For households that have been physically displaced, post-displacement monitoring will be conducted within the first year after the move. A mid-term evaluation will be conducted for all physically displaced typically three years after displacement. A final long-term evaluation will be conducted for the same group of PAHs. This is typically five to seven years after displacement, but will be determined for each RAP/LRP in turn. The purpose of the monitoring is to verify that PAP have attained a standard of living at least equal to the situation prior to the resettlement process.

12.1.2 *Monitoring of Livelihoods Restoration*

Post-displacement monitoring should follow up with those economically displaced households participating in the Project's livelihood restoration and improvement programs beginning two years after compensation payments have been made and livelihood assistance delivered. The purpose of the monitoring is to assess their socio-economic quality of life, as well as to identify PAHs who may have restored their livelihoods after impact mitigation activities have ended, but for whom residual effects may persist. Based on the analysis of data collected within the livelihood restoration programs an assessment can be made whether PAHs have been given a reasonable opportunity to restore their livelihoods. This mid-term assessment will help to identify general trends as to whether or not the livelihoods programs are having success, and whether or not PAPs are on course to restore their livelihoods. This will guide the course for taking corrective action, as needed.

In order to document whether PAHs' livelihoods have been fully restored, a long-term evaluation should take place typically 5-7 years after displacement. If the livelihoods of the vast majority of PAHs have been restored, RAP/LRP implementation can be considered complete.

12.1.3 *Vulnerability Monitoring*

The primary objective of vulnerability monitoring is to avoid the occurrence of project-induced vulnerability, and if it occurs, to mitigate this through support measures and follow-up monitoring. It is important to monitor effects on PAHs who are especially vulnerable to negative impacts and who, without special consideration, may not receive a proportionate share of Project benefits.

International standards stipulate that:

- Project proponents identify individuals and groups that may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status.
- Project sponsors assess potential impacts on these individuals and groups and propose as necessary, specific measures and accommodations to address potential impacts.

- Project monitoring track the well-being of these individuals and/or households on a disaggregated basis.

Data collected from all households will be analysed periodically to continuously identify households who's pre-existing vulnerable status may be exacerbated as a result of the Project, or who may become vulnerable due to Project displacement.

12.2 External Monitoring and Completion Audit

External resettlement monitoring and evaluation supports and strengthens a Project's internal monitoring system, and is conducted by an independent third party. The key objective is to determine whether Project efforts to restore / improve the living standards and livelihoods of the affected communities have been properly conceived and executed. The audits verify that all physical inputs committed to in the RAP(s) have been delivered and all livelihood restoration measures provided. In addition, the audits evaluate whether the mitigation measures prescribed in the RAP and any corrective actions developed and implemented since the RAP have had the desired effect.

BGHES will have a third-party auditor undertake annual reviews during Project implementation to assess compliance with the RAP(s). The audits will provide the Project Implementation Team with recommendations for improving RAP implementation and addressing any gaps. They will also determine when the final RAP completion audit should be undertaken to determine the following:

- Assess the effectiveness of measures to avoid and minimise displacement impacts by comparing those identified in the RAP/LRP with actual impacts on people and land;
- Verify that implementation complies with applicable international policies;
- Verify that all entitlement and commitments described in the RAP/LRP have been delivered;
- Assess the fairness, adequacy and promptness of the compensation and resettlement procedures as implemented;
- Determine whether the measures identified in the RAP/LRP have been effective in restoring and enhancing affected peoples' livelihood and quality of life, particularly for those households deemed vulnerable;
- Check on any systemic grievances that may be outstanding; and
- Identify any corrective actions necessary to achieve completion of RAP/LRP commitments.

13. ANNEXES

13.1 Annex 1 Grievance forms

To be completed by ZRA personnel (if grievance being submitted in person) or person submitting complaint

Grievance Record	
Reference No: (for official use)	
Full Name	
Contact Information **Please mark how you wish to be contacted (letter, telephone, e-mail).**	☐ **Address/village/traditional authority and ward:** _____ _____ _____ _____ _____ ☐ **Telephone:** _____ ☐ **E-mail:** _____
Preferred Language for communication	
Description of Incident or Grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?
Date of Incident/Grievance	
	☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	
Additional Comments:	

13.1.1 *Grievance Record*

– to be used as part of the database

Grievance Record			
Grievance Number:	Date Submitted:	Target Date for Resolution:	
Name:			
Address and Contact Details			
Grievance Received By:			
Name of Grievance Coordinator:			
Description of Grievance:			
Assessment of Grievance Level:		Notification to CEO or other senior management?	Y/N
Actions to Resolve Grievance			
Delegation to:			
Action	**Who**	**When**	**Completed Y/N/Date**
Response/Resolution:			
Strategy to Communicate Response:			
Sign-Off:			
Date:			
Conclusion			
Is complainant satisfied?	Y/N	Comments from Grievance Coordinator	
Grievance Closed?	Y/N	Grievance Resubmitted?	Y/N
Signature of CEO:		Date:	
Date:		New Grievance Number:	

13.1.2 *Grievance Receipt Form*

– to be used to acknowledge grievances submitted

Grievance Receipt Form		
Grievance Number:	Date Submitted:	Target date for initial meeting to address grievance:
Name:		
Address and Contact Details		
Grievance Received By:		
Name of Grievance Coordinator:		
Contact details of Grievance Coordinator	Telephone: Email: Address:	

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Resettlement Policy Framework (RPF) - Zambia

Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

Zambezi River Authority (ZRA)

26 February 2019

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26 February 2019

Resettlement Policy Framework (RPF) - Zambia

Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

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DEFINITIONS

Affected Persons: Any individual, persons, family, household, group, or collective body that is affected by either physical or economic displacement and are deemed eligible to resettlement assistance and/or compensation under this RPF.

Asset Inventory: The investigation and measuring of all land, interest on and rights to that land, as well as any assets and unexhausted improvements on that land. The Asset Inventory forms of the basis for the determination of resettlement assistance and/or compensation to be granted to Affected Persons.

Allowances: Cash compensation provided in addition to any resettlement assistance and/or compensation provided for the loss of assets, and generally provide transitional support while Affected Persons restore their living conditions and livelihoods after resettlement.

Compensation: The forms or combination of cash or in-kind replacement assets to be provided to Affected Persons to compensation of the acquisition of land or the loss of assets. In most cases, compensation denotes cash only.

Cut-off Date: The date which establishes the deadlines for entitlement to Compensation and/ or Entitlements in respect of Eligible Land, Crops, Trees and Structures. Persons occupying the project footprint after the cut-off date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the cut-off date (usually the date of completion of the assets inventory, or an alternative mutually agreed on date), will not be compensated

Economic Displacement: The loss of assets or access to assets that leads to loss of income sources or livelihoods but does NOT necessarily result in the direct loss of a place of residence.

Eligible Persons: See Affected Persons

Entitlement Framework: A framework that establishes the specific entitlements (i.e. forms of compensation) granted to Affected Persons whom will lose proven assets, as determined during the Asset Inventory.

Household Census: The registration of Affected Persons and the collection of their details and forms the basis for the confirmation of Affected or Eligible Persons.

Improvements: Anything resulting from expenditure of capital or labour – including carrying out of any building, engineering, clearing, improvement, or other operations - in, on, over, or under land, or the making of any material change in the use of any building or land and charges for services provided and other expenses incurred in the development or towards the development of land.

Livelihood Restoration: A range of measure and programmes that ensure that the existing livelihoods of Affected Persons is restored, or ideally improved, during and after the land acquisition and/or resettlement process.

Livelihood Restoration Plan: A plan that establishes the entitlements (e.g., compensation, other assistance) of affected persons and/or communities economically displaced by a Project, in order to provide them with adequate opportunity to re-establish their livelihoods**.** The Project will not involve any physical displacement (i.e. to a place of residence), solely economic displacement.

Livelihoods Restoration and Improvement Plan: A detailed plan which is developed to replace or restore and maintain or improve previous levels of income, employment, and food security for Project-Affected Persons through provision of economic opportunities and income generating activities, including agricultural production and processing, employment promotion, and enterprise development.

Physical Displacement: The displacement, loss, or destruction of the place of residence as a direct result of the development of the Project.

Resettlement assistance: Support provided to people who are physically displaced by a Project. Assistance may include transportation, food, shelter, and social services that are provided to affected people during their relocation. Assistance may also include cash allowances that compensate affected people for the inconvenience associated with resettlement and defray the expense of transition to a new locale, such as moving expenses and lost work days.

Replacement cost: The rate of compensation for lost assets calculated at full replacement value, that is, the market value of the assets (i.e. land, crops, structures) plus transaction costs (i.e. any registration costs, transfer taxes).

Resettlement Policy Framework: A framework document that defines the principles and steps to be adopted in the development of a Resettlement Action Plan. The framework is a precursor to the Resettlement Action Plan and does not replace it.

Resettlement Action Plan: is a plan prepared by the sponsor or other parties responsible for resettlement (such as government agencies), specifying the procedures it will follow and the actions it will take to properly resettle and compensate people and communities physically displaced by a Project.

Specially Gazetted Land: This is agricultural land, which has been identified for compulsory acquisition and has been gazetted for such acquisition.

State Land: This refers to any Land not deeded and land belonging to the State.

ACRONYMS

Abbreviation	Full Definition
BGHES	Batoka Gorge-Hydro Electric Scheme
CAI	Census and Asset Inventory (CAS Census and Asset Survey)
CFF	Community Feedback Forums
ESIA	Environmental and Social Impact Assessment
ESS5	Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
FPIC	Free, Prior, and Informed Consent
GDP	Gross Domestic Product
GII	Gender Inequality Index
GO	Grievance Officer
ICP	Informed Consultation and Participation
ICT	Information and Communication Technology
IDP	Internally Displaced Persons
IFC	International Finance Corporation
IFC PS	IFC Performance Standards
IP	Indigenous People
KPI	Key Performance Indicator
LRIP	Livelihood Restoration and Improvement Plan
LRP	Livelihood Restoration Plan
M&E	Monitoring and Evaluation
NLC	National Land Commission
PAH	Project-Affected Household
PAP	Project-Affected Person
RAP	Resettlement Action Plan
ROW	Right-of-way
RPF	Resettlement Policy Framework
RSC	Resettlement Steering Committee
RSLF	Resettlement Stakeholder Leadership Forum
SEP	Stakeholder Engagement Plan
SLF	Stakeholder Leadership Forum
VSP	Vulnerable Support Plan
ZRA	Zambezi River Authority

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1. INTRODUCTION

This Resettlement Policy Framework (RPF) sets out the guiding principles and procedures that will be followed in managing the impacts of acquiring land for the Batoka Gorge-Hydro Electric Scheme (BGHES) in Zambia. It will guide the compensation of losses and mitigation of potentially adverse Project effects experienced by persons and/or communities through the construction and operation of all components of the hydropower project in this country. Following RPF approval, a detailed Resettlement Action Plan (RAP) or Livelihood Restoration Plan (LRP)[1] will be prepared that covers all project components following finalization of their specific location, boundaries and land area requirements. In the event that Project components will be developed in phases, separate RAPs/LRPs will be prepared.

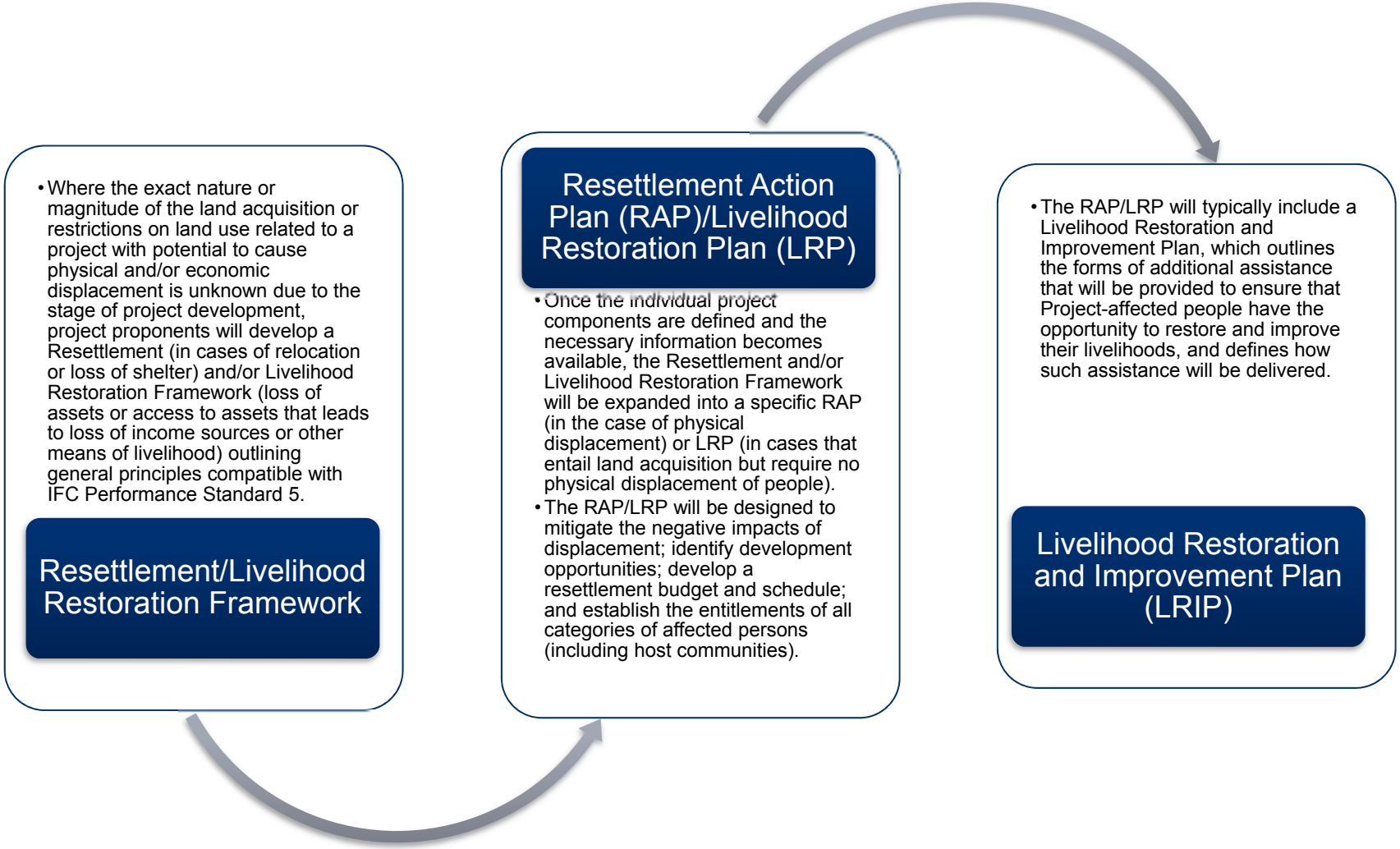
As illustrated in **Figure 1,** a Resettlement Policy Framework is prepared when the exact nature and magnitude of the land acquisition is unknown. Once individual project components are fully defined, and necessary information becomes available, then Resettlement Action Plan(s) can be prepared. Chapter 12 Implementation Arrangements outlines the detailed tasks and resources required to move from a Resettlement Policy Framework to an endorsed RAP(s).

Two RPFs have been prepared, as the Project straddles the Zambia and Zimbabwe border, with hydropower infrastructure components requiring access to land in both countries. The principles and approach of the RPFs are similar; however there are differences in the community context and legal framework governing land allocation and access in each country.

The Project Proponent is the Zambezi River Authority (ZRA), a corporation jointly and equally owned by the governments of Zambia and Zimbabwe. The ZRA is governed by a four-person council two of whom are Ministers in the Government of the Republic of Zambia and two of whom are Ministers in the Government of the Republic of Zimbabwe. The ZRA 's primary functions are operating and maintaining the Kariba Dam Complex, investigating and developing of dam sites on the Zambezi River and analysing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba.

[1] For projects which result in economic displacement only Livelihood Restoration Plans are required; for projects involving **both** physical and economic displacement Resettlement Action Plans are required.

Figure 1 Resettlement Policy Frameworks and Action Plans



1.1 Project Description

Geological investigations into a hydropower project on the Zambezi River began in the early 1900's. In 1972, studies concluded that Batoka Gorge was the best site for the development of a hydropower project. Investigations conducted in 1981-1983 and 1989 identified a specific site in the Batoka Gorge for the Project, prompting a full feasibility study in 1993. The BGHES will be located in the central portion of the Zambezi river basin, upstream of the existing Kariba Dam and approximately 47 km downstream of Victoria Falls.

In 2014, the (ZRA) appointed Studio Pietrangeli (SP) Consulting Engineers to update the engineering feasibility study for the Project, and engaged Environmental Resources Management (ERM) South Africa to undertake an Environmental and Social Impact Assessment (ESIA), including RPFs for Zambia and Zimbabwe.

The Project includes the following components as depicted in **Figure 2:**

- Dam wall and impoundment, including spillway;
- Outdoor power houses, one on each side of the river;
- Transmission lines comprising: two (2) 330kV OHTLs to the Mukuni 330/220kV station, approximately 21km ;one (1) 330kV OHTL to Muzuma 330/132/88kV station, 150km ; two (2) 330kV OHTLs interconnecting the two power stations, Batoka North and Batoka South 5.5km;
- Access roads, 31 km in total;
- Project township/staff housing to accommodate workers and their families during construction and operations; and
- Quarry.

1.2 Land Acquisition and Resettlement Context

Involuntary resettlement processes present a high level of risk for both project proponents and for the people and communities being displaced.[2] For proponents, resettlement can be controversial, costly and time-consuming. If mismanaged, involuntary resettlement processes can cause social unrest, delays to project development, and can damage the proponent's reputation and social license to operate. Displacement poses particular risks for people who may already be marginalized because of socio-economic status, gender, health/ability, ethnicity and/or age. However, when involuntary land acquisition and resettlement is well planned, properly managed, and carried out in conjunction with impacted persons and communities, the risks can be minimised and mitigated and the process can be used to create positive outcomes for project proponents and for local people, including the most vulnerable.

International experience in involuntary resettlement projects indicates that resettlement-induced impoverishment can be characterized by:

- Landlessness: loss of land assets, including common property;
- Joblessness: loss of workplaces and markets;
- Homelessness: loss of shelter;
- General economic set-back or marginalisation (loss of income/livelihood);
- Social disorganisation: increased rates of crime, reduced influence of traditional leaders, loss of culture and negative social behaviour; and
- Impacts to health and safety: disease, mortality, food insecurity and malnutrition.

Displacement poses particular risks for people who may already be marginalized because of socio-economic status, gender, health/ability, ethnicity and/or age. However, when involuntary land acquisition and resettlement is well planned, properly managed, and carried out in conjunction with impacted persons and communities, the risks can be minimised and mitigated and the process can be used to create positive outcomes for project proponents and for local people, including the most vulnerable.

The risks identified above are particularly relevant in the context of this Project as the legacy of the Kariba Dam displacement in the late 1950's persists. Although the Kariba resettlement was undertaken in a very different time, when current governments were not in power and the Zambezi River Authority did not exist, some stakeholders in the Project area continue to raise their concerns that the mistakes of the past will be repeated. In an effort to understand and honour these concerns, it is useful to draw on the research undertaken by the World Commission on Dams.

In an effort to contribute to the global debate around the development effectiveness of large dams ongoing in the 1980/90's, the World Commission on Dams included the Kariba Dam as one of seven case studies worldwide. Close to 60,000 Tonga who inhabited both banks of the Zambezi Valley in 1957 were reported to have been forcibly moved, sparking resistance and violent confrontation causing eight deaths and numerous injuries.[3]

In their assessment of the dam's social impacts, particularly related to resettlement, the WCD found that affected people were neither adequately informed nor consulted:

> *Most of the new land (to which people were resettled) was of poor quality and easily erodible. In addition, as no recession agriculture was possible due to the far distance to the river, only*

[2] Resettlement is involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement.

3 https://cpb-us-e1.wpmucdn.com/share.nanjingschool.com/dist/1/43/files/2013/05/World_Commission_on_Dams_2000_Case_Study_Kariba_Dam_Final_Report_November_2000-2etc5lv.pdf accessed 26_11_2018 page xi

> *one crop per year could be produced. Resettling too many people to areas too small aggravated the problem. It is therefore not surprising that food production decreased and famine occurred in the first years after resettlement…..There are a few things which are certainly better than in pre-Kariba times, such as the access roads to the area, schools and medical facilities. But not all promises made during the resettlement campaign have been met. Most villages are still without electricity.*[4]

It is these experiences and the lessons emanating from them that inform current national and international standards guiding land acquisition and resettlement, including International Finance Corporation (IFC) Performance Standard 5 (2013) and the World Bank Environmental and Social Framework (2016). And, it is these standards which will guide any physical and economic displacement as a result of the Batoka Gorge-Hydro Electric Scheme.

The objective of this document is to outline a framework for resettlement that seeks to avoid, and where avoidance is not possible mitigate the risks posed by displacement, through sound planning and resettlement implementation, and adherence to national laws and international standards of good practice. This document will guide all future land acquisition associated with the Project, and is grounded in the following principles:

- Avoid and minimise physical and economic displacement by exploring alternative project designs;
- Mitigate and compensate adverse impacts from land acquisition or restrictions;
- Improve, or at least restore, pre-Project livelihoods and standards of living for all Project-affected persons (PAPs);
- Improve the living conditions of physically displaced households through the provision of adequate housing with security of tenure and the provision of basic infrastructure and amenities;
- Establish standards of compensation that are transparent, consistent, and reflect the full replacement value of all impacted assets eligible for compensation;
- Guide the design of the resettlement process through free, open, transparent and informed engagement with PAPs;
- Establish grievance and conflict resolution mechanisms to address any grievances raised by PAPs or other stakeholders;
- Identify and bridge gaps between Zimbabwe legal requirements and the requirements of the World Bank Environment and Social Framework (2016);
- Give particular attention to vulnerable groups and if necessary implement measures to ensure that vulnerable groups have equitable access to opportunities and benefits; and
- Promote gender equity in all compensation, allowances and livelihood restoration measures.

1.3 Scope and Structure of the RPF

The RFP framework covers the full scope of the Project's planned land acquisition based on available information current to December 2018, and is organised as follows:

- **Chapter 1 Introduction**: provides an overall introduction, Project description and context for the RFP.

[4] https://cpb-us-e1.wpmucdn.com/share.nanjing-school.com/dist/1/43/files/2013/05/World_Commission_on_Dams_2000_Case_Study_Kariba_Dam_Final_Report_November_2000-2etc5lv.pdf accessed 26_11_2018 page xii

- **Chapter 2 Legal & Institutional Framework:** describes the institutional and legal framework that has guided the preparation of the Framework.
- **Chapter 3 Overview of Project-affected Population:** presents the socio-economic conditions of the Project-affected persons (PAPs), households and communities.
- **Chapter 4 Stakeholder Engagement:** describes stakeholder participation and planned consultation activities throughout the resettlement planning process.
- **Chapter 5 Project Impacts**: provides an overview of impacts on Project-affected persons, households, and communities, as well as impacts on public facilities and public access.
- **Chapter 6 Compensation Principles & Entitlements:** presents the policies guiding resettlement compensation and outlines the Project's compensation strategy for all forms of ownership and use rights affected by the Project.
- **Chapter 7 Replacement Assets:** outlines the process for defining the replacement assets that will form part of the entitlements for PAPs and Project-affected Households (PAH).
- **Chapter 8 Livelihood Restoration & Improvement:** defines the planning process for livelihood restoration and enhancement initiatives to help PAH re-establish existing livelihoods or develop new ones.
- **Chapter 9 Vulnerable Support:** describes the measures to be adopted by the Project to ensure that Vulnerable Persons are not disadvantaged in the resettlement process.
- **Chapter 10 Grievance Management**: describes the mechanisms available to Project-affected people for the processing and resolution of grievances or claims related to the Project's land acquisition process.
- **Chapter 11 Implementation Arrangements:** provides an overview of the implementation arrangements and the actions required to develop a detailed RAP/LRP(s), once the location of all components are known.
- **Chapter 12 Monitoring & Evaluation**: describes the monitoring and evaluation procedures required to ensure that objectives of the Project are met.

2. LEGAL AND INSTITUTIONAL FRAMEWORK

Chapter 2 provides an overview of the legal and institutional framework guiding the preparation of this RFP. It describes Zambian national legislative requirements relevant to land access and resettlement, and compares them with the World Bank's Environmental and Social Framework (2016). The RPF draws from the laws, standards, and principles laid out in in this Chapter and the principles outlined in the previous section.

2.1 Legislative Framework

The most relevant Acts related to land access and acquisition are listed below and described in the following sections.

- Constitution of Zambia;
- The Lands Act;
- The Land Acquisition Act;
- Local Government Act;
- Chiefs Act; and
- Electricity Act.

2.1.1 The Constitution of Zambia (Amendment) Act, No. 2 of 2016

The Constitution is the supreme law of Zambia and establishes the fundamental rights with respect to human dignity, equity, social justice, equality, and non-discrimination.

Relevant to this RPF are the sections in the Constitution that refer to the alienation of rights to land or acquisition of land. Articles 233 and 254 grant powers to the President, through the Commissioner of Lands, to alienate land held by both citizens and non-citizens. The Constitution however does not provide any specific procedures, or proscriptions regarding the legal power to alienate land.

Article 253 states that land will be held, used and managed with consideration to ensure equitable access to land, protecting the tenure for lawful landholders, and that land-use planning be conducted in a consultative and participatory manner.

2.1.2 Lands Act, Cap 1853

The Lands Act[5], states that all land in Zambia be held in perpetuity and in trust on behalf of the people of Zambia.

Article 3(2) grants power to the President to alienate land from any Zambian or Non-Zambian citizen. The President may only alienate land held under customary tenure when they have taken consideration of local customary law on land tenure, consulting the local Chief and authorities as well as consulting with any persons or body with a vested interest in the land.

In addition, the President shall not alienate land without providing any consideration or monies for such alienation except where the alienation is for a public purpose. The term public purpose under the Land Law does include provision for the Project under Article 4(2a) the exclusive use of Government or for the general benefit of the people of Zambia, and Article 4(2g) for obtaining control over land required for or in connection with hydro-electric or other electricity generation and supply purposes by the Government.

Customary land is legally recognised under the Land Act under Article 7 and establishes that the customary systems in placed at the commencement of the Land Act will continue to be so held and recognised and the Provisions of the Land Act will not be construed as to infringe on these customary

[5] Including amendments made in the Land (Amendment) Act of 2010 and 2015

rights. In addition, the Act also recognises the rights and privileges of any persons to hold land under customary tenure as determined by the local customary law.

In the context of compensation and resettlement, land includes any unexhausted improvements on the land. Improvements include anything resulting from the expenditure of capital or labour; and includes any buildings or any activity that results in a material change in the use of land and other expenses incurred in the development or towards the development of land.

2.1.3 Land Acquisition Act, 189

The Land Acquisition Act grants powers to the President to acquire any property of any description, where the President is of the opinion that such acquisition is desirable or in the interests of the Republic.

Under Article 4, the President, via the Ministry of Land or any authorised person, is permitted to access the targeted land to undertake surveys or any other act necessary to ascertain whether the land is or may be suitable for the purpose in question.

The procedure for acquiring land includes issuing suitable notice to persons with an interest in the land. This notice will, under Article 7, be served either personally on the persons to be served or by leaving it at their last usual place of residence or business if any such place can after reasonable inquiry be found. This notice will be supported by the issuance of a similar notice in the government gazette. Upon serving the notice, the interested persons may submit a claim for compensation.

Under Article 6, the President may take possession of the land on the expiration of the period specified in the notice, No specific provision is made limiting the taking of possession of land after the payment of fair compensation.

Article 8 states that where any property is to be partially acquired and where the residual land is less than 0.5 acres, the owner of the land may submit a claim for the acquisition of the whole of the land. Article 9 permits, where land acquisition results in the taking of part of any house of building, the owner to make a claim for the acquisition of the whole house or building.

Article 10 requires that compensation in money be paid for any property to be acquired under the Act. The compensation amount may be determined via an agreement, or where an agreement cannot be reached then in accordance with the provisions of the Act.

Article 10 also makes provision for in-lieu compensation of or in addition to any monetary compensation. This may be in the form of a grant of other land, as far as may be practicable, as those under which the land acquired was held.

Article 12 defines the principles for the assessment of compensation, which include:

1. No allowance shall be made on account of the acquisition being compulsory;
2. The value of property shall, be the amount which the property might be expected to realise if sold in the open market by a willing seller;
3. Any deductions related to any returns and assessments of capital value for taxation made or acquiesced in by the claimant;
4. Any deductions related to any money, services, equipment granted by the Government, by a Company or any other body unless any contributor indicates in writing that the contribution was specifically made for the use and benefit of the registered owner;
5. The special suitability or adaptability of the property for any purpose shall not be considered;
6. No allowance shall be made on account of any improvements effected or works constructed after the publication of the notice to yield up possession;

7. Where part only of the land held by any person is acquired, there shall be considered any probable enhancement of the value of the residue of the land by reason of the proximity of any improvements or works made;
8. Allowance shall be made for the damage by reason of the severance of the acquired land from any other land belonging to the same person; and
9. No allowance shall be made for any probable enhancement in the future of the value of the land to be acquired.

Article 15 limits compensation with respect to undeveloped land or unutilised land where no form of compensation will be payable by the President. Exception is given to where unutilised land to which an absentee owner is beneficially entitled, however compensation is limited to unexhausted improvements on the unutilised land.

The definition of undeveloped land includes any land in a rural area used for agricultural, pastoral, or mixed agricultural and pastoral purposes, which has not been used during the period of two years immediately preceding the Article 7 notice.

2.1.4 The Lands Customary Tenure Conversion Regulations, 89 of 1996

These regulations may apply where the Project seeks to convert customary land to a leasehold tenure. A leasehold is defined as the holding of property by lease with the landowner generally not exceeding 99 years.

The applicant must apply to the Chief of the area for permission to convert the land into leasehold tenure. The Chief has the authority to give or refuse consent of the application. Where consent is granted, the Chief informs the Local Council who makes a recommendation to the provincial planning authority, who in-turn makes a recommendation to the Commissioner of Lands. No specific provisions are made under these regulations with respect to additional measures where the Chief refuses the application.

2.1.5 Local Government Act, Cap 281 of 19914

The Local Government Act grants powers to the relevant councils in acquiring any land by agreement whether by way of purchase, lease, exchange, or gift. Where such acquisition cannot be agreed between the relevant parties, the Council may approach the President to compulsory acquire the land consistent with the Land Acquisition Act.

2.1.6 Chiefs Act, Chapter 287

This Act makes provision for the recognition, appointment, and functions of Chiefs and Deputy Chiefs. The Chief is required to discharge the traditional functions of his office under African customary law as far as the discharge of such functions is not contrary to the Constitution or any written law and is not repugnant to natural justice or morality.

2.2 Land Tenure

In Zambia, similar to many other African countries, land tenure is categorised into two tenure systems, namely statutory and customary.

2.2.1 Statutory Tenure

Statutory tenure refers to state land that is administered by the Commissioner of Lands through local authorities on behalf of the President. The President of Zambia holds the country's land in perpetuity on behalf of the Zambian people. However, power to make and execute grants and disposition of land is delegated to the Commissioner of Lands. The Commissioner has agents who plan the land into plots and thereafter select and recommend suitable candidates to the Commissioner of Lands for issuance of certificate of title. In this context, the Commissioner's agents are the District, Municipal,

and Town Councils. These agents are considered Planning Authorities and use the Urban and Regional Planning Act No. 3 of 2015 to plan the land in their areas.

To acquire state land, the District, Municipal or Town Council identifies an area for which a layout plan is made, and subdivide the identified land into several plots. For agricultural land, the relevant departments in the Ministry of Agriculture and the Resettlement Department under the Vice President's office are responsible. The layout plan is endorsed and stamped by the appropriate planning authority that later transmits the endorsed plan to the Lands Department for scrutiny and verification of the planned land's availability.

If the planned land is available, the plan is approved and transmitted to the Survey Department for surveying and numbering as per the Land Survey Act. Upon receipt of numbered and surveyed plots, the relevant authorities advertise them to the public, after which applicants are interviewed. Selected applicants are recommended for further consideration and approval by the office of the Commissioner of Lands, who is the final authority to grant title to the land.

2.2.2 Customary Tenure

Customary law is based on individual community practices and traditions, organized under a common customary system. Under the customary system, the Chief or designated sub-chief allocates land. The chiefs can give land to individuals or families for their personal use and occupation. The precise mechanism by which land is distributed and rights granted to the holder of the land under customary laws differs with each community. This system of tenure is most prevalent in rural areas, including the BGHES area.

Under the customary system, the prospective developer can approach the Chief of the area for consent to hold land on leasehold tenure and obtain a certificate of title (or PTO Permission to Occupy) for land delivery of less than 250 hectares. Where the Chief is satisfied that the land being requested is available, the Chief writes a consent letter to the office of the Council Secretary of the respective local government, with the land's location site plan attached.

The Council Secretary arranges for the land in question to be inspected by a committee that deals with land matters in the area. The committee also interviews the applicant. If the applicant is successful, the Council Secretary brings the application to the full council for consideration.

If the council approves the application, they will recommend to the provincial planning office, who will recommend to the Commissioner of Lands the allocation of the unnumbered plot to the applicant. The application forms, site plans and council minutes are attached to the recommendation letter, which certifies that the plot is unoccupied. If satisfied, the Commissioner of Lands approves the application. For land in excess of 250 hectares, the Commissioner of Lands is required to seek clearance from the Minister of Lands before approval.

2.3 Electricity Act

The Act grants the President the authority to acquire any land, including State land, required for the transmission, distribution or supply of electricity. The Act does indicate that the Operator take 'reasonable steps to acquire the land intended to be used on reasonable terms by agreement with the owner of the land,' and to notify the owner/user of the intention to erect the line and a description of the lines to be installed.

The Act also states:

> *Adequate compensation shall, from moneys appropriated for the purpose by Parliament, be paid to any person who suffers loss or damage through the exercise of the powers conferred by this section in accordance with the provisions of the Lands Acquisition Act (Part III, Section 4).*

2.4 The National Resettlement Policy

The Zambian National Resettlement Policy was adopted in October 2015[6] to ensure resettlement projects are economically productive, socially secure and environmentally sustainable for persons voluntarily or involuntarily displaced. The Policy consists of the following guidelines to frame the development of sustainable resettlement projects:

- All persons, groups and the communities have the right to suitable resettlement which include right to alternative land, which is safe, secure, accessible, affordable and habitable;
- The choice of location for resettlement scheme should take into account elements such as topography, soil, climate, among other and be weighed against the requirements of the proposed land use;
- Government shall ensure that guidelines and procedures regarding settler selection criteria are clearly spelt out;
- There is need to provide basic public services in resettlement schemes if settlers are to be attracted and encouraged to settle there;
- The settlers shall be given permanent right of ownership and use of their land by being issued with certificates of title to the land;
- The Government will encourage Ministries/institutions to carry out activities relevant to their respective mandates in the resettlement schemes. This includes forging partnerships with all interested stakeholders, including cooperating partners, the private sector and NGOs;
- Involuntary resettlement should be in line with the international human rights and humanitarian law as set out in the 1998 United Nations Guiding Principles on Internal Displacement, which are recognised as an important international framework for the protection of internally displaced persons;
- Involuntary resettlement should be avoided where feasible. Where population displacement is unavoidable, it should be minimised by exploring all viable options;
- People unavoidably displaced should be compensated and assisted so that their economic and social future would be generally as favourable as it would have been in the absence of the project or better; and
- Involuntary resettlement should be conceived and executed as part of the project. The full cost of resettlement and compensation should be included in the presentation of project costs and benefits.

To facilitate implementation of the Policy, the Department of Resettlement, falling under the Office of the Vice President, is responsible for the actual resettlement process. Their specific responsibilities include:

- Identification and acquisition of land for resettlement;
- Demarcation of resettlement plots;
- Processing applications for resettlement;
- Allocation of settlement plots to suitable applicants;
- Recommending deserving settlers to acquire certificate of titles to their farm plots from the Ministry of Lands; and
- Coordinating provision of infrastructure in resettlement programme schemes and resettlement schemes.

[6] http://www.zla.org.zm/wp-content/uploads/2017/02/Final-National-Resettlement-Policy2.pdf accessed 08_12_2018

The Department of Resettlement will have an important role in the land acquisition required for BGHES.

2.5 International Resettlement Standards

The World Bank policies regarding involuntary resettlement are defined through the Bank's Safeguard Policies. The Environmental and Social Framework (ESF) was updated in 2016.[7]

ESF's Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5) establishes the following objectives:

- To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives;
- To avoid forced eviction;
- To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by:
    - Providing timely compensation for loss of assets at replacement cost; and
    - Assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.
- To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure;
- To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant;
- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.[8]

Replacement cost is defined by ESS5 as the method of valuation yielding compensation sufficient to replace assets and necessary transaction costs. Where functioning markets exist, replacement cost is the market value as established through independent and competent real estate valuation, plus transaction costs. Where functioning markets do not exist, replacement cost may be determined through alternative means, such as calculation of output value for land or productive assets, or the un-depreciated value of replacement material and labour for construction of structures or other fixed assets, plus transaction costs.

In all instances where physical displacement results in loss of shelter, replacement cost must at least be sufficient to enable purchase or construction of housing that meets acceptable minimum community standards of quality and safety. The valuation method for determining replacement cost should be documented and included in relevant resettlement planning documents. Transaction costs include administrative charges, registration or title fees, reasonable moving expenses, and any similar costs imposed on affected persons. To ensure compensation at replacement cost, planned compensation rates may require updating in project areas where inflation occurs or delivery of payment time is lengthy.

"Security of tenure" means individuals or communities are resettled to a site that they can legally occupy, where they are protected from the risk of eviction and where the tenure rights provided to them are socially and culturally appropriate. In no instance will resettled persons be provided tenure

[7] https://www.worldbank.org/en/projects-operations/environmental-and-social-framework accessed 05_12_2018

[8] Guidance Note – ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement page 1

rights that are weaker than the rights they had to the land or assets from which they have been displaced.

Other key points in ESS5 include:

- The Proponent will engage directly with affected communities and persons through a process of stakeholder engagement through the planning, implementation, monitoring, and evaluation of the resettlement process;
- The Proponent will establish a grievance mechanism to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion;
- In the development of the RAP or LRP, the Proponent will be required to conduct a census to determine eligible peoples and an inventory of their assets as a basis of determining their asset holdings. Both will be linked to a suitable development moratorium (i.e. eligibility cut-off date);
- Where affected persons are required to be relocated, the Proponent will offer feasible resettlement options, including adequate replacement housing or cash compensation where appropriate;
- Documentation of ownership or occupancy and compensation payments should be issued in the names of both spouses or single heads of households, Other resettlement assistance, such as skills training, access to credit, and job opportunities, should be equally available and adapted to women. Where national law and tenure systems do not recognize the rights of women to hold or contract in property, measures should be considered to provide women with as much protection as possible with the objective to achieve equity with men;"[9] and
- The mitigation of economic displacement will be considered complete when the completion audit concludes the affected persons or communities have received all of the assistance for which they are eligible, and have been provided with adequate opportunity to re-establish their livelihoods.[10]

Critical to the above requirements is the recognition of affected persons with different land tenures. Displaced (or affected) persons, under the World Bank and IFC Performance Standards may be classified as persons:

1) Who have formal legal rights to the land or assets they occupy or use;
2) Who do not have formal legal rights to land or assets but have a claim to land that is recognized or recognizable under national customary law; or
3) Who have no recognizable legal right or claim to the land or assets they occupy or use.

Affected persons who fall into the third category are considered eligible for compensation for any lost assets other than land (such as crops, irrigation infrastructure and other improvements to the land) at replacement cost. ESS5 also stipulates that the Borrower provide assistance in 'lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere'.[11]

2.6 Governance Structure

Zambia is a presidential representative democratic republic, whereby the head of state and government is the President of Zambia. The country is divided into ten provinces, each administered

[9] Environmental and Social Framework (2018) page 57

[10] Ibid page 59

[11] Ibid page 59

by an appointed deputy minister. Provinces are further divided into districts comprised of different wards.

Under Zambian law, councils form local governance. Town Councils govern urban districts, municipal councils for suburban areas, and district councils for rural areas. Ward Councillors (elected volunteer representatives) act as the link between district councils and customary authorities. They bring chiefdom concerns to the District Commissioner, who serve as links to the provincial and national government. The division of power between customary and state authorities can be understood as; personal / family matters are the responsibility of customary authorities (the headperson or chief, depending on the nature and severity of the issue.) Infrastructural concerns such as the building of roads, clinics, or educational facilities fall under the state's mandate.

Land jurisdiction operates similarly in Zambia. State lands are under the authority of the state, and customary lands (all lands relevant to the Project) are subject to norms guiding customary practice (de jure ownership still resides with the state.) For state land, the Commissioner of Lands holds vested administrative authority over questions of land distribution and ownership. Under the customary system, local chiefs hold lands in trust on behalf of their subjects (i.e. those within their chiefdoms / kingdoms) and are responsible for administering land allocations, overseeing disputes, and enforcing usage restrictions. They often, delegate these duties to village headpersons, as they are often more familiar with local land dealings and history.

Regarding institutional responsibilities with respect to resettlement, there are three main bodies with responsibility for the development and implementation of the RAP(s)/LRP(s). They include the Zambezi River Authority, Traditional Leaders of the Project area and Government of Zambia.

The ZRA will be the primary responsible party in terms of the development and implementation of the RPF, consistent with its legal obligations under the Environmental License. This will include the management and financing of all required studies, negotiation on entitlements, stakeholder engagement, and provision of resettlement assistance and payment of compensation.

The financing for the Project and the resettlement will be sourced from a range of international private and public financiers. The conditions for securing international financing includes ensuring that the resettlement process conforms with international resettlement standards (as framed in the World Bank Environmental and Social Standards, 2016).

2.7 Gaps Analysis between National Laws and International Standards

Table 1 compares national laws with World Bank standards pertinent to land acquisition and resettlement. The compensation entitlements, livelihood restoration and vulnerable support measures outlined in later chapters of this RFP are designed to adhere fully to Zambian legislation and address any gaps with international standards.

Table 1 Comparison between National and International Standards Regarding Resettlement

Project impact/component	Zambian Legislation	World Bank Environmental and Social Standard 5	Measures to Address Gaps
Compensation for 'squatters'	No mention in national legislation or resettlement policy of 'squatters' being eligible for compensation.	Affected persons include those with no recognizable legal right or claim to the land or assets they occupy or use; they will be compensated for assets other than land (such as crops, irrigation infrastructure and other improvements made to the land) at replacement cost. Additionally, they will be provided with assistance in lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere. (Note: people who encroach on the project area after the cut-off date for eligibility are not entitled to compensation or assistance)	See Chapter 6 Compensation Principles; Table 6 Eligible Persons includes de-facto occupant or user
Compensation rates	National Resettlement Policy states: Compensation should be paid to persons that are physically and/or economically displaced before commencement of the development project causing displacement; (ii) Provide prompt and effective compensation at market and/or full replacement cost whichever is higher for losses of livelihoods, assets and loss of access to the assets attributable directly to the project.	Land will be accessed only after compensation in accordance with ESS has been made available and where applicable, displaced people have been resettled and moving allowances (in addition to compensation) have been provided to the displaced persons. Affected persons are entitled to compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or livelihoods.	See Chapter 6 Compensation Principles Table 7 Entitlement Matrix
Compensation for land	The Land Act stipulates that compensation for land be paid, this does not include 'undeveloped land or	When land acquisition or restriction on land use (whether permanent or temporary) cannot be avoided, compensation at replacement cost will be offered to	See Chapter 6 Compensation Principles Table 7 Entitlement Matrix

Project impact/component	Zambian Legislation	World Bank Environmental and Social Standard 5	Measures to Address Gaps
	unutilised land.' Exception is given to land owned by an absentee owner, compensation is limited to unexhausted improvements on the unutilised land.	affected persons. Other assistance, as necessary, may be offered to help them improve or restore their standards of living or livelihood.	
Livelihood restoration	National Resettlement Policy recommends; targeted assistance including farming inputs, credit facilities, agriculture extension and opportunities to improve or restore their means of income earning capacity, productivity levels and standards of living to economically displaced persons whose livelihoods or income levels are affected.	Recommends provision of support to displaced persons for transition period and to ensure livelihood restoration and where possible improvement.	Entitlement Matrix and programs implemented as part of Livelihood Restoration and Improvement, Chapter 8
Valuation methods	Asset valuation practice considers depreciation when determining replacement cost.	Full replacement cost does not consider depreciation.	See Chapter 6 Compensation Principles Table 7 Entitlement Matrix
Stakeholder engagement and consultation	Public notification (i.e. gazetting) of the land acquisition is required by Zambian legislation. National Resettlement Policy requires that resettlement activities disclose relevant information, consult fully affected persons during implementation.	Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected	Chapter 4 outlines the three tiered approach to stakeholder engagement and participation
Vulnerable groups	National Resettlement Policy states payment of compensation should prioritise	Where the environmental and social assessment of the project identifies specific individuals or groups as disadvantaged or vulnerable[12]; the borrower will propose	Chapter 9 outlines the Project approach to identifying and providing

Project impact/component	Zambian Legislation	World Bank Environmental and Social Standard 5	Measures to Address Gaps
	households headed by women and other vulnerable groups.	and implement differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing any development benefits and opportunities resulting from the project.	support to PAP deemed 'vulnerable'

3. OVERVIEW OF PROJECT-AFFECTED POPULATION

Chapter 3 provides an overview of the socio-economic conditions of households affected by the Project's requirement to access land. Information draws primarily from baseline survey data gathered in the Project area for the updated ESIA (2016). Preparation of a RAP/LRP will require a full census and asset inventory of all affected households and collection of up to date socio-economic data specifically related to land acquisition and resettlement. This will establish a baseline for Project outcome monitoring, and will assist in livelihood restoration programming.

For the ESIA, primary and secondary data was collected to establish a social area of influence, comprised of a 3 km wide study area along the transmission line route; see **Figure 3 Social Area of Influence**. A household survey involving a sample of 1000 households drawn randomly from all villages within this area was also conducted.

The Project is located in the Southern province of Zambia, in the districts of Kazungula, Zimba, Kalomo and Choma. Kazungula District, and in particular the ward of Mukuni, which falls in the Katombola Constituency and is under the jurisdiction of Chief Mukuni, will be most directly affected due to the placement of the dam infrastructure, access roads and township. The proposed transmission line impacts on Kazungula District, as well as Zimba District, (namely Zimba ward), which is under the jurisdiction of Chief Sipatunyana, Kalomo District (especially Chawila ward), also under Chief Spatunyana and Choma District (in the ward of Singani). In Choma, Chief Singani holds influence in the area of interest.

3.1 Demographics

The demographic data presented in the following sections is based on a representative sample survey of households drawn from all villages within the Project-affected area. The data is compared with available national and regional statistics, where available and relevant.

3.1.1 Population Size

As of 2010, Zambia's total population was approximately 13.1 million people, an increase of 32% from 2000, which gives it one of the fastest growing populations in Sub-Saharan Africa, largely due to its high fertility rates. Zambia's population is also predominantly rural, with 61% of its population living in rural areas and a population density of 17.4 persons per km².[13] The average household size in 2010 was 5.2 persons nationally (5.4 provincially), with 22% of households headed by females. Population statistics at national, Southern Province, and district levels are all weighted slightly towards females, who account for 50.7% of the total population.[14] Zambia's national population is also young (45% are under 15 years of age) and predominantly Christian. Protestants and Catholics form 75% and 20% of the population, while Muslims and other religious groups constitute about 3%.[15]

BGHES is located in the Southern Province. The region covers an area of 85,283 km² and has a population of approximately 1.6 million people, accounting for approximately 12% of the total national population. The population density is 18.6 persons per km², with 75% of people living in rural areas. **Table 2** presents the population figures for the districts within the social area of influence in Zambia. Choma, the provincial capital, has the largest population, but the smallest population density at 1.9 people per km². Livingstone District, the tourist capital of the country, is the most densely populated district in the province, at 200.7 people per km².[16]

Table 2 District Population

District	Population (people)	Population density (km²)	No. of Households
Kazungula	104,731	6.2	20,417
Livingstone	139,509	200.7	31,177
Zimba	66,725*	16.9	13,284
Kalomo	191,845*	4.4	33,180
Choma	247,860	1.9	45,733

Source: All figures from the 2010 national census unless marked by * [17].

The Project is located in Kazungula District, which has a population of 1,887 people, living in 451 households with an average size of 5.2 people. All respondents to the household survey classified themselves as Christians, although a councillor from the Zimba District villages noted that there are some rare cases of ancestral worship and/or animism practiced therein.

3.1.2 Ethnicity and Language

Zambia is home to over 70 ethnic groups. The Bemba is the largest ethnic group (21% of the population) the most commonly spoken language (34% of the population.) The second largest ethic-linguistic group is Tonga, accounting for 14% of the national population. The Southern Province is predominantly populated by Tonga people (75%.) Other ethnic groups include Namwanga, Mambwe, Luvale and Lala.

The social study was conducted with Project affected communities in Kazungula District. All households surveyed belong to the Leya tribe and speak Leya, a dialect of Tonga, as their primary language. Discussions with village headman in Mukuni chiefdom revealed that there are also small numbers of Tongas and Lozis in the villages. In Musokotwane, the village head noted that in addition

(13) Central Statistical Agency (2010). 2010 Census of population and Housing: Population Summary Report, Lusaka, Republic of Zambia
(14) Central Statistical Agency (2010). 2010 Census of population and Housing: Population Summary Report, Lusaka, Republic of Zambia
(15) ibid
(16) ibid
(17)* As noted previously, Zimba District was created in 2012. It is made up of seven wards, which used to belong to Kalomo District. Population figures for Zimba have been obtained from the Zimba District Situation Analysis report (2014). Population figures for Kalomo were calculated by subtracting the population figure for Zimba from the population figure given for Kalomo in the 2010 census.

to Lozis, the Ngoni also formed a sizeable minority. In other Project-affect areas such as the Zimba, Kalomo and Choma districts, the majority of residents belong to the Tonga tribe and speak Tonga.

3.2 Gender Roles

Zambian society adheres to clearly defined gender roles in the domestic, productive, and community settings. Societal expectations dictate that women and girls take a domestic, caretaking role including fetching water, cooking, cleaning and taking care of children, the sick, and the elderly. Male roles include fulfilling community responsibilities such as attending meetings and organising projects, and various other economic activities.

The Gender Inequality Index (GII) reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity. As of 2017, Zambia's GII score was 0.517, ranking it 125th out of 189 countries in terms of gender inequality. Although women form the majority population in Zambia, as of 2017, they held only 18% of seats in parliament. Thirty nine percent of females have achieved a secondary or higher level of education, compared to 52% of males. Labour force participation rates show a similar trend, with 70% of women engaged in economic activity, versus 78% of men.

In the Project area, men tend to conduct hard agricultural labour, such as ploughing. Women assist with crop maintenance such as planting, weeding, watering and harvesting. Men also fish and make curios. Women help men polish curios and engage in other trading activities, men generally control income from the sale of any crops and curios. The study also revealed that women play a limited role in decision-making, local leadership and politics. Although there are village matriarchs and a Bedyango, which is a Toka-Leya high priestess who conducts important rituals and has a final say on the choice of a new chief, anecdotal evidence suggests that the Chief and the male village elders are the primary decision-makers in the community.

3.3 Land Tenure | Land Reform

As mentioned in Chapter 2, there are two types of land tenure in Zambia; customary land and state leasehold land. Both forms of land tenure are recognised in the Land Act No. 27 of 1995. Approximately 94% of land in Zambia is customary land consisting of individual plots, forested land, common land within a village, and communal grazing land. [18]

The 1995 Land Act recognizes customary lands but provides little guidance concerning their governance. Thus, local norms that differ according to tribe, chiefdom, and localized land pressures govern customary lands.[19]

3.4 Livelihoods and Local Economy

Since 2004, Zambia has experienced sustained economic growth of approximately 6% per year. This is attributed to strong performance in construction, transport, communications, the public sector, trading and mining. [20] The World Bank reclassified Zambia as a middle-income country (from a low-income) in 2011 to reflect this growth. In 2013, Zambia's Growth Domestic Product (GDP) was USD 22.38 billion. Construction accounts for 29% of the GDP, followed by 18% agriculture (including hunting, forestry and fishing), finance, real estate and business services at 9% and manufacturing 8% (see **Figure 4**). Although the mining sector only contributes 2%, it has attracted significant foreign interest and investment, leading to predictions that mining will experience significant growth in the

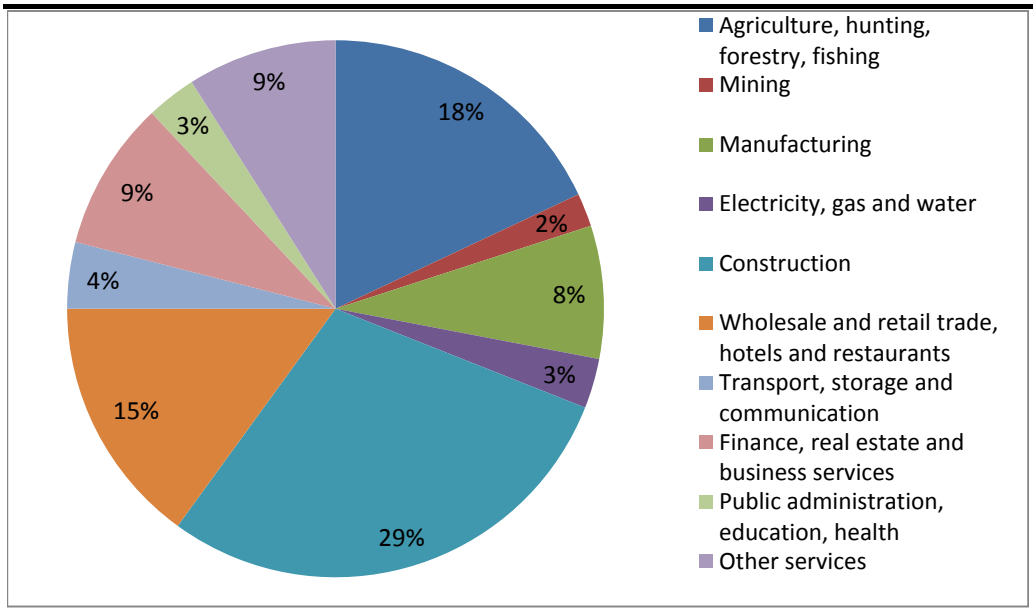
(18) "Zambian Land Policy Guarantees Ownership by Women". 2011, September. Gender Links for Equality and Justice. Available at http://www.genderlinks.org.za/article/zambian-land-policy-guarantees-ownership-by-women-2011-09-30, accessed 02.12.2015

[19] Tucker 2014

(20) http://www.worldbank.org/en/country/zambia/overview. Accessed 12.12.2014

next few years. This is particularly the case for copper development, as Zambia seeks to maintain its position as Africa's largest copper producer and the fifth largest global producer. [21]

Figure 4 Sectoral Contributions to the GDP



Source: African Economic Outlook: Zambia, 2014 [22]

As in many other countries in Sub-Saharan Africa, high economic growth rates have not translated into significant growth in jobs or reduction in poverty. Per capita income is $821 (USD) and 61% of households live below the poverty line[23], with 42% living in extreme poverty. Poverty levels in the Southern Province are higher; 68% live in overall poverty and 47% in extreme poverty. Rural poverty is also higher, at 78% compared to 27.5% in urban areas. [24]

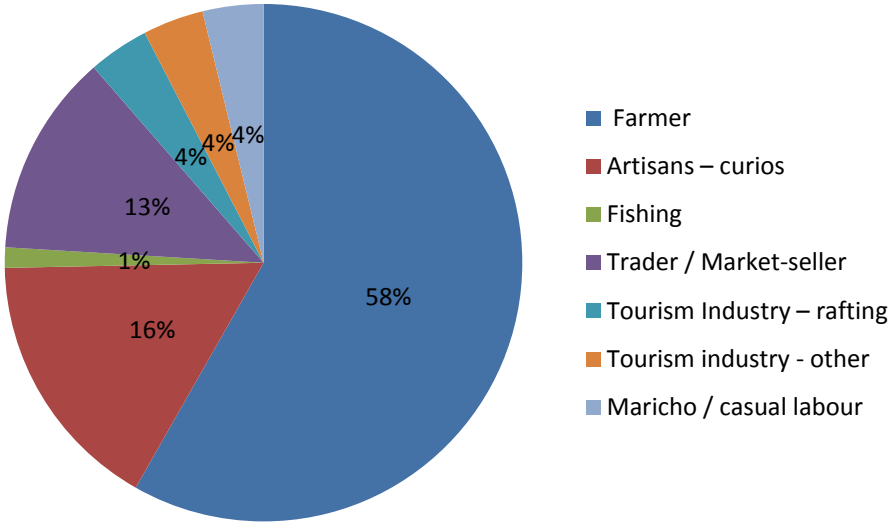
Unemployment is relatively high in Zambia, with 13% of the national population unemployed (17% of youth aged 15 to 25) as of 2010. Unemployment rates in the Southern Province are slightly below the national average at 12%.[25] The majority of employment is within the informal sector, which is characterised by low pay and poor working conditions. Small-scale subsistence agriculture has traditionally dominated the economy, providing employment to just under 66% of the population. [26]

As with much of the broader region, communities in the study area rely primarily on subsistence farming, selling what additional crop farms produce to generate a small income. Communities in Kauzngula district are substantially engaged in the curio trade. In the Project areas, Villages in Zimba, Kalomo and Choma Districts are significantly less engaged in the tourism and curio trade.

Figure 5 Primary Livelihoods within Study Area shows the results from the household surveys relating to the primary livelihoods people reported.

(21) Rasmussen et al 2014. Zambia 2014. AfDB, OECD, UNDP. Available at http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2014/PDF/CN_Long_EN/Zambia.pdf. Accessed 12.12.2014
(22) ibid
[23] Inetrnational poverty line is US$1.90/day (as per World Bank 2011 purchasing-power parity)
(24) Central Statistical Agency (2010). 2010 Census of population and Housing: National Analytical Report, Lusaka, Republic of Zambia
(25) ibid
(26) ibid

Figure 5 Primary Livelihoods within Study Area



Source: ERM Social Survey, October 2014

3.4.1 Agriculture

To sustain their livelihoods, approximately 95% of households included in the social study are engaged in the collection of forest products, both timber and non-timber. Almost all households collect fruit for both consumption and income purposes, many make honey and f use plants for medicinal purposes. The majority of households (92%) collect firewood from forest areas and a few residents collect charcoal.

Livelihoods consist primarily of agricultural production and all households surveyed are engaged in the cultivation of crops, regardless of whether they consider it their primary occupation. Agriculture practices across the area are relatively uniform. The staple crop grown is maize. Sorghum, cowpeas, pumpkins, beans, groundnuts are also cultivated. For villages in Zimba, Kalomo and Choma, sunflower and cotton are also important crops grown, mainly due to their status as cash crops. Tobacco is cultivated in Choma.

Farmers tend to use simple hoes and machetes and often do not have the funds to purchase modern equipment. They also use fertilisers, which they either buy or access through the government-funded Fertiliser Support Programme. As there is very little or no irrigation used, farmers tend to rely on rainwater.

3.4.2 Livestock Rearing

The majority of households (85%) also rear livestock, mainly for income purposes. Poultry is the most commonly owned animal, owned by all households who own livestock. Goats are also popular, owned by 77% of households, followed by cows (43%). Only 2% rear pigs. Cattle tend to used to pull ploughs. Cows form dowry payments, and are used as sacrifices in rituals. Cows are also sold to generate income, normally to raise enough funds so that children can access higher education or occasionally. Income may also be used to help pay for funerals.

3.4.3 Trading (Curios)

The majority of people within villages surveyed in Kazungula are engaged in the curio trade. It is the primary livelihood for 16% and secondary livelihood for 38% of all household survey respondents. Curios include intricately carved wooden animals, bowls, utensils, baskets and jewellery. Although the

forestry department requires those who wish to cut down trees have a license, many involved in the curio trade either do not obtain such licenses or flout the rules. The sector is primarily occupied by male youth; females less involved. Curio markers are located in Livingstone and Mukuni village.

3.4.4 Fishing and Hunting

Just under 20% of survey respondents reported commercial and artisanal fishing as a household livelihood activity. Focus group discussions held as part of the social study revealed that in Kazungula, households tend to sell that majority of a catch, selling fish in markets within Mukuni village, Livingstone or Victoria Falls. Fishing is less common for villages in Kalomo district due to drought and fewer rivers.

The social study results imply that hunting is not prevalent in the area. It is possible that there is a reluctance to admit hunting activity, as most hunters do so illegally.

3.4.5 Tourism

The primary tourist attraction in the Southern Province is Victoria Falls, which attracts thousands of visitors each year. Almost 10% of households in the study area in Kazungula District are engaged in the tourism industry, most commonly employed as white water rafting guides or porters. Other activities in the gorge include birding, angling, hiking and jet extreme boating. Tourism is not as developed in the other Project-affected districts and thus very few people living in these areas are engaged in this sector.

3.5 Household Income and Expenditure

Food is the major expenditure for all households included in the social study, accounting for 48% to 52% of monthly spending. Most purchased food is that which communities cannot easily grow (e.g. salt, sugar and oil.) Clothing is another common household expenditure. However, households reported finding it difficult to estimate monthly expenditure on key items, as the money tends to be spent as soon as it is obtained. A number of communities in Zambia have small savings groups, but these schemes are very small with few funds.

3.6 Education and Health

3.6.1 Education

The education system in Zambia is a three-tier system consisting of seven years of primary school, two years of junior secondary school, and three years of senior secondary school. Optional preschool education is open to children aged between three and six years old. Tertiary education follows senior secondary, and includes either university (four to seven years depending on the degree type) or training at a vocational or technical institute. In 2002, The Ministry of Education enacted the Free Basic Education policy for grades one to seven. This increased student enrolments at the primary level from 62% in 2000 to 74% in 2010.[27] Educational budgets are inadequate and a shortage of teachers and learning materials are major challenges to achieving universal education. In 2013, the mean years of schooling per adult in Zambia was 8.5 years, below the statutory requirement.[28]

At the national level, literacy amongst youth (those aged 15 to 24 years) is 89%, compared to 91% for the Southern Province. Literacy rates are higher in urban than rural areas (94% and 74% respectively.) Males also have a higher literacy rate (89%) than females (78%).[29] Within the Project-affected area, literacy levels are below the national average with 27% of those surveyed aged 15 years being unable to read and write. Only 27% of people have been to secondary school and 4%

(27) Central Statistical Agency (2010). 2010 Census of population and Housing: National Analytical Report, Lusaka, Republic of Zambia
(28) UNDP, 2013. Human Development Report 2013: Zimbabwe. Available at http://hdr.undp.org/sites/default/files/Country-Profiles/ZWE.pdf. Accessed 15.12.2014.
(29) Central Statistical Agency (2010). 2010 Census of population and Housing: Population Summary Report, Lusaka, Republic of Zambia

have never received a formal education. None of the household representatives interviewed had received a tertiary education. Although the communities located within Kalomo and Zimba Districts were not included within the household survey, District Education Officers hinted that levels of literacy were likely to be lower than the national average in many of these villages. This is because of poor state of infrastructure making many of the schools inaccessible for rural communities.

3.6.2 Health

According to the Ministry of Health, the leading causes of mortality and morbidity in Zambia are malaria, respiratory infections (non-pneumonia), diarrhoea (non-blood), trauma (accidents, injuries, wounds and burns), eye infections, skin infections, respiratory infections (pneumonia), ear, nose and throat infections, intestinal worms and anaemia. Studies conducted in 2010 estimate life expectancy at birth in Zambia at 51.2 years; 49.2 for males and 53.4 for females.[30] Life expectancy in the Southern Province is the highest in the country at 56 years.[31] While malnutrition rates are relatively low, 78% of households stated that they suffer from food shortages, especially between September and February, when food harvested from the last farming is gone.

An HIV impact assessment undertaken in Zambia in 2015-2016 reported that 980,000 or 12.3% of adults aged 15-59 are HIV positive (14.9% of females and 9.5% of males.)[32] A health worker at Mukuni Clinic health reported that rates of HIV/AIDs in the area were as high as 30%, significantly above the district average of 14% and 31% in Livingstone Town. Relevant district health officers noted rates of 8% in Zimba and 16% in Kalomo and Choma districts.

All districts in the Project area have a district hospital, with the exception of Kazungula and Zimba. Kazungula District has 22 Rural Health Centres; however, the majority are understaffed. The centres are run by a nurse, environmental health technician or midwife, and few have electricity.[33]

3.7 Vulnerable People

In reviewing data collected as part of the baseline household survey, the groups below were identified as being at a higher risk of experiencing hardship as a result of the land access requirements of the Project. Their needs will be considered in resettlement planning and implementation, and an assessment made regarding additional forms of support they may require. This is discussed further in **Chapter 9.**

- **Elderly:** The elderly within a village are less likely to receive an income, and depending on their health, may be completely reliant upon other members of a household for care and support. In the social study area, 5% of people are aged 60 years and older.
- **Women / female headed-households**: Females face reduced access to income generating opportunities and typically suffer from higher levels of food insecurity, because of domestic relations and traditional practices. The household survey results showed that female-headed households account for 28% of households in the social study area. Girls in Zambia tend to marry young, and women in both Zambia and Zimbabwe have higher levels of HIV/AIDS compared with men. As well, high rates of women report physical and/or sexual violence in Zambia.
- **People with physical / mental health illnesses and disabilities:** People that lack physical mobility or who have mental health issues are less likely to adapt to changes within their environment and less able to generate income for themselves, thus forcing them to rely upon others. Approximately 8% of households in the study area have a household member who suffers from a physical or mental illness/disability.

(30) Central Statistical Agency, 2010. 2010 Census of population and Housing: National Analytical Report, Lusaka, Republic of Zambia
(31) Central Statistical Agency et al., 2014. Zambia Demographic and Health Survey 2013-14, Preliminary Report, Lusaka, Republic of Zambia
32 https://phia.icap.columbia.edu/wp-content/uploads/2016/09/ZAMBIA-Factsheet.FIN_.pdf accessed 20/12/2018
(33) Kazungula District Strategic Plan 2013 - 2017

- **People with HIV/AIDS:** Households with members who have tested positive for HIV/AIDS may be at a higher risk of being disproportionally affected by the Project, depending on the stage of the disease and the extent to which they are socially isolated. The HIV/Aids infection rate in the Southern province where the Project is located was estimated at 14.5%.[34]
- **Households with low income and/or solely dependent on subsistence activities:** These households have fewer assets and rely more heavily on the land they farm. As a result, they are more vulnerable to shocks (such as death, illness or natural disaster) and change (such as inflation and relocation), with fewer resources to fall back on.
- **Households with high number of dependant household members (i.e. including child orphans):** Households with a high number of dependent children and/or elderly members may be less able to adapt to change associated with land acquisition and displacement. Their resources may be limited, the number of people depending on them high, and their well-being related directly to what they are able to produce from the land.

[34] Central Statistical Agency et al, 2014. Zambia Demographic and Health Survey 2013-14, Preliminary Report, Lusaka, Republic of Zambia

4. STAKEHOLDER ENGAGEMENT

This Chapter describes stakeholder engagement activities planned for the BGHES. It highlights the Project's approach to ensuring free, prior and informed consultation of stakeholders and their representative institutions in Project planning and implementation as it pertains to land acquisition and resettlement.

Project stakeholder engagement activities are divided into three sections:

1. **Stakeholder Engagement Approach**: Description of the overall approach to stakeholder engagement, and the specific goals and objectives of the engagement strategy.
2. **Stakeholder Identification and Engagement Methods**: Identification of key stakeholder groups and individuals at the affected community, local, district and provincial level, and how they will be involved in resettlement discussions and planning
3. **Future Engagement Activities:** Description of planned engagement strategies moving forward.

4.1 Stakeholder Engagement Approach

The ESIA team established a Project stakeholder database, which identifies and registers all interested and affected individuals, groups and organizations. Information about the Project generated by the ESIA process has been widely distributed to stakeholders in person, by regular mail and when feasible, via email. In 2016, notices were published in newspapers with a wide readership in the Southern Province. Information meetings were held with traditional leaders, including headman and village heads, to further encourage the involvement of stakeholders in project impact discussions. Through recent field visits to the area, stakeholders expressed concern with the lack of information on the status of the Project and when land will be acquired.

Resettlement stakeholder engagement is the broad, inclusive, and continuous process of relationship building between a project proponent and its resettlement stakeholders. The objectives of the land acquisition and resettlement engagement strategy include the following:

- Establish and maintain a constructive, ongoing relationship with those to be displaced, as well as other resettlement stakeholders, based on mutual understanding, respect and trust;
- Ensure that engagement activities are undertaken in a manner that is inclusive, culturally appropriate, and tailored to the language preferences and decision-making processes of those displaced, and the needs of vulnerable groups therein;
- Engage with those displaced as a group – via an informed, structured consultation and participation process. This is to establish the general terms and conditions that will guide the resettlement and livelihood restoration process;
- Undertake good faith negotiations with individual affected households on the basis of the general terms and conditions established through the group engagement described above;
- Mitigate the risks of asymmetry of information and bargaining power in the engagement / negotiations process through effective disclosure of timely, relevant and understandable, information, capacity building, and third party appointments;
- Ensure that all engagement activities are free of intimidation or coercion, and all participants are fully aware of their rights according to national law and international standards; and
- Work towards creating broad community support for the resettlement and Project as a whole.

Land acquisition and resettlement typically involves collective negotiations with key stakeholders and/or their representatives to determine compensation entitlements and eligibility, and plan for resettlement. Once all necessary data is collected and analysed, and each component of the resettlement process fully discussed and agreed upon with affected communities, the project

prepares for resettlement implementation. This includes the individual household sign-off process, where each directly affected household reviews and signs off on the compensation entitlements they are eligible to receive.

The specific individuals and groups and how they will be engaged in resettlement planning is described in the next section.

4.2 Stakeholder Identification and Engagement Methods

Resettlement stakeholders are those individuals, groups and organizations with a legitimate interest in the resettlement and livelihood restoration processes. In particular, stakeholders are those people and households that experience displacement directly. For the Project, key stakeholders fall into one of the following categories:

- Government officials and bodies at the national, provincial, district and ward level; relevant to where land will be acquired and households resettled;
- Traditional leaders, including chiefs, headmen and village heads of those respective areas;
- Elected officials responsible for the Project area;
- Individuals/Households living on and/or living from the land required to construct and operate BGHES or any associated infrastructure;
- Communities hosting Project displaced households;
- Community based organizations active in the Project area; and
- National and international interest groups/NGOs.

Table 3 Project Stakeholders lists the key stakeholders with an interest in land acquisition and resettlement identified to date.

Table 3 Project Stakeholders

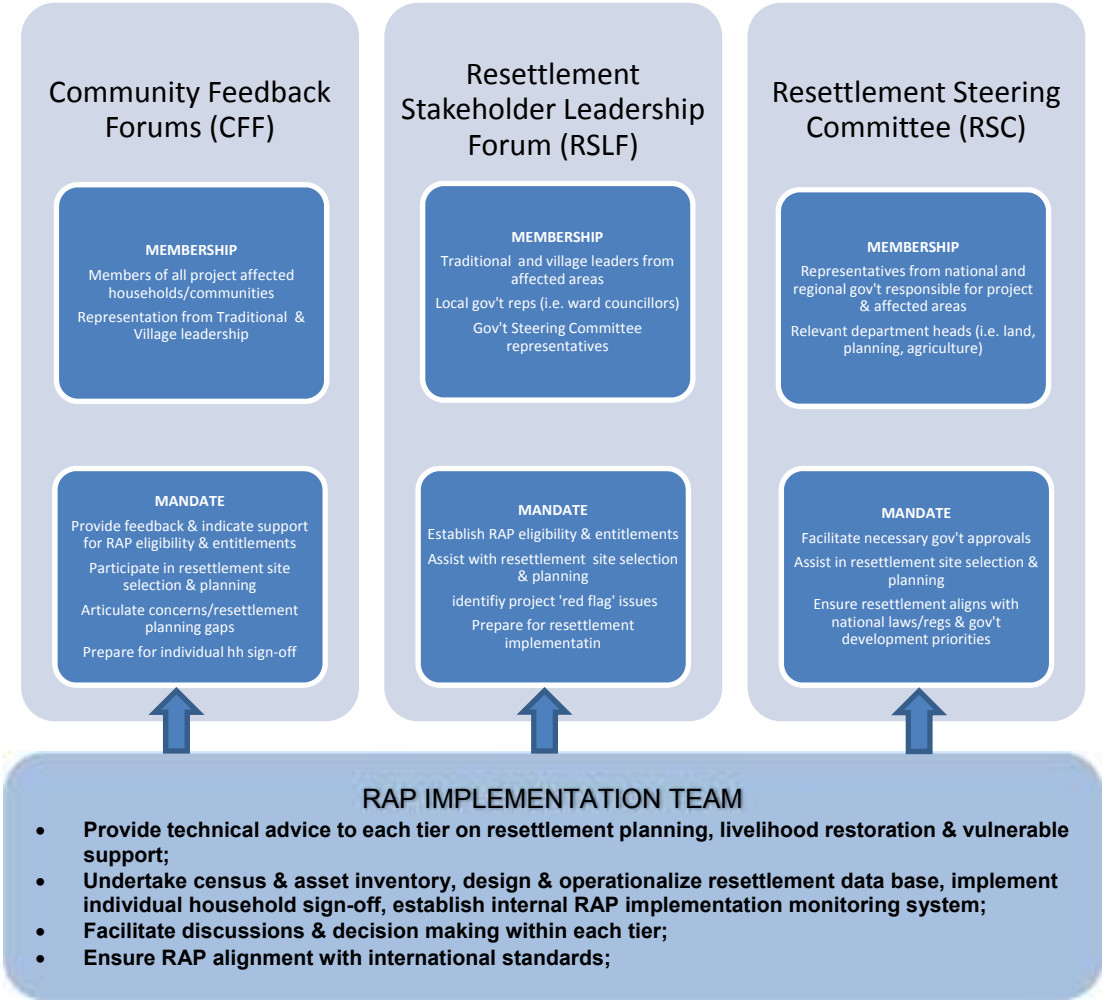
Stakeholder Category	Key Stakeholders
Government officials – National/Provincial/District	Ministry of Lands and Natural Resources, Ministry of Agriculture, Ministry of Fisheries and Livestock, Ministry of Local Government, Ministry of Infrastructure and Housing, Ministry of Community Development, Mother and Child Health, Ministry of Health, Ministry of Gender, Department of Resettlement, Commissioner of Land, Kazungula District Development Coordinating Committee, District Planning Department, Livingston Municipal Council
Traditional leadership	Mukuni Chiefdom
Elected officials	Project-affected Ward Councillors (Mukuni and Katapazi), Member of Parliament
Residents of main villages/settlements with affected land (PAP)	Chibule, Chilizya, N'gandu, Mukuni, Siachuma, Siamatete
Communities Hosting Displaced HH	To be decided
Community-based organizations	Zambia Vulnerability Assessment Committee, Farmers Associations, The Butterfly Tree, Response Network, Alliance for Sustainable Agriculture, Zambia Chamber of Small and Medium Business

	Associations, Zambia Community Based Natural Resource Management Forum, and faith-based organizations
National and international groups/ENGOs	USAID, Plan International, World Vision, Save the Children, UNICEF, CARE International, Caritas, Africa Impact, Corridors of Hope

Stakeholder engagement methods will continue to include informal engagement (together with the use of social media where appropriate.) it may also include information sharing and formal notifications (i.e. gazetting), as required by national legislation governing land acquisition. To align more closely with international standards around land acquisition and resettlement, the Project will adopt a three-tiered stakeholder engagement approach to reach collective agreement on key aspects of land acquisition and resettlement. This is to ensure appropriate involvement and participation of stakeholders, particularly those directly affected, in resettlement planning and implementation going forward.

As depicted in **Figure 6**, the three tiers include a high-level Resettlement Steering Committee (RSC) composed mainly of representatives from key government ministries and departments with responsibility for land acquisition and resettlement as identified in **Table 3**. A Stakeholder Leadership Forum (SLF) aimed at involving traditional leadership and local representatives in the planning process represents the second tier. The third tier will be Community Feedback Forums (CFF) held in affected communities to facilitate the flow of information and meaningful involvement of those households directly impacted by land access and resettlement.

Figure 6 RAP Engagement Approach



The CFF will be organized to ensure households from all of the affected villages are able to participate. **Table 4** lists all the households defined as being within the Project's social area of influence, which includes a 3km width zone along the transmission line route. Not all of these communities and households will be directly affected by land access required for the Project. Once the precise route of the transmission lines has been determined, understanding more fully which settlement areas will be directly affected will be possible. The communities to be included in the CFF will be confirmed during the initial phase of RAP/LRP preparation and planning.

Table 4 Zambian Villages/Settlements within the Project Social Area of Influence[35]

Village	Population count	Number of Households
Mukuni ward, Kazungula District		
Siamatete	343	64
Munstumuswana	217	59
Chibule	215	51
N'gandu	233	62
Mukalahani	51	12
Munwana	46	13
Siachuma	173	46
Chilizya	128	36
Zangala	83	22
Namatongo	106	26
Siachalwa	62	15
Sichlobe	101	16
Tembo	129	29
Zimba ward, Zimba District		
Ward level	12,699	2,531
Chawila ward, Kalomo District		
Mweebo	100	25
Singani ward, Choma District		
Simpwezi	385	-
Gameela	-	64
Nkwanyonyona	560	-
Nakeempa	739	95
Siamaluba	123	-
Siandibubi	-	460
Mulundu	385	76

4.2.1 Resettlement Steering Committee

At the State level, a Resettlement Steering Committee (RSC) will be established to oversee the resettlement planning and implementation process. It will be comprised of representatives of the ZRA, and key government bodies as outlined in **Table 3**.

The RSC role will be to ensure resettlement planning and implementation in both countries reflects the common principles and procedures outlined in the Resettlement Policy Frameworks, and to facilitate necessary government approvals. This body will ensure entitlements and resettlement-planning measures adhere to national laws and government policies and practices around land acquisition, compensation and resettlement; and are aligned with international resettlement standards. The RSC will identify available replacement land suitable for displaced households, and representatives from the RSC will participate in stakeholder leadership meetings as required, to confirm the government's support of the Project and resettlement planning process. The Project RAP

[35] Extracted from the BGHES ESIA (2016)

Implementation Team (further detailed in Chapter 12) will provide technical advice to the RSC, and engage regularly with senior officials within the various departments, as required, to progress planning and to ensure key individuals are briefed regularly on Project progress.

4.2.2 Resettlement Stakeholder Leadership Forum

The Resettlement Stakeholder Leadership Forum (RSLF) will be established to involve traditional rulers and leaders from each affected community and local government in resettlement planning and implementation.

Key aspects of their role will include:

- Confirm RAP/LRP(s) eligibility & entitlements;
- Assist with the identification of replacement land for displaced communities;
- Identify Project 'red flag' issues; and
- Support the resettlement planning and implementation process by facilitating the flow of information to and from the Project-affected people they represent.

4.2.3 Affected Community Feedback Forums (CFF)

Regular forums will be held in in local villages and communities to support the efforts of members of the RSLF. This ensures all affected households are fully informed of project progress and issues being discussed within the other tiers. This may include having targeted forums with key groups within affected communities (i.e. youth, women, marginalized groups). These forums will be designed to provide directly affected people with the opportunity to participate more fully in the resettlement planning process and the decisions that will affect them.

The RAP Implementation Team provides technical advice and support to each tier. This team undertakes the work approved by the stakeholders, ensures resettlement planning and implementation aligns with this RPF, and the commitments included in the RAP/LRP(s).

Key issues requiring stakeholder approval that will inform the sequence of discussions within all three tiers include:

- Preparing for the demarcation on the ground of the land required by the Project;
- Undertaking the census and asset inventory of affected land and establishing the Project cut-off date for eligibly and entitlement;
- Disclosure of valuation of land parcels/assets and compensation entitlements;
- Finalizing the criteria for Project eligibility and all components of the entitlement matrix;
- Confirming the approach to physical resettlement (i.e. assisted self-resettlement option and/or construction of new settlement areas);
- Preparing for the individual affected household sign-off on compensation and resettlement;
- Confirmation of support programs that will be provided (i.e. additional livelihood restoration assistance and vulnerable support) and their method of delivery;
- Management of land acquisition and resettlement related grievances;
- Resettlement monitoring and evaluation; and
- Formally approving and publically disclosing the finalized RAP(s)/LRP(s).

4.3 Future Engagement Activities

Disclosure of the RPF will follow the three tiered approach outlined in this Chapter, setting the stage for fully operationalizing this model of engagement for the more detailed resettlement planning and preparation of the RAP(s).

The RPF will be distributed to key stakeholders within government who will form the Resettlement Steering Committee. It will also be made available on the Project website. A summary of the RPF will be prepared and distributed to traditional leaders and local government within Tier 2, in the appropriate local language. They will be encouraged to post the summary in affected communities and supported in sharing its content in meetings with their constituents.

A detailed Stakeholder Engagement Plan (SEP) will also be developed as part of preparing the Resettlement Action Plan(s). It will outline roles and responsibilities for keeping all stakeholders appropriately informed of Project progress, and involved in resettlement planning and implementation. It will identify and map all Project stakeholders with an interest, or ability to influence the land acquisition and resettlement process, and assist with finalizing the membership of the RSLF and CCFs.

The SEP will confirm the specific membership, terms of reference and meeting schedule (including sequence of discussion topics and milestone decisions) for each of the three bodies; Resettlement Steering Committee, Resettlement Stakeholder Leadership Forum and Community Feedback Forums.

5. PROJECT IMPACTS

Chapter 5 presents the scope of displacement impacts resulting from the development of BGHES based on current Project designs. It describes how displacement is minimized and how finalizing the design and location of the remaining project components will further these efforts.

5.1 Efforts to Minimize Displacement

Despite ongoing efforts to minimise impacts, Project construction and operation will result in the economic and likely some physical displacement of people, households and communities. These impacts can be characterised in terms of the assets that have the potential to be affected; including structures, land, crops and trees, community infrastructure and public facilities, cultural heritage and wildlife. The loss of these assets will affect the people, households and communities that own or use them. Specifically, people and households may be:

- Physically displaced, if they lose their residence and related assets; and/or
- Economically displaced, if they lose income streams or access to the means of livelihood.

The construction of the dam wall and impoundment, including spillway and outdoor powerhouses, is not expected to physically displace people and/or communities. The main Project components requiring land where physical and/or economic displacement is likely to occur include:

- The Project access roads;
- Transmission lines;
- Staff township; and
- The quarry.

The designs considered for each of these components are summarized below.

5.1.1 Access Roads

The upgrading of existing roads and construction of new roads to access each bank from the main roads linking Livingstone to Lusaka (Zambia) is required. On the Zambia side, a new road alignment of 1.2 km will be required from the North bank to the Batoka dam site.

The Project has considered the extent to which the existing road network can be used, and the level of upgrading required in examining alternatives for access roads from Victoria Falls. The existing road network from Palmgrove to the North bank of the dam site is considered viable for vehicles and is for 29 km. Some upgrading and widening will be required.

For the portion of the road running east towards Mukuni settlement, there are two main options. The first is to use an existing path running through the the village, and the second is to use an existing road that circles the village area. The Chief of Mukuni village has requested that the existing pathway directly through the settlement be upgraded for Project use, which he believes will benefit his community. This option needs to consider the level of physical displacement that would be required (estimated to be between100-200 households) and the health and safety concerns related to use of construction vehicles in a relatively densely inhabited area. The alternative existing roadway circumvents the village. Upgrading this road would avoid physical displacement with only limited economic impacts. It would also lower the health and safety risks to people and livestock. These options will be discussed further with the Chief and area residents.

5.1.2 Project Township

Staff Townships are planned in both countries. During the construction phase, an initial labour force of at least 500 workers is required. Following completion of the access roads and Project infrastructure,

3,000 workers are expected (including security and support staff.) They will be required for the remainder of the construction phase, approximately 7 years.

During operation of the dam, the construction staff will be replaced (or overlap) with operational staff (i.e. maintenance, security, customs services, government officials), with numbers expected to increase to 9,000.

Townships will be located on each side of the river, in close proximity to the dam. They will include housing and requisite infrastructure (i.e. health, education, social and recreation facilities) to accommodate workers and their families. Three alternative locations were considered in each country, with assessments taking into account the social and environmental impacts of each option. Developing the Project Township in its current site avoids physical displacement completely and requires minimal economic displacement (mostly to grazing areas.) However, further investigation is required to assess the area's appropriateness from a technical (engineering/construction) perspective. Consideration will be given to options for building onto existing communities in reasonable proximity to the dam, so to facilitate sharing Project benefits more widely with existing settlement areas.

5.1.3 Transmission Lines

In Zambia, two 330 Kv transmission line routes are required each comprising two outgoing lines. The first routing is from Batoka, terminating at a proposed new 330 kV ZESCO substation to be constructed in Livingstone; this route will be 21 km long. The second line will run in parallel to the existing 220 kV line, terminating at the Muzuma substation in Choma, a distance of approximately 160 km.

Most of the land intended for the transmission line route is currently being used either for cultivation, particularly in the far northern sections, or grazing. Precise siting of the transmission line, and where the 100 meter exclusion zone (wayleave area) will be located will determine the extent of physical displacement. If it can be kept to the northern area of transmission line corridor, minimal physical displacement is anticipated (i.e. 25-30 households); the scope of physical displacement will increase considerably otherwise. Findings from recent field visits suggest that clearing for transmission line construction is considered a benefit to local farmers, as this would facilitate their ability to cultivate the land once construction is complete. Local residents will need to be well informed of the exclusion zone (way leave) areas, and what land use restrictions apply and for what purpose.

Figure 7 Transmission Line Impacts depicts the transmission line, with shaded areas representing settlement areas based on satellite imagery and recent site visits. The most densely populated area (the area circled on Figure 6) is the southern portion near Livingston, where the town of Mukuni is located. This village has approximately 1000 homesteads with a population of 6000 people. There is more formal housing, shops, secondary industries, a clinic, schools, bus stop and the Chief's palace. In light of its proximity to Livingstone and Victoria Falls, it considers itself an important tourist destination.

Depending on final routing of both the access road and transmission line, the risk of physical displacement is high. The majority of the transmission line routing will consist of mainly economic displacement (i.e. grazing) with isolated pockets of farming.

5.2 Scope of Displacement

The preparation of the RAP(s)/LRP(s) will include a comprehensive Census and Asset Inventory (CAI) in the areas where land will be required. The CAI data will be used to determine the total number of households that will be displaced, classified into physically displaced households and economically displaced households. It will also confirm and quantify affected assets for each of the following categories:

- Impacts to land area according to land type (i.e. agriculture land both cultivated and fallow, grazing land, residential land);
- Impacts to crops and trees;
- Impacts to public facilities and infrastructure (i.e. wells/boreholes, schools, clinics, places of worship etc.);
- Impacts to graves, shrines and other areas where cultural heritage exists (if applicable); and
- Impacts to host communities.

Table 5 summarizes the land area requirements for each Project component, based on current Project planning and design.

Table 5 Summary of Displacement Impacts

Project Component	Land Area Required	Anticipated nature of displacement
Dam wall, impoundment including spillway	Area lining the banks of the Zambezi River and gorge	Steep rocky terrain with no inhabitants or economic activity
Staff Township Area & project offices	491 hectares	No physical displacement, limited economic displacement (i.e. grazing)
Transmission lines	210 hectares (21 km length X100 m width)	Physical and economic displacement, depending on where precisely the exclusion zone falls
Road access	9.93 km new road link 29.39 km existing road to be upgraded	Upgrading the existing road circumventing Mukoni will avoid physical displacement. Economic displacement, predominantly to portions of people farms or grazing areas
Quarry	70.40 hectares	Economic displacement
Host communities	If physical displacement is kept to a minimum, households can be accommodated either in a different location on their existing property or on alternative land within their village area	

The total land area required for the Project is less than 900 hectares, the majority is used for farming or grazing and is uninhabited. Based on an average plot size of five hectares, it is estimated that fewer than 200 households who rely on the proposed land area may be displaced.

6. COMPENSATION PRINCIPLES

This Chapter describes the general principles and policies that the Project proposes to apply to determine eligibility and define entitlements for compensation resulting from the acquisition of land required for the BGHES.

The two main objectives of the compensation framework include:

- Provide transparent, fair and timely (prior to displacement) compensation for displacement impacts to all PAPs in accordance with Zambian law and World Bank ESS5.
- Compensate for lost assets at agreed replacement rates to give PAPs, PAHs and communities the opportunity to at least restore, if not improve, their standard of living and livelihoods.

6.1 Eligibility

Eligible persons include all persons with a formal interest in the land required by the Project – in the form of propriety ownership, co-proprietary, tenants, or any persons with other limited interests. The term is further expanded to include affected persons. The term Affected Persons is more comprehensive and includes those with:

- Formal or legal rights to land and assets consistent with national law;
- Customary rights to lands and assets recognised under national law; and
- Legitimate and verifiable interest in the land and assets

6.1.1 Immovable Assets

Immovable assets generally considered eligible for compensation include the following:

- Land, including cultivated and fallow land, forest, and residential plots;
- Crops, both annual and perennial (including economic trees);
- Common property resources, including wild plants and animals, fuel wood and timber;
- Structures, including houses, annexes and derelict buildings, along with fences and other built improvements; and
- Other infrastructure, either communal infrastructure or private, including roads, and irrigation infrastructure;
    - Businesses;
    - Public access, including informal roads and footpaths and navigable waterways; and,
    - Cultural heritage, including sacred sites, graves and cemeteries.

Immoveable assets are typically held under three types of tenure arrangements:

- Registered ownership, through possession of formal title deeds that are registered with the Commissioner of Lands;
- Customary ownership, based on rights recognised under traditional law, which may or may not be formally documented. Customary owners may be individuals, families, clans or villages, or even some combination of these; and
- Customary use, which reflects informal use agreements.

Table 6 outlines the persons eligible for compensation based on the types of assets that the Project has the potential to affect.

Table 6 Eligible Persons

Type of Loss	Eligible Persons	Description
Customary Private Land	Land owner	The person, family, or collective entity with exclusive rights to the land, secured under customary tenure through (1) written Land Ownership Certificate, or (2) recognised by the headman and community.
	Tenant	Tenants recognised by the land-owner that actively farm or utilise portion of the land separately or jointly (sharecropping) with the Land-Owner, but do not have any claim to the land itself.
	De-facto Occupant or User	Any person, family, or collective entity that utilises land without any form of secure tenure but are tolerated by the land-owner.
Residential Structures	Structure-Owner	The person, family, or collective entity with uncontested ownership of any residential structures, irrespective of their tenure status to the land on which the structure is built.
	Tenant	Tenants that occupy a residential structure via a written or verbal agreement with the structure-owner, but do not have any ownership claims to the structure itself.
	De-Facto Occupant or User	Any person, family, or collective entity that occupies a structure without any form of secure tenure.
Secondary Structures & Other fixed assets	Asset-Owner	The person, family, or collective entity with uncontested ownership of any secondary structures or other fixed assets, irrespective of their tenure status to the land on which the structures or fixed assets are built.
Crops and Trees	Crop-Owner	The person, family, or collective entity that solely tends annual and perennial crops on land, irrespective of the type of tenure on that land.
	Sharecroppers	The person, family, or collective entity that tends annual and perennial crops on land jointly with the landowner, irrespective of the type of tenure on that land.
Community/ Institutional Structures	Affected Community	Any community, or institution that are the owners or custodians of any structures, infrastructure or immobile fixtures used for the collective benefit of the community.
Community Common Land	Affected Community	Any community that are the owners or custodians of any community common land used for the collective benefit of the community.
Graves/Shrines	Owners	Any person, family or collective entity that are the legitimate owners/caretakers of a particular grave or shrine.

6.2 Entitlement Framework

The Entitlement Framework defines the types of compensation or resettlement assistance to be provided to eligible persons based on the type of asset that will be lost. The framework also establishes the conditions where eligible persons are granted allowances or access to livelihoods restoration programs. Where possible, a range of options are provided allowing households to select the type of compensation that best suits their conditions.

Entitlement policies define the specific type of compensation to be made available to those affected by specific displacement impacts. Entitlements vary by interest and by severity of impact, but generally fall into the following categories:

- In-kind compensation, which involves the planning, design and development of replacement assets and livelihood activities to compensate for those lost to the Project;
- Cash compensation, which involves the payment of cash to compensate for assets, lost to the Project, at agreed replacement rates of the lost asset (this option will include appropriate financial management counselling).

In accordance with international standards, the Project will favour the provision of in-kind compensation over cash compensation wherever feasible. It provides reduced risk (for both the Project and those affected) of entitlement mismanagement, inequitable distribution, and long-term impoverishment. Cash compensation as part of a self-resettlement option will be offered under carefully controlled conditions, described in more detail in **Section 7.6.**

In general, the owner (whether customary or formal) of a particular asset (land, structures or crops) will be compensated for its loss in full. Users will be compensated for the loss of their specific interest in that asset for a period of time and assisted in their re-establishment.

All compensation rates will be established to provide PAHs/PAPs with compensation equal to or greater than full replacement value, with no deduction for depreciation. An independent and specialised valuation expert will be contracted to undertake a comprehensive analysis of the market value of affected land, crops and structures in the Project Area.

In addition to compensation for impacts on immoveable assets, those displaced will also be eligible for the following, depending on their specific circumstances and displacement impacts:

- Participation in a Livelihood Restoration and Improvement Program;
- Participation in a Vulnerable Assistance Program;
- Receipt of a mobilisation and re-establishment allowance to cover some of the costs associated with mobilisation (e.g., packing, salvaging) and re-establishment (e.g., unpacking, building, clearing);
- Receipt of a transportation allowance to move belongings and moveable assets to a new location.
- Right of salvage to provide opportunity to salvage immoveable assets, prior to destruction, to the extent practical. This may include individual property, for example building materials, or common property.

The preliminary entitlement matrix outlined in **Table 7** is based on World Bank standards and requirements stipulated by Zambian law. It will be presented together with the eligibility criteria to Project stakeholders, using the three-tiered approach described in **Chapter 4.** Based on these discussions and confirmation of the types of impacts resulting from all Project components, any necessary adjustments will be made and a final version included in the RAP(s)/LRP(s).). A key consideration in finalizing the resettlement assistance and livelihood restoration programs to be implemented, and how they will be delivered, is the extent to which they adhere to agreed upon principles of sustainability.

Table 7 Entitlement Matrix

Project Impact	Category of Project-affected Entity	Mitigation Measures
Loss of Land		
Residential land	Owner currently residing	Replacement residential plot, ideally area for area, with access to services and infrastructure comparable to that of affected plot *plus* Cash compensation at agreed replacement rates for any area not replaced *or* In exceptional circumstances, cash compensation at agreed replacement rates
	Owner not currently residing	Cash compensation at agreed replacement rates
Institutional land	Owner	Replacement plot, ideally area for area, suitable for original purpose with access to services and infrastructure comparable to that of lost plot *plus* Cash compensation at agreed replacement rates for any area not replaced
Agricultural land	Owner currently farming	Replacement agricultural lands of equal or greater potential productivity and locational advantages, and assistance in re-establishment, including preparation of new land to comparable condition to affected land *or* In exceptional circumstances, cash compensation at agreed replacement rates
	Tenant currently farming	Support securing suitable replacement agricultural land to rent *plus* Assistance in reestablishment
	Owner currently not-farming (landlord)	Cash compensation at agreed replacement rates
Communal land	Communities / government	Access to equivalent area of equal or greater potential productivity and locational advantages *or* Alternative investments of a communal nature *or* In exceptional circumstances, cash compensation at agreed replacement rates

Project Impact	Category of Project-affected Entity	Mitigation Measures
Loss of Structures		
Residential structures	Owner currently residing	In-kind replacement house of modern materials at settlement scheme [36], with at least as many rooms as the original house and sanitation facilities (latrine/ shower) *or* Cash compensation at agreed replacement rates (including construction supervision as part of the self-resettlement option see **Section 7.6**) *plus* Right to salvage materials, transportation allowance, and mobilisation and re-establishment allowance
	Owner not currently residing	Cash compensation at agreed replacement rates *plus* Right to salvage materials, transportation allowance, and mobilisation and re-establishment allowance
	Renter / occupier	Replacement tenancy agreement in replacement house of current landlord or in another house, and assistance in reestablishment. *or* Provision of a rental allowance for a fixed term and assistance in reestablishment.
Other including seasonal, annex, incomplete, ruins, uninhabitable structures and fences	Owner	Cash compensation at agreed replacement rates *plus* Right to salvage materials
Institutional	Communities / government / religious groups	In-kind replacement facilities of suitable capacity for settlement scheme *or* Cash compensation at agreed replacement rates
Infrastructure	Communities / government	In-kind replacement facilities of suitable capacity for settlement scheme
Loss of Crops & Economic Trees		
Crops and trees	Crop or tree owner	Cash compensation at agreed replacement rates or government rate, whichever is higher [37] *plus* Right to harvest existing crops

[36] The exact details of replacement assets, including structures, will be determined in detail in the RAP.

[37] Full replacement value for agricultural assets must reflect the time required to bring replacement crops or trees to the maturity of the assets that were lost.

Project Impact	Category of Project-affected Entity	Mitigation Measures
Loss of Business, if required		
Businesses	Registered or community owner	Cash compensation for agreed lost net income during a transition period and assistance with re-establishment. *or* Where reestablishment not possible, support for establishment of alternative livelihood, and if necessary transitional income support
Employees	Employee of affected business	Replacement employment agreement with affected businesses and compensation for agreed lost income. *or* Where replacement of employment not possible, support for establishment of alternative livelihood, and if necessary transitional income support
Loss of Cultural Heritage, if required		
Shrines, graves and sacred sites	Affected household / community	Relocation or removal in collaboration with traditional cultural / religious leaders, with necessary expenses covered by the Project in accordance with Government rates
Other heritage	Customary owner of asset	Appropriate management to be determined in collaboration with local authorities, spiritual leaders and others as appropriate.

6.3 Eligibility Cut-off Date

The commencement date of the census and asset inventory will determine the cut-off date for compensation eligibility. This date will be used to define the assets eligible for compensation and to provide an empirical baseline to limit opportunistic activity (i.e., to prove ineligibility). Up to and including that date, immoveable assets will be considered eligible for entitlement compensation. Immoveable assets established after the cut-off date will not be considered eligible for entitlement compensation nor will persons occupying the project area after the cut-off date be considered eligible for compensation/resettlement assistance.

Prior to the cut-off date and the commencement of survey activities, engagement will be conducted with those affected to explain the survey process, and the cut-off date and its implications. As noted above, assets established within the Project Footprint after the cut-off date are not eligible for compensation and/or resettlement assistance.

Following the cut-off date, the Project area will be monitored by community leaders (and by Project staff) so that people remain informed of the cut-off date and its implications. Any new in-migrants will be informed of the moratorium on establishment of new assets. Where new assets do appear, they will not be considered eligible for compensation. The owner will be given reasonable notice to remove or salvage the asset, and if they do not, the asset will be removed by Project staff.

6.3.1 Survey Implementation

Following agreement on the cut-off date, survey teams will commence a comprehensive census of 100% of affected households, regardless of their tenure status. A socio-economic survey and an immovable asset inventory will also be conducted.

The surveys will have the following objectives:

- Construct a detailed demographic and socio-economic profile of each affected household;
- Identify the specific impacts of land acquisition on each household, including a detailed, legal description of affected immoveable assets;
- Cap beneficiaries and entitlements;
- Inform entitlement planning;
- Provide a baseline for monitoring and evaluation; and
- Serve as the basis for individual agreements.

Survey teams will administer the census and socio-economic survey to the asset owner(s) / household head(s), or his/her designated representative. Survey teams will undertake the immoveable asset inventory in his/her presence, as well as that of adjacent property holders wherever possible.

In accordance with standard practice, registered surveyors and valuers will be responsible for ensuring that:

- Every crop survey is confirmed by the responsible farmer, or his/her designate and documented by the survey team with support from agronomists and other professionals;
- Every land survey is witnessed and confirmed by the responsible landholder, or his/her designate and documented by the survey team with support from accredited land surveyors; and
- Every structure survey is confirmed by the responsible owner, or his/her designate.

The asset survey will provide a detailed inventory of all immovable assets and will form the basis for the valuation of assets.

6.4 Loss of Land

6.4.1 Residential Land

For impacts to residential land, the Project will provide either:

- Replacement residential plot, ideally area for area, with access to services and infrastructure comparable to that of the lost plot plus cash compensation at agreed replacement rates for any area not replaced; or
- In exceptional circumstances, cash compensation at agreed replacement rates for all structures.

If in-kind replacement plots are smaller than the original residential plots, households will receive cash compensation for the difference. The assets survey process will identify the landowner as the primary impacted person and the land user(s) if different from the owner will be identified for the assets they own on the said piece of land.

For non-resident owners, including landlords, land will be compensated in cash.

6.4.2 Institutional Land

For impacts to institutional land, the Project will allocate in-kind replacement land within a settlement scheme in accordance with the relevant planning standards; this may be at a resettlement site, or within an existing community.

In the case where an entire community is physically displaced, land will be designated for schools, health facilities and other social facilities and infrastructure of sufficient size to meet the needs of the resettled population and nearby host populations. All land for public infrastructure and communal facilities will be provided in accordance with relevant planning standards.

6.4.3 Agricultural Land

The Project will provide access to agricultural land either through replacement land, or in exceptional circumstances, through cash compensation at agreed replacement rates. Consideration will be given to the productivity and locational advantages of replacement agricultural lands. Where adequate access, quantity, or quality of replacement agricultural land cannot be secured, the Project will assist farmers through livelihoods restoration programs which could include measures to make existing agricultural lands more productive, or measures to transition PAPs to alternative livelihoods.

6.4.4 Communal Land

The design of new settlement schemes will incorporate areas to compensate for the loss of communal land. These could include communal grazing land, forest, and other natural areas that provide benefit to communities. The siting of new settlement schemes could take advantage of existing communal areas, in which case access to these areas would have to be negotiated and secured through engagement with host communities. Alternatively, the designs of new settlement schemes will be developed to provide access to new communal land. In some cases, this might require sustainable improvements to other resource lands to increase production of key commodities, alternative investments of a communal nature. In exceptional circumstances, cash compensation for lost communal land at agreed replacement rates.

6.5 Loss of Structures

6.5.1 Residential Structures

For impacts to owner-occupied residential structures, the Project will provide either:

- In-kind replacement house of modern materials at a settlement scheme, with at least as many rooms as the original house and sanitation facilities (latrine/ shower); or
- In exceptional circumstances, cash compensation at agreed replacement rates.

Where a cash compensation option is offered, eligible households will be required to prove that they have an alternative residence, either currently owned, proposed for purchase, or under construction. Specifically, to be eligible for cash compensation PAH must provide documents establishing at least one of the following:

- Ownership of an alternative residence of acceptable quality;
- Access to an alternative residence of acceptable quality available for purchase; or
- Proof of ownership or access to a lot where a residence will be built.

When alternative residences do not meet all of these requirements, compensation payments must be used to bring the quality of the residence up to standard. Consideration will be given to a supervised self-build option, once all land requirements have been finalised and the number of physically displaced households has been confirmed. This will be captured in the RAP(s).

An independent valuation expert will be contracted to undertake a comprehensive analysis of the full replacement value of any affected structure.

6.5.2 Other Structures

All other structures will be compensated in cash at agreed replacement rates. This includes but is not limited to; rental structures, seasonal structures, secondary residential structures, unoccupied structures, annexes, incomplete structures, ruins, animal enclosures, fences and walls, and food storage. The expectation is that PAHs will rebuild these structures on their own.

6.5.3 Institutional Structures

The Project will provide new social facilities for any existing facilities that are impacted. Depending on the final resettlement site locations and the proximity to, and size of, any host population, these facilities may also be designed for use by the adjacent host populations. Alternatively, where host communities have existing facilities, the Project may increase the capacity in terms of size and quality to mitigate for increasing demand resulting from the resettlement process. Input from local government will be required prior to the design of institutional assets, as these entities will be assuming responsibility for the management of these facilities.

For privately owned institutional structures, such as places of worship, private schools, private clinics, and others, the Project may provide either in-kind replacement assets or cash compensation for the lost assets. In addition, privately owned institutions may be considered as a source of income for some individuals, and as such will be eligible for compensation as a business.

6.5.4 Infrastructure

Infrastructure will be replaced through the development of new settlement schemes, which will include all basic utilities (roads, water, and sanitation) as well as any additional infrastructure that was impacted. Replacement infrastructure will be of equal or greater quality than the infrastructure lost. Input from local government will be required prior to the design of institutional assets, as these entities will be assuming responsibility for the management of these facilities.

For privately owned infrastructure, such as private wells, latrines, shower facilities, power supply, telecommunications, and others, the Project may provide either in-kind replacement assets or cash compensation for the lost assets. In addition, privately owned infrastructure may be considered as a source of income for some individuals, and as such will be eligible for compensation as a business.

6.6 Loss of Crops and Economic Trees

The Project will compensate for all eligible crops enumerated in the asset survey. Compensation payments for crops, trees and other agricultural assets will be awarded according to official government rates, or based on full replacement value, whichever rate is higher and in line with applicable law.

An independent valuation expert will be contracted to undertake a comprehensive analysis of the market value of enumerated crops and economic trees and set the Project's rate at replacement value. The value of perennial crops and economic trees will include compensation for production lost during the transition period, the time it will take for replacement crops and trees to reach the same maturity and productivity level as the plants being lost.

The Census and Asset Survey will be designed to identify the different crop categories and crop owners, and to ensure that compensation is calculated in accordance with agreed upon rates for compensation of crops and economic trees.

6.7 Loss of Businesses

Impacted businesses may be entitled to compensation for the loss of revenues that result due to the resettlement process. This may include the loss of rental income for rental structures and rental rooms; interruptions to businesses such as restaurants and commercial enterprises; loss of tuition or medical fees for private institutions; loss of revenue for infrastructure services such as water and power; and any other loss of income.

6.7.1 Loss of Revenue

Compensation for lost revenue will be calculated by determining the average monthly revenue for an impacted business, and multiplying this rate by the duration of time that the business will be impacted. If accurate records of revenue are not available, the Project may define a set minimum rate to be applied.

6.7.2 Loss of Employment Income

For the employees of impacted businesses, an allowance for lost income may be applied to cover the period of unemployment that will result from disturbances to businesses.

6.8 Loss of Cultural Heritage

6.8.1 Transfer of Shrines, Graves and Sacred Sites

In the event that the Project affects any areas of cultural significance, consultations will be held with each affected community. The relocation process and the required ceremonies will be determined, as will the cost of moving each existing grave or shrine to a site preferred by the owner. The compensation will be agreed with the individual or entity that owns the grave or shrine and they will be responsible for the relocation of the graves or shrines.

7. REPLACEMENT ASSETS

This Chapter presents the objectives that will guide the replacement of assets forming part of the entitlements for PAPs and PAHs. Replacement assets may include the construction of new housing for physically displaced PAHs, as well as the possible development of new settlement schemes (resettlement sites) for physically displaced communities and larger groups of PAHs.

The specific facilities to be affected and the extent of physical displacement is not known, as the location and extent of impact of all Project components has not yet been finalized. The RAP(s) will detail resettlement schemes including site and parcel plans, and the design of infrastructure and social facilities (including management, governance and handover plans), if required.

In-kind compensation is the preferred option for replacement of primary dwellings and for groups of households living close together as a community who wish to maintain their community structure.

7.1 Objectives

Replacement assets will be designed to meet or exceed in-country regulations and standards. Project land acquisition may result in an improvement over the assets lost by PAHs as a result of the Project. The design of replacement assets will reflect the feedback of stakeholders who will be engaged in the design process through the tiered engagement model described in Chapter 4.

The design of replacement assets will be guided by the following high-level objectives:

- **Reflect Community Input:** engage impacted communities and households in the design of all replacement assets, providing meaningful opportunity for PAPs to provide commentary and feedback on all designs and how social cohesion can best be maintained.
- **Provide Choice:** PAHs should have a choice of housing designs that are appropriate both culturally and geographically. Impacted communities should have choice of where to re-establish themselves (site selection) and should have the option to be resettled together as a community. Similarly, individual households that want to be resettled on their own should have this option. Where possible, PAPs should have the option of being compensated in cash or in-kind.
- **Provide Flexibility**: replacement assets should be designed to accommodate a diversity of uses and needs that may change over time. Replacement assets including housing, infrastructure, social facilities, and communities should be expandable in order to accommodate growth over time.
- **Improve the Standard of Living for PAHs:** all replacement assets should be built with high quality, durable materials and should reflect an improvement over existing conditions.
- **Improve Infrastructure and Access to Services:** resettlement sites should provide improved access to essential services, including access to potable water, sanitation, health-care, and education.
- **Reflect Local Conditions and Increase Sustainability**: designs should consider the maintenance, operation and upkeep requirements of replacement assets to ensure that PAHs and communities are able to take ownership of the assets and care for them over time.

7.2 Resettlement Schemes

In the event that a resettlement scheme is required to accommodate physically displaced households or groups of households, perhaps as part of a more extensive plan for Project staff housing, the following components will be considered.

7.2.1 Site Selection

The site selection process requires community consultation. The criteria for selecting settlement schemes generally include:

- Proximity to the current area occupied;
- Proximity to the preferred areas indicated by the affected community;
- Sufficient and suitable land available for the building of replacement assets;
- Sufficient and suitable land available for replacement agricultural land and livelihoods;
- Accessibility to existing transport network;
- Maintaining social support networks;
- Consideration for access to schools, infrastructure and other essential services;
- Currently uninhabited or sparsely inhabited; and
- Currently not in use for agricultural plantations.

Results of the Census and Asset Survey will provide information on the population and area of the community affected. Data results may then be used to calculate area requirements for the settlement scheme in conjunction with existing planning regulations and available land areas. The settlement schemes will comprise of residential plots, commercial plots, community facility plots, infrastructure, buffer zones and natural areas based on the number of households being physically displaced (or planned for.)

7.2.2 Site Planning

Preliminary Physical Plans for new settlement schemes will be developed, indicating land use, basic plot sizes, topography, and interconnectivity to adjoining settlements. A Technical Planning Report will be developed, and submitted for approval alongside the Physical Plans to the appropriate ministry. An assessment will be made as to whether an Environmental Impact Assessment for the resettlement schemes is required.

Resettlement site planning will also require a final Plan of Subdivision, which will be developed in consultation with PAHs and relevant government bodies.

7.3 Housing

Replacement housing design will be prepared in consultation with impacted households in order to increase buy-in and create ownership for the final designs. The construction process will seek to maximise local employment by contracting of local construction companies, and hiring PAPs to work on the construction of all replacement housing, to the extent possible.

7.4 Institutions

Schools and health facilities in settlement schemes will be built in collaboration with local authorities, and compliance with applicable service standards. Consideration will be given to whether or not existing neighbouring schools or health centres can absorb the additional population moving into the neighbourhood as a result of the resettlement.

The Project may alternatively plan to enhance the capacity of existing facilities, rather than creating new ones. New facilities are planned through consultations with community members and local government, to meet the needs and development objectives of the community. The ultimate goal is to ensure that PAHs have equal or improved access to public services, and that relevant service standards are met.

7.5 Infrastructure

Infrastructure at settlement schemes should at a minimum include; roads and drainage, water supply, electricity, and solid waste disposal. It may also include power, telecommunications and other infrastructure that existing communities currently have access to. The details of existing infrastructure and access to services will be specified in the baseline census and surveys.

All replacement infrastructure should be built in collaboration with local authorities in compliance with applicable standards and laws. In some cases, the Project may opt to improve and upgrade existing facilities rather than construct new infrastructure. All settlement schemes will have an equal or improved level of services, compared to the communities impacted.

7.5.1 Roads and Drainage

Access roads should be built (or existing roads upgraded) as necessary to connect new settlement schemes to surrounding communities. On-site roads will provide circulation within the settlement schemes. All roads should be designed and constructed in accordance with existing standards.

7.5.2 Water Supply

An adequate potable water supply should be established in all settlement schemes, based on either a piped scheme with central water points, or drilled boreholes with hand or solar pumps. Water access points should be located within a practical distance from the houses they serve. Consideration should be given to the following in designing water supply systems:

- Outcomes of community consultation processes;
- Service at original site;
- Population and consumption requirements of the community;
- Availability of ground water of potable quality at resettlement sites;
- Future growth of the community; and
- Surrounding communities.

Once water infrastructure is in place, resettled PAPs will have to cover the cost of operating and maintaining these facilities as per local standards. This message will be disseminated clearly from the very beginning of the resettlement process, so that communities can organise themselves in this regard. This organisation is usually best done through the establishment of a Water Users' Committee, which is the formal custodian of the facility on behalf of its owner, the community as a whole.

7.5.3 Electricity

Where the existing communities affected by the project are connected to the electrical grid, then they will be reconnected to the grid in the new locations. If the host communities are connected to the grid then new in-fill replacement houses will be connected. House connections will be provided if grid power is available.

The details of what level of service and design of replacement assets to be provided should a resettlement scheme be necessary will be detailed in the RAP(s).

7.6 Assisted Self-Resettlement Option

For projects where physical displacement is limited and/or dispersed (i.e. not a full or significant portion of a community), or will be undertaken in phases over a prolonged period, an assisted self-resettlement option may be suitable. With this option, eligible people receive their entitlement of cash for land and other affected assets, sufficient to replace their residence in an area of their choosing.

However, they are provided with technical assistance and construction oversight from qualified personnel. Compensation is paid in instalments based on achieving particular milestones.

These milestones include:

- Upfront instalment upon signing onto the program;
- Second instalment when access to appropriate replacement land is confirmed;
- Third instalment once house design is finalized, and foundations completed; and
- Final instalment once construction is completed and inspected by the Construction Team.

The Construction Supervision Team regularly monitors the progress of all participants, to ensure that the replacement housing is of an acceptable quality and meets certain minimum standards.

8. LIVELIHOOD RESTORATION AND IMPROVEMENT

International standards define 'livelihoods' as referring to the full range of activities that individuals, families, and communities engage in to make a living. This includes, "wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering."

This Chapter presents:

- Livelihood characteristics of affected households;
- A summary of likely Project impacts to livelihoods;
- The approach to preparing a Livelihood Restoration and Improvement Plan as part of the RAP(s)/LRP(s); and
- Program types.

A RAP/LRP generally includes a Livelihood Restoration and Improvement Plan (LRIP) prepared with input from displaced persons and affected communities through participatory assessments and working group activities. The LRIP outlines the Project's strategy to support physically and economically displaced households and host communities in a continuous and sustainable improvement in their economic activities following displacement.

Livelihood programs evolve over time as additional feedback is received from various stakeholders and as the Project gains experience through implementation of livelihood restoration programs and the RAP/LRP(s). Implementation of the LRIP will continue until all PAPs have restored their livelihoods, or have been given sufficient opportunity to do so.

In addition, livelihood programs will be based on the characteristics of the sites selected for the new settlement schemes where land acquisition involves community displacement and construction of resettlement sites.

8.1 Livelihood Characteristics of Affected Households

8.1.1 Livelihood Roles

In the different communities within the Project footprint, men, women, and youth tend to engage in different livelihood strategies. In summary, common roles are that:

- Men are the holders of fixed assets (land, houses, etc.) and are the main producers of food. Where large livestock is owned, they are primarily controlled by men.
- Women are the care-givers, the producers of supplementary food, tending market gardens or owning small livestock. Women also engage in food processing and trade food products at local markets.
- Youth are mainly a source of labour, and are not considered to own any of the production they facilitate within their household. Young men may also work independently as wage labourers. Female youth are more likely to continue supporting household activities, particularly around child rearing and food processing.

8.1.2 Wealth and Livelihood Types

Livelihood activities within a community show distinctions between households of different relative wealth within a community. In this case, the classification of 'wealthy', 'average', and 'worse off' are relative classifications within a community that are based on self-identification during consultations.

- Wealthy households tend to be older families and have large landholdings, where they will hire paid labourers to work. They may also allow other households farm on their land holdings, normally for a token gift. Wealthy households are also more likely to engage in small and medium-size business, such as running local shops.

- Average households are generally comprised of an established family with usage rights over a smaller plot of agricultural land. These households usually farm, fish and market garden, as well as providing agricultural labour for wealthier families.
- Worse-off households have small landholdings in areas that are not ideal for farming. They may have a large number of dependants within the household, some of whom are frail elderly, chronically ill and/or disabled and limited assets. These households primarily engage in wage labour activities with some harvesting of natural resources and whenever possible, small trading to earn income.

8.2 Impacts on Livelihoods

This Section summarises how resettlement impacts to livelihoods align with the five 'livelihood capitals' - financial, social, human, physical and natural. These five capitals form part of the Sustainable Livelihood Approaches (SLA) utilized by a number of international development agencies in understanding community resilience and addressing poverty and food insecurity. [38]It considers both the context in which people live and how it is shaped by different constraints and opportunities; and how people draw on different livelihood assets or capitals, in different combinations. It is useful in understanding people's economic wellbeing prior to Project-related displacement, and informing the most suitable programs to restore and where possible, strengthen livelihoods through resettlement implementation.

8.2.1 Impacts to Financial Capital

The resettlement process is expected to have both negative and positive impacts to the availability of financial capital in the Project area and to host communities.

In the short-term, access to financial resources will increase significantly as compensation is disbursed. Opportunities for local employment and procurement with the Project, as well as indirect opportunities created by the Project's presence, will also increase access to financial resources.

In the long term, there will be increased risk of inflation (and therefore the erosion of savings) and the potential for irresponsible use of compensation amounts leading to impoverishment.

The LRIP will include measures to mitigate these negative risks, including:

- Prioritise PAHs for local employment and local procurement opportunities with the Project and Project contractors, as per the employment strategy;
- Stagger cash compensation payments to limit large cash infusions into the local economy;
- Account for access impacts to familiar markets, traders, and suppliers;
- Use formal financial services (such as recognised banks) to deliver and manage cash compensation and train households in establishing budgets and saving strategies; and
- Supporting the establishment of microfinance banks and strengthen existing village saving and loans associations.

8.2.2 Impacts to Social Capital

Social relationships allow for the transfer of information, materials, and goods and services within households, between households, and between communities. Existing livelihood strategies rely on strong intra-household bonds of mutual support.

The Project's resettlement process is not expected to have significant impacts on social capital. The Project will seek to avoid the most common risk to social capital, the loss of support networks. Protecting social networks occurs by avoiding resettlements completely, resettling impacted

[38] http://www.glopp.ch/B7/en/multimedia/B7_1_pdf2.pdf accessed 03/01/2019

households to a new location within their community or by resettling affected communities as a whole. For example, moving all community members who wish to remain with their community of origin to the same resettlement site. The most significant residual risk to social capital is the potential for intra- and inter-household conflict around how cash compensation is spent.

To mitigate for this residual risk and to provide protections for social capital in general, the following activities are proposed:

- Ensure that all 'primary adults' (i.e. the head of household and all spouses) have equitable access to compensation;
- Train PAHs on compensation management and financial planning;
- Strengthen community associations through direct support and/or by relying on them for the implementation of RAP/LRIP activities; and
- Provide adequate support for vulnerable households to enjoy the same benefits that other PAHs are able to capture from the resettlement process.

8.2.3 Impacts to Human Capital

It is possible that displacement will have negative impacts on some people's health as a result of the stress associated with change and resettlement. This can be mitigated by keeping people informed of Project developments and offering opportunities for them to participate in the decisions that will impact their lives. With respect to education, the Project may have a slightly positive impact. It can provide incentives to households to value education in light of the semi-skilled and skilled wage employment opportunities that become available.

To leverage Project presence to improve human capital, the following activities are proposed:

- Support for local community health providers and outreach associations;
- Outreach to local schools; and
- Provision of training and vocation opportunities for adult and young adult PAH members, preferably aligned with and in advance of Project construction.

8.2.4 Impacts to Physical Capital

Project impacts to physical capital, particularly to infrastructure, are expected to be positive, Impacts include; construction of new roads and the improvement of existing road infrastructure, and the provision of staff housing and associated health and education facilities for those employed by the Project.

A detailed Project employment strategy will be required, which outlines how local communities will be able to access opportunities with the Project in a way that is seen as transparent and fair, based on the labour skills required and available local capacity. The employment levels anticipated also suggest that the risk of an influx of outsiders and opportunists to the Project area is high. Project planning will need to include discussions with community leadership and other stakeholders around the management of influx and minimizing pressure to existing area infrastructure.

Over the longer term, positive impacts will include increased access to electricity generated by the dam.

8.2.5 Impacts to Natural Capital

Negative impacts associated with physical capital include the impact of the dam on river flows essential for particular tourist activities such as rafting and jet boating, and related businesses. There are also longer-term impacts on wildlife and fisheries. The impacts and mitigation measures to address these impacts are considered in a separate document.

The majority of households affected by Project land take are outside of urban and semi-urban centres and depend on land and other natural resources as sources of food, income, and status in the community. Impacts to natural capital for any physically displaced households are expected to be negative in the short term, as households are displaced from their lands.

8.3 Livelihood Restoration and Improvement Plan

The LRIP will consist of tailored programs based on the existing livelihood activities of PAHs.

The Project will assume responsibility for implementing the LRIP. To ensure its sustainability, the LRIP will prioritise strengthening partnerships with governmental and civil society organisations that operate in the Project area.

LRIP activities will begin prior to displacement so that PAHs have the opportunity to learn new skills. Pre-displacement activities will focus on training and will establish the effective support structures necessary, while post-displacement activities will focus on the provision of direct support.

The LRIP will detail the specific programs and activities that will be delivered, how and when they will be delivered, as well as eligibility for participation.

8.3.1 Goals and Objectives

The goal of the LRIP will be to help restore, and potentially improve, the livelihoods and living standards of physically and economically displaced PAH and host communities. The LRIP will assist men, women, youth, and communities in re-establishing and strengthening current livelihood practices in the short and medium term, and develop transferable skills and engender self-reliance in the long term.

The specific objectives of the LRIP include:

- Provide extensive support so that the abilities, resources, and assets of Project-affected households (PAHs) are effectively deployed in meaningful livelihood initiatives;
- Enable affected households to benefit from multiple sustainable livelihood activities within the Project Area;
- Meet the compensation commitments, such that compensation and other displacement related assistance is effectively and sustainably managed by PAHs;
- Support the improvement of commercial skill-based livelihoods to create opportunities for PAHs to benefit from a skills-based economy;
- Deliver training, and provide people with work experience and transferable skills that will help them compete for Project-related jobs and future opportunities; and
- Provide support so that PAHs and communities are able to maintain equal access to broader community, district, and regional development programs.

8.3.2 Principles

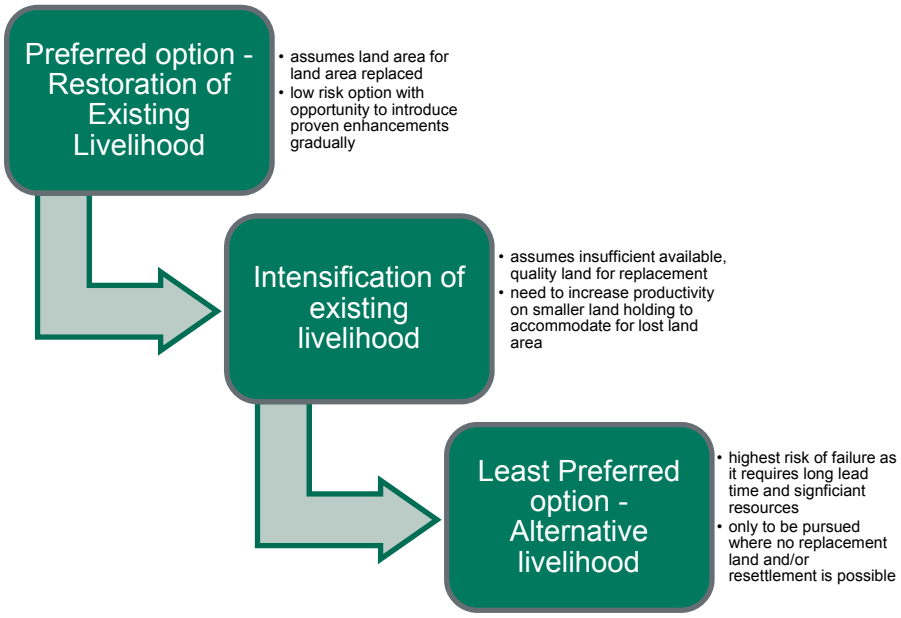
The following principles will be applied in the design and implementation of the LRIP:

- **Identify Livelihood Impacts Systematically** – Livelihood impacts on local people will be determined systematically through detailed surveys and engagement. To the extent possible, such impacts will be quantified and the affected people identified individually. Impacts will be considered even if the affected people are not resident in the area, do not own the land, or do not have legal title or access to the resources.
- **Recognise Advantages of Location as an Asset** – Replacement land for habitation, farming or other activities should have advantages of location at least equivalent to their

existing land. If this is not possible, any loss of advantage of location will be considered as an additional impact requiring mitigation.

- **Plan and Negotiate Appropriate Measures with Affected People** – The planning of livelihoods restoration / improvement is not a purely technical exercise, but requires a high level of interaction with the affected people in order to develop the most feasible and desirable mitigation measures. The agreed measures, in the form of compensation entitlement, will be incorporated into formal collective and/or individual agreements. All three tiers of stakeholders described in Chapter 4 will review and approve the LRIP.
- **Give Preference to Replacement of Existing Livelihood Activities** – Livelihood restoration / improvement measures will be planned according to the hierarchy illustrated **in Figure 8 Livelihood Restoration Hierarchy**.

Figure 8 Livelihood Restoration Hierarchy



8.3.3 Eligibility & Target Groups

The LRIP will develop different levels of intervention for physically displaced PAHs, economically displaced PAHs and host communities. Eligibility for programs developed will relate to the scale and type of impact experienced by the household. Program development will consider the livelihood support needs of women and youth, and any marginalized and vulnerable groups at an elevated risk of experiencing hardship as a result of being displaced.

8.4 Livelihood Restoration and Improvement Program Types

As part of developing the RAP/LRP(s) and its LRIP, an inventory of government, donor and not-for-profit services and programs (both existing and planned) relevant to the Project area will be undertaken. Additionally, an assessment of possible implementing partners will be conducted with a view to identifying those with expertise in the following types of programs:

- Establishing farmer-field schools that provide training to farmers (both men and women) on their farms, and identify and train local mentors in being an ongoing source of support in improved farming and animal husbandry practices;

- Increasing access to improved seeds, fertilizer and other agricultural inputs;
- Improved crop processing options and storage facilities;
- Facilitating access to markets and the buying of local crops and produce by regional buyers;
- Mechanisms for improving access to capital; and
- Entrepreneurial training and access to credit for traders and small business owners.

9. VULNERABLE SUPPORT

This Chapter outlines the general approach that will be taken in identifying and providing support to vulnerable households. It will be further detailed in the RAP(s)/LRP(s) based on more in-depth information gathered from affected households and through consultation with them. Vulnerable people are defined in Section 3.8.

For this Project, vulnerability will be considered on a household basis rather than at an individual level. The rationale is that where potentially vulnerable people are present within a household with people who are not vulnerable, then vulnerable members have sources of support and representation in resettlement planning and implementation.

Household vulnerability may be either:

- Pre-existing: present in a Project area prior to the start of Project activities; or
- Project-induced: a result of Project activities.

The Project will seek to ensure PAHs identified with pre-existing vulnerability have equal access to the benefits of RAP/LRP activities, and take steps to avoid or mitigate any instances of Project-induced vulnerability.

The RAP/LRP includes the specific approach to identifying, assessing and accommodating households with pre-existing vulnerable status, and those whose vulnerable status is project-induced. The plan will minimise risks, and mitigate impacts to vulnerable households.

Zambia's Vulnerability Assessment Committee was formed as part of the country's disaster management planning. It studies and monitors households, communities and regions and their ability to deal with external hazards/change (i.e. drought, climate change or economic crisis). The committee will be contacted and any tools that can assist with the assessment/verification of vulnerability as part of this Project, will be utilised, if appropriate.

9.1 Vulnerable Support Program (VSP)

The RAP/LRP(s) will include details of the Vulnerable Support Program (VSP) that includes three main components:

- Monitoring, identification, tracking, and follow-up of all PAHs to ensure they have access to, and benefit from, RAP/LRP activities and Project interventions. This may include special accommodations in the resettlement process (i.e. additional individual meetings, provision of special assistance in relocating their home. The vulnerable support program will monitor Project-affected communities and host communities to ensure that residents will not be made vulnerable by the Project.
- Established interventions to ensure that the execution of RAP/LRP activities minimises Project-induced vulnerability while accommodating PAHs with pre-existing vulnerability.
- Referral of vulnerable households to existing reputable community service providers (or provision of assistance to access these services) when RAP/LRP activities are unable to sufficiently address pre-existing and/or Project-induced vulnerability.

9.1.1 Vulnerable Support Program (VSP) Goals and Objectives

The VSP will focus primarily on monitoring, follow-up, and referral of vulnerable households to the RAP/LRP implementation team and / or existing community service providers.

The goal of the VSP is to identify, assess, support, and provide remedial assistance and follow-up for PAHs experiencing severe transitional hardship as a result of Project impacts. The specific program objectives include:

- Ensure that PAHs are provided with supplementary support or assistance so they can participate and benefit from RAP/LRP programs, particularly the LRIP;
- Identify PAHs who may potentially be vulnerable and ensure that they are able to participate in all aspects of the planning, implementation, and monitoring of the RAP/LRP; and
- Strengthen individual, household, and community support services.

9.1.2 Identification of Vulnerable Persons

Any PAHs displaced by Project activities, as well as those households from host communities that exhibit markers of vulnerability will be eligible to participate in the support programming outlined in the VSP. A three-stage process will be used to monitor, identify, and track vulnerability.

- Inclusion in the Project's Vulnerable Watch List using proxy vulnerability benchmarks;
- Verification through discussion with leaders or through a Vulnerable Assessment Home Visit; and
- Approval of eligibility and referral to appropriate assistance and service providers.

9.1.2.1 Vulnerable Watch List

A Vulnerable Watch List will be used to identify potentially vulnerable PAHs using broad proxy vulnerability benchmarks. The main function of the Vulnerable Watch List is to highlight households that may be vulnerable for closer monitoring and support. The Vulnerable Watch List serves as an "early warning system" to identify potential issues with RAP/LRP implementation that may result in vulnerability. Some RAP/LRP processes may be changed to accommodate individuals on the Vulnerable Watch List, no direct assistance or benefits will be provided, solely on the basis that a PAH is on the Watch List.

Proxy benchmarks should align with, but are not limited to, community and government conceptions of vulnerability. The proxy benchmarks will be reviewed and revised by Project-affected communities. Proxy benchmarks of potential vulnerability include at least the following.

- Elderly people (including widows) lacking adequate extended family support who do not own means of production;
- Single and adolescent mothers (or soon to be mothers) lacking adequate extended family support and/or means of production;
- Persons with HIV/AIDS or other chronic illnesses or disabilities who are unable to regularly engage in income generating activities; and
- Households with limited means of production but a high number of dependants (i.e. orphans).

9.1.2.2 Confirmation of Vulnerability

PAHs on the Vulnerable Watch List will be considered for a home visit to determine if they require referral for supplementary assistance. Survey data will be reviewed and leaders consulted regarding whether the PAH may indeed be vulnerable. If they may be, a home visit will be conducted. As a better understanding of vulnerability emerges, appropriate adjustments will be made to the execution of RAP/LRP activities to reflect this.

Where home visits are appropriate, they will be conducted by a representative from the Project, local health care professionals, and any relevant community support organisations. Appropriate, sustainable, support will be designed based on the causes of the PAH's vulnerability and referring them community and government care providers.

In exceptional cases, supplementary assistance provided through the resettlement implementation process could include:

- Adjustment of house designs to accommodate mobility challenged persons;

- Allocation of resettlement houses near caregivers and near central locations for elderly persons and those with mobility challenges;
- Additional training and mentorship during the provision of RAP/LRP entitlements including livelihood restoration support; and
- Exceptional assistance tailored to their needs, as deemed necessary by the RAP implementation team.

10. GRIEVANCE MECHANISM

This chapter describes the grievance mechanism that will be available for the submission and resolution of grievances (complaints or claims) related to the Project's land acquisition and resettlement processes. Notably, the grievance management process is not meant to address the collection and collation (reporting on) of stakeholder feedback that does not require an individual response. Other avenues (i.e. Project Offices and Community Liaison Officers) will be available to address general comments or requests for information.

10.1 Objectives

Objectives of the grievance redress process are:

- To provide PAPs with accessible procedures for resolving perceived or actual harm done to their well-being or their belongings as a result of Project activities, and for the settlement of disputes, including the possibility of third-party adjudication, at no cost to them;
- To identify and implement appropriate and mutually acceptable corrective actions to address complaints;
- To avoid, wherever possible, the need to resort to judicial proceedings.

10.2 Types of Grievances and Disputes

The following types of grievances are most common in resettlement planning and implementation:

- Planning:
  - Complaints about survey activities;
  - Complaints about scope / lack of information provided by the Project;
  - Claims of unfair exclusion from engagement activities;
- Entitlement processing:
  - Misidentification of owner / occupier of eligible property assets;
  - Errors in counting or measuring crops and/or other property assets;
  - Complaints about compensation entitlement rates;
  - Complaints about the entitlement policy;
- Livelihood Restoration:
  - Complaints about allocation of livelihood opportunities;
  - Complaints about training, employment and recruitment procedures.

10.3 Grievance Management Process & Resolution Mechanisms

A dedicated Grievance Officer (GO) will be appointed to coordinate the grievance resolution process. The GO will address and track grievances as they emerge and prepare internal reports. The grievance process, including how to access it, will be widely communicated to Project-affected communities.

Experience demonstrates that anyone involved in Project development should be prepared to receive grievances from affected stakeholders, either in person or through correspondence. All personnel (Project or contractor staff, local government representatives who are known to be in contact with Project staff, etc.) involved in any public aspect of the Project where they may interact with local stakeholders will receive training on how to deal with grievances. Most often the appropriate response

will be to direct the complainant to the GO so that they can relay their grievance in person. This means that personnel will always have the contact details of the GO.

Where language or other barriers to submitting a grievance directly exist, the person receiving the grievance may pass it on themselves, along with the contact information for the original complainant.

If the person lodging the grievance is unable to write, the grievance and relevant personal information will be recorded on their behalf and read back to the claimant for their approval. Once the description of the grievance has been approved by the claimant, they will mark the document with their thumbprint.

Upon receipt of a grievance (see Annex 1 General Project Grievance Form), the GO will confer with the complainant to verify that this is the first time that this particular grievance has been submitted by this complainant. If the grievance is related to a previous submission, the GO will inform the complainant of the status of that grievance and record that the grievance has been re-submitted.

Grievances will be tracked in a Resettlement Grievance Database. It will constitute a register of all grievances submitted, identifying who received the grievance, and the status of the grievance. If the grievance is new, the GO 'opens the grievance' by beginning to fill in a grievance form, and creating an entry in the Grievance Database. This form will track how the grievance is dealt with from submission through to resolution.

Open grievances will be reviewed weekly. Those that are not being resolved in a timely fashion, or have been assessed at a higher level of severity, will be referred to management, as described in **Table 9**. People who submit grievances retain their rights to, at any point in the grievance resolution process, refer their grievance to the court system as a formal judicial action.

10.3.1 Grievance Process

Following submission of a grievance or upon receipt of a grievance (i.e. by mail or email), the GO opens the case and begins the preliminary investigation. This may begin immediately if the grievance is submitted in person, or may require the GO to locate the claimant. As above, the name of the complainant and their contact details are recorded, as well as the details of the grievance. Complainants will be presented with a standardized written acknowledgment that the grievance has been received. Once the grievance is logged and acknowledged, the significance is assessed, based on the criteria described in **Table 9**. For second, third and fourth level grievances, higher levels of management will need to be informed and involved in the grievance process.

Table 8 Grievance Significance Level

Significance Level	Type of Grievance	Responsibilities
Level 1	A grievance that is isolated or 'one-off' and essentially local in nature and restricted to one complainant. Note: Some one-off grievances may be significant enough to be assessed as a Level 4 grievance e.g. when a national or international law is broken (see Level 4 below)	Grievance Officer
Level 2	A grievance that extends to the local community or region and has occurred more than once, which is judged to have the potential to cause disruption to ZRA operations or to generate negative comment from local media or other local stakeholders	Grievance Officer & Stakeholder Engagement Manager
Level 3	A grievance which is widespread and repeated or has resulted in long term damage and/or has led to negative comment from local media, or is judged to have the potential to generate negative media and local stakeholder comments (e.g. damage to a sacred site or flooding of local school)	Stakeholder Engagement Manager & Resettlement Manger
Level 4	A one-off complaint, or one which is widespread or repeated and , **in addition,** has resulted in a serious breach of ZRA policies, Zambian or Zimbabwean or International Law and/or has led to negative national/international media attention, or is judged to have the potential to generate negative comment from the media or other key stakeholders (e.g. failure to pay compensation where appropriate, e.g. resettlement)	Resettlement Manager & Project CEO

The process and timeframe for resolving grievances is depicted in **Figure 10**. The Project commits to recording, assessing and acknowledging receipt of the grievance, within seven days. All grievances submitted will be investigated fully, involving other departments, contractors and senior management as required in order to fully understand the circumstances that led to the grievance being raised. The aim is to resolve any grievances within 30 days from the date that it was initially received. This timeframe can be extended to 60 days for more complex grievances (i.e. level 3 or 4 grievances), if required.

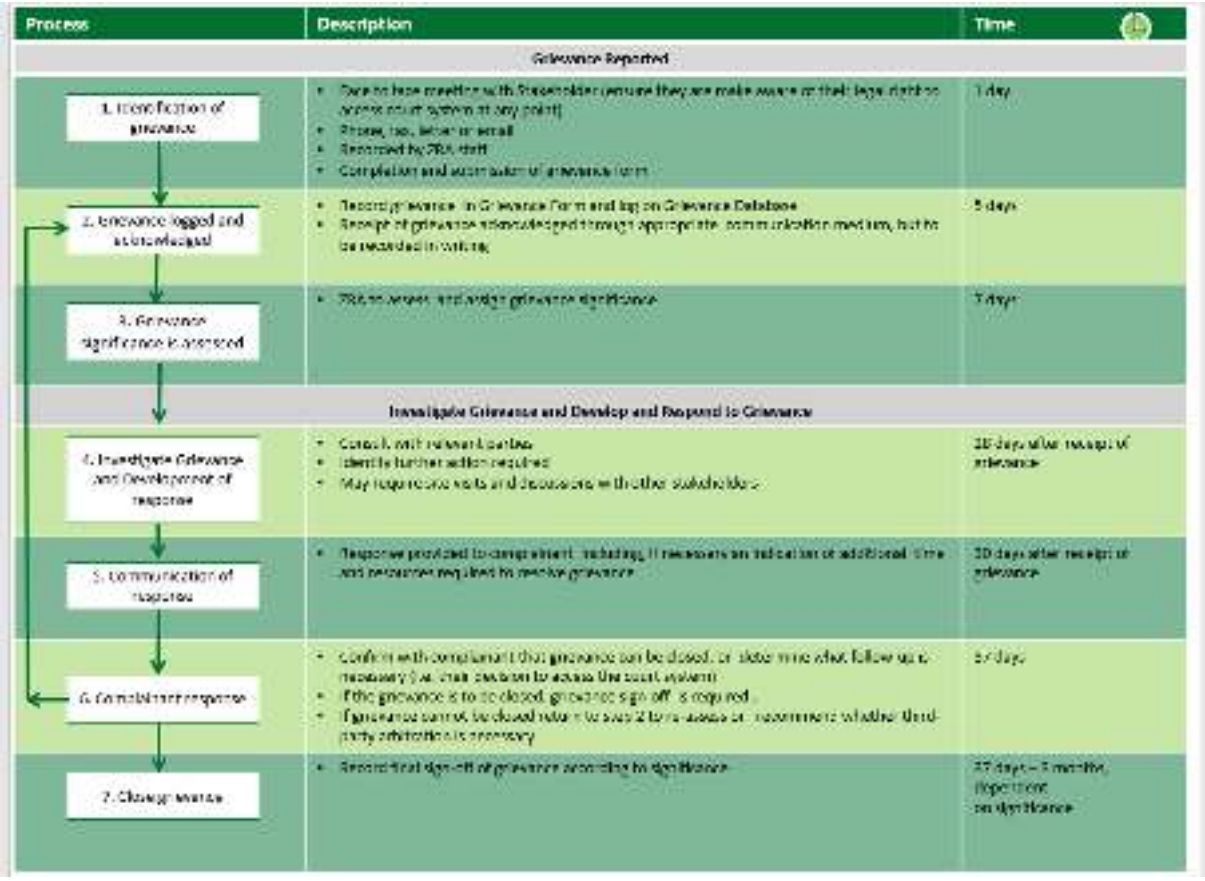
The grievance resolution process includes the following steps:

- Obtain as much information as possible from the person who received the complaint, as well as from the complainant to gain a first-hand understanding of the grievance.
- Undertake a site visit, if required, to clarify the parties and issues involved. Gather the views of other stakeholders including Project staff, if necessary and identify initial options for settlement that parties have considered.
- Determine whether the grievance is eligible (i.e. relates directly or indirectly to BGHES), and if ineligible, determine the more appropriate vehicle for addressing the issue, a full explanation as to the reasons for its ineligibility will be given to the complainant and recorded in the Grievance Database.
- If the grievance is eligible, determine its severity level using the significance criteria in Table 9. This will help to determine whether the grievance can be resolved immediately by the GO

or requires further investigation and whether senior management will need to be informed of the grievance and who specifically.

- If the grievance concerns physical damage, (e.g. crop, house, community asset) take a photograph of the damage and record the exact location as accurately as possible.
- Inform the complainant of the expected timeframe for resolution of the grievance.
- Enter the findings of the investigation in the Grievance Database.

Figure 9 Grievance Management



10.3.2 Grievance Settlement and Resolution Approach

All grievances shall be dealt with on a case by case basis. Where possible, they will be addressed directly by the Project. The resolution proposal shall be respectful and considered, including the rationale and any data used in developing the proposed resolution. If wider consultation is necessary, grievances will be forwarded to a neutral, external third party.

The third party could be an existing body or one established for this purpose (i.e. Grievance Review Committee). The body would need to be well-respected, and agreed upon by both Project Management and the affected parties. It could include public defenders, legal advisors, local or international NGOs, or technical experts. In cases where further arbitration is necessary, appropriate government involvement will be requested.

10.3.3 Monitoring and Reporting

Project management will monitor grievances routinely as part of the broader management of the Project. This entails good record keeping of complaints raised throughout the life of the construction and operation of the Project. On receipt of grievances, Project management will receive electronic notification. Grievance records will be made available to management at all times, and the appropriate protocols established and followed for grievances assessed to be at a high significance level.

Monthly internal reports will be compiled by the Grievance Officer and distributed to the management team. These grievance reports will include:

- The number of grievances logged in the proceeding period by level and type;
- The number of stakeholders that have come back after 30 days stating they are not satisfied with the resolution;
- The number of grievances unresolved after 60 days by level and type;
- The number of grievances resolved between ZRA and complainant, without accessing legal or third party mediators, by level and type;
- The number of grievances of the same or similar issue;
- Project responses to the concerns raised by the various stakeholders;
- The measures taken to incorporate these responses into project design and implementation; and
- These reports and other records will be made available for external review if required.

An appropriate grievance report will be included in the Project's annual reporting. Annual reports will be made available to the public at Project offices, and an electronic copy online.

The grievance database will allow for monitoring the success of the grievance resolution process. Internally, grievance resolution timeframes will be monitored through weekly meetings between the GO and Resettlement Manager. Open grievances will be reviewed, and emergent and recurring issues discussed. Where grievances remain open beyond the established timeframe, the GO will be responsible for providing the given claimants with an explanation and an assurance that their grievance has not been lost or forgotten.

Lastly, reporting on grievances will be provided to external auditors as a component of the regular evaluations that will be conducted for the resettlement process overall.

10.3.4 Recourse to the Judicial System

Although it is hoped that all grievances will be resolved internally and through the aforementioned process, it will be communicated to stakeholders that at any time during the grievance resolution process, they retain their rights to refer their grievance to the appropriate arbitrative or legal body within the Zambian judicial system.

In the event that a grievance becomes a case presented by the claimant's legal counsel, the Project's Legal Advisor will be directly responsible for responding to the claim.

11. IMPLEMENTATION ARRANGEMENTS

Chapter 12 describes the organisational arrangements and work plan required for the resettlement planning and collective negotiation phase resulting in an endorsed RAP/LRP(s).

11.1 Work Plan

The work plan consists of four phases that guide land acquisition and the management of related displacement impacts. The phases enable the Project to move from a Resettlement Policy Framework to a fully endorsed Resettlement Action Plan(s). This is followed by RAP implementation to Project completion. They work plan phases are:

- **Phase 1**: Development of a bridging strategy outlining how the RPF will be expanded into a detailed RAP(s) endorsed by Project stakeholders;
- **Phase 2**: Survey execution and collective engagement, resulting in a final, approved and fully costed RAP(s) and LRIP(s);
- **Phase 3**: RAP/LRP(s) Implementation and individual household sign-off; and
- **Phase 4**: Delivery of supportive programs

Table 9 Preliminary Work Plan presents an indicative work plan for completing the first two phases within a 10-month period, the outcome of which will be a finalized RAP(s) endorsed by Project stakeholders and completed preparations for an individual household sign-off to secure required land.

11.1.1 Phase 1: Resettlement Bridging Strategy

The resettlement bridging strategy details how the Resettlement Policy Framework will be expanded into a detailed Resettlement Action Plan. It will frame the entire resettlement and livelihood restoration process from beginning to end. As a “plan for a plan”, it will set the stage for subsequent planning and engagement activities.

The objectives of the Strategy include:

- To develop and agree to a RAP/LRP(s) planning strategy and schedule based on this RPF;
- To determine the most appropriate approach to use in terms of efficient resource deployment, stakeholder engagement;
- To develop a schedule that indicates how timelines available for the deliverables (mainly the RAP) for the Project will be met;
- To confirm the resettlement stakeholder engagement program as outlined in the RPF and based on that, provide a detailed Resettlement Stakeholder Engagement Plan;
- To confirm the organisational arrangements that will carry out planning and implementation of land access and resettlement, and livelihood restoration activities and resources required.

11.1.2 Phase 2: Planning and Collective Engagement

This phase comprises technical planning activities and engagement activities designed to verify and quantify displacement impacts and confirm the general terms and conditions that will guide land acquisition resettlement. It includes the declaration of a cut-off date, planning and implementation of a comprehensive census and asset survey.

This phase results in a RAP/LRP(s) that confirms the location of all project components, and further specify the procedures that the Project will follow and the actions that it will take to mitigate and redress adverse effects. It details how the Project will compensate for losses, provide development benefits to those affected, and otherwise manage displacement impacts.

The quantification of impacts will be accompanied by a first order estimate of costs and a schedule for resettlement.

The content of the RAP/LRP(s) will build on the Resettlement Policy Framework with significantly more detail regarding compensation eligibility and entitlements (i.e. specific crop compensation rates), supportive programs, and implementation procedures. The RAP/LRP(s) will follow the outline below:

- Include the introduction section of the RPF. The introduction describes; the Project setting, measures taken to avoid or reduce the scope of displacement, the need for resettlement, and the overall approach to and principles guiding resettlement planning and implementation;
- Characterise baseline conditions among those directly affected by Project land-take, building on information collected as part of the ESIA baseline and presented in the RPF, with information collected through the census and asset inventory;
- Quantify impacts of land acquisition (i.e. number of properties, structures, people, crops);
- Identify and analyse resettlement stakeholders and describe the engagement activities that have been undertaken as part of RAP/LRP preparation, including the identification of vulnerable people and groups, and the mobilisation and ongoing management of the resettlement steering committee and forums;
- Confirm eligibility and entitlement policies as described in the RPF, and finalise entitlement matrix;
- Define cash compensation policies, rates, and related procedures, and demonstrate how the rates meet the definition of “full replacement value”;
- Describe the resettlement assets to be delivered, including final resettlement site(s) and host communities, as well as conceptual plans of communities and house designs, if required (or details of the Assisted Self-Resettlement Option);
- Describe the livelihood restoration and vulnerable support program, and the implementation partners and model of program delivery;
- Summarize the grievances received to date and their status;
- Confirm details of the monitoring and evaluation program to ensure that the objectives of the resettlement process are met in accordance with international standards and national laws and regulations.
- Confirm the organisational arrangements for implementation of the RAP/LRP(s), including work plan, schedule and budget estimated for the implementation of the RAP/LRP(s).

11.1.3 Phase 3: Implementation and Individual Engagement

This phase results in individual household agreements, which reflect the general terms and conditions documented in the RAP/LRP and the results of the census and asset survey exercise. The resulting agreement should specify all compensation due to the individual household and will be signed by the affected household’s representative, the Project representative, and potentially, village representatives. By the end of this phase, the Project secures access to the land that it requires to develop the Project. Those affected receive all their entitlements and those physically displaced are relocated, in accordance with the terms and conditions outlined in the RAP/LRP(s).

11.1.4 Phase 4: Delivery of Support Programs

This phase includes implementation of agreed livelihood restoration, vulnerable assistance and ongoing monitoring. All of which continue until those affected have been able to restore their livelihood and establish an improved quality of life, confirmed through a completion audit undertaken by an external third party.

11.2 Organizational Arrangements

Figure 10 RAP Planning and Implementation Team presents a preliminary organizational chart outlining the resources required to develop the RAP/LRP(s). As noted above the final team structure will be confirmed as part of the development of the Land Acquisition and Resettlement Bridging Strategy in Phase 1. The team resources will be adjusted as necessary for Phases 3 and 4.

The Resettlement Team is comprised of ZRA staff, government staff and third party service providers. The Team's role is to lead the stakeholder engagement process, undertake technical work in support of the resettlement process, check that international standards are met, and prepare the RAPs/LRPs. Proposed roles and responsibilities are outlined below

11.2.1 Management:

- Resettlement Manager: will manage the Resettlement team's activities, guiding the engagement process and technical work streams and overseeing preparation of the RAP/LRP(s) documents. The Resettlement Manager will be a member of the Resettlement Steering Committee.

11.2.2 Survey and Data Management Groups:

- Data Management Coordinator and GIS Specialist, who will be responsible for managing the database / GIS, reporting on surveyed data, and supporting the engagement and negotiations process;
- Survey Management Coordinator, who will plan and administer the census, livelihood survey, and immoveable asset inventory in accordance with international and national standards, and oversee the QA/QC process;
- Social Surveyors, who will administer the census and livelihood surveys to all displaced households;
- Asset Surveyors, who will administer the immoveable asset inventory (lands, crops / trees, buildings, other built improvements) to all displaced households, together with the valuers; and
- Data Entry Clerks, who will enter gathered data into the database / GIS.

11.2.3 Stakeholder Engagement Group:

- Engagement Coordinator, who will manage the leadership forums and community feedback meetings, planning and implementing the stakeholder engagement plan, and administering the grievance management system;
- Community Liaison Officers, who will support the Engagement Coordinator in the above; and
- Grievance Officer, who will manage the grievance management system.

11.2.4 Physical Resettlement Planning and Design Support Group:

- Construction supervisor and assistants will oversee the self-build program. If a full resettlement is required a larger team of planning, design and engineering specialists will be required. This assumes that physical resettlement is limited and an assisted self-resettlement option is the most appropriate for the Project.

11.2.5 Livelihood and Vulnerable Support Group:

- Livelihood Restoration Coordinator, who will assist the Resettlement Manager in coordinating the Team's activities and in documenting and reporting on the process;

- Sector Specialists (e.g. agricultural and livestock specialists), who will support the Livelihood Restoration Coordinator in planning appropriate programs and activities in support of land-based livelihoods as per the RAP/LRP(s) and its LRIP; and
- Vulnerable Support Officer, who will lead delivery of Project vulnerable support and monitoring measures.

11.2.6 Financial Management Group

- A Finance Manager will be responsible for ensuring a reliable system of calculating and processing cash compensation payments is established and appropriate checks and balances are in place.

Figure 10 RAP Planning Team

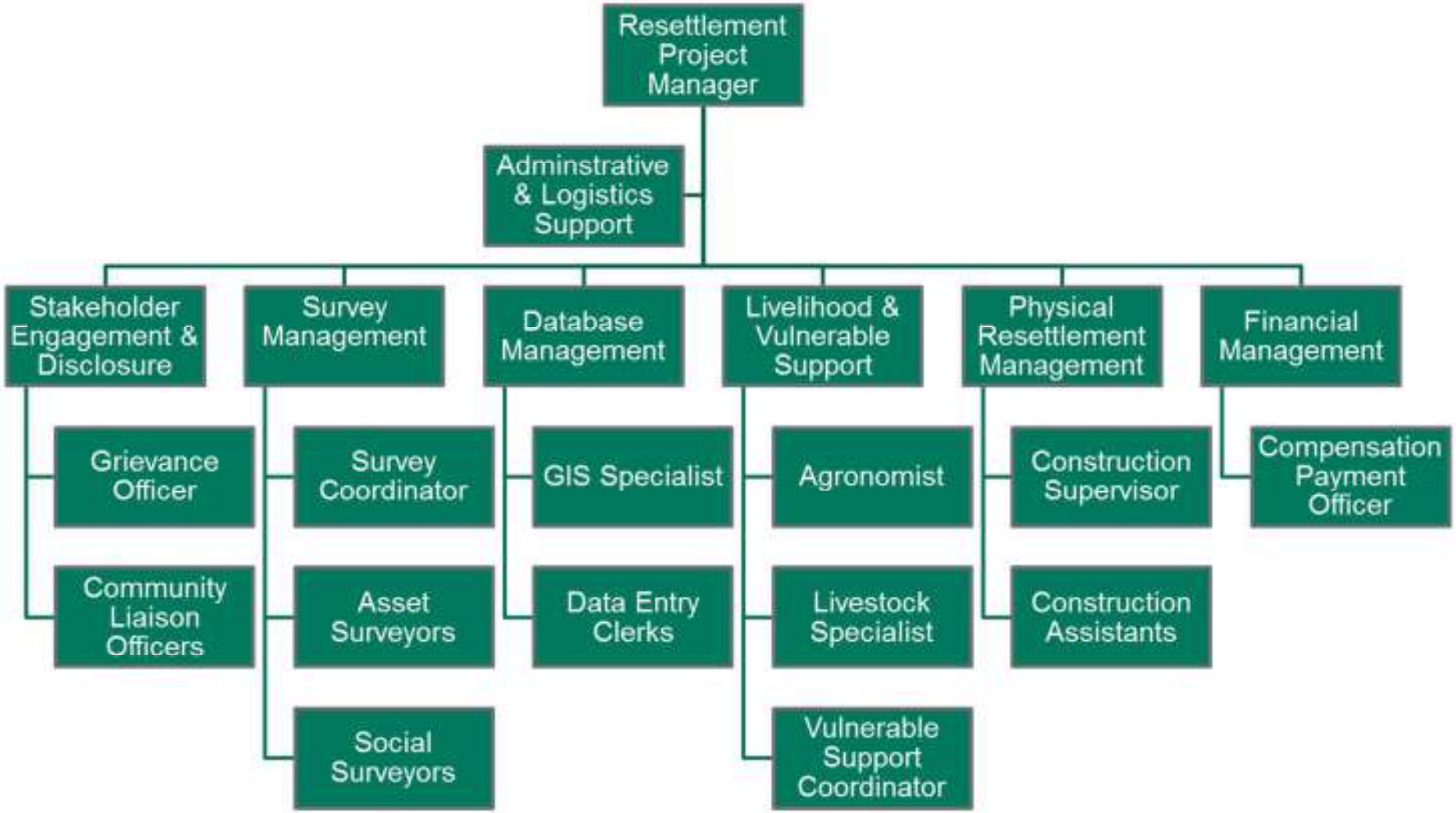


Table 9 Preliminary Work Plan

Table 10 RAP Indicative Work Plan

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10
PHASE 1 BRIDGING STRATEGY											
1.0	Develop Land Acquisition & Resettlement Bridging Strategy										
	Prepare & Update Project work plan and schedule										
	Present Strategy & Secure Approval from ZRA										
PHASE 2 PLANNING AND COLLECTIVE NEGOTIATIONS											
1.0	**MANAGEMENT**										
1.1	Mobilize Resettlement Planning Team										
1.2	Establish & Manage Resettlement Planning Process										
1.3	Detail Stakeholder Engagement Program (SEP) for Phase 2										
2.0	**STAKEHOLDER ENGAGEMENT**										
2.1	Mobilize and Manage Resettlement Steering Committee										
2.2	Establish and Operationalize Leadership & Community Forums										
2.3	Operationalize Grievance Management System										
3.0	**TECHNICAL WORK STREAMS**										
3.1	Confirm Project Description and Displacement Impacts										
3.2	Design census and asset survey instrument, methodology and database / GIS										
3.3	Mobilize and train survey teams and observers										
3.4	Issue cut off date										
3.5	Implement surveys enter data and check										
3.6	Confirm Eligibility and Entitlement Policies & Packages										
3.7	Engage valuers to investigate compensation rates										
3.8	Finalize compensation rates and define related processes (i.e. payment process)										
3.9	Define In Kind Entitlements										
3.10	Select and secure resettlement sites, if required										
3.11	Undertake conceptual planning and design of replacement assets, if required										
3.12	Define in-kind entitlements for supervised self-build option, if required										
3.13	Undertake conceptual planning and design of replacement assets										
3.14	Plan permitting, approvals, design, tendering, construction, and handover process										
3.15	Finalize details of Assisted Self-build Resettlement Option										
3.16	Undertake inventory of gov't programs/services; NGO's; donors										
3.17	Assess potential implementing partners										
3.18	Define Supportive Programs										
3.2	Confirm RAP implementation costing										
4.0	**FINALIZE RAP/LRP**										
4.1	Present RAP/LRP to RSC, RSLP & CCF										
4.2	Finalize RAP & LRP in light of any comments received								*		
PHASE 3: IMPLEMENTATION AND INDIVIDUAL HOUSEHOLD SIGN-OFF											
1.1	Re-Tool Team & Prepare for Phase 3 Implementation										

12. MONITORING AND EVALUATION

Monitoring and Evaluation (M&E) of resettlement activities is carried out so that the RPF and RAP/LRP(s) objectives can be met and implemented in accordance with Project objectives, Zambian Law, and international resettlement standards. M&E provides Project management, lenders and other key stakeholders with information on whether resettlement, livelihood restoration and land acquisition initiatives are on schedule.

M&E is firmly rooted in a participatory approach that involves the direct and active participation of displaced persons and stakeholders, and the incorporation of their feedback into the Project's land acquisition and resettlement activities. The tiered engagement and consultation approach described in Chapter 4 is designed to ensure community participation in the planning and implementation of the overall compensation and resettlement process.

Monitoring of resettlement and compensation activities is conducted both internally and externally. Internal monitoring focuses on inputs and outputs, observing the short-term changes in different indicators. External evaluation focuses on processes and outcomes, using the findings of internal monitoring, as well as investigations completed by external, third party organisations.

M&E activities continue until it can be demonstrated that displaced persons have successfully re-established their livelihoods and restored their quality of life. This is confirmed through a completion audit.

12.1 Internal Monitoring

An internal performance and impact monitoring system will be developed to regularly track and report on the following:

- Progress against the detailed RAP/LRP implementation schedule such as:
  - Number of individual household sign-offs completed;
  - Number of affected households receiving full cash compensation entitlements;
  - Number of replacement land plots acquired and physically displaced people adequately re-housed; and
  - Livelihood restoration measures initiated and completed.
- Alignment with overall Project schedule and budget;
- Verification that vulnerable households have received agreed additional assistance;
- Review of grievances submitted including analysis of trends which may require program adjustments; and
- Stakeholder engagement milestones achieved.

Internal progress monitoring reports will be prepared at regular intervals beginning with the commencement of implementation activities. The frequency of reporting will depend on the stage of the implementation of the RAP/LRP(s), with more frequent reporting likely during the earlier phases to ensure implementation is on track.

Outcome monitoring assesses the effectiveness of the RAP/LRP(s) and associated programs in supporting Project-affected people in re-establishing their livelihood. It requires a different approach, typically involving surveys of affected households and focus groups to collect information. The collected data can be compared with baseline data prior to resettlement in order to better understand:

- Changes in quality and quantity of agricultural production and livestock holdings/health compared with pre-Project levels;
- Changes in household income levels;

- Changes in household expenditure patterns;
- Changes in asset ownership / quality / size;
- Changes in disease incidence; and
- Satisfaction of affected communities with the resettlement initiatives.

The timing of the outcome monitoring takes into consideration the implementation schedule, and assists the Project Implementation Team in making program adjustments and preparing for external evaluations.

12.1.1 Monitoring of Physically Displaced Households

For households that have been physically displaced, post-displacement monitoring will be conducted within the first year after the move. A mid-term evaluation will be conducted for all physically displaced PAHs typically three years after displacement. A final long-term evaluation will be conducted for the same group of households. This is typically five to seven years after displacement, but will be determined for each RAP/LRP(s) in turn. The purpose of the monitoring is to verify that the Project-affected population have attained a standard of living at least equal to the situation prior to the resettlement process.

12.1.2 Monitoring of Livelihoods Restoration

Post-displacement monitoring should follow up with those economically displaced households participating in the Project's livelihood restoration and improvement programs beginning two years after compensation payments have been made and livelihood assistance delivered. The purpose of the monitoring is to assess their socio-economic quality of life. It also serves to identify households who may have restored their livelihoods after impact mitigation activities have ended, but for whom residual effects may persist. Based on the analysis of data collected within the livelihood restoration programs an assessment can be made whether affected households have been given a reasonable opportunity to restore their livelihoods. This mid-term assessment will help to identify general trends as to whether or not the livelihoods programs are having success, and whether or not PAPs are on course to restore their livelihoods. This will guide the course for taking corrective action, as needed.

In order to document whether livelihoods have been fully restored, a long-term evaluation should take place typically 5-7 years after displacement. If the livelihoods of the vast majority of households have been restored, the RAP/LRP and its LRIP implementation can be considered complete.

12.1.3 Vulnerability Monitoring

The primary objective of vulnerability monitoring is to avoid the occurrence of project-induced vulnerability, and if it occurs, to mitigate this through support measures and follow-up monitoring. It is important to monitor effects on PAHs who are especially vulnerable to negative impacts and who, without special consideration, may not receive a proportionate share of Project benefits.

International standards stipulate that:

- Project proponents identify individuals and groups that may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status;
- Project sponsors assess potential impacts on these individuals and groups and propose as necessary, specific measures and accommodations to address potential impacts; and
- Project monitoring track the well-being of these individuals and/or households on a disaggregated basis.

Data collected from all households will be analysed periodically to identify households who's pre-existing vulnerable status may be exacerbated as a result of the Project, or who may become vulnerable due to Project displacement.

12.2 External Monitoring and Completion Audit

External resettlement monitoring and evaluation supports and strengthens a Project's internal monitoring system, and is conducted by an independent third party. The key objective is to determine whether Project efforts to restore / improve the living standards and livelihoods of the affected communities have been formed and applied. The audits verify that all physical inputs committed to in the RAP/LRP(s) have been delivered and all livelihood restoration measures provided. In addition, the audits evaluate whether the mitigation measures prescribed in the RAP/LRP(s)and any corrective actions developed and implemented since the RAP/LRP(s) have had the desired effect.

The BGHES will have a third-party auditor undertake annual reviews during Project implementation to assess compliance with commitments contained in both the RPF and the more detailed Resettlement Action Plan (s). They will provide the Project Implementation Team with recommendations for improving RAP implementation and addressing any gaps. They will also determine when the final RAP/LRP completion audit should be performed to determine the following:

- Assess the effectiveness of measures to avoid and minimise displacement impacts by comparing those identified in the RAP/LRP(s) with actual impacts on people and land;
- Verify that implementation complies with applicable international policies;
- Verify that all entitlement and commitments described in the RAP/LRP(s) have been delivered;
- Assessment of the fairness, adequacy and promptness of the compensation and resettlement procedures as implemented;
- Determine whether the measures identified in the RAP/LRP(s) have been effective in restoring and enhancing affected peoples' livelihood and quality of life, particularly for those households who have been physically displaced;
- Check on any systemic grievances that may be outstanding; and
- Identify any corrective actions necessary to achieve completion of RAP/LRP(s) commitments.

13. ANNEXES

13.1 Annex 1 Grievance forms

To be completed by ZRA personnel (if grievance being submitted in person) or person submitting complaint

Grievance Record	
Reference No: (for official use)	
Full Name	
Contact Information **Please mark how you wish to be contacted (letter, telephone, e-mail).**	☐ **Address/village/traditional authority and ward:** _____ _____ _____ _____ _____ ☐ **Telephone:** _____ ☐ **E-mail:** _____
Preferred Language for communication	
Description of Incident or Grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?
Date of Incident/Grievance	
	☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	
Additional Comments:	

13.1.1 Grievance Record

– to be used as part of the database

Grievance Record			
Grievance Number:	Date Submitted:	Target Date for Resolution:	
Name:			
Address and Contact Details			
Grievance Received By:			
Name of Grievance Coordinator:			
Description of Grievance:			
Assessment of Grievance Level:		Notification to CEO or other senior management?	Y/N
Actions to Resolve Grievance			
Delegation to:			
Action	**Who**	**When**	**Completed Y/N/Date**
Response/Resolution:			
Strategy to Communicate Response:			
Sign-Off:			
Date:			
Conclusion			
Is complainant satisfied?	Y/N	Comments from Grievance Coordinator	
Grievance Closed?	Y/N	Grievance Resubmitted?	Y/N
Signature of CEO:		Date:	
Date:		New Grievance Number:	

13.1.2 Grievance Receipt Form

– to be used to acknowledge grievances submitted

Grievance Receipt Form		
Grievance Number:	Date Submitted:	Target date for initial meeting to address grievance:
Name:		
Address and Contact Details		
Grievance Received By:		
Name of Grievance Coordinator:		
Contact details of Grievance Coordinator	Telephone: Email: Address:	

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Annex Q

Letter from Zimbabwean Ministry of Defence

All correspondence should be addressed to "The Secretary"

Telephone: 791760/9
Fax: 797956, 727524, 706753, 797955
Website: www.energy.gov.zw
Email: energy@gta.gov.zw

ZIMBABWE

MINISTRY OF ENERGY & POWER DEVELOPMENT

Second Floor John Boyne Building
Cnr. Innez Terrace/ Speke Avenue
Private Bag 7758, Causeway
HARARE, Zimbabwe

REF: 60/111/5/E/296

September 22, 2014

Chief Executive Officer
Zambezi River Authority

LANDMINE CLEARANCE: DEVELOPMENT OF THE BATOKA GORGE HYDRO ELECTRIC SCHEME

Attached please find a self explanatory minute relating to the query you raised regarding landmine clearance around the Batoka Gorge.

We trust this meetings your requirement.

P. I. Mbiriri
Secretary for Energy and Power Development

All official communications Should be addressed to the "SECRETARY"

Telephone: 700155
Telegraphic address:
"DEFENCE HARARE"

ZIMBABWE

Reference:

MINISTRY OF DEFENCE
Private Bag 7713
Causeway

Ref: Def /39/ 7/10

10 September 2014

Secretary for Energy and Power Development

Attention: Mr P I MBIRIRI

RE: LANDMINE CLEARANCE: DEVELOPMENT OF THE BATOKA GORGE HYDRO ELECTRIC SCHEME

I refer to your letter referenced 60 /111 /5 /E /293 dated 27 August 2014 on the above subject matter. Please be advised that we have consulted the Commander of the Corps of Engineers of the Zimbabwe National Army. The response was as follows:

The area earmarked for the hydroelectricity power station is located at an area approximately 3 to 5 kilometres away from the former mined area. There have been no reports of any mine incidents around the locality of the proposed hydroelectricity power station site.

The access route to the site cuts across the former minefield which was cleared in 2000.There is a road which was opened by the National Mine Clearance Squadron in the late 80s.

For further verification, the Zimbabwe Corps of Engineers is currently not in a position to deploy a demining team, all its demining equipment is deployed at Mugiviza and Mukumbura respectively.

However arrangements can be made with your Ministry for earlier verification to be made subject to availability of resources.

P MACHAYA
Acting Secretary for Defence

c c. Chief of Staff Joint Ops &Plans

SECRETARY
MINISTRY OF ENERGY AND POWER DEVELOPMENT
22 SEP 2014
P. BAG 7758, CAUSEWAY
ZIMBABWE TEL: 733092

Annex R

Greenhouse Gas Assessment

Greenhouse Gas (GHG) Assessment

Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

Zambezi River Authority (ZRA)

18 September 2019

Project No.: 0239269

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18 September 2019

Greenhouse Gas (GHG) Assessment

Proposed Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

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Acronyms and Abbreviations

Name	Description
AfDB	African Development Bank
BGHES	Batoka Gorge Hydro-Electric Scheme
CO_2e	Carbon Dioxide equivalent emissions
EBRD	European Bank for Reconstruction and Development Bank
EIB	European Investment Bank
GHG	Greenhouse Gas Emissions
GWP	Global Warming Potential
IFC	International Finance Corporation
IHA	International Hydropower Association
IPCC	Intergovernmental Panel on Climate Change
O&M	Operations and maintenance
SP	Studio Pietrangeli Consulting Engineers
UNFCCC	United Nation Framework Convention on Climate Change

OVERVIEW

This greenhouse gas (GHG) assessment estimates the emissions contributing to climate change from the proposed Batoka Gorge Hydro-Electric Scheme (hereafter known as the proposed Project or BGHES) during its construction and operation.

The construction of the proposed BGHES includes estimations for emissions associated with the combustion of fuel from the transportation of materials to site, transportation of excavated materials and use of construction plant; and emissions released from biogenic carbon contained within the vegetation that is cleared for the construction sites. The most significant source of GHG emissions during construction is associated with land use change from the clearance of vegetation for the construction sites.

The operation of the proposed BGHES includes estimations for emissions associated with the combustion of fuel from maintenance vehicles as well as from the decay of the remaining biomass submerged within the BGHES reservoir. The most significant source of GHG emissions during operation is associated with the decay of remaining biomass submerged within the BGHES reservoir, which contributes approximately 99.9% of the total emissions [(1)].

Mitigation proposed to reduce the most significant sources of GHG emissions includes utilising cleared vegetation (wood) for commercial timber and community fuelwood rather than clearance by fire during the construction period, and minimising the amount of biomass available to decay before the BGHES reservoir is inundated. It is suggested that a timber survey be carried out to estimate the amount of commercially viable timber, which could be recovered from the areas that will be cleared of vegetation during construction. It would then be possible to estimate the amount of biomass that would not release GHGs and reduce the impact from land use change emissions.

When the proposed BGHES is compared against fossil fuel electricity generation technologies over the 50 to 100 year Project lifetime, the GHG emissions associated are significantly lower per GWh of electricity generated. Although there is a high initial GHG impact primarily associated with the clearance of vegetation during construction and decay of vegetation from inundation, the emissions over the Project lifetime are significantly lower due to the minimal emissions associated with generating electricity once in operation. This means the BGHES will have a much lower contribution to climate change over its lifetime compared to any fossil fuel electricity generation technologies.

[(1)] Total emissions, during years 1-25 of BGHES operation have been calculated as 304,614 tCO_2e. Of this total, emissions associated with the decay of remaining biomass amounts to 304,594 tCO_2e (equating to 99.99% of the total).

1. INTRODUCTION

This greenhouse gas (GHG) assessment estimates the emissions contributing to climate change from the Batoka Gorge Hydro-Electric Scheme (BGHES), (hereafter known as the proposed Project or BGHES), during its construction and operation phases.

1.1 Assessment Objectives

The objectives for this assessment are:

- To undertake GHG modelling and calculation of the construction and operational carbon footprint of the BGHES through an impact assessment.
- To contextualise annual emissions against international and national thresholds.
- To determine whether expected GHG emissions are deemed to be 'significant'.
- To develop viable mitigation measures and management actions that are designed to reduce any significant GHG emissions.
- Assuming the implementation of the suggested mitigation measures and management actions, a residual impact assessment rating has being assigned.

1.2 Scope of the Assessment

The GHG assessment looks at the emissions associated with the BGHES during its construction and operation phases. These can be described as follows:

- During construction, GHG emissions are linked with the clearance of vegetation in the construction sites, as well as typical activities associated with construction such as the transportation of raw materials, use of heavy vehicles and on-site power generation [(1)].
- Emissions associated with the BGHES during its operation are related to the decay of biomass in the reservoir and additionally very limited vehicle transport and power generating requirements expected at and around the site.

1.3 Relevant Documents, Standards and Guidelines

1.3.1 Zambia GHG Documents, Standards and Guidelines

Zambia has various climate change-related policies, strategies, projects and programs in response to climate change impacts. These documents are aligned with the National Development Plans [(2)] and the Vision 2030, both of which support development of a low carbon and climate-resilient development pathway. In 2016, Zambia launched its National Climate Change Policy [(3)] aimed at stemming the impact of climate change, and introduces a well-structured and coordinated national strategy to effectively tackle the adverse effects of climate change. The policy is driven by the Ministry of National Development.

[(1)] Scope 3 emissions associated with the mining/manufacture of the raw materials used for construction of the BGHES (e.g. cement and steel) are considered to be outside the scope of this Assessment. Emissions associated with transportation of these raw materials to the project site have however been included within the scope of work.

[(2)] Zambia's latest National Development Plan for 2017-2021 is available at: http://extwprlegs1.fao.org/docs/pdf/zam170109.pdf

[(3)] http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/laws/8142.pdf

1.3.2 Zimbabwe GHG Documents, Standards and Guidelines

The Zimbabwean National Climate Change Response Strategy [1] provides a framework for the comprehensive and strategic approach to managing climate change. The response strategy includes climate change policies designed to make Zimbabwe more resistant to climate pressures and help it meet its international carbon-cutting pledges. Of particular note, the National Climate Policy [2] aims to help Zimbabwe put in place the legal structures needed to guide businesses on becoming greener.

1.3.3 IFC Performance Standards

Regarding resource efficiency, including the use of energy and other GHG-relevant activities, the IFC's Performance Standard 3: Resource Efficiency and Pollution Prevention [3] states that:

The client will implement technically and financially feasible and cost effective measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities. Such measures will integrate the principles of cleaner production into product design and production processes with the objective of conserving raw materials, energy, and water. Where benchmarking data are available, the client will make a comparison to establish the relative level of efficiency.

With specific reference to GHGs, the Standard states that:

The client will consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project. These options may include, but are not limited to, alternative project locations, adoption of renewable or low carbon energy sources, sustainable agricultural, forestry and livestock management practices, the reduction of fugitive emissions and the reduction of gas flaring.

For projects that are expected to or currently produce more than 25,000 tonnes of CO_2-equivalent annually, the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary, as well as indirect emissions associated with the off-site production of energy used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.

As the BGHES is expected to produce more than 25,000 tonnes of CO_2-equivalent annually, the project is required to undertake consideration of the emissions associated with the BGHES during its initial design and later operational stages. "Project-related" should be considered to include any emissions related to the construction and operation of the BGHES.

1.3.4 African Development Bank (AfDB) Standards

The AfDB clearly sets out that the impact of climate change on the sustainability of investment projects, and the contribution of projects to global GHG emissions must be systematically considered.

This is outlined as an Operational Standard (OS 4) within its Integrated Safeguards System: "*Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency – This safeguard covers the range of impacts of pollution, waste, and hazardous materials for which there are agreed international conventions and comprehensive industry-specific standards that other multilateral development banks follow. It also introduces vulnerability analysis and monitoring of greenhouse gas emissions levels and provides a detailed analysis of the possible reduction or compensatory measures framework*" [4].

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[1] Government of Zimbabwe, Ministry of Environment, Water and Climate. Available online at: https://www.climatechange.org.zw/sites/default/files/National%20Climate%20Change%20Response%20Strategy.pdf

[2] http://newfour.ncuwash.org/wp-content/uploads/2017/08/Zimbabwe-Climate-Policy-2016.pdf

[3] International Finance Corporation, Performance Standard 3, 2012

[4] African Development Bank Group's Integrated Safeguards System, 2013

1.3.5 European Investment Bank (EIB) Standards

The EIB's Environmental and Social Handbook [1] has Climate Standards which require it's financing to be aligned with EU climate policy. Of particular note, the EIB is committed to: assessing and reporting the carbon footprint of EIB financed investment projects, their annual aggregate GHG emissions and savings. These are published in the EIB's Annual Report for each year of finance contract signature [2].

1.3.6 European Bank for Reconstruction and Development Bank (EBRD) Standards

The EBRD's Protocol for Assessment of GHG Emissions [3] sets out its methodology for how consultants should assess the GHG emissions from projects. The EBRD has assessed the impact on GHG emissions of its direct investments (loan and equity) since 2003. Summaries have been published in the Bank's annual Environmental or Sustainability Reports since that date. Although in most years all direct investment projects with emissions, or emissions savings, exceeding 20 kt CO_2e per annum have been assessed, the focus has been on large projects, i.e. those emitting > 100 kt per annum, mainly in the energy and industrial sectors, which dominate the portfolio GHG footprint.

1.3.7 Hydro-Electric Electricity Generation in Context

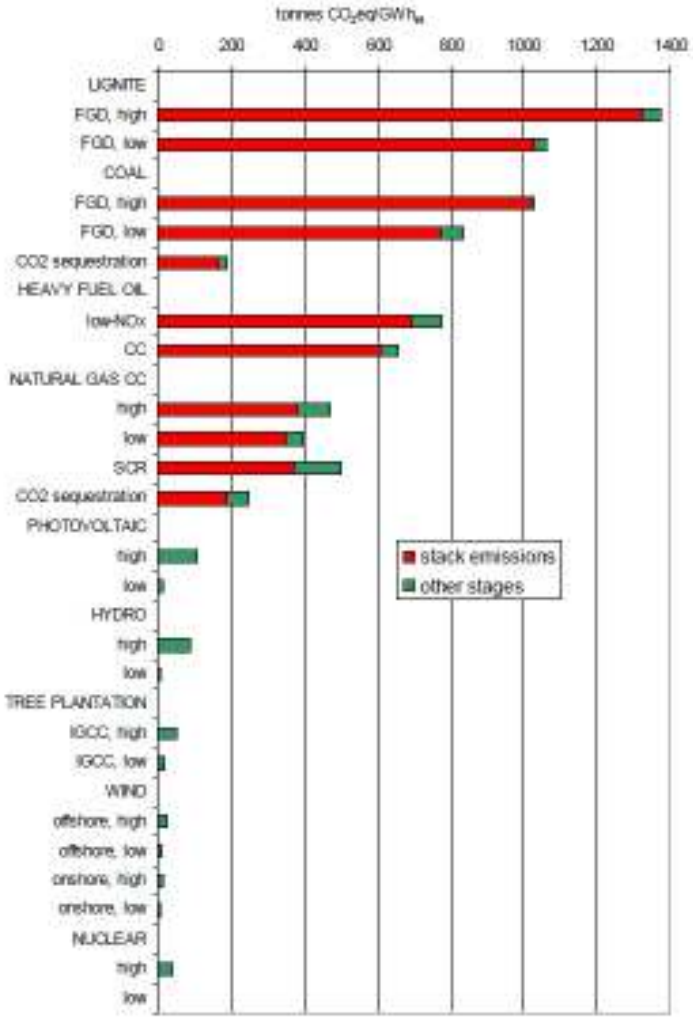
Figure 1.1 shows the relative contribution of GHG emissions from the different lifecycle stages over the lifetime of different power generation technologies, clearly showing the GHG benefit of power generation through hydro-electricity in comparison with other more GHG intensive technologies. *Figure 1.2* shows GHG emissions over the lifecycle of different hydropower technologies based on a literature review of studies since 1980 carried out by the Intergovernmental Panel on Climate Change (IPCC). *Figure 1.2* shows that GHGs (carbon dioxide and methane) associated with the construction and operation of hydro-electric projects are largely due to the decay of reservoir biomass (inundated areas). Moreover, *Figure 1.2* shows there is significant variation between schemes depending on the size of the inundated area and the vegetation type and extent of coverage within it.

[1] European Investment Bank, Environmental and Social Handbook, 2018

[2] European Investment Bank, Environmental and Social Handbook, 2013

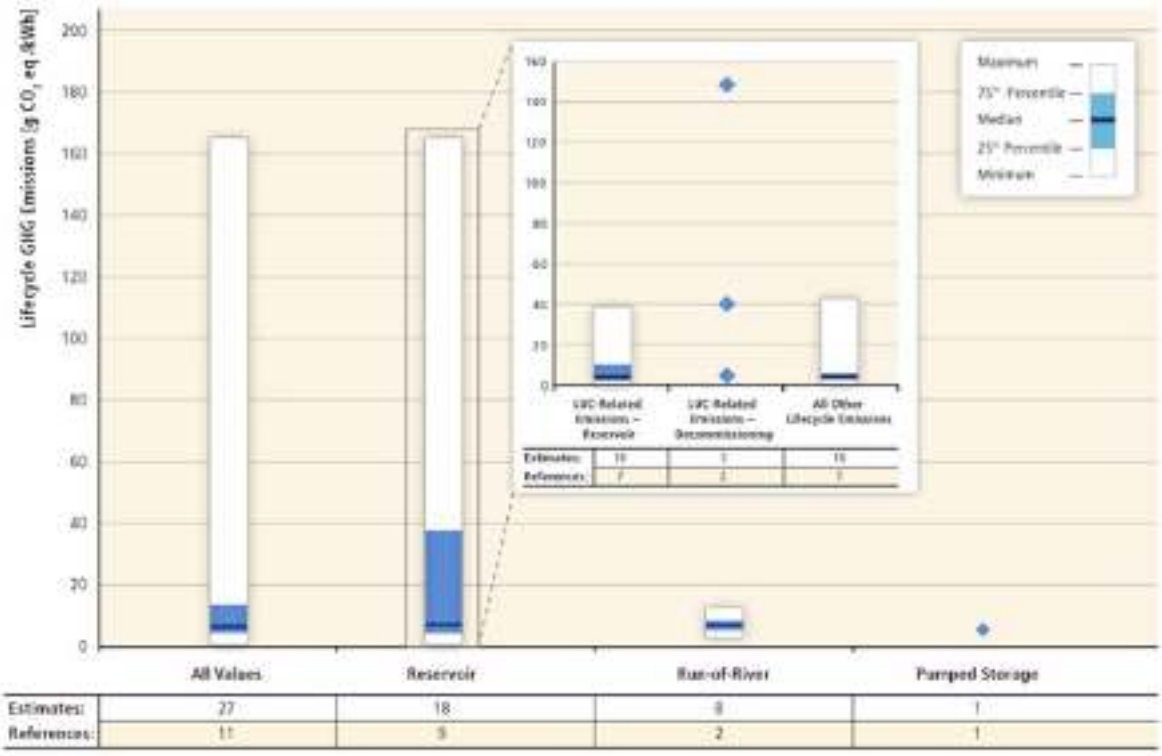
[3] European Bank for Reconstruction and Development Bank, Protocol for Assessment of Greenhouse Gas Emissions, 2010

Figure 1.1 Lifecycle Emissions from Operation of Power Generation Technologies [1]



[1] Source: World Energy Council, taken from http://www.worldenergy.org/wp-content/uploads/2012/10/PUB_Comparison_of_Energy_Systens_using_lifecycle_2004_WEC.pdf

Figure 1.2 Lifecycle GHG Emissions from Different Hydropower Technologies [1]



[1] Source: Kumar, A., T. Schei, A. Ahenkorah, R. Caceres Rodriguez, J.-M. Devernay, M. Freitas, D. Hall, Å. Killingtveit, Z. Liu, 2011: Hydropower. In IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

2. BASELINE

The baseline for GHG emissions prior to the development of the BGHES (i.e. – prior to the construction phase) is defined as zero for the purposes of this impact assessment, as it is understood that BGHES will provide additional capacity to meet energy demand rather than displacing existing grid capacity. Construction and operational activities will lead to incremental increases in GHG emissions, primarily due to the consumption of fuel and land use changes.

For context, the annual national emissions of Zimbabwe were 59.9 million tonnes of carbon dioxide equivalent ($MtCO_2e$) in 2010, whilst annual national emissions of Zambia were 396.4 million tonnes of carbon dioxide equivalent ($MtCO_2e$) in 2010. These figures represented 0.12% and 0.78% of global emissions in 2010 (global emissions amounted to 50,911 million tonnes of carbon dioxide equivalent ($MtCO_2e$) [(1)].

2.1 National GHG Inventories for Zimbabwe and Zambia

Zimbabwe submitted its Third National Communication Update Report (NC3) to the UN Framework Convention on Climate Change in 2017 [(2)]. NC3 includes information on Zimbabwe's greenhouse gas inventory for the year 2006, measures to reduce emissions (mitigation) and adaptation to climate change.

Zambia submitted its Second National Communication Update Report to the UN Framework Convention on Climate Change in 2014 [(3)]. NC2 summarises the national GHG inventory for the year 2000.

Given that the National Communication reports for Zimbabwe and Zambia only include GHG emissions data up to 2006 and 2000 (respectively), UNFCCC (United Nation Framework Convention on Climate Change) 2010 data has been used in this assessment [(4)].

Table 2.1 summarises Zimbabwe and Zambia's emissions from 1990 to 2012, compared with total global emissions. Zimbabwe and Zambia had an estimated 72.1 and 320 million tCO_2e (respectively) in 2012, excluding the emissions from land use, land use change and forestry. The countries were therefore responsible for 0.13% and 0.59% (respectively) of global emissions in 2012 and are considered to be low emitters. However, between 1990 and 2012, national emissions grew by 105% in Zimbabwe and 53% in Zambia, whilst global emissions increased by 41% over the same period.

The data available are not sufficiently detailed to show the sector emissions specifically associated with energy for Zimbabwe and Zambia.

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(1) Source: Country information from UNFCCC (UNFCCC, 2010), data on current emissions and their share of global emissions including LULUCF from JRC/PBL (2012) (EDGAR 4.2 FT2010): http://edgar.jrc.ec.europa.eu/overview.php https://edgar.jrc.ec.europa.eu/overview.php?v=GHGts1990-2012

(2) Source https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-update-reports-non-annex-i-parties/national-communication-submissions-from-non-annex-i-parties

(3) Source: https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-update-reports-non-annex-i-parties/national-communication-submissions-from-non-annex-i-parties

(4) Country information from UNFCCC (UNFCCC, 2010), data on current emissions and their share of global emissions including LULUCF from JRC/PBL (2012) (EDGAR 4.2 FT2010): http://edgar.jrc.ec.europa.eu/overview.php https://edgar.jrc.ec.europa.eu/overview.php?v=GHGts1990-2012

Table 2.1 World, Zimbabwe and Zambia GHG Emissions [1]

		1990	2000	2010	2011	2012
World	Total Mt CO_2e, excluding LULUCF	38,232.0	40,563.0	50,911.0	53,197.0	53,937.0
Zimbabwe	Total Mt CO_2e, excluding LULUCF	35.1	51.4	71.0	71.6	72.1
	Relative to 1990 base %	-	46.5	102.3	1.309	105.3
Zambia	Total Mt CO_2e, excluding LULUCF	209.6	290.8	319.8	320.0	320.3
	Relative to 1990 base %	-	38.7	52.5	52.6	52.8

[1] Source: https://edgar.jrc.ec.europa.eu/overview.php?v=GHGts1990-2012&sort=asc1

3. METHODOLOGY

3.1 GHG Emissions Calculations

3.1.1 Introduction

The calculation of GHG emissions arising from the BGHES has been calculated using the design specifications provided by the design engineers for the BGHES (Studio Pietrangeli Consulting Engineers (SP)) and for a construction period of 7 years.

The carbon footprint for both the construction and operational phases have been estimated using the documents listed below:

- Greenhouse Gas (GHG) Protocol: Corporate Accounting & Reporting Standard (World Resources Institute/World Business Council for Sustainable Development [(1)];
- Intergovernmental Panel on Climate Change (IPCC) 2006 GHG Inventory guidelines [(2)];
- IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation [(3)];
- Green Investment Group - Green Impact Reporting Criteria [(4)];
- ACM0002 - Large-scale Consolidated Methodology Grid-connected electricity generation from renewable sources (v.19.0) [(5)];
- FAO Global Forest Resources Assessments (GFRA) [(6)];
- UK Government GHG Conversion Factors for Company Reporting [(7)] ;
- IFI (Interim) Dataset of Harmonized Grid Factors (v.1.016) [(8)]; and
- IGES List of Grid Emission Factors 2019 (v.10.4) [(9)]

The GHG Protocol Corporate Accounting & Reporting Standard divides emissions into three 'Scopes', which are defined as:

- **Scope 1** – direct emissions from sources owned or under the operational control of the company;
- **Scope 2** – indirect emissions from the consumption of purchased electricity; and
- **Scope 3** – indirect emissions an optional reporting category allowing for other indirect emissions associated with, but not controlled by the company.

Emission estimates for BGHES cover those which are under their direct operational control (scopes 1 & 2), with some limited coverage of indirect emissions (scope 3).

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(1) Available online at : https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

(2) Available online at: https://www.ipcc-nggip.iges.or.jp/public/2006gl/

(3) IPCC, 2011 – Ottmar Edenhofer, Ramón Pichs-Madruga, Youba Sokona, Kristin Seyboth, Patrick Matschoss, Susanne Kadner, Timm Zwickel, Patrick Eickemeier, Gerrit Hansen, Steffen Schloemer, Christoph von Stechow (Eds.) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1075 pp.Available from Cambridge University Press, The Edinburgh Building Shaftesbury Road, Cambridge CB2 2RU ENGLAND

(4) Available online at: http://greeninvestmentgroup.com/media/157426/gig_green_reporting_1017_02.pdf

(5) Available online at: https://cdm.unfccc.int/filestorage/5/8/I/58IAGB7SZUDEO2VN6LYM30K41HFPRQ/EB100_repan06_ACM0002.pdf?t=elJ8cHdqazN2fDBdFaeroak0uJq7GZc-_jUp

(6) Available online at: http://www.fao.org/forest-resources-assessment/en/

(7) 2018 emission factors available online at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

(8) Available online at: http://greeninvestmentgroup.com/media/185865/ifi_interim_dataset_of_harmonized_grid_factors_v1-0-with-cover.xlsx

(9) Available online at: https://pub.iges.or.jp/pub/iges-list-grid-emission-factors

Good practice dictates the use of actual activity data (e.g. litres of diesel consumed) for calculating a carbon footprint. Given that the BGHES involves an estimation of a future carbon footprint for activities yet to begin, a number of assumptions have been made in order to forecast the activity data required to undertake this GHG assessment. Calculation assumptions have been referenced within the relevant sections of this repot and are set out within the calculation spreadsheets (*Appendix A*). It should be noted that limited detail around BGHES construction and operation was available from SP at the time of this assessment. Calculations have therefore been undertaken on the basis of limited data, assumptions and experience of previous hydro-electric projects.

When assessing GHG emissions through the operational phase of BGHES, we have assumed full, normal operability.

3.1.2 Impact Assessment Methodology

A traditional impact assessment is conducted by determining how the proposed activities will affect the state of the environment described in the baseline (*Section 2*). In the case of GHG emissions, this process is complicated by the fact that the potential impact of GHG emissions on the environment cannot be quantified within a defined space and time.

As mentioned, the greenhouse effect occurs on a global basis and the specific source of GHG emissions cannot be linked directly to the future potential impact on the climate or on the BGHES geography. In the absence of such causal links, this *Section* presents a methodology that provides an appropriate and practical link between the GHG emissions of the BGHES and the impact assessment process adopted for this assessment.

The magnitude of GHG emissions from the BGHES has been compared to national and international (i.e. IFC) GHG emissions criteria [(1)].

Identifying Impact Magnitude

The magnitude of GHG emissions is defined as the tonnes of carbon dioxide equivalent (tCO_2e), emitted. GHG emissions which should be included in a GHG assessment, as stated by the GHG protocol Corporate Accounting & Reporting Standard (refer to *Section 3.1.1*), are the six greenhouse gases covered by the Kyoto Protocol. These are:

- Carbon dioxide (CO_2),
- Methane (CH_4),
- Nitrous oxide (N_2O),
- Hydrofluorocarbons (HFCs),
- Perfluorocarbons (PFCs), and;
- Sulphur hexafluoride (SF_6)

The quantity of these gases emitted must be multiplied by the gas' global warming potential (GWP) to convert this into tonnes CO_2e. *Table 3.1* shows the latest 100 year time horizon GWP's, relative to CO_2 are set out within the IPCC's Fifth Assessment Report, 2014 (AR5) [(2)].

[(1)] International Finance Corporation Performance Standard 3 – Resource Efficiency and Pollution Prevention (2012)

[(2)] IPCC's Fifth Assessment report, 2014 available online at https://www.ipcc.ch/assessment-report/ar5/

Table 3.1 Global Warming Potential Values

GHG	Fifth Assessment Report (AR5)
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous oxide (N_2O)	265
Hydrofluorocarbons (HFCs)	4 - 12,400
Perfluorocarbons (PFCs)	6,630 – 11,100
Sulphur hexafluoride (SF_6)	23,500

In the absence of national laws relating to the magnitude of GHG emissions from project developments, international standards are used to place project emissions into perspective.

Table 3.2 shows a potential magnitude scale for project-wide GHG emissions that is derived from, and in line with, reporting thresholds adopted by a number of current international lender organisations or groupings, such as the IFC Standards, the European Bank for Reconstruction and Development (EBRD) GHG assessment methodology [(1)] and the Equator Principles [(2)].

Table 3.2 Magnitude Scale for Project-Wide GHG Emissions

Project-Wide GHG Emissions / annum	Magnitude Rating
>1,000,000 tCO_2e	Very Large
100,000 – 1,000,000 tCO_2e	Large
25,000 – 100,000 tCO_2e	Medium
5,000 - 25,000 tCO_2e	Small
<5,000 tCO_2e	Negligible

The IFC's Performance Standard 3 defines a reporting threshold for annual GHG emissions of 25,000 tonnes of CO_2 equivalent (tCO_2e) and, as mentioned in *Section 1.3.3*, requires clients to "…*consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project*".

An annual GHG emissions threshold of 25,000 tCO_2e has also been adopted by the EBRD within its Environmental and Social Policy [(3)]. This updated policy reduces the GHG reporting threshold within projects that the EBRD supports from 100,000 to 25,000 tCO_2e / year and requires annual client quantification and reporting of these emissions. EBRD guidance on assessment of GHG emissions also defines a series of categories and thresholds for different project types (shown in Table 3.3). Hydroelectric power generation projects are considered likely to fall into the EBRD's 'Low' category.

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(1) EBRD Methodology for Assessment of Greenhouse Gas Emissions (2010) http://www.ebrd.com/downloads/about/sustainability/ghgguide.pdf

(2) Available online at: http://www.equator-principles.com/index.php/ep3

(3) EBRD Environmental and Social Policy, 2014. Available online at: https://www.ebrd.com/downloads/research/policies/esp-final.pdf

Table 3.3 EBRD GHG Emissions Reporting Categories

GHG Emissions / annum	Magnitude Description
> 1,000,000 tCO_2e	High
100,000 – 1,000,000 tCO_2e	Medium-High
20,000 – 100,000 tCO_2e	Medium-Low
< 20,000 tCO_2e	Low
Not defined	Negligible

The Equator Principles require all projects, in all locations, to conduct an alternatives analysis to evaluate less GHG intensive alternatives when combined Scope 1 and Scope 2 operational emissions are expected to be more than 100,000 tCO_2e annually. In addition, the Equator Principles require that "*the client (should) report publicly on an annual basis on GHG emission levels (combined Scope 1 and Scope 2 emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually. Clients will be encouraged to report publicly on Projects emitting over 25,000 tonnes*."

Determining Significance

The receptor for GHG emissions is the global climate, and the natural and societal systems and infrastructure which the climate will influence.

In order to conclude whether the potential impact from GHG emissions is deemed significant or not, a risk classification approach is used. The approach is derived from classic risk assessment terminology, which involves the expression of risk as the consequence of the event multiplied by the probability of that event. The environmental assessment equivalent is the magnitude of the impact multiplied by the likelihood of the impact. Impact magnitude is a function of the potential intensity of the impact, moderated by the extent and duration of that impact. Expressed mathematically impact significance is:

Impact significance = (intensity + extent + duration) × likelihood

When considering GHGs, the extent and duration of the potential impact will always be the same. The extent is international as it is the total stock of world GHG emissions (leading to the greenhouse effect) that are directly increased due to the impact of a project. The greenhouse effect is transboundary and so global emissions and national emissions are both directly affected. The duration of the impact is regarded as permanent as the persistence of carbon dioxide in the atmosphere ranges between 100 and 300 years [(1)] and continues beyond the life of the project. Therefore, the magnitude of the potential impact is directly related to the intensity, or volume of emissions. Likelihood can be defined as 'Unlikely', 'Seldom/Occasional' or 'Likely' (see Table 3.4).

Table 3.4 Likelihood Definitions

Likelihood	Criteria
Unlikely	Reasonable to expect that the consequence will not occur at this facility during its lifetime.
Seldom/Occasional	Exceptional circumstances/conditions may allow the consequence to occur within the facility lifetime.
Likely	Consequence can reasonably be expected to occur within the life of the facility.

[(1)] Carbon Dioxide Information Analysis Centre (CDIAC) - http://cdiac.ornl.gov/pns/current_ghg.html Last accessed: 30/01/2015

The magnitude of a potential impact and the likelihood have been assessed in combination to evaluate whether a potential GHG impact is significant and if so, its degree of significance. This is illustrated in Table 3.5.

Table 3.5 GHG Impact Significance Rating

		LIKELIHOOD		
		Unlikely	**Seldom/ Occasional**	**Likely**
MAGNITUDE	**High**	**Major**	**Major**	**Major**
	Medium-High	**Moderate**	**Major**	**Major**
	Medium-Low	**Minor**	**Moderate**	**Major**
	Low	**Negligible**	**Minor**	**Minor**
	Negligible	**Negligible**	**Negligible**	**Negligible**

4. IMPACT ASSESSMENT

As discussed in *Section 3*, it is not possible to link emissions from a single source, such as the BGHES, to particular impacts in the broader study area. This study, therefore, looks at the potential impact of the BGHES on Zimbabwe and Zambia's National GHG Inventory and the likely implications of this rather than the potential physical impacts of climate change.

A full outline of data used and assumptions made is included in data supplied within the calculation spreadsheets (*Appendix A*). It should be noted that limited detail around BGHES construction and operation was available from SP at the time of this assessment. Calculations have therefore been undertaken on the basis of limited data, assumptions and experience of previous hydro-electric projects.

GHG sources associated with the construction and operation of the BGHES are listed within Table 4.1. Due to a number of factors, not all of the listed emission sources have been included within the assessment. Reasons for exclusion are also provided within Table 4.1.

Table 4.1 Emission Sources during Construction and Operation

Project Phase	Source	Included	Reason for Exclusion
Construction	Transport of materials (for the dam, access roads and transmission lines)	Yes	N/A
Construction	Transport of generation equipment	No	No data on equipment type, weight, volume, origin, mode of delivery transport, pre-assembly was available for ERM use at the time of the assessment.
Construction	On-site fuel use	Yes	N/A
Construction	Land use change of Project areas (including dam site, project townships, access roads and for transmission lines)	Yes	Land use change associated with the potential quarry sites excluded due to lack of available data and also uncertainty around whether these area(s) will be excavated.
Construction	Quarry emissions (quarrying and internal transportation)	No	Excluded due to uncertainty of the extent of the quarry areas. In addition lack of available data (e.g. quantity of aggregate required, machinery employed) meant that it was not possible to develop a proxy GHG figure for this activity.
Construction	Construction of two project townships	No	Constriction of the two project townships was excluded due to lack of available data around these activities. Land use change associated with the two project townships was included (see above).
Construction	Waste management activities	No	Given the uncertainty on exact details for waste management of the BGHES, emissions associated with BGHES construction waste is classified as scope 3 (indirect). It is understood that extracted materials (which will make up the majority of

Project Phase	Source	Included	Reason for Exclusion
			construction waste), will be diverted to form construction aggregate. As a result a significant proportion of the construction waste is reused onsite. Should any of the extracted material be sent for landfill, it is considered to be a low emitting material, so would likely have minimal GHG implications. No data was available on other construction wastes (quantity, composition, disposal route), however it is unlikely that these waste streams will be significant.
Operation	Decay of reservoir biomass (inundation)	Yes	N/A
Operation	On-site fuel use during site operation (Operations and Maintenance - vehicle movements)	Yes	N/A
Operation	Waste management activities:	No	Given the uncertainty on exact details for waste management of the BGHES, emissions associated with BGHES operational waste is classified as scope 3 (indirect). No data was available on operational wastes from BGHES or the two project townships (quantity, composition, disposal route), however it is unlikely that these waste streams will be significant. It is likely that the two project townships will not remain in the direct control of BGHES following construction. In this instance, domestic waste from the two project townships would not be part of the BGHES waste inventory.
Operation	Operation of the two project townships	No	Emissions associated with the operation of the project townships have been excluded from the assessment due available data. It is likely that the two project townships will not remain in the direct control of BGHES following construction, in which case all emissions associated with the townships will be categorised as scope 3 (indirect).
Operation	Sulphur hexafluoride (SF_6) and refrigerants, within electrical circuit	No	No data on the possible use of SF_6 within electrical circuit breakers or refrigerants within air cooling units was available and

Project Phase	Source	Included	Reason for Exclusion
	breakers/switchgear and air cooling units.		therefore potential fugitive emissions from these sources have been excluded from the assessment.

4.1 Construction Impacts

4.1.1 Transport of Materials Emissions

Emissions are associated with the transport required to deliver materials, predominantly cement, fly ash and steel to and around the BGHES construction areas. It has been assumed that the vehicles used for delivery of raw materials to and around the site will be owned and operated by BGHES and therefore sit within the scope 1 emissions category.

The base data provided by SP for undertaking the calculation estimates is shown in Table 4.2. According to SP, there will not be any aggregate transportation to the site, as it is intended that excavated material will be used as an aggregate in the concrete required for construction. If the aggregate is of insufficient quality, it is intended that alternative aggregate will be extracted from the on-site quarry. In the absence of certainty on data around the potential quarry sites, emissions associated with this activity (quarrying and transportation) have been excluded from the GHG assessment.

In the absence of data, transportation of materials associated with construction of the two project townships has been excluded from the assessment, as has emissions around transportation of generation equipment.

Table 4.2 Materials Requiring Transportation

Construction Location	Item	Volume	Unit
Dam and associated generation areas	Cement	65,143	tonnes
Dam and associated generation areas	Reinforcing Steel	8,571	tonnes
Transmission lines	Steel lattice towers	1,517	tonnes
Transmission lines	Cement	150	tonnes
Road	Construction material	67,168	tonnes

In the absence of data, a range of assumptions were made around the transportation vehicles used and distance travelled to the collection points. Based on estimated volumes (set out in Table 4.2), number of trips /total distance were calculated and the estimated tCO_2e calculated (set out in Table 4.3).

Table 4.3 Emissions Associated with Transportation of Materials

Part of Journey	Total Journeys (number)	Total Distance (km)	Conversion	Total
Full Leg	6,480	259,181	0.89125 kg CO_2e/km	231 tCO_2e
Empty (return) leg	6,480	259,181	0.67174 kg CO_2e/km	174 tCO_2e
Total				405 tCO_2e

Construction emissions associated with materials transport were estimated as an average 57.9 tonnes CO_2e per year over the construction period [1], equating to 405 tCO_2e over the whole construction period. On the basis of the estimations set out above, annual construction emissions associated with transport of materials therefore amount to less than 1% of Construction Activity Fuel Use Emissions.

Construction emissions associated with materials transport are classified as having a **Low** magnitude according to the EBRD GHG emission reporting categories (refer to *Table 3.3* in *Section 3.1.2*) and emissions likelihood is considered to be **Likely** (see *Table 3.4* likelihood definitions). As a result, the average annual emissions and are considered to be **Minor**, as set out within the GHG Impact Significance Rating matrix (*Table 3.5* in *Section 3.1.2*).

4.1.2 On-Site Fuel Use Emissions

There will be demand for fuel for excavation and construction machinery and on-site power generation (including power generation for the project townships). Table 4.4 shows fuel demands associated with the BGHES. The calculation is based on an estimated daily consumption of mineral diesel over a 7 day working week, provided by SP.

Table 4.4 On-Site Fuel Use for Construction Activities

Area	Item	Value	Conversion	Annual Emissions
Fuel use for excavation & construction machinery and on-site power generation	1,274,000 Mineral diesel	litres per year	2.688 kg CO2e/litre	3,424 tCO2e

Construction emissions associated with the excavation and construction machinery and on-site power generation have been estimated as 3,424 tCO_2e/year, equating to 23,970 tCO_2e over the whole construction period (7 years). On the basis of the estimations set out above, annual fuel use emissions are estimated to be less than 5% of average annual construction emissions.

Construction emissions associated with on-site fuel use are classified as having a **Low** magnitude according to the EBRD GHG emission reporting categories (refer to *Table 3.3* in *Section 3.1.2*) and emissions likelihood is considered to be **Likely** (see *Table 3.4* likelihood definitions). As a result, the average annual emissions and are considered to be **Minor**, as set out within the GHG Impact Significance Rating matrix (*Table 3.5* in *Section 3.1.2*).

4.1.3 Land Use Change Emissions

GHG emissions will result from land clearance in the areas required for construction of BGHES infrastructure and inundation following construction of the dam. GHGs resulting from clearance will be determined by the current use of the land, and how much carbon is estimated to be stored within it. The different land uses and their associated areas for BGHES are shown in Table 4.5. The area totals for each of the land use types has been calculated from data provided within the BGHES documentation or estimated, based on likely areas. It is understood that the reservoir area will not be cleared of vegetation extensively before inundation.

SP have indicated that in the first instance excavation materials from BGHES will be used as aggregate for the BGHES construction. Should this aggregate be of insufficient quality or quantity, it is understood that aggregate will be taken from the proposed quarry sites. According to SP, there is still uncertainty

[1] Distribution of materials transport within the construction period is unknown. In order to provide an average annual emissions figure, the total construction emissions associated with materials transport, it has been assumed that transport is spread evenly across the 7 year construction period.

on data around the potential quarry sites. As a result of this uncertainty, emissions associated with land use change across the potential quarry areas has been excluded from the calculations.

Table 4.5 Land Use Types and Total Areas of Land Use Change

Current land use	Area	Units	Existing land use	Conversion	Units
Transmission lines	0.44	ha	Wooded Grassland	165	tCO_2e/ha
Roads	178.00	ha	Wooded Grassland	165	tCO_2e/ha
Project townships	420.00	ha	Wooded Grassland	165	tCO_2e/ha
Impoundment area	2,200.00	ha	Wooded Grassland	165	tCO_2e/ha
Surface power plants, switch yards and batching areas	0.30	ha	Wooded Grassland	165	tCO_2e/ha
Total land area changed	**2,799.00**	**ha**	**Wooded Grassland**		
Converted totals	**461,835.00**	**tCO_2e**			

Construction emissions associated with the land use change have been estimated at 461,835 tCO_2e. The majority of emissions associated with land use change will occur at the time of the disturbance, which is likely to occur towards the beginning of the construction phase. In the absence of detailed information around construction schedules, land use change emissions have been spread across the 7 year construction period, equating to an estimated annual emission of 65,976 tCO_2e/year.

Whether land use change emissions occur within year 1 or split to provide an average annual emissions across the 7 year constriction period, these emissions account for 99% (emissions occurring within year 1) or 94.9% of average annual construction emissions.

Construction emissions associated with land use change are classified as having a **Medium-High** (emissions occurring within year 1) or **Medium-Low** magnitude (spread equally across the 7 year construction period) according to the EBRD GHG emission reporting categories (refer to *Table 3.3* in *Section 3.1.2*) and emissions likelihood is considered to be **Likely** (see *Table 3.4* likelihood definitions). As a result, the average annual emissions (years 1 to 7) are considered to be **Major** as set out within the GHG Impact Significance Rating matrix (*Table 3.5* in *Section 3.1.2*).

4.1.4 Impact Assessment Summary

The total expected GHG emissions for the 7 year BGHES construction period and associated GHG emission impact significance is summarised in Table 4.6.

Table 4.6 Total Expected Construction GHG Emissions

Item	Estimated annual emissions	Estimated total construction phase emissions	Magnitude Rating	Likelihood	GHG Impact Significance Rating
Transport of materials	57.90	405.1	Low	Likely	**Minor**

Item	Estimated annual emissions	Estimated total construction phase emissions	Magnitude Rating	Likelihood	GHG Impact Significance Rating
Excavation and construction activity	3,424.00	23,970	Low	Likely	**Minor**
Land use change	65,976.00 [1]	461,835	Medium-High to Medium-Low	Likely	**Major**
Total Construction	**69,459 tCO_2e**	**486,210 tCO2e**			**Major**

4.2 Operational Impacts

4.2.1 Decay of Reservoir Biomass Material

Best available research (IPCC) suggests that decay of biomass material in inundated reservoirs leads to emissions of both CO_2 and CH_4 with the main impact occurring during the first 10 years of relevant projects [2]. The IPCC has suggested an approach to calculating these emissions, which takes the total area to be inundated, the climate in which it is situated and multiplies it by estimated daily GHG emissions produced.

It should be noted that in 2017, the International Hydropower Association (IHA) and the UNESCO launched a web based tool (the GHG Reservoir (G-res) Tool) [3], to estimate and report net GHG emissions from planned and existing reservoirs.

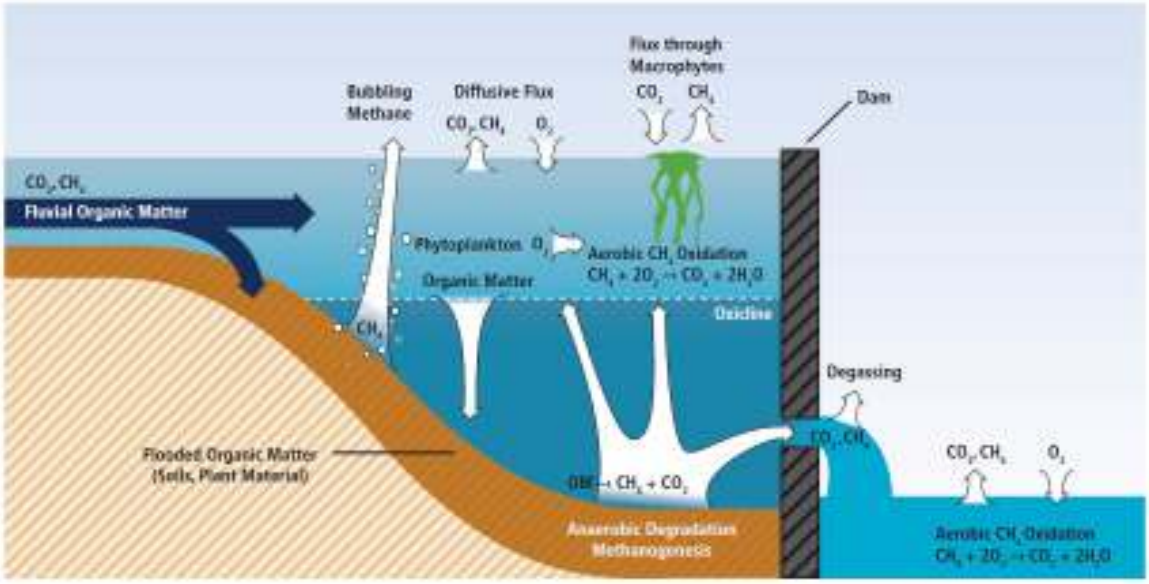
In this instance, the IPCC approach was used because the data constraints from a proposed development allows for a high-level 'Tier-1' estimation of GHG emissions. This only accounts for the diffusive flux emissions across the air-water interface as shown in *Figure 4.1.*

[1] The majority of emissions associated with land use change will occur at the time of the disturbance, which is likely to occur towards the beginning of the construction phase. In the absence of detailed information around construction schedules, land use change emissions have been spread across the 7 year construction period.

[2] IPCC research indicates that emissions are associated with decay of organic matter in the first 10 years following inundation of a previously vegetated area. The best available research indicates that these emissions do not remain beyond this initial period. Source:http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_p_Ap2_WetlandsCO2.pdf

[3] Available online at: https://g-res.hydropower.org/

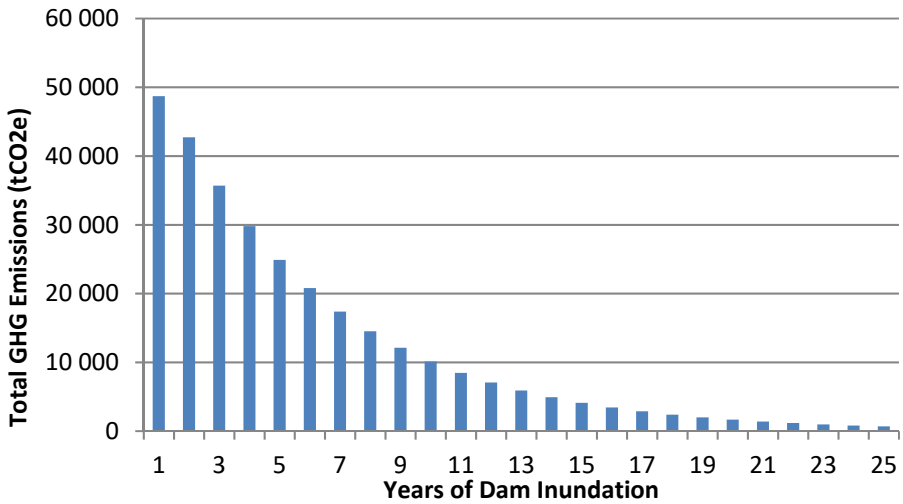
Figure 4.1 Carbon dioxide and Methane Pathways in a Freshwater Reservoir [1]



BGHES is expected to create an inundated area with a surface area of 2,200 ha. Inundation is expected to take approximately four months, leading to 100% inundation at the end of the four month period.

Figure 4.2 shows the estimated emissions throughout the whole 25 year period. Over 25 years, it is estimated that the total GHG emissions emitted from the decay of biomass is 304,594tCO_2e, of which 256,718 tCO_2e (84.3%) occurs during the first 10 years. This is primarily from CO_2 emissions, which account for approximately 74% of the total and 26% is from CH_4.

Figure 4.2 GHG Emissions from Decay of Biomass Material in the BGHES Reservoir



[1] Source: Figure 5.16, Chapter 5; Kumar, A., T. Schei, A. Ahenkorah, R. Caceres Rodriguez, J.-M. Devernay, M. Freitas, D. Hall, Å. Killingtveit, Z. Liu, 2011: Hydropower. In IPCC Special Report on Renewable Energy Sources and Climate Change

Research by the IHA [1] suggests that emissions will decrease in the years following full inundation, falling to 50% of peak emissions by year 8 following inundation; and less than 25% of peak emissions by Year 10 following inundation. The average annual operational emissions are equivalent to 12,184 tCO_2e over a 25 -year period. After 25 years annual operational emissions associated with decaying vegetation are approximately 2% of peak emissions and would continue to decline thereafter.

GHG emissions associated with the decay of biomass material in the BGHES reservoir over the 25 year period amounts to 304,594 tCO_2e, of which 256,718 tCO_2e (84.3%) occurs during the first 10 years.

Operational emissions associated with the decay of biomass material in the BGHES reservoir are classified as having a **Medium-Low** magnitude during the first 6 years of operation and a **Low** magnitude thereafter, according to the EBRD GHG emission reporting categories (refer to *Table 3.3* in *Section 3.1.2*) and emissions likelihood is considered to be **Likely** (see *Table 3.4* likelihood definitions). As a result, the average annual emissions and are considered to be **Major** during the first 6 years and **Minor** thereafter, as set out within the GHG Impact Significance Rating matrix (*Table 3.5* in *Section 3.1.2*).

4.2.2 BGHES Site Operation Emissions

SP were unable to provide any data around O&M (Operations and Maintenance) vehicle movements or on-site fuel consumption during the operational phase of the BGHES at the time of this assessment. As a result, vehicles emissions have been estimated based on an assumed number and length of on-site journeys, multiplied by GHG conversion factors for vehicle emissions per km. In the absence of data, it has been assumed that the O&M vehicle type is a 'van' [2]. Calculations are based on an average van [3]. A total of 75 return journeys, each covering a one-way distance of 10 km per year, (a total of 1,500 km per year) is assumed for the O&M vehicle emissions. On-site fuel consumption has been based on our experience of previous hydro-electric projects. Estimated annual operational emissions are set out in *Table 4.7.*

It is not clear whether the two project townships will remain in the direct control of BGHES following construction; however, in the absence of data, operational emissions associated with the two project townships (likely to comprise fuel and electricity consumption) has been excluded from the assessment.

Sulphur hexafluoride (SF_6) and many refrigerants, including Hydrofluorocarbons (HFCs) are potent GHG's (see *Table 3.1*). No information on the possible use SF_6 within electrical circuit breakers or refrigerants within air cooling units was available and therefore potential fugitive emissions from these sources have been excluded from the assessment.

Table 4.7 Annual Expected Emissions from Site Operations

Item	Estimated Annual Emissions (tCO_2e)
O&M vehicles	0.39
Operations activity, including machinery fuel use, on-site power generation (no imported electricity)	0.40
Total	**0.79**

Operational emissions associated with O&M vehicles and all other operational activity (excluding decay of biomass material) has been estimated as 0.79 tCO_2e/year.

[1] International Hydropower Association, 2010. 'GHG Measurement Guidelines for Freshwater Reservoirs'. Calculation Manual, pp121

[2] a van can be defined as a multipurpose, enclosed boxlike motor vehicle.

[3] Factor taken from UK Government GHG Conversion Factors for Company Reporting 2018 (version 1.01)

Construction emissions associated with site operations (excluding decay of biomass) are classified as having a **Low** magnitude according to the EBRD GHG emission reporting categories (refer to *Table 3.3* in *Section 3.1.2*) and emissions likelihood is considered to be **Likely** (see *Table 3.4* likelihood definitions). As a result, the average annual emissions and are considered to be **Minor**, as set out within the GHG Impact Significance Rating matrix (*Table 3.5* in *Section 3.1.2*).

4.2.3 Impact Assessment Summary

The GHG emission impact significance for during the operational phase of the BGHES is summarised in Table 4.7.

Table 4.7 Operational Phase Impact Rating

Operational Phase Annual Impact		Estimated annual emissions	Estimated total operational phase emissions (1)	Magnitude Rating	Likelihood	Significance
O1	Emissions associated with the decay of reservoir biomass material within the inundated area	Variable	304,594tCO_2e	Medium-Low	Likely	**Major**
O2	Emissions associated with onsite fuel or energy use (O&M transport and Operational Activity)	0.79 tCO_2e	19.75 tCO_2e	Low	Likely	**Minor**

(1) Note – this assumes a period of 25 years.

Based on the data in *Section 2.1*. Zimbabwe and Zambia emitted an estimated 72.1 and 320 million tCO_2e (respectively) in 2012, excluding the emissions from land use, land use change and forestry. The countries were therefore responsible for 0.13% and 0.59% (respectively) of global emissions in 2012, and are considered to be low emitters. However, between 1990 and 2012, national emissions grew by 105% in Zimbabwe and 53% in Zambia, whilst global emissions increased by 41% over the same period.

During the first year of operation, it is estimated that the BGHES emissions, including those from decay of biomass, will increase the national inventory of Zimbabwe (excluding LULUCF) by 0.03% and Zambia by 0.008%, based on 2012 emissions levels (assuming 50/50 split of BGHES emissions by country). It will gradually decrease down to 0.0005 and 0.0001% by year 25 (based on the assumption that BGHES emissions will split equally between the two countries).

The EBRD guidance on assessment of GHG emissions sets out that hydro-electric power generation projects are considered likely to fall into the EBRD's 'Low' category (i.e. <20,000 t CO_2e/year). In line with this assumption, the BGHES is expected to meet this criterial from year 7 of operation (refer to *Figure 4.2* in *Section 4.2.1*).

Based on the calculations undertaken through this assessment, it is identified that from year 5 of operation onwards, BGHES falls beneath the 25,000 tCO_2e significance threshold, set out within the IFC Performance Standard 3 (mirrored by EBRD's 2014 Environmental & Social Policy and the Equator Principle).

5. MITIGATION MEASURES AND RESIDUAL IMPACTS

5.1 Construction

Mitigation of GHG emissions during construction can be achieved through a series of measures that can be included within a Construction and Environment and Social Management Plan. These mitigation measures are split between the impacts, as follows and identified in *Table 5.1.*

1. **Emissions associated with transport of raw materials**:
    a. Type and quantity of raw material
    b. Distance the raw material is transported
    c. Type and efficiency of transportation vehicle
    d. Optimum working conditions for transportation vehicles
2. **Emissions associated with excavation transport**:
    a. Quantity of the subsurface material excavated
    b. Density of excavated subsurface material
3. **Emissions associated with construction activity**:
    a. Type and efficiency of construction vehicles
    b. Optimum working conditions for construction vehicles
    c. Source of on-site power generation
4. **Emissions associated with land use changes**:
    a. Current use of the land (quantity of carbon stored pre construction)

Table 5.1 Mitigation Measures

Impact		Mitigation Measures
C1	Emissions associated with transport of raw materials	■ Where possible, favour the use of raw materials that are easier to transport (lighter less volume) plus consideration for on-site assembly of parts. Where there are limited raw material options, focus should be on optimisation of transportation. ■ Reducing and / or optimising the quantities of construction material transported (dependant of the final dam design and its implementation). ■ Management of transport logistics to ensure efficient carriage of raw materials. ■ Management of voids and compaction of loads to ensure maximum safe payloads are transported. ■ Reducing vehicle idling times through focus on scheduling of construction operations. ■ Where possible, consideration for sourcing of materials from suppliers closest to the construction site. Where local suppliers are not available or their use feasible, focus should be on optimisation of transportation. ■ Prioritise the use of fuel efficient transportation vehicles and ensure regular maintenance of vehicles. ■ Consider using a less carbon intensive fuel (e.g. a biofuel blend), although this needs to be considered in the context of availability. ■ Provide efficient driving guidelines to transportation vehicle drivers, to promote fuel efficiency.
C2	Emissions associated with excavation	■ Prioritise the use of fuel efficient excavation machinery and ensure regular maintenance of machinery. ■ Provide efficient working guidelines to excavation machinery operators, to promote fuel efficiency. ■ Management of transport logistics to ensure efficient carriage of excavated materials. ■ Management of voids and compaction of loads to ensure maximum safe payloads are transported. ■ Reducing vehicle idling times through focus on scheduling of excavation operations. ■ Consider using a less carbon intensive fuel (e.g. a biofuel blend), although this needs to be considered in the context of availability.
C3	Emissions associated with construction activity	■ Prioritise the use of fuel efficient construction vehicles and ensure regular maintenance of vehicles. ■ Provide efficient working guidelines to construction vehicle drivers, to promote fuel efficiency. ■ Reducing vehicle idling times through focus on scheduling of construction operations. ■ Consider using less carbon intensive fuel (e.g. a biofuel blend), although this needs to be considered in the context of availability. ■ Ensuring that on-site power generation is designed, sized and operated for emissions performance as well as reliability. ■ Where possible, minimise the area of land clearance.

Impact		Mitigation Measures
C4	Emissions associated with land use change	■ Reduction in GHG releases through a thorough salvage of commercial timber and fuelwood. It is suggested that a timber survey be carried out to estimate the amount of commercially viable timber that could be recovered from the areas that will be cleared of vegetation during construction. It would then be possible to estimate the amount of biomass that would not release GHGs and reduce the impact from land use change emissions. It is also suggested that once an estimate of commercially viable timber is known, that markets for this are actively sought to make the proposed mitigation as commercially viable as possible. However, it is not believed that the reduction of GHG emissions from this would significantly change the conclusions of this impact assessment. ■ Productive utilisation of biomass material (wood) subsequent to land clearance. This will also serve to reduce the use of wood harvested away from the proposed inundation area for wood fuel for use by local communities, which is the current practice. ■ Consider planting/re-planting of suitable indigenous trees around the complex.

It should be noted that whilst each of these mitigation measures represents a small potential reduction in GHG, the reality of the BGHES and its location are likely to dictate whether the mitigation measures suggested are practical or feasible.

5.2 Operation

GHG emissions associated with the operation of BGHES are primarily linked to the decay of reservoir biomass material within the inundated area; however, some measures associated with on-site fuel or energy use have been identified, as set out in *Table 5.2*. An additional measure has been identified, relating to the potential use of SF6 and refrigerants during operation: Ensure management controls that minimise the potential for losses or leakage of these substances and track any emissions that occur during operation.

Table 5.2 Operational Mitigation Measures

Impact		Mitigation Measures
O1	Emissions associated with onsite fuel or energy use	■ Prioritise the use of fuel efficient on-site vehicles and ensure regular maintenance of vehicles.
O2	Emissions associated with the decay of reservoir biomass material within the inundated area	■ Reduction in GHG releases through a thorough salvage of commercial timber and fuelwood. ■ Consider planting/re-planting of suitably indigenous trees around the complex.

5.3 Residual Impacts

Table 5.3 identifies the residual impact significance ratings for both the construction and operation impacts. It should be noted that whilst improvements/reductions in GHG emissions can be achieved through identified mitigation measures, the emission sources identified cannot be completely removed from BGHES construction and operation activities, and therefore residual emissions will remain (likely falling within the identified significance category). Further in depth quantification of residual emissions would require a more detailed understanding of construction and operational activities alongside likely adoption of mitigation.

Table 5.3 Residual Impact Assessment Rating

Impact		Magnitude Rating (post-mitigation)	Likelihood	Significance (post-mitigation)
C1	Annual emissions associated with transport of raw materials	Low	Likely	**Minor**
C2/C3	Annual missions associated with excavation and construction activity	Low	Likely	**Minor**
C4	Emissions associated with land use change [1]	Medium-Low to Medium-High	Likely	**Major**
O1	Emissions associated with the decay of reservoir biomass material within the inundated area	Medium-Low	Likely	**Major**
O2	Emissions associated with onsite fuel or energy use (O&M transport and Operational Activity)	Low	Likely	**Minor**

Note: For further information detailing the methodological approach for the calculation of magnitude ratings refer to *Section 3*. These Tables present the magnitude scale categories for the BGHES wide GHG emissions and is in line with the EBRD GHG Emissions Reporting Categories.

[1] Whether considering land use change emissions occurring within year 1 of construction only or split to provide an average annual emissions across the 7 year constriction period.

APPENDIX A OVERVIEW OF EMISSION CALCULATION SHEETS

GHG Assessment of BGHES

Scope

For compatibility with the IFC standards and Equator Principles, a Greenhouse Gas (GHG) GHG emissions assessment of the BGHES Project will be carried out using established methods and principles and will:

- be carried out in conformity with the IFC Performance Standard 3 on Resource Efficiency and Pollution Prevention, and will follow internationally recognised methodologies and good practice (as provided by the IPCC, other international organisations, and any Zimbabwe/Zambia Governmental requirements);
- include a quantification of direct emissions from the construction and operation of the proposed Project, as well as any indirect emissions associated with the off-site production of energy used by the Project;
- use and present a robust, clear and defendable methodology;
- consider the magnitude of annual Project GHG emissions within the context of IFC Guidelines thresholds and Zimbabwe/Zambia's national GHG emissions;
- consider technically and financially feasible options for the reduction of GHG emissions in summary form.

Assessment Results

Construction Emissions	***Year***	*Materials Transport*	*Excavation Transport*	*Construction Activity*	*Land Use Change*	***Total***
(t CO2e)	1	57.87	0	3424	461835	465,317
	2	57.87	0	3424		3,482
	3	57.87	0	3424		3,482
	4	57.87	0	3424		3,482
	5	57.87	0	3424		3,482
	6	57.87	0	3424		3,482
	7	57.87	0	3424		3,482
Total Construction (years 1-7)		405.10	0.0	23,970	461,835	**486,210**
Total Annual emissions (equal distribution)		57.87	0.00	3,424	65,976	**69,459**
Total Annual emissions (100% LUC emissions in yr. 1)		57.87	0.00	3,424	461,835	**465,317**

Operational Emissions	***Year***	*O & M Transport*	*Operational Activity*	*Reservoir Emissions*		***Total***
(t CO2e)	1	0.39	0.40	48,702		***48,703***
	2	0.39	0.40	42,713		***42,714***
	3	0.39	0.40	35,684		***35,684***
	4	0.39	0.40	29,806		***29,807***
	5	0.39	0.40	24,897		***24,898***
	6	0.39	0.40	20,796		***20,796***
	7	0.39	0.40	17,370		***17,371***
	8	0.39	0.40	14,509		***14,509***
	9	0.39	0.40	12,119		***12,119***
	10	0.39	0.40	10,122		***10,123***
	25	0.39	0.40	680		***681***
Total years 1 to 25		9.75	10.00	304,594		***304,614***
	%	0.00320077	0.003282841	99.99351639		100 %
Average annual emissions		0.39	0.4	12,183.8		12184.5664

Context: Total life cycle emissions over 50 years dam lifetime

Annual generation (GWh)	10,046		
Lifetime generation (GWh)	502,300		**tCO2e per GWh (dam lifetime)**
Total construction emissions (tCO2e)		24,375	0.05
Total LUC emissions (tCO2e)		461,835	0.92
Total operational emission - excluding decay (tC		71	0.00014
Total decay emissions over 25 years (tCO2e)		304,594	0.61
Total tCO2e per GWh		2	

CONSTRUCTION ACTIVITY DATA							
Name	**Value**			**Unit**	**Fuel Type**	**Source**	**Notes**
	Year 1	Year 2	Year 3				
Construction Phase							
Materials Transport							
Dam, transmission lines and road: Aggregate	0			tonnes			Aggregate assumed to be taken from excavation volume
Dam and associated generation areas: Cement	65143			tonnes			The main bulk of cement is in the dam which has a volume 3,800,000 with a cement content of 120kg/m^3 which equates approximately to 456,000 tonnes. Assumed that this total volume will be split across the 7 year
Dam and associated generation areas: Reinforcing Steel	8571			tonnes			The current estimation for Steel is approximately 60,000 tonnes, excluding generators and other equipment. Assumed that this total volume will be split across the 7 year construction period
Transmission lines: Steel Lattice towers	1517			tonnes		Ratio of kV plus 50%	Total steel lattice towers 487 Assumed mass of steel in a single tower is 21,800kg
Transmission lines: cement (for concrete slab)	150			tonnes			*The foundation pad is constituted by a slab of reinforced concrete, located on the bottom of the trench to a depth of between 2-3m below ground level, according to the tower type. A chimney will be positioned*
Road: Construction material	67168			tonnes			TOTAL road construction material = 276,575m3 (see raw data below) Assumed that the average density of the construction material is 1700 kg/m³
Quarry: additional aggregate source	0						EXCLUDED AS QUARRY MAY NOT BE USED FOR AGGREGATE AND NO DATA AVAILABLE
Project township construction materials	0						EXCLUDED S NO DATA WAS AVAILABLE ABOUT THE PROJECT TOWNSHIPS
Project township goods deliveries	0						EXCLUDED S NO DATA WAS AVAILABLE ABOUT THE PROJECT TOWNSHIPS
Generation Equipment	0						UNKNOWN
Cons. material transport distance (one way)	40			km			No data available on source of construction materials. For the purpose of the calculations, it has been assumed that ALL materials are transported in from the nearest Township, Livingstone, located approximately 40km to the west. Distance from Livingstone to Batoka has therefore been assumed to be 80km (round trip). It should however be noted that the roads have not yet been constructed and therefore actual distance data is was not available at the time of completing these calculations.
Cons material vehicle - capacity	44			tonnes		https://www.gov.uk/government/publications/guide-to-lorry-types-and-weights	Assumed maximum (100%) load within HGV is 44 tonnes. However, capacity figure assumes 50% laden for all 'full leg' journeys, plus 0% laden for return 'empty leg' journeys). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/211948/simplified-guide-to-lorry-types-and-weights.pdf
Cons. Material vehicle - number of journeys (full leg)	6,479.5			Number of vehicle journeys			Capacity figure assumes 50% laden for all 'full leg' NB *2 in calculation accounts for the assumption that each 'full leg' journey will be at an average 50% laden.
Cons. Material vehicle - number of journeys (empty leg)	6,479.5			Number of vehicle journeys			Number of 'emply leg' journeys assumed to match the number of 'full leg' journeys.
Cons. Material vehicle - total distance (full leg)	259,181.0			km		6,47,,,	Calculated by multiplying the estimated number of journeys by estimated length of a (one way) journey.
Cons. Material vehicle - total distance (empty leg)	259,181.0			km			Toal distance of 'empty leg' journeys assumed to match the total distance of 'full leg' journeys.
HGV Articulated (>33t) - 50% laden	0.89125			kg CO2e / km		UK Government GHG Conversion Factors for	In absence of actual data around construction logistics, it has been assumed that deliveries to the BGHES will be made by Articulated HGV (>33t) and assumed that the actual vehicle capacity will be 44 tonnes at 100% load (therefore 22 tonnes at the assumed 50% laden level).
HGV Articulated (>33t) - 0% laden	0.67174			kg CO2e / km		UK Government GHG Conversion Factors for Company Reporting 2018 (version 1.01)	
CO2e of Cons. Material vehicle - total distance (full leg)	231.0			tonnes CO2e			
CO2e of Cons. Material vehicle - total distance (empty leg)	174.1			tonnes CO2e			
Materials Transport Emissions		Breakdown of emissions over time not known					Does not allow for vehicle movements associated with construction of the project townships as NO DATA
Total construction materials transport	**405.10**			t CO2e			Does not allow for vehicle idling time which may be substantial
Assumed Annual emissions	57.9			t CO2e			Does not allow for long distance haulage of hydro generation plant or other non-bulk items
Excavation Transport							
Excavated material	0						Assumed that the excavated material will be used as aggregate within the concrete (mixed up at the batching plant). If required, additional aggregate will be sourced from the site quarry (to be confirmed). Excavated material will also be used along the transmission line and new roads.
Excavation Transport Emissions		Breakdown of emissions over time not known					
Excavation vehicles	**0**			t CO2e t CO2e			
On-Site Construction Activity							
Fuel Use for construction machinery, and on-site power generation (including for project townships).	1,274,000	1,274,000	1,274,000	litres	100% mineral diesel		Information from SP "Based on information from similar project we estimate at least 3,500 litres per day". Assuming a 364 day working year (7 day working week). Assumed that this estimated consumption rate will continue across the 7 year construction period.
Diesel - 100% mineral diesel	2.69			kg CO2e/litre			UK Government GHG Conversion Factors for Company Reporting 2018 (version 1.01)
Grid electricity use	0			kWh			No connection to the grid during construction
Construction Activity Emissions							
Machinery and on-site power generation	**3,424**	**3,424**	**3,424**	t CO2e			Even if this was five times wrong, effect is not great
Grid electricity	**0**	0	0	t CO2e			
Land Use Change							
Total land area changed by transmission lines	0.44			ha			Transmission lines 487 tower pads, each 9m2 (3mx3m) Total 4,393m2
Total land area changed by roads	178			ha			Roads total 1,780,000m2 (as set out below) Main roads (including new and upgrade): 1,365,000m2 (105,000m x 13m) Staff township roads: 250,000m2 (25,000m x 10m) Service roads: 130,000m2 (26,000m x 5m) Site roads: 35,000m2 (7,000m x 5m)
Total land area changed by project townships	420			ha			North side BGHES (Zambia) - Project township estimated area 210 ha South side BGHES (Zimbabwe) - Project township estimated area unknown, therefore assumed to be 210 as per the north side.
Total land area changed by impoundment area	2200			ha			Impoundment area 22km2
Total land area changed by surface power plants, switch yards and batching areas	0.3						Data not available. Assumed to be 3,000m2
Total land area changed by quarry	0						Excluded as creation of the quarry is not certain and will depend on the quality of aggregate taken from the dam excavation area.
TOTAL land area changed by development	2799			ha		From Rachel Melbourne re Habitats Assessment - a number of land use categories are identified	
Agriculture Land	0			ha			4383
Built environment	0			ha			
Hillslope Forest	0			ha			
Riparian Forest	0			ha			
Secondary habitat	0			ha			
Water environment	0			ha			
Wooded Grassland	2799			ha			
Land Use Change Emissions							
All land use types	**461,835**			t CO2e		One-off maximum change	

OPERATION ACTIVITY DATA							
Name	**Value**			**Unit**	**Fuel Type**	**Source**	**Notes**
	Year X	Year Y	Year Z				
Annual Generation	10,046			GWh		Annual	SP data "On the base of the updated analysis carry out by SP Annual energy production is equal to 10'046 GWh/years"
Project lifetime generation	502,300			GWh		Total	
Operation Phase							
O & M Transport							
O & M transport distance	10			km		Assumed	Operational distance (average one-way journey length) is assumed to include journeys within the BGHES site boundary and not shuttling between BGHES and Livingstone/othertownships, as was the case within the Construction phase distance assumptions. Average Operational phase distances are liklely to be lower and, with no data available, it has been assumed that these will be an average of 10km.
				km			
O & M vehicle - journeys	75			journeys		Assumed	Assumed to be 75 journeys per month, based on operational data form a previous HES ESIA. 75 journeys equates to between 1 and 2 (1.44) journeys per week.
O & M vehicle total distance travelled	1500			km			Average distance (one way) multiplied by estimated number of journeys. Total multiplied by 2 to account for return journeys.
Vans Average (up to 3.5 tonnes)	0.2568			kg CO2e/km		UK Government GHG Conversion Factors for Company Reporting 2018 (version 1.01)	O&M vehicle assumed to be a van (up to 3.5 tonnes)
O & M Transport Emissions							
O & M vehicle I	**0.39**			t CO2e			
On-Site Operation Activity							
Fuel Use for machinery	100			litres	100% mineral diesel	Assumed	
Fuel use for on-site power generation	50			litres	100% mineral diesel	Assumed	
Grid electricity use	0					Assumed	It is understood that any electricity consumption will be taken from the BGHES generated output, which is renewable and therefore has zero associated GHG emissions.
Diesel - 100% mineral diesel	2.68779			kg CO2e/litre		UK Government GHG Conversion Factors for Company Reporting 2018 (version 1.01)	
Operation Activity Emissions							
Machinery	**0.27**			t CO2e			
Power generation	**0.13**			t CO2e			
Grid electricity	**0.00**			t CO2e			
Decay of Reservoir Biomass Material							
CO2 emissions				tCO2e			
CH4 emission				tCO2e			
Decay of reservoir biomass material	0	0	0		ALTERNATIVE CALCULATION SHEET		

The assessment of biochemically generated GHGs from the reservoir is recommended to follow a stepwise process to evaluate the supply of carbon stock and the reservoir's condition to create and release GHGs:
1. Does the reservoir have the capacity to create large carbon stock (amount of flooded organic matter, inflowing organic matter, and organic matter produced in the reservoir)? If the carbon stock is small, Global Warming Potential (GWP) is likely negligible.
2. Does the reservoir have the capacity to convert the organic matter to GHGs and, if so, to what type? If the physical conditions disfavour decomposition of organic matter, and especially do not favour creation of CH4 and N2O, GWP is likely negligible.
3. Does the reservoir have the capacity to release the created GHGs into the atmosphere? If the pathways of CH4 and N2O to the atmosphere are few and if the physical conditions favour transformation of these to CO2 before emission, GWP is likely negligible.

In a reservoir, the flooded and inflowing carbon will thus be exported to the atmosphere, stored in the bed sediments, or transported further down the river system. These three processes occur in parallel in varying degrees, depending on the topographical, geological, and climatological conditions, and the biological configuration of the water body.

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Annex S

Project Livelihood Restoration Plans

Livelihood Restoration Plan (LRP) – Zambia Proposed Staff Township

Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

Zambezi River Authority (ZRA)

27 September 2019

Project No.: 0239269

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27 September 2019

Livelihood Restoration Plan (LRP) – Zambia Proposed Staff Township

Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

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Partner in Charge

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Acronyms and Abbreviations

Name	Description
BGHES	Batoka Gorge Hydro-Electric Scheme
CHW	Community Health Workers
CSR	Corporate Social Responsibility
CEO	Chief Executive Officer
ESIA	Environmental and Social Impact Assessment
ESS5	Environmental and Social Safeguard Policy 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
ESMP	Environmental and Social Management Plan
HIV/AIDS	Human-Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
FGD	Focus Group Discussion
KII	Key Informant Interview
GIS	Geographic Information System
GO	Grievance Officer
IFC	International Finance Corporation
GO	Grievance Officer
GM	Grievance Manager
LRIP	Livelihood Restoration and Improvement Plan
LRP	Livelihood Restoration Plan
GRM	Grievance Redress Mechanism
M&E	Monitoring and Evaluation
PAH	Project-Affected Household
SEP	Stakeholder Engagement Plan
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
VSP	Vulnerable Support Program
SP	Studio Pietrangeli
OHTL	Overhead Transmission Line
PTO	Permission to Occupy
ZRA	Zambezi River Authority

DEFINITIONS

Affected Persons: Any individual, persons, family, household, group, or collective body that is affected by either physical or economic displacement and are deemed eligible to resettlement assistance and/or compensation under this RPF.

Compensation: The forms or combination of cash or in-kind replacement assets to be provided to Affected Persons for compensation of the acquisition of land or the loss of assets.

Cut-off Date: The date, which establishes the deadlines for entitlement to Compensation and/ or Entitlements in respect of Eligible Land, Crops, Trees and Structures. Persons occupying the project footprint after the cut-off date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the cut-off date (usually the date of completion of the assets inventory, or an alternative mutually agreed on date), will not be compensated

Economic Displacement: The loss of assets or access to assets that leads to loss of income sources or livelihoods but does NOT necessarily result in the direct loss of a place of residence.

Eligible Persons: See Affected Persons

Entitlement Framework: A framework that establishes the specific entitlements (i.e. forms of compensation) granted to Affected Persons whom will lose proven assets, as determined during the Asset Inventory.

Improvements: Anything resulting from expenditure of capital or labour – including carrying out of any building, engineering, clearing, improvement, or other operations - in, on, over, or under land, or the making of any material change in the use of any building or land and charges for services provided and other expenses incurred in the development or towards the development of land.

Livelihood Restoration: A range of measures and programmes that ensure that the existing livelihoods of Affected Persons is restored, or ideally improved, during and after the land acquisition and/or resettlement process.

Livelihood Restoration Plan: A plan that establishes the entitlements (e.g., compensation, other assistance) of affected persons and/or communities economically displaced by a Project, in order to provide them with adequate opportunity to re-establish their livelihoods**.** The Project will not involve any physical displacement (i.e. to a place of residence), solely economic displacement.

Livelihoods Restoration and Improvement Plan: A detailed plan which is developed to replace or restore and maintain or improve previous levels of income, employment, and food security for Project-Affected Persons through provision of economic opportunities and income generating activities, including agricultural production and processing, employment promotion, and enterprise development.

Physical Displacement: The displacement, loss, or destruction of the place of residence as a direct result of the development of the Project.

Resettlement Policy Framework: The framework document previously prepared for the Project that defines the principles and steps to be adopted in the development of this Livelihood Restoration Plan.

Resettlement Action Plan: is a plan prepared by the sponsor or other parties responsible for resettlement (such as government agencies), specifying the procedures it will follow and the actions it will take to properly resettle and compensate people and communities physically displaced by a Project.

Specially Gazetted Land: This is agricultural land, which has been identified for compulsory acquisition and has been gazetted for such acquisition.

State Land: Land that is not customary.

EXECUTIVE SUMMARY

The Zambezi River Authority (herein referred to as "ZRA"), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (proposed BGHES or Project). The proposed Project will be situated approximately 47 km downstream of Victoria Falls on the Zambezi River.

The proposed Project includes the following components, which will be implemented through a number of Sub-Projects:

- Dam wall and impoundment, including spillway;
- Surface power houses, one on each side of the river;
- Transmission lines comprising:
    - two (2) 330kV OHTLs to the Mukuni 330/220kV station, approximately 21km ;
    - one (1) 330kV OHTL to Muzuma 330/132/88kV station, 150km ;
    - one (1) 400kV OHTL to Hwange 400/330kV substation, 58km; and
    - two (2) 330kV OHTLs interconnecting the two power stations, Batoka North and Batoka South 5.5km.
- Access roads in both Zimbabwe and Zambia;
- Project townships/staff housing to accommodate workers and their families during construction and operations; and
- Quarries.

This Livelihood Restoration Plan (LRP) sets out the guiding principles and procedures that will be followed in managing the impacts of acquiring approximately 489 hectares of land for the proposed Staff Township required by the Project in Zambia only.

The area required for the proposed Staff Township does not have any built assets, agricultural cultivation or human habitation. Hence, the development of the proposed Staff Township will not result in any physical displacement of people, and only limited economic displacement.

Construction and operation of the proposed Staff Township will result in two main losses:

- Foot paths used to access dedicated grazing lands, sources of water for livestock and farm areas beyond the site proposed for the Staff Township; and
- Loss of access to natural resources (both timber and non-timber products).

Based on a comprehensive understanding of proposed Project impacts and land uses within the areas surrounding the proposed Staff Township, a Resettlement Action Plan (RAP) is not required, as construction of this proposed Project component will not affect any primary residential structures and therefore will not result in physical displacement.

1. INTRODUCTION

This Livelihood Restoration Plan (LRP) sets out the guiding principles and procedures that will be followed in managing the impacts of acquiring land for the proposed Staff Township area required by the Batoka Gorge Hydro-Electric Scheme (proposed BGHES or Project) in Zambia.

A Resettlement Action Plan (RAP) is not required, as construction of these Project components will not affect any primary residential structures and therefore will not result in physical displacement.

The LRP reflects the guiding principles described in the Resettlement Policy Framework (RPF) previously prepared and approved by the Project proponent, the Zambezi River Authority (ZRA).

The ZRA, a corporation jointly and equally owned by the governments of Zambia and Zimbabwe. A four-person council two of whom are Ministers in the Government of the Republic of Zambia and two of whom are Ministers in the Government of the Republic of Zimbabwe governs the ZRA. The ZRA 's primary functions are operating and maintaining the Kariba Dam Complex, investigating and developing of dam sites on the Zambezi River and analysing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba.

1.1 Overall Project Description

A hydropower scheme on the Zambezi River downstream of Victoria Falls has been investigated in various degrees of detail since 1904, when geological investigations for potential sites commenced.In 1972, studies concluded that Batoka Gorge was the best site for the development of a hydropower project. Investigations conducted in 1981-1983 and 1989 identified a specific site in the Batoka Gorge for the Project, prompting a full feasibility study in 1993. The proposed BGHES will be located in the central portion of the Zambezi river basin, upstream of the existing Kariba Dam and approximately 47 km downstream of Victoria Falls.

In 2014, the ZRA appointed Studio Pietrangeli (SP) Consulting Engineers to update the engineering feasibility study for the Project, and engaged Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) to undertake an Environmental and Social Impact Assessment (ESIA), including RPFs for Zambia and Zimbabwe.

The Project will be located in the central portion of the Zambezi river basin, upstream of the existing Kariba Dam and approximately 47 km downstream of Victoria Falls.

The Project includes the following components which will be implemented through a number of Sub-Projects:

- Dam wall and impoundment, including spillway;
- Surface power houses, one on each side of the river;
- Transmission lines comprising:
    - two (2) 330kV OHTLs to the Mukuni 330/220kV station, approximately 21km ;
    - one (1) 330kV OHTL to Muzuma 330/132/88kV station, 150km ;
    - one (1) 400kV OHTL to Hwange 400/330kV substation, 58km; and
    - two (2) 330kV OHTLs interconnecting the two power stations, Batoka North and Batoka South 5.5km.
- Access roads in both Zimbabwe and Zambia;
- Project townships/staff housing to accommodate workers and their families during construction and operations; and
- Quarries.

The focus of this LRP is on land acquisition impacts related to the location of the Project proposed Staff Township. The area selected for the Township is located in the Kazungula District of the Southern Province of Zambia, 21 km southeast of Livingstone Town (refer to *Figure* 1.1*)*.

1.1.1 Proposed Staff Township

It is envisaged that the proposed Staff Township will have the following services and amenities:

- 2 Health centres/hospitals;
- 2 Primary schools;
- Secondary Schools;
- Sporting centres;
- 1 Custom service and immigration centre;
- 1 Police station;
- 1 Post office;
- 2 Supermarkets;
- Municipality Office;
- ZRA Offices;
- Warehouses for the plant maintenance;
- Water treatment plant;
- Sewage treatment plant; dump site;
- Hospitals with incinerators; and
- Boreholes.

In addition to these services and amenities, the proposed Staff Township will also have facilities such as banks, shops, private offices etc. During Project construction (up to seven years in duration), the Proposed Staff Township will house approximately 8,000 staff in total (including security and support staff), but this will be only after the first two years, where initially 2,000 construction workers will be involved with the construction of access roads, infrastructure and the camps.

During operation, the construction staff will be replaced with the operational staff (i.e. maintenance, police, custom services, educational experts, governmental figures etc.).

There are no permanent or temporary human habitations in the proposed Staff Township area however the affected land is an important communal resource for grazing livestock and collecting natural resources that support livelihoods.

1.2 Land Acquisition and Resettlement Context

Land acquisition and involuntary resettlement processes present a high level of risk for both Project proponent and for the people and communities being displaced [(1)]. Displacement poses particular risks for people who may already be marginalized because of socio-economic status, gender, health/ability, ethnicity and/or age. However, when land acquisition and resettlement is well planned, properly managed, and carried out in conjunction with impacted persons and communities, the risks can be minimised and mitigated and the process can be used to create positive outcomes for project proponents and for local people, including the most vulnerable.

A Resettlement Action Plan (RAP) describes how both physical and economic displacement will be managed, and an LRP is required for projects involving economic displacement only [(2)]. As the land required for the Proposed Staff Township is not inhabited, there will be no physical displacement.

This LRP is grounded in the following principles:

- Avoid and minimise physical and economic displacement by exploring alternative Project designs;
- Mitigate and compensate adverse impacts from land acquisition or restrictions;
- Improve, or at least restore, pre-Project livelihoods and standards of living for all Project-affected persons (PAPs);
- Establish standards of compensation that are transparent, consistent, and reflect the full replacement value of all impacted assets eligible for compensation;
- Establish grievance and conflict resolution mechanisms to address any grievances raised by PAPs or other stakeholders;
- Identify and bridge gaps between Zambia legal requirements and the requirements of the World Bank Environment and Social Framework (2016);
- Give particular attention to vulnerable groups and if necessary implement measures to ensure that vulnerable groups have equitable access to opportunities and benefits; and
- Promote gender equity in all compensation, allowances and livelihood restoration measures.

1.3 Scope and Structure of the LRP

The objective of this document is to describe the procedure for acquiring land necessary for construction and operation of the Proposed Staff Township in Zambia (the Project component). It describes the efforts undertaken to avoid economic displacement, and mitigate the impacts associated with land acquisition. As noted above, the LRP is guided by the principles described and commitments made in the Resettlement Policy Framework prepared and approved by the ZRA.

The total land area required for the Proposed Staff Township is 489 hectares. The land is communally owned and undeveloped, and not well suited for agriculture.

This document is structured as follows:

- **Chapter 1 Introduction**: provides an overall introduction to the proposed Project, its Components description and context for the LRP.
- **Chapter 2 Legal & Institutional Framework:** describes the institutional and legal framework that has guided the preparation of the LRP.

[1] Resettlement is involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement.

- **Chapter 3 Existing Socio-economic Conditions:** presents the socio-economic conditions of the persons (PAPs), households and communities affected by the acquisition of land required for the proposed Staff Township.
- **Chapter 4 Consultation and Disclosure:** describes the main results of consultation undertaken in order to prepare the LRP.
- **Chapter 5 Project Impacts**: provides an overview of impacts on PAPs, households, and communities, as a result of the land acquisition related to construction and operation of the proposed Staff Township.
- **Chapter 6 Eligibility, Entitlements and Compensation:** presents the policies guiding compensation and outlines the Project's compensation strategy for all forms of ownership and use rights affected by the development of the proposed Staff Township.
- **Chapter 7 Livelihood Restoration and Improvement:** outlines the additional support that will be provided to ensure affected livelihoods are restored, and where possible improved.
- **Chapter 8 Vulnerable Support:** describes the approach to monitoring affected communities for Project-induced vulnerability.
- **Chapter 9 Grievance Redress Mechanism**: describes the mechanisms available to PAPs for the processing and resolution of grievances or claims related to the Project's land acquisition process.
- **Chapter 10 Monitoring and Evaluation**: describes the monitoring and evaluation procedures required to ensure that Project objectives are met.
- **Chapter 11 Implementation Arrangements:** provides an overview of the implementation arrangements and schedule.

2. LEGAL AND INSTITUTIONAL FRAMEWORK

This *Chapter* provides an overview of the legal and institutional framework guiding the preparation of this LRP. It describes Zambian national legislative requirements relevant to land access and resettlement, and compares them with the World Bank's Environmental and Social Safeguard Polices (2016).

2.1 Legislative Framework

The most relevant Acts related to land access and acquisition are listed below and described in subsequent sections:

- Constitution of Zambia;
- The Lands Act;
- The Land Acquisition Act;
- Local Government Act;
- Chiefs Act; and
- Electricity Act.

2.1.1 The Constitution of Zambia (Amendment) Act, No. 2 of 2016

The Constitution is the supreme law of Zambia and establishes the fundamental rights with respect to human dignity, equity, social justice, equality, and non-discrimination.

Relevant to this LRP are the sections in the Constitution that refer to the alienation of rights to land or acquisition of land. Articles 233 and 254 grant powers to the President, through the Commissioner of Lands, to alienate land held by both citizens and non-citizens. The Constitution however does not provide any specific procedures, or proscriptions regarding the legal power to alienate land.

Article 253 states that land will be held, used and managed with consideration to ensure equitable access to land, protecting the tenure for lawful landholders, and that land-use planning be conducted in a consultative and participatory manner.

2.1.2 Lands Act, Cap 1853

The Lands Act [(3)], states that all land in Zambia be held in perpetuity and in trust on behalf of the people of Zambia.

Article 3(2) grants power to the President to alienate land from any Zambian or Non-Zambian citizen. The President may only alienate land held under customary tenure when they have taken consideration of local customary law on land tenure, consulting the local Chief and authorities as well as consulting with any persons or body with a vested interest in the land.

In addition, the President shall not alienate land without providing any consideration or monies for such alienation except where the alienation is for a public purpose. The term public purpose under the Land Law does include provision for the Project under Article 4(2a) the exclusive use of Government or for the general benefit of the people of Zambia, and Article 4(2g) for obtaining control over land required for or in connection with hydro-electric or other electricity generation and supply purposes by the Government.

Customary land is legally recognised under the Land Act under Article 7 and establishes that the customary systems in placed at the commencement of the Land Act will continue to be so held and recognised and the Provisions of the Land Act will not be construed as to infringe on these customary

[(3)] Including amendments made in the Land (Amendment) Act of 2010 and 2015

rights. In addition, the Act also recognises the rights and privileges of any persons to hold land under customary tenure as determined by the local customary law.

In the context of compensation and resettlement, land includes any unexhausted improvements on the land. Improvements include anything resulting from the expenditure of capital or labour; and includes any buildings or any activity that results in a material change in the use of land and other expenses incurred in the development or towards the development of land.

2.1.3 Land Acquisition Act, 189

The Land Acquisition Act grants powers to the President to acquire any property of any description, where the President is of the opinion that such acquisition is desirable or in the interests of the Republic.

Under Article 4, the President, via the Ministry of Land or any authorised person, is permitted to access the targeted land to undertake surveys or any other act necessary to ascertain whether the land is or may be suitable for the purpose in question.

The procedure for acquiring land includes issuing suitable notice to persons with an interest in the land. This notice will, under Article 7, be served either personally on the persons to be served or by leaving it at their last usual place of residence or business if any such place can after reasonable inquiry be found. This notice will be supported by the issuance of a similar notice in the government gazette. Upon serving the notice, the interested persons may submit a claim for compensation.

Under Article 6, the President may take possession of the land on the expiration of the period specified in the notice, No specific provision is made limiting the taking of possession of land after the payment of fair compensation.

Article 8 states that where any property is to be partially acquired and where the residual land is less than 0.5 acres, the owner of the land may submit a claim for the acquisition of the whole of the land. Article 9 permits, where land acquisition results in the taking of part of any house of building, the owner to make a claim for the acquisition of the whole house or building.

Article 10 requires that compensation in money be paid for any property to be acquired under the Act. The compensation amount may be determined via an agreement, or where an agreement cannot be reached then in accordance with the provisions of the Act.

Article 10 also makes provision for in-lieu compensation of or in addition to any monetary compensation. This may be in the form of a grant of other land, as far as may be practicable, as those under which the land acquired was held.

Article 12 defines the principles for the assessment of compensation, which include:

- No allowance shall be made on account of the acquisition being compulsory;
- The value of property shall, be the amount which the property might be expected to realise if sold in the open market by a willing seller;
- Any deductions related to any returns and assessments of capital value for taxation made or acquiesced in by the claimant;
- Any deductions related to any money, services, equipment granted by the Government, by a Company or any other body unless any contributor indicates in writing that the contribution was specifically made for the use and benefit of the registered owner;
- The special suitability or adaptability of the property for any purpose shall not be considered;
- No allowance shall be made on account of any improvements effected or works constructed after the publication of the notice to yield up possession;

- Where part only of the land held by any person is acquired, there shall be considered any probable enhancement of the value of the residue of the land by reason of the proximity of any improvements or works made;
- Allowance shall be made for the damage by reason of the severance of the acquired land from any other land belonging to the same person; and
- No allowance shall be made for any probable enhancement in the future of the value of the land to be acquired.

Article 15 limits compensation with respect to undeveloped land or unutilised land where no form of compensation will be payable by the President. Exception is given to where unutilised land to which an absentee owner is beneficially entitled, however compensation is limited to unexhausted improvements on the unutilised land.

The definition of undeveloped land includes any land in a rural area used for agricultural, pastoral, or mixed agricultural and pastoral purposes, which has not been used during the period of two years immediately preceding the Article 7 notice.

2.1.4 Local Government Act, Cap 281 of 19914

The Local Government Act grants powers to the relevant councils in acquiring any land by agreement whether by way of purchase, lease, exchange, or gift. Where such acquisition cannot be agreed between the relevant parties, the Council may approach the President to compulsory acquire the land consistent with the Land Acquisition Act.

2.1.5 Chiefs Act, Chapter 287

This Act makes provision for the recognition, appointment, and functions of Chiefs and Deputy Chiefs. The Chief is required to discharge the traditional functions of his office under African customary law as far as the discharge of such functions is not contrary to the Constitution or any written law and is not repugnant to natural justice or morality.

2.2 Land Tenure

In Zambia, similar to many other African countries, land tenure is categorised into two tenure systems, namely statutory and customary.

2.2.1 Statutory Tenure

Statutory tenure refers to state land that is administered by the Commissioner of Lands through local authorities on behalf of the President. The President of Zambia holds the country's land in perpetuity on behalf of the Zambian people. However, power to make and execute grants and disposition of land is delegated to the Commissioner of Lands. The Commissioner has agents who plan the land into plots and thereafter select and recommend suitable candidates to the Commissioner of Lands for issuance of certificate of title. In this context, the Commissioner's agents are the District, Municipal, and Town Councils. These agents are considered Planning Authorities and use the Urban and Regional Planning Act No. 3 of 2015 to plan the land in their areas.

To acquire state land, the District, Municipal or Town Council identifies an area for which a layout plan is made, and subdivide the identified land into several plots. For agricultural land, the relevant departments in the Ministry of Agriculture and the Resettlement Department under the Vice President's office are responsible. The layout plan is endorsed and stamped by the appropriate planning authority that later transmits the endorsed plan to the Lands Department for scrutiny and verification of the planned land's availability.

If the planned land is available, the plan is approved and transmitted to the Survey Department for surveying and numbering as per the Land Survey Act. Upon receipt of numbered and surveyed plots,

the relevant authorities advertise them to the public, after which applicants are interviewed. Selected applicants are recommended for further consideration and approval by the office of the Commissioner of Lands, who is the final authority to grant title to the land.

2.2.2 Customary Tenure

Customary law is based on individual community practices and traditions, organized under a common customary system. Under the customary system, the Chief or designated sub-chief allocates land. The chiefs can give land to individuals or families for their personal use and occupation. The precise mechanism by which land is distributed and rights granted to the holder of the land under customary laws differs with each community. This system of tenure is most prevalent in rural areas, including the proposed BGHES area.

Under the customary system, the prospective developer can approach the Chief of the area for consent to hold land on leasehold tenure and obtain a certificate of title (or PTO Permission to Occupy) for land delivery of less than 250 hectares. Where the Chief is satisfied that the land being requested is available, the Chief writes a consent letter to the office of the Council Secretary of the respective local government, with the land's location site plan attached.

The Council Secretary arranges for the land in question to be inspected by a committee that deals with land matters in the area. The committee also interviews the applicant. If the applicant is successful, the Council Secretary brings the application to the full council for consideration.

If the council approves the application, they will recommend the allocation of the unnumbered plot to the applicant by the Commissioner of Lands through the provincial planning office. . The application forms, site plans and council minutes are attached to the recommendation letter, which certifies that the plot is unoccupied. If satisfied, the Commissioner of Lands approves the application. For land in excess of 250 hectares, the Commissioner of Lands is required to seek clearance from the Minister of Lands before approval.

As the land required for the proposed Staff Township falls into the customary tenure category and exceeds 250 hectares, in addition to the process outlined above, clearance from the Minister of Lands is required.

In the context of the Project Area and Mukuni village, land acquisition is the responsibility of the Bedyango. The Bedyango is a designated female who, once given the go ahead by the Chief, is responsible for the management and distribution of replacement land.

2.3 Governance Structure

Zambia is a presidential representative democratic republic, whereby the head of state and government is the President of Zambia. The country is divided into ten provinces, each administered by an appointed deputy minister. Provinces are further divided into districts comprised of different wards.

Under Zambian law, councils form local governance. Town Councils govern urban districts, municipal councils for suburban areas, and district councils for rural areas. Ward Councillors (elected volunteer representatives) act as the link between district councils and customary authorities. They bring chiefdom concerns to the District Commissioner, who serve as links to the provincial and national government. The division of power between customary and state authorities can be understood as; personal / family matters are the responsibility of customary authorities (the headperson or chief, depending on the nature and severity of the issue.) Infrastructural concerns such as the building of roads, clinics, or educational facilities fall under the state's mandate.

Land jurisdiction operates similarly in Zambia. State lands are under the authority of the state, and customary lands (all lands relevant to the proposed BGHES) are subject to norms guiding customary practice (de jure ownership still resides with the state.) For state land, the Commissioner of Lands holds vested administrative authority over questions of land distribution and ownership. Under the customary system, local chiefs hold lands in trust on behalf of their subjects (i.e. those within their chiefdoms /

kingdoms) and are responsible for administering land allocations, overseeing disputes, and enforcing usage restrictions. They often delegate these duties to village headpersons, as they are often more familiar with local land dealings and history.

2.4 International Resettlement Standards

The World Bank policies regarding involuntary resettlement are defined through the Bank's Environmental and Social Standards (2016) [(4)].

Environmental and Social Safeguard Policy 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5) establishes the following objectives:

- To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives;
- To avoid forced eviction;
- To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by:
    - Providing timely compensation for loss of assets at replacement cost; and
    - Assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.
- To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure;
- To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant;
- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.[5]
- Other key points in ESS5 include:
- The Proponent will engage directly with affected communities and persons through a process of stakeholder engagement through the planning, implementation, monitoring, and evaluation of the resettlement process;
- The Proponent will establish a grievance mechanism to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion; and
- In the development of the LRP, the Proponent will be required to conduct a census to determine eligible peoples and an inventory of their assets as a basis of determining their asset holdings. Both will be linked to a suitable development moratorium (i.e. eligibility cut-off date).

2.5 Gaps Analysis between National Laws and International Standards

Table 2.1 compares national laws with World Bank standards pertinent to land acquisition for this Project Component. The compensation entitlements, livelihood restoration and vulnerable support measures outlined in later chapters of this LRP are designed to adhere fully to Zambian legislation and address any gaps with international standards.

[4] https://www.worldbank.org/en/projects-operations/environmental-and-social-framework accessed 05_12_2018

[5] Guidance Note – ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement page 1

Table 2.1 Comparison between National and International Standards Regarding Resettlement

Project impact/component	Zambian Legislation	World Bank Environmental and Social Standard 5	Measures to Address Gaps
Compensation rates	National Resettlement Policy states: Compensation should be paid to persons that are physically and/or economically displaced before commencement of the development project causing displacement: (ii) Provide prompt and effective compensation at market and/or full replacement cost whichever is higher for losses of livelihoods, assets and loss of access to the assets attributable directly to the project.	Land will be accessed only after compensation in accordance with ESS has been made available and where applicable, displaced people have been resettled and moving allowances (in addition to compensation) have been provided to the displaced persons. Affected persons are entitled to compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or livelihoods.	Refer to Chapter 6 Compensation Principles and Entitlement Matrix
Compensation for land	The Land Act stipulates that compensation for land be paid, this does not include 'undeveloped land or unutilised land.' Exception is given to land owned by an absentee owner, compensation is limited to unexhausted improvements on the unutilised land.	When land acquisition or restriction on land use (whether permanent or temporary) cannot be avoided, compensation at replacement cost will be offered to affected persons. Other assistance, as necessary, may be offered to help them improve or restore their standards of living or livelihood.	Refer to Chapter 6 Compensation Principles and Entitlement Matrix
Stakeholder engagement and consultation	Public notification (i.e. gazetting) of the land acquisition is required by Zambian legislation. National Resettlement Policy requires that resettlement activities disclose relevant information, consult fully affected persons during implementation.	Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.	Refer to Chapter 4, which outlines the approach to stakeholder engagement and participation

3. EXISTING SOCIO-ECONOMIC CONDITIONS

3.1 Introduction

This Chapter provides an overview of the baseline socio-economic conditions in communities that will be affected by the Project's requirement to access land for the proposed Staff Township.

3.2 Methodology

In order to assess the baseline conditions of households associated with the area for the proposed Staff Township, the following methods were applied:

- Open meetings and focus group discussions with communities who access the proposed Staff Township Area;
- Interviews and consultations with key stakeholders; and
- Transect walk.

3.2.1 Focus Group Discussions

Open meetings were held in key areas to allow for the participation of affected households as well as the wider community in the land acquisition and livelihood restoration planning process.

Participants were divided into semi-structured focus groups to discuss existing socio-economic conditions of the surrounding areas in order to generate a socio-economic profile for affected villages. Sub-groups included men, women, and youths (ages 18-35).

3.2.2 Key Informant Interview

Primary data was collected through semi-structured KIIs with the following parties:

- District Officials;
- Chiefs;
- Headmen and women; and
- Community members.

3.2.3 Transect Walk

A three-hour transect walk through the proposed Staff Township area was held with a designated community representative. The transect walk included a systematic walk through the area to gain a deeper understanding of the land's importance to livelihoods for communities within the area. During the walk, participants discussed the different resources encountered with team members facilitating exchanges by asking questions and making direct observations.

3.3 Characteristics of the Site

The proposed Staff Township area is located in Zambia's Southern province in Kazungula District, and in particular, the ward of Mukuni, which is under the jurisdiction of Chief Mukuni. Chibule village is the closest settlement to the affected area, other communities within a 10 km radius include Munwana, Siachuma, Chilizya, and Siachalisa (refer to *Figure 3.1*).

The site is gently undulating with drainage channels flowing eastward towards the gorge, which is 3km away. The habitat of the proposed Staff Township area constitutes miombo woodland with shrubs and grasses. The vegetation is dense making it impenetrable in some sections. The majority of the site can be considered transformed by anthropogenic (human) activities.

Figure 3.2 View of South – South Eastern Section of Site, July 2019

3.3.1 Land Use

The main land uses within the area of the proposed Staff Township are listed below.

- Access points to reach communal grazing, farming and fishing areas beyond the proposed Staff Township area; and
- Source of timber and wild plants for food, medicine, curios, construction material and spiritual use.

The nearest settlements to the proposed Staff Township area is Chibule Village, with three huts affiliated to Chibule situated 600 meters north of the site, and the main village of Chibule village 1.8 km away.

The next closest village is Ng'andu is located 4.5 km west of Chibule. There is also a football pitch in active use about 768 m from the site.

Figure 3.3 Sign marking the Chibule Village Grazing Land Adjacent to the Proposed Staff Township Site

The primary economic activity undertaken by Chibule community members is livestock rearing, curio making and wood harvesting (Wood is harvested by both men and women for firewood, livestock fencing, housing material (roof beams, wale poles etc.), furniture and charcoaling.

Curios are sold in Livingstone around the Victoria Falls area, as well as the Mukuni Royal Village, where there is a curio centre frequented by tourists.

Wood demand for both the curios and other wood harvesting activities is resulting in timber reserves being depleted due to deforestation, and community members now venture beyond the immediate area to find appropriate raw materials for their woodcarving, charcoaling and wood harvesting.

3.3.2 Natural Resources

The most important natural resources to local communities is pastoral land for grazing; water sources including the streams, rivers and boreholes; wood for poles, construction of structures, firewood and carving, and thatching grass (elephant grass) for houses and fences.

Particular wild trees are sources of traditional medicine, building materials and wild fruits (e.g. *Nchenje, booma, injii, mawii, embububu*). They are gathered both for household consumption and sale in local markets.

3.4 Demographics

3.4.1 Population Size

The proposed Staff Township area is located in Kazungula District, which has a population of 104,731 people, living in 20,417 households with an average household size of 5.2 people. It is the district with the smallest population density at 8.5 people per km². (ZamStats, 2018) (Refer to *Table 3.1*).

Table 3.1 Population Statistics – District Level

District	Population (2010 census)	No. of Households (2010 census)	Population density (km², 2019 Projection)	Population (2019 Projection)
Kazungula	104,731	20,417	8.480/km²	154,995

Source: Central Statistical Office Zambia (2018)

The proposed Staff Township area falls within Mukuni Chiefdom, which from records kept by the Chiefs Headmen, has a total population of 2,272 people within 522 households.

The village closest to the proposed Staff Township area (Chibule), has 67 households with a total population of 220 persons. *Table 3.2* lists the population of other villages within a 10 km radius of the proposed Staff Township Area

Table 3.2 Population Statistics for the Villages in the Study Area

Village	Population count	Number of Households
Chibule	220	67
Ng'andu	265	55
Munwana	50	14
Chilizya	142	35
Siachalisa	79	18
Sichilobe	106	21

ERM FGDs, 2019

3.4.2 Religion, Ethnicity and Language

Christianity was the dominant religion in the Project Area. Denominations included Roman Catholic, New Apostle, Apostolic Faith Mission, Church of Christ, Pilgrim, Baptist and Seventh Day Adventist. The dominant group is the Toka Leya ethnic group, As such, the most commonly spoken language in the villages around the proposed Staff Township is Toka Leya (which is a dialect of Tonga). Discussions with the village headman in Mukuni chiefdom revealed that there are also small numbers of Tongas and Lozis in the villages.

3.4.2.1 Gender and Age Distribution

In the household survey undertaken in 2014, the population in the wider Project Area was found to be slightly weighted towards males (51%). Youth (under 35 years of age) made up the majority of the population with 26% of the population falling within the age range of 6 to14 years and 29% between 15 to 25 years.

3.4.2.2 Land Tenure and Ownership

The majority of land tenure (94%) in Zambia is customary. In general, land belonging to a community is communally 'owned' but can be allocated to individuals within the village by the headman, under the

chairmanship of the chief or in the case of the Mukuni chiefdom, the Bedyango. Land inheritance is hereditary. Land tends to be allocated to men, or inherited by male family members. Women generally access land through their husbands.

The land required for the proposed Staff Township is communally held and has not been allocated by the Chief or Headman to any individuals. It is an area where livestock grazers pass through in order to reach grazing areas and distant water sources; some community members from the Ng'andu village cluster [(6)] forage for timber and forest products.

3.4.3 Livelihoods and Economy

As with much of the broader region, communities located near the proposed Staff Township area are principally subsistence farmers, selling what additional crops they produce to generate a small income.

There is also substantial engagement in the curio trade with the presence of a major curio market within the Mukuni Royal Village. Sale of curios helps to generate additional income for the household. Other livelihood activities include trading, the collection and selling of firewood and wild fruits, hunting, fishing, casual labour and tourism related activities. There is very limited formal employment.

Communities are reliant on many of the natural resources that are found within and around the villages. A vast majority of households are engaged in the collection of forest products, both timber and non-timber, to sustain their livelihoods. Almost all households collect fruit for both consumption and income purposes. Other products from forests include honey, medicinal plants, firewood, construction materials and charcoal. The forests are also considered an important source of raw materials for wood and beads used to make curio products

Based on KIIs and the transact walk through the area, the supply of trees suitable for curio carving and building construction has been seriously depleted. FGDs indicated that hunting is not that prevalent in the area due to reduced wildlife populations.

3.4.4 Economic and Livelihood Activities in the Project Area

3.4.4.1 Livestock Rearing

Livestock rearing is the most common livelihood activity in the area. The majority of livestock are reared for income purposes. The most commonly owned livestock include poultry, goats, cattle, pigs and donkeys. Cattle and donkeys were observed to be primarily used for ploughing and ox cart transport purposes. Livestock rearing is also an important form of savings from which to barter payments for dowries or consultations with traditional healers. Livestock is also central to sacrifices in rituals.

Community members emphasized that livestock has become a particularly important source of income during drought periods and served as an alternative livelihood strategy when crop harvests were inadequate. The income generated from the sale of livestock is also used to fund children's education, family healthcare and other household requirements. Most villages reported that they did not use livestock for dairy production.

Livestock is sold in market at Chibule and Mukuni Village, where buyers travel from Livingstone and beyond to purchase livestock. Where households were able to, they would pay to rent small trucks, oxcarts and space on private vehicles to transport their livestock to market. Smaller livestock such as chickens were transported via taxi or hitchhiking vehicles, where people paid between 20 and 100 Kwacha one way. The majority of people walked their livestock to market themselves or paid others 100 Kwacha per animal to walk the livestock to market for them.

On average, the following amounts were received for livestock in good health:

[(6)] The Ng'andu village cluster includes the villages of Muntumuswana, Chibule, Ng'andu, Munwana, Mukalahani, Siachuma, Chilizya, Zangala, Namatosgo, Siachalisa, Sichilobe, Siamatete and Tembo

- Juvenile cow (2 years old): Kwacha 1500
- Adult cow: Kwacha 5000
- Goat: Kwacha 150 – 200
- Chicken: Kwacha 30 – 40

The ownership of cattle, like in most of Africa is seen as a wealth status. The more cattle a household or individual owns, the more wealth and status they are perceived to have.

Finding water for livestock was cited as a challenge, particularly under drought conditions currently being experienced in the majority of affected villages. Communities reported to use water sourced from boreholes, dams (where present) or water from streams and rivers.

3.4.4.2 Crop Farming and Gardening

Primary livelihoods in the wider Project Area are almost entirely agriculture based and all village clusters engaged in FGDs are engaged in the cultivation of crops, regardless of whether they consider it their primary occupation. There is very little or no irrigation used and almost all crops are rain fed. The staple crop grown is maize, but millet, sorghum, cowpeas, sunflowers and groundnuts are also cultivated. Focus group participants cited a lack of government support, inadequate mass water infrastructure and distance to maize depots as a primary reason crops were not used for commercial benefit.

Crop farming is focused in the rainy season across the Project Area. Crops are planted between November and January and harvested in April and May. Seeds are sourced from previous harvests or, when previous harvests are poor, they are bought at commercial seed outlets. Equipment used for agriculture is basic e.g. (hoes, machetes, oxen and donkeys) because it was part of the local culture and because they do not have the funds to invest in more efficient equipment. Communities use fertilisers, which are either bought at personal expense or accessed through the Government Funded Fertiliser Support Programme.

Vegetable gardening is undertaken in all communities throughout the year and used for both subsistence and economic purposes. Garden plots are cared for primarily by women and are often communal in nature. Commonly grown plants include tomato, cabbage, onion, butternut, peppers, eggplant, carrots and beans.

As indicated previously, the land required for the proposed Staff Township is communally owned, controlled by the Chief and his appointed headman, with no individual usage rights and no cultivation.

3.4.4.3 Curio Trade

Curios are made by both men and women and sold in tourist hotspots including Livingstone town, within the vicinity of the Victoria Falls and at the Mukuni Curio Market in Mukuni Village. As indicated previously, timber resources in the proposed Staff Township area used for curio making have been severely depleted, and no longer represent a viable source for the local communities.

In Zambia, legislation requires that those who cut down the trees are in position of a permit, however, the majority of 2019 FGDs with those engaged in curio making suggested this was not the case and most people operated without the permit.

Figure 3.4 Wooden carvings created by a Chibule Resident

3.4.5 Household Income and Expenditure

FGDs in 2019 found that the majority of communities earned a small household income, much of which was generated through agricultural activities. In the villages in the Mukuni ward, curios are also significant income generators.

Where greater income to supplement education and healthcare is required, or where households traditional income sources are compromised, livestock sales become an important income generator.

In the household survey undertaken by ERM in 2014, households reported that food was the largest expenditure, accounting for 48% of monthly spend (or 431.75 Kwacha). Food purchased was typically that which cannot be grown (e.g. salt, sugar and oil), however maize was also bought when harvests have been depleted. Clothing was reported as another common household expenditure. In many cases households found it difficult to estimate monthly expenditure on key items as money tends to be spent as soon as it is obtained.

According to the 2014 ERM household survey, some communities in the Project Area had small savings groups. However these schemes are very small with minimal funds.

3.5 Education

Despite the national policy of free primary education, a number of children do not attend school because their parents or guardians cannot afford the additional costs of uniforms, food, transportation and books.

Educational budgets were reported to be inadequate and are blamed for poor delivery and quality of education amongst communities in close proximity to the proposed Staff Township site. A shortage of teachers and learning materials, as well as inadequate infrastructure are major challenges to achieving universal education in the Project Area districts.

There is a shortage of schools in the Project Area, particularly secondary schools which are typically located in market centres of the district including Zimba, Choma, Livingstone and Kalomo.

Observed school infrastructure is generally of poor condition and inadequate for the number of students attending facilities. Buildings were in varying conditions, however many were observed to have peeling walls, broken windows and damp. The majority of schools visited had between 1 and 3 classrooms, however serviced five or more year groups. Classrooms typically had a blackboard and an insufficient number of desks and chairs; whereby students have to share chairs and desks or simply sit on the floor.

The teacher to student ratio for schools in Mukuni ward (Kazungula) was noted to be one teacher to 75 – 80 students.

3.6 Health

Mukuni Clinic provides family planning, maternal, child health, and antenatal care services, treatment of STIs, counselling, testing and care for those with HIV and general treatment of diseases. It is the closest clinic to the proposed Staff Township area.

According to a health worker at Mukuni Clinic, the most common illnesses in order of prevalence are respiratory tract infections, coughs, dental problems, eye disease, pulmonary disease, skin disease, trauma and injuries, ear disease and asthma. Malaria rates were reported to have significantly decreased in recent years due to the effectiveness of preventative measures such as spraying and use of mosquito nets. Community members in associated with the proposed Staff Township Area attested to decreasing malaria rates, but still cited it as a common health problem.

The communities interviewed reported the supply of health facilities and related services as insufficient to cater for the needs of the area. The aforementioned Mukuni Clinic was said to cater for up to 57 Villages about 2,295 people.

Generally, there are long distances involved when accessing the health facilities coupled with high costs of treatment, transport (about 100 Kwacha for a taxi) and shortage of medication and medical personnel. There is only one doctor for the entire chiefdom who is only available for three days every week. Only a clinical officer and eight nurses are available throughout the week. Other reports indicate that the doctor is only available once a week and 12 nurses and a medical assistant service the area.

Table 3.3 Health Facilities in the Project Area

Village Cluster	Village	Nearest Health Facility	Number of health personnel
Ng'andu	Chibule	Mukuni Clinic (15km away for furthest villages)	10 nurses 1 Medical Assistant 1 Co-medical Assistant 1 Doctor (once a week)
	Ng'andu		

*Demonstrates furthest distance travelled to health facility

Source: ERM FGDs, 2019

The greatest impediment to receiving healthcare in the Project Area is shortage of health facilities, drugs, personnel and equipment as well as the distance villagers are required to travel. Mukuni Clinic is particularly overburdened and under resourced. Mukuni Clinic services a population of an estimated 10,000 people. In addition to health personnel available at health posts listed in *Table 3.3*, Community Health Workers (CHW) are located in every village.

CHW are mainly involved in HIV/AIDS awareness campaigns and counselling and home visits. Once a month, CHW organise for health professionals to do rounds in each village in the Project Area, and

to do inoculations and general check-ups. This is particularly beneficial to vulnerable groups including pregnant women, children and the elderly.

3.6.1.1 Traditional Medicine and Healers

Traditional healers are reported to be present in all the communities and are particularly important areas where access to healthcare is extremely difficult. In all other villages, traditional medicine is used as an alternative to conventional medicine when patients cannot afford to pay for treatment, distances to health centres is too great or as a last resort when conventional medicine fails to have an effect.

This is relevant to the proposed Staff Township area as it has been (and to some extent continues to be) a source of forest products useful in preparing traditional medicine; however, this is limited.

3.7 Services and Infrastructure

3.7.1 Transportation

Kazungula District is primarily connected by the tarred T1 road (Livingstone to Kalomo to Zimba to Choma) to the North. Access to amenities, larger settlements and service infrastructure not located along the T1road is via secondary, graded roads while the majority of settlements are accessed by sand and gravel roads. A large number of these roads are in poor condition and are impassable in the wet season.

Public transport is generally available in Livingstone, However, public transport within the villages close to the proposed Staff Township is virtually non-existent. As such, the majority of villagers explained in the FGDs that they walked, rode bicycles or motorbikes and caught lifts with villagers who had access to private vehicles. Private taxis are available, however they are costly and cost 250 Kwacha one way.

Oxcarts were used to transport goods and services as well as donkeys, which were observed to be important pack animals in a number of communities.

Figure 3.5 Donkeys on the Mukuni Road to Chibule

3.7.2 Water

Communities in the Project Area that participated in the 2019 FGDs accessed water from wells/boreholes and rivers. Wells and boreholes were the most popular source of water. Surface water including dams, streams and rivers were relied upon for both household and agricultural activities. In villages where mechanised wells were available, they were hand pumps and water from wells was used not only for household use but for watering of cattle, gardening and brick making. Each village cluster

reported to have between 2 and 4 boreholes per village Water collection is primarily undertaken by women and children and distances travelled to collect water varied from 500m to 10 km.

Access to water was reported as an issue in the villages affected by the proposed Staff Township. This was particularly true of the dry season, when FGDs reported that many water sources dry out and distance to collect water increases. Reason for water issues included drought, damming of rivers by upstream agricultural users and damaged/non-maintained infrastructure.

Figure 3.6 Manual Hand Pump (left) and Pan used to Water Cattle (right)

3.8 Telecommunications

Most people who attended the village FGDs owned mobile phones and used them as their primary means of communication. Telephone reception however is poor in the majority of the communities, particularly the more isolated villages.

3.8.1 Recreational facilities

Sport is an important social activity in all the villages that participated in the 2019 FGDs and all villages affected by the proposed Staff Township participated in inter-village football and netball leagues. Each village has at least one field/court, however equipment including balls were not always available. Some schools also have courts and fields on which children played against one another within the village and against other villages.

4. CONSULTATION AND DISCLOSURE

This *Chapter* describes stakeholder engagement activities undertaken and planned for the acquisition of land for the proposed Staff Township area. It highlights the Project's approach to ensuring free, prior and informed consultation of stakeholders and their representative institutions in land access and acquisition.

Stakeholder engagement activities are divided into five sections:

- **Stakeholder Engagement Approach**: Description of the overall approach to stakeholder engagement, and the specific goals and objectives of the engagement strategy.
- **Stakeholder Identification and Engagement Methods**: Identification of key stakeholder groups and individuals at the affected community, local, district and provincial level, and how they will be involved in resettlement discussions and planning.
- **Engagements to Date:** Summary of engagement activities undertaken during June and July 2019;
- **Key Issues Raised by Stakeholders:** Summary of key issues raised by stakeholders during recent field activities; and
- **Disclosure:** Disclosure of the LRP and description of planned engagements moving forward.

In addition to this LRP, a detailed Stakeholder Engagement Plan (SEP) has been prepared for the proposed BGHES as whole. The SEP outlines the roles and responsibilities for keeping all stakeholders appropriately informed of Project progress, and involved in resettlement planning and implementation.

The SEP will identify and map all Project stakeholders with an interest, or ability to influence the land acquisition and resettlement process, and provide guidance on the establishment of Project steering and advisory committees.

4.1 Engagement Approach

Stakeholder engagement is the broad, inclusive, and continuous process of relationship building between a Project proponent and its stakeholders, particularly those directly affected.

The specific approach to stakeholder engagement for land acquisition related to the proposed Staff Township include the following:

- Establish and maintain a constructive, ongoing relationship with those to be displaced, as well as other resettlement stakeholders, based on mutual understanding, respect and trust;
- Ensure that engagement activities are undertaken in a manner that is inclusive, culturally appropriate, and tailored to the language preferences and decision-making processes of those displaced, and the needs of vulnerable groups therein;
- Engage with those displaced as a group – via an informed, structured consultation and participation process. This is to establish the general terms and conditions that will guide the resettlement and livelihood restoration process;
- Undertake good faith negotiations with individual affected households on the basis of the general terms and conditions established through the group engagement described above;
- Mitigate the risks of asymmetry of information and bargaining power in the engagement / negotiations process through effective disclosure of timely, relevant and understandable, information, capacity building, and third party appointments;
- Ensure that all engagement activities are free of intimidation or coercion, and all participants are fully aware of their rights according to national law and international standards; and
- Work towards creating broad community support for the resettlement and Project as a whole.

The specific groups affected by access to land and how they will be engaged in livelihood restoration planning is described in *Section 4.2*.

4.2 Stakeholder Identification and Engagement Methods

Stakeholders are those individuals, groups and organizations with a legitimate interest in the land access and livelihood restoration processes. In particular, stakeholders are those people and households that experience displacement directly. In the context of this LRP, key stakeholders fall into one of the following categories:

- Government officials and bodies at the national, provincial, district and ward level; relevant to where land will be acquired and households resettled;
- Traditional leaders, including chiefs, headmen and village heads of those respective areas;
- Elected officials responsible for the Project Area;
- Individuals/Households accessing the land required for construction and operation of the proposed Staff Township for livelihood purposes; and
- Community based organizations active in the area.

Table 4.1 lists the key stakeholders with an interest in this component of the Project.

Table 4.1 Project Stakeholders

Stakeholder Category	Key Stakeholders
Government officials – National/Provincial/District	Ministry of Lands and Natural Resources and district government officials necessary for issuing a permit to occupy the required land
Traditional leadership	Mukuni Chiefdom
Elected officials	Project-affected Ward Councillors (Mukuni), Member of Parliament
Residents of main villages/settlements in close proximity to the proposed Staff Township	Chibule, Ng'andu, Chilizya, Mukuni, Siachuma, Siamatete
Community-based organizations	Zambia Vulnerability Assessment Committee, Farmers Associations, The Butterfly Tree, Response Network, Alliance for Sustainable Agriculture, Zambia Chamber of Small and Medium Business Associations, Zambia Community Based Natural Resource Management Forum, and faith-based organizations

The methods for engaging stakeholders include informal engagement and information sharing (including the use of social media) and formal notifications, as required by national legislation governing land acquisition.

To align more closely with international standards around land acquisition and resettlement, the Project will establish a three-tiered stakeholder engagement approach (see Resettlement Policy Framework) to reach collective agreements on key aspects of land acquisition and resettlement, and to steer resettlement planning and implementation on subsequent Project phases. This will be particularly important for the next phase of the Project (i.e. construction of transmission lines), where land acquisition impacts will be significant and will likely include physical displacement.

The Project will establish a dedicated RAP/LRP Implementation Team (refer to *Chapter 11*) responsible for, among other, conducting additional engagement as well as providing technical advice and support to each stakeholder tier. The Implementation Team will work collaboratively with Project stakeholders

to ensure land access and livelihood restoration aligns with the Resettlement Policy Framework and the commitments made in this LRP.

Key issues requiring stakeholder participation include:

- Reviewing and finalizing the criteria for Project eligibility and components of the entitlement matrix;
- Management of land acquisition related grievances; and
- Livelihood restoration monitoring and evaluation.

4.3 Engagement to Date

The Project's Environmental and Social Impact Assessment (ESIA) team established a Project stakeholder database, which identifies and registers all interested and affected individuals, groups and organizations. General information about the Project generated by the ESIA process has been widely distributed to stakeholders in person, by regular mail and where feasible, via email.

In 2016, notices were published in newspapers with a wide readership in Matabeleland North, and information meetings were held with traditional leaders, including headmen and village heads, to further encourage the involvement of stakeholders in Project impact discussions, including impacts related to the land acquisition process.

With respect to land access related to the components associated with this LRP (proposed Staff Township), as described previously, field work was undertaken in June and July 2019 including FGDs, KIIs, participant observation and transect walks through the proposed Staff Township area.

A summary of the FGDs held in the communities relevant to this Project Component are presented in *Table 4.2*.

Table 4.2 Summary of FGDs held with Affected Communities

Village Cluster	Village	District	Province	Ward	Engagement Activity
Ng'andu	Chibule	Kazungula	Southern	Mukuni	FGDs with villagers and headmen, including vulnerable groups
	Ng'andu	Kazungula	Southern	Mukuni	FGDs with villagers and headmen, including vulnerable groups
	Munwana	Kazungula	Southern	Mukuni	FGDs with villagers and headmen, including vulnerable groups
	Chilizya	Kazungula	Southern	Mukuni	FGDs with villagers and headmen, including vulnerable groups
	Siachalisa	Kazungula	Southern	Mukuni	FGDs with villagers and headmen, including vulnerable groups
	Sichilobe	Kazungula	Southern	Mukuni	FGDs with villagers and headmen, including vulnerable groups

4.1 Perceptions on Land Access in Affected Communities

In FGDs with affected communities as well as KIIs with Headmen and the Chief, land was considered to be adequate in the broader area. People understood and respected traditional land rights and the Chiefs ultimate ownership and management of all land in the Chiefdom. The land set aside for the proposed Staff Township was said to be largely unutilised and overexploited. However, this along with the prospective acquisition of the land for the proposed Staff Township was not seen as problematic, as alternative land is available and being used for wood harvesting, grazing and other land uses.

4.2 Other Key Issues Raised by Stakeholders

Table 4.3 summarizes community concerns regarding the proposed BGHES, raised during the meeting held with the Village headmen at Mukuni Royal Village on 1st July, 2019.

Table 4.3 Concerns Raised by Village Headmen at Mukuni Village

Concerns from Headmen	Response from ZRA/ERM
Previous projects like the Victoria Falls Power Station, Kariba Dam, and the Bridge on the Zambezi River never considered the views of the people. What measures are being put in place to ensure that the view of the affected communities are incorporated in the proposed BGHES project implementation?	The proponent and Project partners are keen not to repeat the mistakes of the past. During implementation, the ESMP and monitoring plan will ensure that all the views of the community are taken into consideration. A public disclosure period will follow submission of the ESIA and related reports – at key areas accessible to communities – as well as in the newspapers and the ZRA website to request comments from the stakeholders. Public meetings will also be held as part of the disclosure process.
What areas of Corporate Social Responsibility (CSR) are being considered in the Project?	CSR issues will be considered in the development of impact mitigation measures
After completion of the dam: what will the staff housing be used for?	The projection is for the Project proposed Staff Township to be utilised for the construction phase of the project – up to 7 years in duration. Operational phase staff will replace the construction staff. The current plan is for the proposed Staff Township to remain in the hands of the proponent. ZRA and/or its representatives will communicate any changes otherwise made to the Project plan to the community.
When will the Project start?	The implementation of the Project is in phases. The feasibility phase is complete and currently the ESIA report is being updated. These studies are being undertaken concurrently with the Engineering, legal and Financial work streams. These studies are proposed to be completed in 2019. Possible developers have already been identified but consultations are still ongoing. The outcomes will be formally communicated in due course.
How is the matter of the possible flooding of the rapids being addressed?	The consultants will as part of their assignment conduct a flow rate analysis as well as a tourism study. The purpose of the latter will be to find out the operation regime of the river-based tourism activities, and potential impacts on the sector the project might have. This will also take into account rafting seasons and other activities dependent on the rapids.
What will be the impact of the project on the Victoria Falls?	Feasibility studies have been undertaken and results indicate that Victoria Falls will not be affected by the Project.

4.3 Future Engagement

Additional meetings will be held with key government ministries and departments with responsibility for land acquisition including the Ministry of Lands, District Administrator's office, and officials from the local government to ensure permission for the Project to occupy the proposed Staff Township area is properly secured.

Additional engagement will be held with the traditional leadership and local representatives of affected communities to facilitate the land acquisition process; and to ensure there is a flow of Project-related information and meaningful involvement of affected people in the finalization of compensation and livelihood restoration measures. This will include appropriate formal public notification (gazetting) of the Project's intention to acquire the land for the proposed Staff Township.

4.4 LRP Disclosure

A summary of the LRP, in the appropriate local language will be prepared and distributed to traditional leaders and local government. They will be encouraged to post the summary in affected communities and will be provided with Project support in sharing its content in meetings with their constituents.

5. PROJECT IMPACTS

This *Chapter* describes the displacement impacts resulting from the acquisition of land required for the proposed Staff Township, and the efforts to locate and design the township to avoid economic displacement.

5.1 Efforts to Minimize Displacement

The proposed BGHES requires proposed Staff Townships in both Zimbabwe and Zambia. Six alternative areas were preliminarily identified, three locations in Zimbabwe and Zambia respectively. Proposed Staff Townships will be located on the North bank of the dam (in Zambia) and the South bank (in Zimbabwe).

In Zambia, the most suitable location for the proposed Staff Township is shown in Figure 5.1. The proposed site was selected due to the proximity to the different Project components. As has been noted, land-take associated with proposed Staff Township construction and operation will not result in physically displacement of any households. Economic displacement will be limited to loss of access to communal land.

5.2 Physical and Economic Impacts

Under customary law, the Chief of Mukuni Chiefdom has the power to allocate land and grant usage rights. Chief Mukuni confirmed that the area chosen for the proposed Staff Township is communally owned and accessed predominantly by the 220 residents of Chibule village. The Chief verified that no individual customary usage rights to the area have been granted.

An assessment was undertaken to better understand and confirm how acquisition of the land for the proposed Staff Township would impact the following:

- People/households of nearby villages;
- Land area according to land type (i.e. agriculture land both cultivated and fallow, grazing land, residential land);
- Crops and trees;
- Public facilities and infrastructure (i.e. wells/boreholes, schools, clinics, places of worship etc.); and
- Graves, shrines and other areas where cultural heritage exists (if applicable).

The area required for the proposed Staff Township does not have any built assets, agricultural cultivation or human habitation. Hence, the development of the proposed Staff Township here will not result in any physical displacement of people, and only limited economic displacement.

Construction and operation of the proposed Staff Township in this area will result in two main losses:

- Foot paths used to access dedicated grazing lands, sources of water for livestock and farm areas beyond the Staff Township site; and
- Loss of access to natural resources (both timber and non-timber products).

5.2.1 Loss of Land

Land take required for the development of the proposed Staff Township is 489 hectares. This land is unpopulated and not considered suitable for farming. No agricultural fields or residential plots will be affected. The land is communally held and used. An estimated 210 households from six villages travel through the land and periodically gather timber and non-timber forest products from within.

5.2.2 Loss of Access

The proposed Staff Township contains a number of important pathways to fishing locations and vegetable gardens in addition to being adjacent to the area designated by the Chiefdom as Chibule Grazing Lands. While the Project footprint for the proposed Staff Township does not directly affect these resources, its location will require the communities accessing the grazing land and associated surface water resources to find different access routes.

Figure 5.2 Path within the Proposed Staff Township Site

5.2.3 Loss of Trees

5.2.3.1 Timber Products

Traditionally timber in the footprint of the proposed Staff Township was reported to be used for curio making as well as for firewood, construction poles and other building materials. However, during FGDs and KIIs with local leaders and area residents, it was confirmed that timber resources used were almost completely depleted from the site.

5.2.3.2 Non –Timber Forest Products (NTFPs)

Non-timber forest products available in the proposed Staff Township site include the following:

- Wild fruits (injii, marula and mumbububu), honey, edible root tubers (particularly a climbing tuber – known locally as Makuli) and leaves of various plants used as feed for livestock; and
- Medicinal plants including the Kanunkira tree whose roots are used to treat headaches, Mululwe whose bark has medicinal value, Aloe Vera used to treat malaria, diarrhoea and burns, Mopane used to treat diarrhoea in cattle and syphilis in human beings.

Similar to timber resources, the supply of these products has become depleted due to over exploitation and drought.

5.2.4 Impacts on Cultural Heritage Sites

No graves or other cultural heritage sites have been identified in the area required for the proposed Staff Township. However, the Project will implement a “chance find” procedure whereby work will be

suspended if a grave or cultural site is identified during construction until there has been additional engagement with the community and affected household.

6. ELIGIBILITY, ENTITLEMENTS AND COMPENSATION

6.1 Introduction

This *Chapter* describes the general principles and policies applied to determine eligibility and define entitlements for compensation resulting from the acquisition of land required for the proposed Staff Township.

The objective of the eligibility and entitlement framework is to provide transparent, fair and timely (prior to displacement) compensation for impacts to all PAPs in accordance with Zambian law and World Bank Environmental and Social Safeguard Policy Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.

6.2 Eligibility

Eligible persons include all persons with a formal interest in the land required by the Project – this may take the form of propriety ownership, co-proprietary, tenants, or any persons with other limited interests. The term is further expanded to include affected persons – persons who gain a benefit or utilise the land or improvements made on that land irrespective of their legal standing.

Immovable assets typically considered eligible for compensation include the following:

- Land, including cultivated and fallow land, forest, and residential plots;
- Crops, both annual and perennial;
- Common property resources, including wild plants and animals, fuel wood, and timber;
- Structures, including houses, annexes and derelict buildings, along with fences and other built improvements;
- Other infrastructure, either communal infrastructure or private, including wells, roads, and irrigation infrastructure; and
- Public access, including informal roads and footpaths and navigable waterways.

The above assets are typically held under three types of tenure arrangements:

- Registered ownership, through possession of formal title deeds that are registered;
- Communal ownership, where by the State has authorized local government authorities or traditional leaders to manage the asset on their behalf, which may or may not be formally documented. Individuals, families, clans or villages, or even some combination of these may use communal assets; and
- State owned.

With respect to compensation, as no one has been granted individual usage rights by the Chief to the proposed Staff Township area and because there are no immoveable assets (i.e. structures, annual/perennial crops), compensation will be based on communal usage of the land.

The land is used by community members in the following two ways:

(i) Public access: foot paths used to access dedicated grazing lands, sources of water for livestock and farm areas beyond the proposed Staff Township site; and

(ii) Foraging natural resources (both timber and non-timber products).

Table 6.1 outlines the persons eligible for compensation based on the assessed impacts.

Table 6.1 Types of Loss & Eligibility for Compensation

Type of Loss	Eligible Persons	Description
Communal Land	Individual and communal land users, authorized by local gov't / traditional leaders	Land managed by local government or traditional leadership, on behalf of the State. It is common for these entities to give permission for use to people / communities / tribes.
Community Access Points	Communal Users	The communal users who access / utilize village access points and right-of-way to support and maintain livelihoods.

6.3 Entitlement Framework

The Entitlement Framework defines the types of compensation or resettlement assistance that will be provided to eligible persons based on the type of asset that will be lost. The framework also establishes the conditions under which eligible persons are granted allowances or access to livelihood restoration programmes. Where possible and reasonable, a range of livelihood assistance options will be provided that allows households to select the type of compensation that best suits their unique conditions.

Entitlement policies define the specific type of compensation to be made available to those affected by specific displacement impacts.

Entitlements generally fall into the following categories:

- In-kind compensation, which involves the planning, design and development of replacement assets and livelihood activities to compensate for those lost to the Project; or
- Cash compensation, which involves the payment of cash to compensate for assets, lost to the Project, at agreed replacement rates of the lost asset.

In accordance with international standards, the Project favours the provision of in-kind compensation over cash compensation wherever feasible, as it represents a reduced risk – for both the Project and those affected – of entitlement mismanagement, inequitable distribution, and long-term impoverishment. Cash compensation will only be provided under circumstances, for specific types of impacts, and under carefully controlled conditions.

All compensation will be established in consultation with affected communities and local authorities including technical services. Compensation rates will be equal to or greater than full replacement value of the affected asset with no deduction for depreciation.

The Entitlement Matrix (see *Table 6.2*) defines the types of compensation or assistance to be provided to eligible persons based on the type of asset that will be lost and according to World Bank standards and requirements stipulated by Zambian law. It will be presented together with the eligibility criteria to local stakeholders during LRP disclosure. Based on these discussions, any necessary adjustments will be made and a final version included as an Annex to this LRP.

Table 6.2 Entitlement Matrix

Project Impact	Eligible Party	Eligibility Criteria	Mitigation Measures
Loss of Land			
Communal Land	Community members utilizing the proposed Staff Township area for collection of natural resources	Permanent loss of communally used land and associated common property resources within proposed Staff Township area	■ Access to equivalent area of equal or greater potential value (i.e. timber and non-timber products) and locational advantages; ■ Access to Livelihood Restoration Measures (Section 7.2.4.1.). *or* ■ In the event that suitable replacement land cannot be identified, in-kind improvements of a communal nature that will benefit the affected users of the land (e.g. support for improved road access, water, power, or health and education facilities) will be provided.
Loss of Village Access Points			
Access Points and Foot Paths	Communal Users	Loss of foot paths and village access routes within the Project area	■ Establishment of alternative paths and access points

6.4 Loss of Communal Land and Common Property Resources

Communal land and common property resources located in the area designated for the proposed Staff Township totals approximately 489 hectares. This is the maximum area of replacement land that the Project will need to secure for communal users in the surrounding areas. In line with Zambian legislation as well as international standards, the Project will compensate the loss of communal land through the provision of alternative land at a site comparable to the current area.

During the site visit and meeting with Chief Mukuni on 4 December 2018, a verbal agreement between ZRA and the Chief was reached. The Chief agreed that the land selected for the proposed Staff Township could be acquired by the Project and prior to the start of Project construction. His chiefdom would be responsible for ensuring that communal land use and access routes are re-established elsewhere. It is understood that until such time, the area will remain uninhabited and individual usage rights to the area will not be allocated.

Subsequent to the December meeting, the Chief has spoken to the Bedyango [(7)], who have identified uninhibited land as replacement. In consultation with the Chief and Bedyango, this replacement communal land will be assessed and confirmed as suitable using the following criteria:

- **Geographic Location:**
  - Distance from the location of the original site (km);
  - Distance from the area being replaced (km);
  - Distance to existing water sources (km);
  - Distance from impacted communities (km);
- **Physical Characteristics:**
  - Acceptable and amenable relief / topography;
  - Soil quality appropriate for planned land use and livestock activities;
  - Natural drainage;
  - Absence of natural risks;
- **Land Area:**
  - Availability of sufficient surface area (ha);
  - Social and environmental impact to host communities and existing land owners/users [8];
- **Economic Activities:**
  - Availability of existing pastoral areas;
  - Availability of wild trees of economic and / or medicinal value;
  - Availability of natural resources such as thatching grass;
- **Recommendations for site improvements.**

A summary of the site assessment will be prepared for each potential site and presented along with photos and maps to authorities and affected communities during LRP Disclosure.

[(7)] In Mukuni Chiefdom, the Bedyango is a designated female responsible for the management and distribution of land

[(8)] A key consideration in the selection of replacement land is the potential impact on host communities. Where necessary, the Project will include additional engagement activities with host communities and / or existing landowners to gain a deeper understanding of the social and environmental impacts as well as possible mitigation measures.

Any differences in access and availability of natural resources as well as recommendations for site improvements will be considered under the Livelihood Restoration and Improvement Program (LRIP) described in *Chapter 7*. Any recommendations for improvements beyond the targeted LRIP scope and budget will be considered for integration into the extended community outreach programs developed under the Project's Environmental and Social Management Plan (ESMP).

Existing lands demarcated by the Chief as communal grazing lands already exist 2 km south of the Proposed Staff Township. This area represents one option which can included in the replacement site assessment process.

6.5 Loss of Village Access Points

It is recognised that the proposed Staff Township provides an important pathway to fishing locations as well as vegetable gardens, grazing land, and water sources, all of which are located outside of the proposed Staff Township area. To mitigate this impact and minimize disruption to important livelihood activities, a participatory process will be undertaken with the Chief and affected communities to identify and map alternative routes around the proposed Staff Township in order to access these resources and other locations of interest. Improvements to the new routes to facilitate access will be provided, if required.

7. LIVELIHOOD RESTORATION AND IMPROVEMENT

7.1 Introduction

International standards define 'livelihoods' as the full range of activities that individuals, families, and communities engage in to make a living. It includes wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

This *Chapter* details the Project's approach to livelihood restoration for economically impacted households so that they are able to demonstrate a continuous and sustainable improvement in their economic activities following displacement. The overarching goal of the proposed Livelihood Restoration and Improvement Plan (LRIP) is to ensure that the livelihood of each household affected by the proposed Staff Township is restored and improved to a level equal to or greater than the level preceding impact of the Project.

In addition to the in-kind compensation for the proposed Staff Township area, the Project has developed complementary programs (*Section 7.2.4*) under the LRIP comprised of additional compensation measures to support economically displaced populations.

The livelihood programs detailed within this LRP will evolve over time as additional feedback is received from various stakeholders during LRIP disclosure and additional input provided by technical services. Feedback will be integrated into the framework below, which will be included as an Annex to this document. Implementation of the LRIP will continue until all PAHs have restored their livelihoods, or have been given sufficient opportunity to do so.

7.2 Livelihood Restoration and Improvement Plan (LRIP)

As noted above, this *Chapter* expands upon the Entitlement Framework (6.3) and details how the compensation provided will be supported through additional programming to achieve sustainable livelihood restoration and improvement. The LRIP consists of tailored programs based on the existing livelihood activities of the affected population and the extent to which the Project affects people's livelihood. These measures will be expanded to address land acquisition impacts resulting from subsequent phases of the Project.

The Project will lead the process of establishing LRIP programs as well as provide the resources needed for implementation. Implementation of the LRIP will be based on a third-party model [(9)] with in-house coordination from the ZRA LRP Implementation Team working in tandem with selected partners. The Project will also seek to collaborate with technical services, NGOs, and other development partners in the management and implementation of LRIP programs.

LRIP activities will begin prior to displacement to establish the effective support structures necessary, while post-impact activities will focus on the provision of additional support where necessary and monitoring of impacts.

7.2.1 Goals and Objectives

The goal of the LRIP will be to help restore, and where possible improve, the livelihoods and living standards of economically displaced PAHs. The LRIP will assist men, women, youth, and communities in re-establishing and strengthening current livelihood practices in the short and medium term, and develop transferable skills and engender self-reliance in the long term.

The specific objectives of the LRIP include:

- Provide support so that the abilities, resources, and assets of PAHs are effectively deployed in meaningful livelihood initiatives;

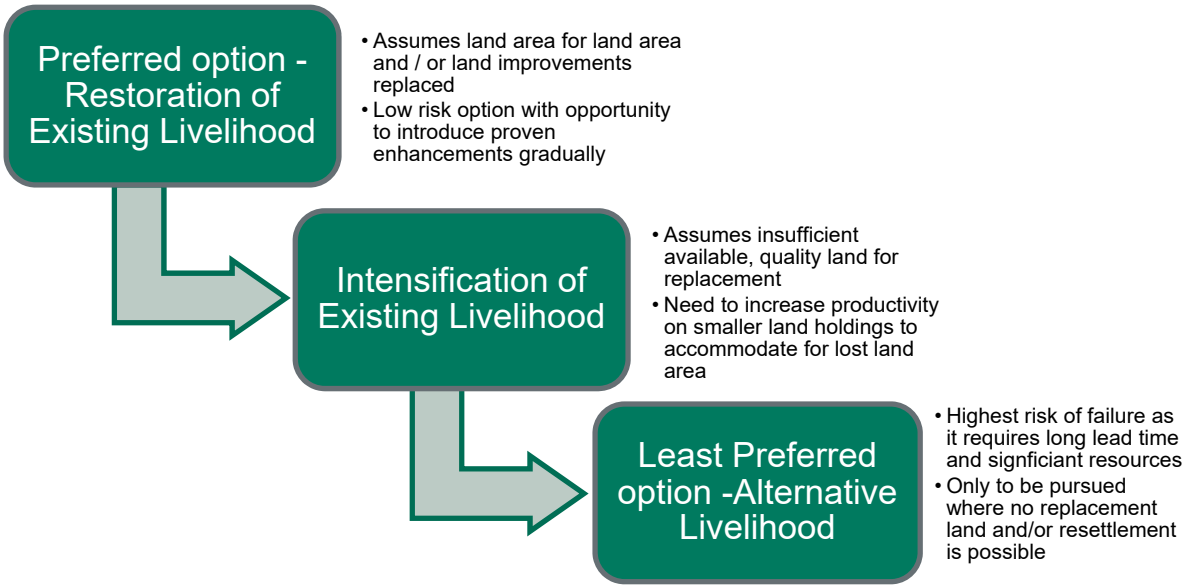
- Enable PAHs to benefit from multiple sustainable livelihood activities within the Project Area;
- Meet the compensation commitments – as agreed with PAHs – such that compensation and other displacement related assistance is effectively and sustainably managed by PAHs;
- Support the improvement of commercial skill-based livelihoods to create opportunities for PAHs to benefit from a skills-based economy;
- Deliver training, and provide people with work experience and transferable skills that will help them compete for Project-related jobs and future opportunities; and
- Provide support so that PAHs and communities are able to maintain equal access to broader community, district, and regional development programs (i.e. government programs, Project community development activities, etc.).

7.2.2 Principles

The following principles have been applied in the design and implementation of the LRIP:

- **Identify Livelihood Impacts Systematically** – Livelihood impacts on local people will be determined systematically through the asset surveys and engagement with those affected. To the extent possible, such impacts will be quantified and the affected people identified individually. Impacts will be considered even if the affected people are not resident in the area, do not own the land, or do not have legal title or access to the resources.
- **Plan and Negotiate Appropriate Measures with Affected People** – The planning of livelihood restoration / improvement is not a purely technical exercise, but requires a high level of interaction with the affected people in order to develop the most feasible and desirable mitigation measures. The agreed measures, in the form of compensation entitlement, will be incorporated into formal collective and/or individual agreements. All three tiers of stakeholders described in *Chapter 4*will provide input and approve the LRIP.
- **Give Preference to Replacement of Existing Livelihood Activities** – Livelihood restoration / improvement measures will be planned according to the hierarchy illustrated in *Figure 7.1.*

Figure 7.1 Livelihood Restoration Hierarchy



7.2.3 Eligibility & Target Groups

Eligibility for programs is dependent on the scale and type of impact experienced by the household. The LRIP considers the livelihood support needs of women and youth, and any marginalized and / or vulnerable groups.

7.2.4 Livelihood Restoration and Improvement Program Types

7.2.4.1 Improvement and Sustainable Management of Replacement Land Resources

The Project will seek to improve the management of natural resources available on the land selected as replacement for the proposed Staff Township area.

Improvements will first seek to fill any gaps in access and availability of natural resources between the proposed Staff Township affected area and the selected replacement site. The list of necessary improvements will be dependent upon the results of the site assessment. Further improvements will be considered based on the recommendations of technical services as well as the needs of affected users.

These improvements may include but are not limited to:

- Formalisation of a Land & Forest Management Committee to promote sustainable and regenerative management of forest and forest products on the replacement communal land;
- Training and capacity building on natural resource management for the Committee and interested, affected community members; and
- Establishment of market linkages for timber and non-timber forest products.

7.2.4.2 Enhancement of Natural Resources and Livelihood Activities

In addition to replacing key resources that support uses of the communal land, the Project will also use the results of the site assessment to fill any gaps in other natural resources that play an important role in local livelihoods.

The Project will consider designating portions of replacement land for growing thatching grass as well as a campaign to reforest beneficial trees used for construction materials and traditional medicine.

The Project will follow up with skills training on processing and marketing to promote the use natural resources as an income generating activity. Support will primarily target women in the communities surrounding the proposed Staff Township area who depend on selling and utilizing grass and trees products.

7.3 Optimization of Local Employment

The development of the proposed Staff Township will create a range of employment opportunities, including short-term positions during the construction phase. Although not part of LRP / LRIP activities or budget, local employment will be important in maintaining and enhancing the income of affected households. Where feasible, the Project will give first priority selection of unskilled labour positions to PAHs as part the local employment plan. Candidates will be selected through an independent committee and validated using information in the LRP database.

In continuity with the principles of the proposed BGHES Project and more broadly the ZRA, local employment will be supported through the Project's community outreach initiatives as a way to extend Project-related benefits to affected communities.

The Project will seek to build upon and strengthen existing training programs offered through local government to ensure that local candidates have the best opportunity to successfully fill required positions while increasing their broader skill set and retention for skilled jobs during operations.

Due to the nature of the Project, it is envisioned that the majority of jobs will be comprised of construction roles that traditionally disadvantage female candidates and candidates with lower physical capital due to age or handicap.

To ensure that Project-related benefits are inclusive of all categories of people in the Project Area, the Project will integrate gender and other social dimensions into existing policies to build and maintain a diverse and gender-balanced work force.

8. VULNERABLE SUPPORT

Vulnerable persons are defined by the World Bank as those who, "by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status, may be more adversely affected by resettlement than others, and who may be limited in their ability to claim or take advantage of resettlement assistance and related development benefits." These standards require that particular attention be paid to the needs of the poor and vulnerable in resettlement planning.

Vulnerability will be considered on a household basis rather than at an individual level. The rationale is that where potentially vulnerable (e.g. frail elderly) people are present within a household with people who are not vulnerable (e.g. adult children), then vulnerable members have sources of support and avenues for being represented in resettlement planning and implementation.

Household vulnerability may be either:

- **Pre-existing:** present in a Project area prior to the start of Project activities; or
- **Project-induced:** a result of Project activities.

As a principle, the Project will seek to ensure PAHs identified with pre-existing vulnerability have equal access to the benefits of LRP activities, and take steps to ensure they are fully informed of Project progress.

In addition, it is noted through stakeholder feedback that vulnerable groups, particularly those with physical and / or mental handicaps, feel excluded from project developments and will therefore be engaged during subsequent developments in a way that ensures they are given adequate opportunity to provide input.

8.1 Vulnerable Support Program (VSP)

For the Project as a whole, a Vulnerable Support Program has been developed which includes three main components:

- Continuous monitoring, identification, tracking, and follow-up of all PAHs to ensure they have access to, and benefit from, LRP / LRIP activities and Project interventions. This may include special accommodations (i.e. additional individual meetings to ensure they are fully informed, and provision of special assistance in reconstructing fences / non-residential structure).
- Established interventions to ensure that the execution of LRP activities minimises Project-induced vulnerability while accommodating PAHs with pre-existing vulnerability.
- Referral of vulnerable households to existing reputable community service providers (or provision of assistance to access these services) when LRP activities are unable to sufficiently address pre-existing and / or Project-induced vulnerability.

8.1.1 Vulnerable Support Program (VSP) Goals and Objectives

The VSP focuses primarily on monitoring, follow-up, and referral of vulnerable households to the LRP implementation team and / or existing community service providers.

The goal of the VSP is to identify, assess, support, and provide remedial assistance and follow-up for affected households experiencing severe hardship as a result of Project impacts.

The specific program objectives include:

- Ensure that PAHs are provided with supplementary support or assistance so they can participate and benefit from LRP programs, particularly the LRIP;
- Identify PAHs who may potentially be vulnerable and ensure that they are able to participate in all aspects of the planning, implementation, and monitoring of the LRP(s); and

- Strengthen individual, household, and community support services.

8.1.2 Identification of Vulnerable Persons

Any PAHs that exhibit markers of vulnerability will be eligible to participate in the support programming outlined in the VSP.

A three-stage process will be used to monitor, identify, and track vulnerability:

- Inclusion in the Project's Vulnerable Watch List using proxy vulnerability benchmarks;
- Verification through discussion with the Ministry of Social Welfare, traditional leaders, or through a Vulnerable Assessment Home Visit;
- Approval of eligibility and referral to appropriate assistance and service providers such as the Hwange District food distribution scheme, tuition assistance / loans for the disabled, and / or assisted medical treatment.

8.1.2.1 Vulnerable Watch List

A Vulnerable Watch List will be used to identify potentially vulnerable PAHs using broad proxy vulnerability benchmarks. The main function of the Vulnerable Watch List is to highlight households that may be vulnerable for closer monitoring and support. As such, the Vulnerable Watch List serves as an "early warning system" to identify potential issues with LRP implementation that may result in vulnerability. (While some LRP processes may be changed to accommodate individuals on the Vulnerable Watch List, no direct assistance or benefits will be provided, solely on the basis that a PAH is on the Watch List).

The markers (proxy benchmarks) of potential vulnerability include at least the following.

- Elderly, frail people (including widows) lacking adequate extended family support who do not own means of production and maybe more reliant on proposed Staff Township area forest products for their survival;
- Persons with HIV/AIDS or other chronic illnesses or disabilities who are unable to regularly engage in income generating activities;
- Households with limited means of production, particularly female-headed, but a high number of dependants (i.e. orphans); and
- Child-headed households.

8.1.2.2 Confirmation of Vulnerability

During LRP / LRIP implementation, PAHs on the Vulnerable Watch List will be considered for a home visit to determine if they require referral for supplementary assistance. Survey data will be reviewed and leaders consulted regarding whether the PAH may indeed be vulnerable. If they may be, a home visit will be conducted. As a better understanding of vulnerability emerges, appropriate adjustments will be made to the execution of LRP activities to reflect this – i.e. to promote the participation of vulnerable households in the LRP process and support them in accessing LRP benefits equally.

Where home visits are appropriate, they will be conducted by a representative from the Project, local health care professionals or representative from social welfare, and any relevant community support organisations.

9. GRIEVANCE REDRESS MECHANISM

This *Chapter* describes the Grievance Redress Mechanism (GRM) that will be available for the submission and resolution of grievances (complaints or claims) related to the Project's land acquisition and resettlement processes.

Notably, the GRM is not meant to address the collection and collation (reporting on) of stakeholder feedback that does not require an individual response. Other avenues (i.e. Project Offices and Community Liaison Officers) will be available to address general comments or requests for information.

This Grievance Redress Mechanism has been considered in parallel to the Stakeholder Engagement Plan (SEP) due to the inter-relationship between these two planning mechanisms. It has been designed for grievances specific to the proposed Staff Township to meet the legal requirements of Zambia and the requirements of the International Finance Corporation (IFC) in relation to grievance management.

9.1 Objectives

This Grievance Redress Mechanism will be applied to stakeholder complaints and grievances, perceived or actual, which relate to the activities of the ZRA and its contractors in relation to the Project components.

Objectives of the grievance redress process are:

- To provide PAPs with accessible procedures for resolving perceived or actual harm done to their well-being or their belongings as a result of Project activities, and for the settlement of disputes, including the possibility of third-party adjudication;
- To identify and implement appropriate and mutually acceptable corrective actions to address complaints; and
- To avoid, wherever possible, the need to resort to judicial proceedings.

9.2 Types of Grievances and Disputes

The following types of grievances are most common in resettlement planning and implementation:

- Complaints about survey activities;
- Complaints about scope / lack of information provided by the Project; and
- Claims of unfair exclusion from engagement activities.

Entitlement processing:

- Misidentification of owner / occupier of eligible property assets;
- Errors in counting or measuring crops and/or other property assets;
- Complaints about compensation entitlement rates; and
- Complaints about the entitlement policy.

Livelihood restoration:

- Complaints about allocation of livelihood opportunities; and
- Complaints about Project training, employment and recruitment opportunities and procedures.

9.3 Grievance Management Process & Resolution Mechanisms

Implementation of the Grievance Redress Mechanism for the proposed BGHES will be the ultimate responsibility of the Grievance Manager (GM) with support from a wider team including the Stakeholder Engagement Manager, ZRA Departments and Contractors, and the ZRA Chief Executive.

The GM will be appointed to coordinate the grievance resolution process. The GM will address and track grievances as they emerge and prepare relevant reports. The grievance process and how to access it will be widely communicated to Project-affected communities.

Experience demonstrates that anyone involved in project development should be prepared to receive grievances from affected stakeholders, either in person or through correspondence. All personnel (Project or contractor staff, local government representatives who are known to be in contact with Project staff, etc.) involved in any public aspect of the proposed Staff Township where they may interact with local stakeholders will receive training on how to deal with grievances. Most often the appropriate response will be to direct the complainant to the GM so that they can relay their grievance in person. This means that personnel will always have the contact details of the GM.

Where language or other barriers to submitting a grievance directly exist, the person receiving the grievance may pass it on themselves, along with the contact information for the original complainant.

If the person lodging the grievance is unable to write, the grievance and relevant personal information will be recorded on their behalf and read back to the claimant for their approval. Once the description of the grievance has been approved by the claimant, they will mark the document with their thumbprint.

Upon receipt of a grievance (see *Appendix A:* General Project Grievance Form), the GM will confer with the complainant to verify that this is the first time that this particular grievance has been submitted by this complainant. If the grievance is related to a previous submission, the GM will inform the complainant of the status of that grievance and record that the grievance has been re-submitted.

Grievances will be tracked in an overall Resettlement Grievance Database developed for the Project including all of its Sub-Projects. It will constitute a register of all grievances submitted, identifying who received the grievance, and the status of the grievance. If the grievance is new, the GM 'opens the grievance' by beginning to fill in a grievance form, and creating an entry in the Grievance Database. This form will track how the grievance is dealt with from submission through to resolution.

Open grievances will be reviewed weekly. Those that are not being resolved in a timely fashion, or have been assessed at a higher level of severity, will be referred to management, as described in *Table 9.1*. People who submit grievances retain their rights to, at any point in the grievance resolution process, refer their grievance to the court system as a formal judicial action.

9.3.1 Grievance Process

The Project's Grievance Redress Mechanism is a simple process whereby stakeholders can submit their complaints free of charge and, if necessary, anonymously or via third parties. The GRM allows complaints to be submitted in more than one format. The process of reporting a grievance is easily accessible and un-intimidating to any stakeholder. The preferable channels for reporting grievances must be confirmed with communities and can be discussed with the community as part of community engagement.

The GRM Process is divided into six key steps as follows:

- Step 1: Receive and log grievance;
- Step 2: Acknowledge grievance;
- Step 3: Assess and Investigate;
- Step 4: Grievance Resolution;
- Step 5: Sign-off on grievance; and
- Step 6: Monitor.

When somebody asks to submit a grievance or upon receipt of a grievance (i.e. by mail or email), the GM opens the case and begins the preliminary investigation. This may begin immediately if the grievance is submitted in person, or may require the GM to locate the claimant. As above, the name of the complainant and their contact details are recorded, as well as the details of the grievance. Complainants will be presented with a standardized written acknowledgment that the grievance has been received. Once the grievance is logged and acknowledged, the significance is assessed, based on the criteria described in *Table 9.1*. For second, third and fourth level grievances, higher levels of management will need to be informed and involved in the grievance process.

Table 9.1 Grievance Significance Levels

Significance Level	Type of Grievance	Responsible Party
Level 1	A grievance that is isolated or 'one-off' and essentially local in nature and restricted to one complainant. Note: Some one-off grievances may be significant enough to be assessed as a Level 4 grievance e.g. when a national or international law is broken (see Level 4 below)	Grievance Manager
Level 2	A grievance that extends to the local community or region and has occurred more than once, which is judged to have the potential to cause disruption to ZRA operations or to generate negative comment from local media or other local stakeholders	Grievance Officer & Stakeholder Engagement Manager
Level 3	A grievance which is widespread and repeated or has resulted in long term damage and/or has led to negative comment from local media, or is judged to have the potential to generate negative media and local stakeholder comments (e.g. damage to a sacred site or flooding of local school)	Stakeholder Engagement Manager & Resettlement Manger
Level 4	A one-off complaint, or one which is widespread or repeated and , **in addition,** has resulted in a serious breach of ZRA policies, Zambian or Zimbabwean or International Law and / or has led to negative national / international media attention, or is judged to have the potential to generate negative comment from the media or other key stakeholders (e.g. failure to pay compensation where appropriate)	Resettlement Manager & Project CEO

The process and timeframe for resolving grievances is depicted in Figure 9.1. The Project commits to recording, assessing and acknowledging receipt of the grievance, within seven days. All grievances submitted will be investigated fully, and will involve other departments, contractors and senior management as required in order to fully understand the circumstances that led to the grievance being raised. The grievance process ill aim to resolve any grievances within 30 days from the date that it was initially received. This timeframe can be extended to 60 days for more complex grievances (i.e. level 3 or 4 grievances), if required.

The grievance resolution process includes the following steps:

- Obtain as much information as possible from the person who received the complaint, as well as from the complainant to gain a first-hand understanding of the grievance.

- Undertake a site visit, if required, to clarify the parties and issues involved. Gather the views of other stakeholders including ZRA employees, if necessary and identify initial options for settlement that parties have considered.
- Determine whether the grievance is eligible (i.e. relates directly or indirectly to the proposed BGHES, and if ineligible, determine the more appropriate vehicle for addressing the issue, a full explanation as to the reasons for its ineligibility will be given to the complainant and recorded in the Grievance Database.
- If the grievance is eligible, determine its severity level using the significance criteria in *Table 9.1*. This will help to determine whether the grievance can be resolved immediately or requires further investigation and whether senior management will need to be informed of the grievance and who specifically.
- If the grievance concerns physical damage, (e.g. crop, house, community asset) take a photograph of the damage and record the exact location as accurately as possible.
- Inform the complainant of the expected timeframe for resolution of the grievance.
- Enter the findings of the investigation in the Grievance Database.

Figure 9.1 Grievance Management

Process	Description	Time
	Grievance Reported	
1. Identification of grievance	• Face to face meeting with Stakeholder (ensure they are make aware of their legal right to access court system at any point) • Phone, sms, letter or email • Recorded by ZRA staff • Completion and submission of grievance form	1 day
2. Grievance logged and acknowledged	• Record grievance in Grievance Form and log on Grievance Database • Receipt of grievance acknowledged through appropriate communication medium, but to be recorded in writing	5 days
3. Grievance significance is assessed	• ZRA to assess and assign grievance significance	7 days
	Investigate Grievance and Develop and Respond to Grievance	
4. Investigate Grievance and Development of response	• Consult with relevant parties • Identify further action required • May require site visits and discussions with other stakeholders	28 days after receipt of grievance
5. Communication of response	• Response provided to complainant, including, if necessary an indication of additional time and resources required to resolve grievance	30 days after receipt of grievance
6. complainant response	• Confirm with complainant that grievance can be closed, or determine what follow-up is necessary (i.e. their decision to access the court system) • If the grievance is to be closed, grievance sign-off is required. • If grievance cannot be closed return to step 3 to re-assess or recommend whether third-party arbitration is necessary	32 days
7. Close grievance	• Record final sign-off of grievance according to significance	32 days – 3 months, dependent on significance

9.3.2 Grievance Settlement and Resolution Approach

All grievances will be dealt with on a case by case basis. Where possible, they will be addressed directly by the GM. The resolution proposal shall be respectful and considered, including the rationale and any data used in developing the proposed resolution. If wider consultation is necessary, grievances will be forwarded to a neutral, external third party.

The third party could be an existing body or one established for this purpose (i.e. grievance review committee). It would need to be well-respected, and agreed upon by both Project management and the affected parties. It could include public defenders, legal advisors, local or international NGOs, or technical experts. In cases where further arbitration is necessary, appropriate government involvement will be requested.

9.3.3 Monitoring and Reporting

Grievances will be monitored routinely as part of the broader management of the Project. This entails good record keeping of complaints raised throughout the life of the construction and operation of the Project. On receipt of grievances, electronic notification to management must be distributed. Grievance records must be made available to management at all times, and the appropriate protocols established and followed for high level grievances.

Monthly internal reports will be compiled by the Grievance Officer and distributed to the management team. These grievance reports will include:

- The number of grievances logged in the proceeding period by level and type.
- The number of stakeholders that have come back after 30 days stating they are not satisfied with the resolution.
- The number of grievances unresolved after 60 days by level and type.
- The number of grievances resolved between ZRA and complainant, without accessing legal or third party mediators, by level and type
- The number of grievances of the same or similar issue
- ZRAs' responses to the concerns raised by the various stakeholders.
- The measures taken to incorporate these responses into project design and implementation.
- These reports and other records will be made available for external review if required.

An appropriate grievance report will be included in ZRA's annual reporting. Annual reports will be made available to the public. A hard copy will be located at the ZRA offices, and an electronic copy will be made available online.

The grievance database will allow for the relative success of the grievance resolution process outlined above to be regularly monitored and evaluated. Internally, grievance resolution timeframes will be monitored through weekly meetings between the GO and Resettlement Manager. Open grievances will be reviewed, and emergent and recurring issues discussed. Where grievances remain open beyond the established timeframe, the GO will be responsible for providing the given claimants with an explanation and an assurance that their grievance has not been lost or forgotten.

Lastly, reporting on grievances will be provided to external auditors as a component of the regular evaluations that will be conducted for the resettlement process overall.

9.3.4 Recourse to the Judicial System

Although it is hoped that all grievances will be resolved internally and through the aforementioned process, it will be communicated to stakeholders that at any time during the grievance resolution process, they retain their rights to refer their grievance to the appropriate arbitrative or legal body within the Zimbabwean judicial system.

In the event that a grievance becomes a case presented by the claimant's legal counsel, the Project's Legal Advisor will be directly responsible for responding to the claim.

10. MONITORING AND EVALUATION

Monitoring and Evaluation (M&E) of land access activities will be carried out to ensure commitments made in the RPF and LRP / LRIP are met and implemented in accordance with Project objectives, Zambian Law, and international resettlement standards. M&E provides Project management, lenders and other key stakeholders with timely, concise, indicative information on whether land acquisition initiatives and commitments are on schedule, as well as on track to achieve sustainable restoration of livelihoods and living conditions, or if adjustments are required.

M&E is firmly rooted in a participatory approach that involves the direct and active participation of displaced persons and stakeholders, and the incorporation of their feedback into the Project's land acquisition and resettlement activities. The tiered engagement and consultation approach described previously is designed to ensure community participation in the planning and implementation of the overall land access process, including land required for this Project Component.

Monitoring of land access activities is conducted both internally and externally. Internal monitoring focuses on inputs and outputs, observing the short-term changes in different indicators. External evaluation focuses on processes and outcomes, using the findings of internal monitoring, as well as investigations completed by external, third party organisations.

M&E activities continue until it can be demonstrated that displaced persons have successfully re-established their livelihoods and restored their quality of life. This is confirmed through a completion audit.

10.1 Internal Monitoring

An internal performance and impact monitoring system will be developed to regularly track and report on the following:

- Progress against the detailed LRP implementation schedule such as:
    - Replacement communal land secured;
    - Alternative community access routes identified and mapped; and
    - Livelihood restoration measures initiated and completed.
- Alignment with overall Project schedule and budget;
- Review of grievances submitted including analysis of trends which may require program adjustments; and
- Stakeholder engagement milestones achieved.

Internal progress monitoring reports will be prepared at regular intervals beginning with the commencement of implementation activities. The frequency of reporting will depend on the stage of the implementation of the LRP, with more frequent reporting likely during the earlier phases to ensure implementation is on track.

Outcome monitoring assesses the effectiveness of the LRP(s) and associated programs in supporting Project-affected people in re-establishing their livelihood. It requires a different approach, typically involving surveys of affected households and focus groups to collect information. The collected data can be compared with baseline data prior to land access in order to better understand:

- Changes in quality and quantity of agricultural production and livestock holdings/health compared with pre-Project levels;
- Changes in household income levels;
- Changes in household expenditure patterns; and
- Satisfaction of affected communities with compensation and/or livelihood restoration activities.

The timing of the outcome monitoring takes into consideration the implementation schedule, and assists the Project Implementation Team in making program adjustments and preparing for external evaluations.

10.1.1 Monitoring of Livelihoods Restoration

Post-displacement monitoring should follow up with those economically displaced households participating in the Project's livelihood restoration and improvement programs beginning two years after compensation payments have been made and livelihood assistance delivered. The purpose of the monitoring is to assess their socio-economic quality of life. It also serves to identify households who may have restored their livelihoods after impact mitigation activities have ended, but for whom residual effects may persist. Based on the analysis of data collected within the livelihood restoration programs an assessment can be made whether affected households have been given a reasonable opportunity to restore their livelihoods. This mid-term assessment will help to identify general trends as to whether or not the livelihoods programs are having success, and whether or not PAPs are on course to restore their livelihoods. This will guide the course for taking corrective action, as needed.

In order to document whether livelihoods have been fully restored, a long-term evaluation should take place typically 5 to 7 years after displacement. If the livelihoods of the vast majority of households have been restored, the LRP and its LRIP implementation can be considered complete.

10.1.2 Vulnerability Monitoring

The primary objective of vulnerability monitoring is to avoid the occurrence of project-induced vulnerability, and if it occurs, to mitigate this through support measures and follow-up monitoring. It is important to monitor effects on PAHs who are especially vulnerable to negative impacts and who, without special consideration, may not receive a proportionate share of Project benefits.

International standards stipulate that:

- Project proponents identify individuals and groups that may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status;
- Project sponsors assess potential impacts on these individuals and groups and propose as necessary, specific measures and accommodations to address potential impacts; and
- Project monitoring track the well-being of these individuals and/or households on a disaggregated basis.

Data collected from all households will be analysed periodically to identify households whose pre-existing vulnerable status may be exacerbated as a result of the Project, or who may become vulnerable due to Project displacement.

10.2 External Monitoring and Completion Audit

External land acquisition monitoring and evaluation supports and strengthens a Project's internal monitoring system, and is conducted by an independent third party. The key objective is to determine whether Project efforts to restore / improve the living standards and livelihoods of the affected communities have been formed and applied. The audits verify that all physical inputs committed to in the LRP have been delivered and all livelihood restoration measures provided. In addition, the audits evaluate whether the mitigation measures prescribed in the LRP and any corrective actions developed and implemented since the LRP have had the desired effect.

The proposed BGHES will have a third-party auditor undertake annual reviews during Project implementation to assess compliance with commitments contained in both the RPF and LRP. They will provide the Project Implementation Team with recommendations for improving LRP implementation and addressing any gaps. They will also determine when the final LRP completion audit should be performed to determine the following:

- Assess the effectiveness of measures to avoid and minimise displacement impacts by comparing those identified in the LRP with actual impacts on people and land;
- Verify that implementation complies with applicable international policies;
- Verify that all entitlement and commitments described in the LRP(s) have been delivered;
- Assessment of the fairness, adequacy and promptness of the compensation and restoration procedures as implemented;
- Determine whether the measures identified in the LRP have been effective in restoring and enhancing affected peoples' livelihood and quality of life;
- Check on any systemic grievances that may be outstanding; and
- Identify any corrective actions necessary to achieve completion of LRP commitments.

11. IMPLEMENTATION ARRANGEMENTS

This *Chapter* describes the responsibilities, budget and time schedule for implementing this LRP and LRIP.

11.1 Organizational Arrangements

There are three main bodies with responsibility for the development and implementation of the LRP(s): the ZRA; local government and traditional leaders in the Project Area; and the Government of Zambia.

The ZRA will be the primary responsible party in terms of adherence to this LRP, consistent with its legal obligations under current environmental regulations. This will include the management and financing of all required studies, negotiation on entitlements, stakeholder engagement, provision of livelihood assistance, and payment of compensation.

The financing for the Project and the resettlement will however be sourced from a range of international private and public financiers (i.e. World Bank, African Development Bank). The conditions for securing international financing includes ensuring that the resettlement process conforms to international good practice (as framed in the World Bank Environmental and Social Safeguard Policies, 2016).

Figure 11.1 presents the full resources required to implement all components of the proposed BGHES. Priority staff resources required to implement this LRP will be Project Management, Stakeholder Engagement and Livelihood Support.

The role of the LRP Implementation Team, made up of a mix of ZRA staff, government staff and third party service providers, will be to lead the stakeholder engagement process, undertake technical work in support of the land acquisition process, and check that international standards are met. Additionally, the LRP Implementation team will assess partners in their capacity and ability to provide day-to-day oversight of LRP programs, facilitate consultation and engagement with Project stakeholders, and alert BGHES staff to any potential problems. Proposed roles and responsibilities are outlined in the following sections.

11.1.1 Management

A Resettlement and Livelihood Restoration Manager will manage the Livelihood Restoration Implementation Team's activities, guiding the engagement process, assessment and management of third party partners, technical work streams and overseeing implementation of this Livelihood Restoration Plan. This will include coordinating the government approvals and permits necessary to secure access to Project land.

11.1.2 Data Management Groups

- Data Management Coordinator and GIS Specialist, who will be responsible for managing the database / GIS, reporting on surveyed data, and supporting the engagement and negotiations process.
- Data Entry Clerks, who will enter gathered data into the database / GIS.

11.1.3 Stakeholder Engagement Group

- Engagement Coordinator, who will manage Project and Project Component stakeholder meetings and feedback forums, and administer the grievance management system.
- Community Liaison Officers, who will support the Engagement Coordinator in the above.
- Grievance Manager, who will manage the grievance management system.

11.1.4 Livelihood & Vulnerable Support Group

- Livelihood Restoration Coordinator, who will oversee implementation of appropriate scaled livelihood and vulnerable support activities and in documenting and reporting on the process.
- Sector Specialists (e.g. agricultural and livestock specialists), as deemed necessary by the Livelihood Restoration Coordinator

11.2 Work Plan

Table 11.1 presents an indicative work plan, the outcome of which will be a finalized LRP endorsed by Project stakeholders and completed preparations for acquiring the land necessary for the proposed Staff Township.

Figure 11.1 Overall Project RAP/ LRP Planning Team

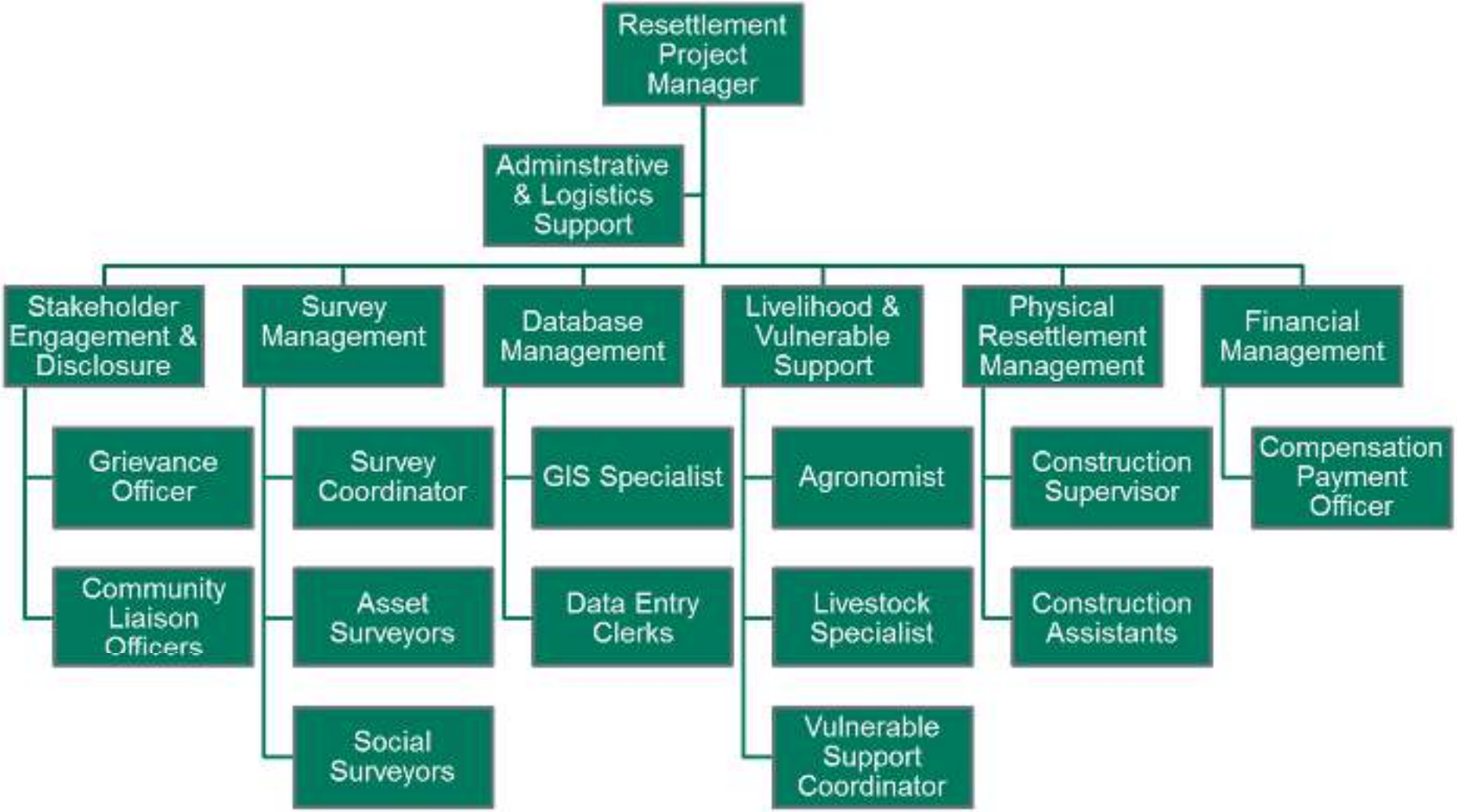


Table 11.1 LRP Indicative Work Plan

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
1.0	**LRP Planning**									
1.1	Develop Stakeholder Engagement Plan specifically for LRP Disclosure and Implementation									
1.2	Mobilize Livelihood Restoration Team and related staff appropriate for the implementation of this LRP (including third party assessment and mobilization)									
1.2	Operationalize Grievance Management System									
1.3	Finalize in-kind entitlements									
1.4	Conduct preliminary identification and assessment of Alternative Communal Land									
1.5	Establish LRP Database									
2.0	**LRP Disclosure**									
2.1	Present LRP and Solicit Feedback									
2.3	Finalize LRP Annexes and budget									
2.4	Prepare for Community Sign-off									
3.0	**Implementation**									
3.1	Identify and map alternative access routes									
3.2	Implement alternative access route improvements if required									
3.3	Secure and improve alternative communal land									
4.0	**Access to Project Land**									
5.0	**Monitoring and Evaluation**									

12. CONCLUSION

This LRP details the policies, procedures, methodology, entitlements, and livelihood restoration measures that will be implemented to support economically displaced households to restore their standard of living and livelihoods. It also describes the activities that will be undertaken throughout the delivery of compensation and other entitlements, as well as procedures to monitor the effectiveness of the LRP in delivering its intended outcomes so that necessary adjustments can be made.

It is noted that this LRP is a living document and therefore will be updated throughout the development of continued technical planning and subsequent consultations with Project stakeholders.

Next steps in technical planning will be harmonized with other Project activities undertaken as part of ESIA disclosure activities, which are proposed to take place in November 2019. Next steps also include the establishment of relevant committees detailed in the Resettlement Policy Framework (2019).

APPENDIX A GRIEVANCE FORMS

To be completed by ZRA personnel (if grievance being submitted in person) or person submitting complaint

Grievance Record	
Reference No: (for official use)	
Full Name (optional)	
Contact Information **Please mark how you wish to be contacted (letter, telephone, e-mail).**	☐ **Address/village/traditional authority and ward:** _____ _____ _____ _____ _____ _____ ☐ **Telephone:** _____ ☐ **E-mail:** _____
Preferred Language for communication	
Description of Incident or Grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?
Date of Incident/Grievance	
	☐ **One time incident/grievance** **(date _____)** ☐ **Happened more than once** **(How many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	
Additional Comments:	

APPENDIX B GRIEVANCE RECORD

To be used as part of the database

Grievance Record			
Grievance Number:	Date Submitted:	Target Date for Resolution:	
Name (optional):			
Address and Contact Details			
Grievance Received By:			
Name of Grievance Coordinator:			
Description of Grievance:			
Assessment of Grievance Level:		Notification to CEO or other senior management?	Y/N

Actions to Resolve Grievance			
Delegation to:			
Action	**Who**	**When**	**Completed Y/N/Date**
Response/Resolution:			
Strategy to Communicate Response:			
Sign-Off:			
Date:			

Conclusion			
Is complainant satisfied?	Y/N	Comments from Grievance Coordinator	
Grievance Closed?	Y/N	Grievance Resubmitted?	Y/N
Signature of CEO:		Date:	
Date:		New Grievance Number:	

APPENDIX C GRIEVANCE RECEIPT FORM

To be used to acknowledge grievances submitted

Grievance Receipt Form		
Grievance Number:	Date Submitted:	Target date for initial meeting to address grievance:
Name (optional)		
Address and Contact Details		
Grievance Received By:		
Name of Grievance Coordinator:		
Contact details of Grievance Coordinator	Telephone: Email: Address:	

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Livelihood Restoration Plan (LRP) – Zimbabwe Access Road & Staff Township

Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

Zambezi River Authority (ZRA)

27 September 2019

Project No.: 0239269

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27 September 2019

Livelihood Restoration Plan (LRP) – Zimbabwe Access Road & Staff Township

Batoka Gorge Hydro-Electric Scheme (Zambia and Zimbabwe) on the Zambezi River

Mike Everett
Partner in Charge

Environmental Resources Management (ERM) Southern Africa (Pty) Ltd.

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Acronyms and Abbreviations

Name	Description
BGHES	Batoka Gorge-Hydro Electric Scheme
CAI	Census and Asset Inventory (CAS Census and Asset Survey)
CFF	Community Feedback Forums
FPIC	Free, Prior, and Informed Consent
GO	Grievance Officer
ICP	Informed Consultation and Participation
ICT	Information and Communication Technology
IDP	Internally Displaced Persons
IFC	International Finance Corporation
IFC PS	IFC Performance Standards
IP	Indigenous People
KPI	Key Performance Indicator
LRP	Livelihood Restoration Plan
LRIP	Livelihood Restoration and Improvement Plan
M&E	Monitoring and Evaluation
NLC	National Land Commission
PAH	Project-Affected Household
PAP	Project-Affected Person
LRP	Resettlement Action Plan
ROW	Right-of-way
RPF	Resettlement Policy Framework
RSC	Resettlement Steering Committee
RSLF	Resettlement Stakeholder Leadership Forum
SEP	Stakeholder Engagement Plan
VSP	Vulnerable Support Plan
ZRA	Zambezi River Authority

DEFINITIONS

Affected Persons: Any individual, persons, family, household, group, or collective body that is affected by either physical or economic displacement and are deemed eligible to resettlement assistance and/or compensation under this RPF.

Asset Inventory: The investigation and measuring of all land, interest on and rights to that land, as well as any assets and unexhausted improvements on that land. The Asset Inventory forms of the basis for the determination of resettlement assistance and/or compensation to be granted to Affected Persons.

Allowances: Cash compensation provided into addition to any resettlement assistance and/or compensation provided for the loss of assets, and generally provide transitional support while Affected Persons restore their living conditions and livelihoods after resettlement.

Census: The survey enumerating all people affected by a project. The completion of the census typically represents the cut-off date for eligibility for resettlement assistance.

Communal Land: Communal land is land owned by the State, the management of which is seconded to the local rural authorities

Compensation: The forms or combination of cash or in-kind replacement assets to be provided to Affected Persons to compensate for the acquisition of land or the loss of assets. In most cases, compensation denotes cash only.

Cut-off Date: The date which establishes the deadlines for entitlement to Compensation and/ or Entitlements in respect of Eligible Land, Crops, Trees and Structures. Persons occupying the project footprint after the cut-off date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the cut-off date (usually the date of completion of the assets inventory, or an alternative mutually agreed on date), will not be compensated.

Economic Displacement: The loss of assets or access to assets that leads to loss of income sources or livelihoods but does NOT necessarily result in the direct loss of a place of residence.

Eligible Persons: See Affected Persons

Entitlement Framework: A framework that establishes the specific entitlements (i.e. forms of compensation) granted to Affected Persons who will lose affected assets, as determined during the Asset Inventory.

Household Census: The registration of Affected Persons and the collection of their details, which forms the basis for the confirmation of eligibility to resettlement entitlements.

Improvements: Anything resulting from expenditure of capital or labour - including carrying out of any building, engineering, clearing, improvement, or other operations - in, on, over, or under land, or the making of any material change in the use of any building or land and charges for services provided and other expenses incurred in the development or towards the development of land.

Livelihood Restoration: A range of measure and programmes that ensure that the existing livelihoods of Project-affected persons is restored, or ideally improved, during and after the land acquisition and/or resettlement process.

Livelihood Restoration Plan: A plan that establishes the entitlements (e.g., compensation, other assistance) of affected persons and/or communities economically displaced (i.e. project does not result in physical displacement) by a Project, in order to provide them with adequate opportunity to re-establish their livelihoods**.**

Livelihoods Restoration and Improvement Plan: A detailed plan included in an LRP or RAP which is developed with the goal of restoring and where possible improving previous levels of income, employment, and food security for Project-Affected Persons through provision of economic opportunities and income generating activities (i.e. agricultural production and processing, employment promotion, and enterprise development).

Physical Displacement: The displacement, loss, or destruction of the place of residence as a direct result of the development of the Project.

Resettlement assistance: Support provided to people who are physically displaced by a Project. Assistance may include transportation, food, shelter, and social services that are provided to affected people during their relocation. Assistance may also include cash allowances that compensate affected people for the inconvenience associated with resettlement and defray the expense of transition to a new locale, such as moving expenses and lost work days.

Replacement cost: The rate of compensation for lost assets calculated at full replacement value, that is, the market value of the assets (i.e. land, crops, structures) plus transaction costs (i.e. any registration costs, transfer taxes).

Resettlement Policy Framework: A resettlement policy framework is required for projects with subprojects or multiple components that cannot be identified before project approval. This instrument may also be appropriate where there are valid reasons for delaying the implementation of the resettlement, provided that the implementing party provides an appropriate and concrete commitment for its future implementation.

Resettlement Action Plan: is a plan prepared by the sponsor or other parties responsible for resettlement (such as government agencies), specifying the procedures it will follow and the actions it will take to properly resettle and compensate people and communities physically displaced by a Project. Where a project results in both physical and economic displacement, impacts associated with economic displacement should be incorporated into the Resettlement Action Plan.

Socioeconomic Survey: Surveys that generate a set of data that describe the socioeconomic conditions, living standards, and livelihoods of project-affected communities prior to resettlement.

Specially Gazetted Land: This is agricultural land, which has been identified for compulsory acquisition and has been gazetted for such acquisition.

State Land: This refers to any land not deeded and land belonging to the State.

Wayleave: A right of way over another's ground or property usually associated with power lines.

EXECUTIVE SUMMARY

The Zambezi River Authority (herein referred to as "ZRA"), a bilateral organisation equally owned by the Governments of Zambia and Zimbabwe, proposes the development of the Batoka Gorge Hydro-Electric Scheme (BGHES or Project). The Project will be situated approximately 47 km downstream of Victoria Falls on the Zambezi River.

The Project includes the following components which will be implemented through a number of Sub-Projects:

- Dam wall and impoundment, including spillway;
- Surface power houses, one on each side of the river;
- Transmission lines comprising:
    - two (2) 330kV OHTLs to the Mukuni 330/220kV station, approximately 21km ;
    - one (1) 330kV OHTL to Muzuma 330/132/88kV station, 150km ;
    - one (1) 400kV OHTL to Hwange 400/330kV substation, 58km; and
    - two (2) 330kV OHTLs interconnecting the two power stations, Batoka North and Batoka South 5.5km.
- Access roads in both Zimbabwe and Zambia;
- Project townships/staff housing to accommodate workers and their families during construction and operations; and
- Quarries.

This Livelihood Restoration Plan (LRP) sets out the guiding principles and procedures that will be followed in managing the impacts of acquiring approximately 160 hectares and 705 hectares of land for the proposed BGHES access road and proposed Staff Township in Zimbabwe respectively.

The area required for the proposed Staff Township does not have any built assets, agricultural cultivation or human habitation. Hence, the development of the proposed Staff Township will not result in any physical displacement of people, and only limited economic displacement.

Based on a comprehensive understanding of Project impacts and land uses within the areas surrounding the proposed Staff Township and access road, a Resettlement Action Plan (RAP) is not required, as construction of these proposed Project components will not affect any primary residential structures, and therefore will not result in physical displacement. It is noted however that the area selected for the access road will have an economic impact on 222 households in the villages of Monde, Sizinda, Chisuma, Vukuzenzele, and Jabula.

Due to the existing Sizinda Road, impacts are minimal and consist primarily of boundary infringements upon agricultural fields and field demarcations such as fencing, bush fences, and protective wild trees.

Households Economically Affected by the BGHES Access Road in Zimbabwe

Village	Sub-Village	Affected Households	Affected Fields	Average Area of Affected Field
Monde	-	17	18	0.08
Sizinda	-	16	16	0.07
Chisuma	-	18	18	0.10
Vukuzenzele	Jembwe	51	52	0.08
Jabula	Jabula 1 – 7	114	115	0.13
	Kasikiri	6	8	0.08

Village	Sub-Village	Affected Households	Affected Fields	Average Area of Affected Field
Total		**222**	**227**	**0.11**

There are no permanent or temporary human habitations in the area proposed for the Staff Township; however, the affected land is an important communal resource for grazing livestock and collecting natural resources that support livelihoods. Affected households include communal users throughout the Nemanhanga Ward, and more specifically approximately 35 households in the settlements of BH55, Kasikiri, and Sidakeni (Sub-Villages of Jabula Village).

Populations Affected by Land Acquisition Proposed for the BGHES Staff Township in Zimbabwe

Village	Sub-Village	Affected Households
Jabula	BH55	35
	Kasikiri	
	Sidakeni	
Total		**35**

1. INTRODUCTION

This Livelihood Restoration Plan (LRP) sets out the guiding principles and procedures being undertaken to manage the economic impacts resulting from land acquisition for the Access Road and Staff Township necessary for the Batoka Gorge-Hydro Electric Scheme (BGHES or Project) in Zimbabwe.

A Resettlement Action Plan (RAP) is not required, as construction of these Project components will not affect any primary residential structures and therefore will not result in physical displacement.

The LRP reflects the guiding principles described in the Resettlement Policy Framework (RPF) previously prepared and approved by the Project proponent, the Zambezi River Authority (ZRA).

1.1 Project Description

A hydropower scheme on the Zambezi River downstream of Victoria Falls has been investigated in various degrees of detail since 1904, when geological investigations for potential sites commenced. In 1972, additional studies concluded that Batoka Gorge represents the best site for the development of a hydropower scheme. Further investigations conducted in 1981/82, 1983 and 1989 identified a specific site within the Batoka Gorge suitable for such a project, prompting a full feasibility study in 1993.

In 2014, the ZRA appointed Studio Pietrangeli (SP) Consulting Engineers to update the engineering feasibility study for the scheme, and in parallel engaged Environmental Resources Management Southern Africa (Pty) Ltd. (ERM) to undertake an Environmental and Social Impact Assessment (ESIA), including the development of RPFs for each country.

The BGHES is being undertaken by the ZRA, a corporation jointly and equally owned by the governments of Zambia and Zimbabwe. The ZRA is governed by a four-person council, two members of which are Ministers in the Government of the Republic of Zambia, and two are from the Government of the Republic of Zimbabwe. The council's primary responsibilities are the operation and maintenance of the Kariba Dam Complex, investigation and development of new dam sites on the Zambezi River, and analysing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba.

The Project will be located in the central portion of the Zambezi river basin, upstream of the existing Kariba Dam and approximately 47 km downstream of Victoria Falls.

The Project includes the following components which will be implemented through a number of Sub-Projects:

- Dam wall and impoundment, including spillway;
- Surface power houses, one on each side of the river;
- Transmission lines comprising:
    - two (2) 330kV OHTLs to the Mukuni 330/220kV station, approximately 21km ;
    - one (1) 330kV OHTL to Muzuma 330/132/88kV station, 150km ;
    - one (1) 400kV OHTL to Hwange 400/330kV substation, 58km; and
    - two (2) 330kV OHTLs interconnecting the two power stations, Batoka North and Batoka South 5.5km.
- Access roads in both Zimbabwe and Zambia;
- Project townships/staff housing to accommodate workers and their families during construction and operations; and

- Quarries.

The focus of this LRP is on land acquisition impacts related to the Project components covering the south bank Access Road and location of the Project Staff Township (*Figure 1.1*), requiring access to approximately 160 hectares and 705 hectares of land respectively. Additional LRPs and RAPs will be developed for subsequent Project components such as the transmission lines and dam infrastructure.

1.1.1 *Access Road*

In Zimbabwe, the existing Sizinda Road will bring vehicles 5 km east of the Jabula School (Victoria Falls - Jabula School, Trunk A and Trunk B), where an existing secondary road leads firstly to Kasikiri Village (Jabula School – Kasikiri Village), secondly to Batoka Airstrip and, thereafter, to the BGHES dam site (Kasikiri Village – Batoka Airport).

The full alignment will cover a length of 63.5 km. This alignment requires the upgrading of the existing Sizinda Road as well as a new road link (3.6 km long) between the proposed Staff Township and the main access road to the BGHES dam site.

The terrain for the Access Road is mainly level, and therefore structures such as bridges and tunnels will not be required. This said, access roads will need to traverse local depressions and minor water courses, and as such ducts and culverts will be required.

The Access Road will also include the following infrastructure:

- French-type drains to regulate water runoff;
- Traffic signage; and
- Lighting (near the Staff Township and in areas perceived as having high accident risks).

The entire road servitude will be 40 meters wide, 20 meters from the centreline of the road on both sides.

The Access Road will have an economic impact on 222 households in the villages of Monde, Sizinda, Chisuma, Vukuzenzele, and Jabula (refer to *Table 1.1*). Due to the existing Sizinda road, impacts are minimal and consist primarily of boundary infringements upon agricultural fields and field demarcations such as fencing, bush fences, and protective wild trees.

Table 1.1 Households Economically Affected by Access Roads

Village	Sub-Village	Affected Households	Affected Fields	Average Area of Affected Field
Monde	-	17	18	0.08
Sizinda	-	16	16	0.07
Chisuma	-	18	18	0.10
Vukuzenzele	Jembwe	51	52	0.08
Jabula	Jabula 1 – 7	114	115	0.13
	Kasikiri	6	8	0.08
Total		**222**	**227**	**0.11**

1.1.2 *Staff Township*

Project Staff Townships will be located on each side of the river.

It is envisaged that each Staff Township will also have the following services and amenities:

- 2 Health centres/hospitals;
- 2 Primary schools;

- Secondary Schools;
- Sporting centres;
- 1 Custom service and immigration centre;
- 1 Police station;
- 1 Post office;
- 2 Supermarkets;
- Municipality Office;
- ZRA Offices;
- Warehouses for the plant maintenance;
- Water treatment plant;
- Sewage treatment plant; dump site;
- Hospitals with incinerators; and
- Boreholes.

In addition to these services and amenities, the Staff Township will also have facilities such as banks, shops, private offices etc. During construction (up to seven years in duration), the Staff Township will house approximately 8,000 staff in total (including security and support staff), but this will be only after the first two years, where initially 2,000 construction workers will be involved with the construction of access roads, infrastructure and the camps.

During operation, the construction staff will be replaced with the operational staff (i.e. maintenance, police, custom services, educational experts, governmental figures etc.).

There are no permanent or temporary human habitations in the Staff Township area however the affected land is an important communal resource for grazing livestock and collecting natural resources that support livelihoods. Affected households include communal users throughout the Nemanhanga Ward and most directly affect approximately 35 households in the settlements of BH55, Kasikiri, and Sidakeni (Sub-Villages of Jabula Village) (refer to *Table 1.2*).

Table 1.2 Populations Affected by Land Acquisition of the Staff Township Area

Village	Sub-Village	Affected Households
Jabula	BH55	35
	Kasikiri	
	Sidakeni	
Total		**35**

1.2 Land Access Context

Land acquisition and involuntary resettlement processes present a high level of risk for both the Project proponent and for the people and communities being displaced [1]. For the Project proponent, resettlement can be controversial, costly and time-consuming, and if mismanaged can cause social unrest, delays to project development, and can damage the Proponent's reputation and social license to operate. For displaced people and communities, resettlement processes can be confusing, stressful, and if mismanaged can result in long-term impoverishment.

Displacement poses particular risks for people who may already be marginalized because of socio-economic status, gender, health / ability, ethnicity and / or age. However, when involuntary land acquisition is well planned, properly managed, and carried out in conjunction with impacted persons and communities, the risks can be minimised and mitigated and the process can be used to create positive outcomes for project proponents and for local people, including the most vulnerable.

The objective of this document is to describe the procedure for acquiring land necessary for Project Access Roads and Staff Township in Zimbabwe. It describes the efforts undertaken to avoid physical displacement, and minimize and mitigate economic displacement.

The LRP is grounded in the following principles:

- Avoid and minimise physical and economic displacement by exploring alternative Project designs;
- Mitigate and compensate adverse impacts from land acquisition or restrictions;
- Improve, or at least restore, pre-Project livelihoods and standards of living for all Project-affected persons (PAPs);
- Establish standards of compensation that are transparent, consistent, and reflect the full replacement value of all impacted assets eligible for compensation;
- Establish grievance and conflict resolution mechanisms to address any grievances raised by PAPs or other stakeholders;
- Identify and bridge gaps between Zimbabwe legal requirements and the requirements of the World Bank Environmental and Social Standards (2016);
- Give particular attention to vulnerable groups and if necessary implement measures to ensure that vulnerable groups have equitable access to opportunities and benefits; and
- Promote gender equity in all compensation, allowances and livelihood restoration measures.

1.3 Scope and Structure of the LRP

This LRP focuses on the land area required for the Access Road and Staff Township, and is organised as follows:

- **Chapter 1 Introduction**: provides a description of the project, the land acquisition and resettlement context and scope of this LRP.
- **Chapter 2: Legal & Institutional Framework:** describes the institutional and legal framework that has guided the preparation of the LRP.

[1] Resettlement is involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement.

- **Chapter 3 Overview of Existing Socioeconomic Conditions:** summarizes the findings from the census, socio-economic survey and asset inventory of households/communities affected by the land acquisition for the Access Road and Staff Township.
- **Chapter 4 Consultation and Disclosure:** describes the main results of consultation undertaken in order to prepare the LRP;
- **Chapter 5 Project Impacts:** describes the scale of impact to land area, households and immovable assets;
- **Chapter 6 Compensation Principles & Entitlements:** presents the compensation process for all forms of ownership or use rights affected by the Project, including eligibility, entitlements and valuation of affected assets;
- **Chapter 7 Livelihood Restoration & Improvement:** defines the principles and procedures for restoring and enhancing the livelihoods of affected households;
- **Chapter 8 Vulnerable Support:** describes the measures to be adopted by the Project to ensure that Vulnerable Persons are not disadvantaged in the resettlement process;
- **Chapter 9 Grievance Redress Mechanism**: describes the mechanisms available to Project-affected people for the processing and resolution of grievances or claims related to the Project's land acquisition process;
- **Chapter 10 Monitoring & Evaluation:** describes the monitoring and evaluation procedures required to ensure that proposed principles and objectives are met; and
- **Chapter 11 Implementation Responsibilities and Funding:** provides an overview of the implementation responsibilities, budget and time schedule.

2. LEGAL AND INSTITUTIONAL FRAMEWORK

This *Chapter* provides an overview of the legal and institutional framework guiding the preparation of this Resettlement Policy Framework. It provides a summary of international resettlement standards, and compares Zimbabwe national legislative requirements with those of the World Bank's Environmental and Social Safeguard Policies (2016).

2.1 Procedure for Acquiring Land and Compensation for Land

The principle legislation setting out the procedure for the acquisition of land by the State in Zimbabwe, and for compensation for such land can be found in four Acts. They are listed below and described in subsequent sections:

- The Constitution of Zimbabwe Amendment Act (No.20) Act 1 of 2013;
- The Traditional Leaders Act (Chapter 29:17);
- The Land Acquisition Act (Chapter 20:10) for agricultural land, rural land and other private land;
- The Communal Lands Act (Chapter 20:04) for communally held land; and
- The Parks and Wildlife Act (Chapter 20:14).

There are three main types of land tenure in Zimbabwe; privately owned land (registered with the Deeds Registry), communal land (which local authorities and traditional leaders manage on behalf of the State), and State owned land. All land acquisition associated with the Sub-Project is Communal Land which falls under the jurisdiction of the Hwange Rural District Council.

The Communal Lands were borne from the Communal Land Act of 1981, formerly the Tribal Trust Lands and prior to that the Native Reserve Areas. Communal Lands are vested in the President of Zimbabwe who grants land use rights to the inhabitants of the Communal Lands in the form of a permit, consent or as prescribed by the Communal Lands Act. The President and the State hold Communal Lands in trust, and the Minister of Local Government, Public Works, and National Housing or the Minister assigned, are in charge of delegating the traditional leaders working in tandem with the local authorities Rural District Councils (RDCs) on administering and use of land in accordance with the terms stipulated in the Act.

The Communal Land Act grants authority to both the traditional leadership such as the chiefs, headman or village heads and to local authorities from the RDCs. The President or Minister can revoke or constrain the land rights of the users if there is a violation in relation to the terms specified by the permit or in accordance with the act. In the Communal Lands, the community allocates land amongst themselves for cultivation and grazing; and woodlands, rivers etc. are commonly owned and the traditional leadership via the community takes decisions regarding management and control of shared areas and resources [(2)].

2.2 The Constitution of Zimbabwe Amendment (no. 20) Act 1 of 2013

Section 71(3) of the Constitution prohibits both compulsory deprivation and compulsory acquisition without compensation.

Section 71(3) sets the standards that a law of general application permitting compulsory deprivation of property must meet. Briefly, the requirements include that: the deprivation be inter alia in the interests of the community; the acquiring authority gives reasonable notice of intention to acquire; acquiring authority pays fair and adequate compensation; a court of law has jurisdiction in the event of dispute, etc.

[(2)] Communal Land Act Chapter 20:04

Section 72(2) of the Constitution also specifically provides for the compulsory acquisition of agricultural land (especially Gazetted Land). In terms of the Constitution, agricultural land can be compulsorily acquired for any of the following purposes;

- Settlement for agricultural or other purposes;
- Land re-organization, forestry, environmental conservation or the utilization of wild life or other natural resources; or
- The relocation of persons dispossessed as a result of the utilization of land for (i) and (ii).

The Constitution provides that once such agricultural land identified for acquisition is Gazetted, it will be vested in the State from the date of the publication of such a notice in the Government Gazette.

It should also be noted that the Constitution further provides that there is no compensation for the compulsory acquisition of agricultural land save for improvements made on the land before its acquisition. The Act further restricts any court from entertaining any dispute regarding compensation for agricultural land acquired, save for improvements thereon.

2.3 Traditional Leaders Act

The Traditional Leaders Act provides for the appointment of village heads, headmen, and chiefs as well as establishes a Council of Chiefs and village, ward and provincial assemblies and defines their functions. In addition, this Act provides for the issue of village registration certificates and settlement permits to the head of the household which is maintained by the rural district council and district administrator.

2.4 The Land Acquisition Act

The Land Acquisition Act discussed below provides a more detailed procedure for the acquisition of Agricultural Land (Specially Gazetted Land). This Act also provides a detailed procedure for compensation for such land. Although the Constitution and Land Acquisition Act regarding the procedure for acquisition and compensation of agricultural land conflict in places, the provisions of the Land Acquisitions Act provides a more detailed (and comparatively fairer) procedure for compensation and acquisition of agricultural land.

2.4.1 *Land Acquisition Procedure in terms of the Land Acquisition Act (Chapter 20:10)*

As stated above, the provisions of the Land Acquisition Act will be considered when the State seeks to acquire agricultural land, rural land and other privately owned land. It is important to note that the Act provides not only the procedure for the acquisition of land by the State for purposes that are in the interests and benefit to the public, but also provides for the acquisition of land for resettlement purposes. The salient provisions having regard to the acquisition procedure are summarized below.

Section 5. Preliminary Notice of Compulsory Acquisition.

When land for acquisition is identified, and agreement for its acquisition cannot be reached with the holder of such land, a preliminary notice must be given.

The preliminary notice must be published in the Government Gazette. It must also be published for two consecutive weeks in a newspaper circulating in the area where the land that is being acquired is located, the first publication being the same day as the publication of the notice in the Government Gazette.

The preliminary notice should contain the following information:

- Nature and extent of the land, stating that a plan or map of such land is available for inspection at a specified place and at specified times;
- Set out the purpose for which the land is to be acquired for and;
- Calling upon the owner or occupier or any other person having an interest in the land who-
  - Wishes to contest the acquisition of the land, to lodge a written objection within thirty (30) days from the date of publication of the notice in the Gazette; or
  - Wishes to claim compensation to submit a claim within sixty (60) days of publication of the notice in the Gazette.

In addition to the Gazetted publication and the publications in the local newspaper, the Act also requires that a notice in writing be served personally to the owner or occupier of the property, if possible after investigation.

In respect of Specially Gazetted Land, there is no need for personal service -- the publication in the Government Gazette and local newspaper is deemed sufficient. Once a preliminary notice is published the owner of such land is restricted from dealing freely with such land, which includes disposing of the land or making permanent improvements on the land.

A preliminary notice will remain in force for a period of two years from the date of its publication in the Government Gazette. This period will however be interrupted pending any proceedings in a court regarding the acquisition of the land. In short, the period for which the matter is pending in any court will not be counted as part of the two year period.

A preliminary notice must be lodged with the registrar of deeds to prevent anyone from transferring the land to another party pending acquisition.

A preliminary notice may be withdrawn at any time. Any withdrawal must be published in the Government Gazette and served on the affected persons. The notice may at any time after withdrawal, be reissued.

If the preliminary notice lapses before the land is acquired (i.e. on the expiration of the two year period) the notice can only be reissued following a one year period from the date of the notice lapsing or at an earlier time with the agreement of the occupier.

Section 6. Owner may demand acquisition of whole property

This section stipulates that, if a portion of the owner's property is Gazetted in the preliminary notice, the owner may demand for the acquisition of the whole of his property if he believes that the acquisition of the portion will render the remainder of the property unsuitable for the purposes which it was being used.

If such a demand is made the acquiring authority may agree to the acquisition; however, if it rejects the demand then the matter will be referred to the administrative court for determination.

Section 6B of the Act further states that the owner may also request for subdivision of his property if the acquiring authority has sought to acquire the whole property. In requesting subdivision, the owner can agree to the acquisition of a portion of his property as opposed to the whole.

Section 7. Application for an order authorizing or confirming an acquisition following a Preliminary Notice, in cases where the acquisition is contested.

As stated the holder of property being acquired, may object to the preliminary notice within 30 days of the preliminary notice being Gazetted. If such an objection is made, the acquiring authority cannot acquire the property following the 30-day period, but must make an application to the Administrative Court for an order authorizing the acquisition.

The Act provides that once such an application is made the acquiring authority must give notice of the application personally to the holder of land. Although the period for serving such a notice is not stipulated, the Act does state that such notice must be served (personally) within a reasonable time. A reasonable time can be seen as any time before the Administrative Court sits to hear the application, unfortunately a period for when the hearing should take place is also not stipulated.

With respect to agricultural land required for resettlement purposes, the Act provides that notice of the said application in the Government Gazette is sufficient notice.

When determining whether to confirm or authorise the acquisition of land following an objection by the owner of such land the Administrative Court will consider the following:

- That the acquisition of the land is reasonably necessary in the interests of defence, public safety, public order, public morality, public health, town and country planning or the utilization of that or any other property for a purpose beneficial to the public generally or to any section of the public.
- Where the acquisition relates to rural land, that the acquisition is reasonably necessary for the utilization of that or any other land—or settlement for agricultural or other purposes:
  - For purposes of land reorganization, forestry, environmental conservation or the utilization of wild life or other natural resources; or
  - For the relocation of persons dispossessed in consequence of the utilization of land for the above-mentioned purposes.
- Where the acquisition relates to only part of a piece of land, that the acquisition will not render the remainder of that piece of land unsuitable for the purpose for which it was being used or was bona fide intended to be used immediately before the acquisition.
- The Administrative Court may after considering the application grant an order confirming or authorising the acquisition. The Administrative Court may also refuse to confirm or authorise the acquisition in which case the preliminary notice must be withdrawn by notice in the Government Gazette.

Section 8. Vesting of land

Subject to any opposition to the acquisition of land by the holder of land, the acquiring authority may acquire the land in question by a written order not less than thirty days after the Gazetting of the preliminary notice.

An order for the acquisition of land must be served on the holder personally, however if this is not possible this must be done by way of notice in the Government Gazette.

Section 9. Eviction of the owner or occupier

Absent landholder opposition to the acquisition of the land, the Act provides that the owner will have three months written notice to vacate the property. This only applies to the owner of non-agricultural land required for resettlement purposes, as there is no need for persons occupying land for resettlement purposes to move.

Should the holder fail to vacate the property at the expiration of said period, the acquiring authority may obtain an order from the High Court of Zimbabwe for their eviction.

The Act further imposes a criminal penalty of a fine and/or imprisonment for a period not exceeding two years for a holder who after ninety days (three months) from service of the order of acquisition, refuses to vacate his living quarters.

2.4.2 *Compensation for Land as per the Land Acquisition Act (Chapter 20:10)*

Compensation for land in terms of the Land Acquisition Act can be categorized as follows:

- Compensation for Specially Gazetted Land; and
- Compensation for Land Excluding Specially Gazetted Land.

The land required for the Access Road and Staff Township is not Specially Gazetted Land.

Compensation for Land Excluding Specially Gazetted Land

Compensation for Land Excluding Specially Gazetted Land is dealt with in Part V of the Act. The procedure for making such compensation can be summarized as follows;

Any person who wishes to claim compensation for land (excluding Specially Gazetted Land) must submit a written claim for compensation specifying in detail -

- The nature of his loss or deprivation of rights; and
- The amount of compensation claimed by him and the basis on which he has calculated that amount and any actual expense or loss which has been or may reasonably be incurred or suffered directly as a result of the action taken by the acquiring authority.

It can be noted that there is no exact formula for doing so; thus, the claimant must quantify his loss which the acquiring authority can accept or reject.

The claimant must submit a written claim for compensation to the acquiring authority within at least 60 days of Gazetting of the preliminary notice in the Government Gazette.

Any disputes regarding compensation must be referred to the Administrative Court for determination only after a period of thirty days after an order is made regarding the acquisition of the land.

The Administrative Court is authorized to make a determination of fair compensation if there is a dispute.

The Act provides that where land that is not Specially Gazetted Land is acquired temporarily, compensation shall be assessed in terms of the rental value of the land.

Where only a portion of the land, other than Specially Gazetted Land, has been acquired, compensation for that part shall be assessed as the difference between the price or value of the whole piece of land, and the price or value so determined of the remainder of that piece of land.

If immediately before the date of publication of the preliminary notice in the Gazette, land that is not Specially Gazetted Land was used for a special purpose and adapted for that purpose in such a way that there is no general demand or market for the land, then compensation would include the cost of adapting replacement land. The goal being to ensure the claimant is restored as closely as possible to the position in which they were immediately prior to that date, or on any other basis that is considered fair.

2.5 Communal Lands Act (Chapter 20:04)

This Act provides the procedure for the compulsory acquisition of communal land. Having regard to this Act, there are three ways communal land can be acquired, these can be summarized as follows.

Section 6. Additions to or Subtractions from Communal Land

This section authorizes the President after consultation with the rural district council under which the communal land falls to declare by way of a statutory instrument, that such land ceases to be communal land.

When the president takes such action, the land ceases to be communal land and becomes state land until it is sold or otherwise disposed of. This section is gives the President very wide reaching powers as it does not provide opportunity for challenge by an affected party to the

President's decision, nor does it oblige that he gives of a specific reason for the subtraction of such land from communal land.

Section 10. Setting aside of Land for Communal Purposes

This section authorizes the Minister of Local Government, Public Works, and National Housing after consultation with the rural district council established for the area, to set aside any communal land for any purpose for which he considers in the interests of the people of that area or in the public interest.

In acquiring such land (setting aside such land) the Minister publishes a statutory instrument describing the land, the purpose for which the land is being set aside for, specifying the date on which the land will be set aside and ordering all persons occupying such land to permanently vacate the land with their belongings.

Section 11.Servitudes relating to Water Rights over Communal Land

In terms of this section the Administrative Court in terms of the provisions of the Water Act (Chapter 20:24) may grant a servitude over communal land, which servitude could lead to the inundation of an area of communal land. Such a servitude could result in the loss of land by certain occupants of the affected area. This section accordingly can also be seen as a way in which land can be acquired. This section does not provide any specific procedure as to procedure in relocation of affected persons. It furthermore does not provide an internal remedy for recourse against such a decision granting a servitude that would result in the inundation of communal land.

It is worth noting that the Communal Land Act of 1981 does not clearly detail the roles of the traditional leadership and the local authorities. Consequently, disputes may arise because of a lack of clarification on the roles and responsibilities of both parties in administering the communal areas. In some instances, the Rural District Councils (RDCs) may implement decisions based on strategic planning, whereas the traditional leadership claims ancestral rights as custodians of the land.

In essence, the communities residing on Communal Land are governed by their permit or the Act and thus lack formal documentation and land tenure. Misuse of the permit or violations of terms stipulated in the act can lead to the land use rights being revoked, thus leaving the inhabitants without a residential or arable plot.

The RDCs derive their roles and responsibilities from the Rural District Councils Act (Chapter 29:13). RDCs and traditional leaders work together to administer the communal lands. It is worth noting that the local authorities can, and in most cases do, override the functions and authority of the traditional leaders.

2.6 Compensation for Land as per the Communal Lands Act (Chapter 20:04)

In terms of this Act the primary relief for an affected person is, if possible, alternative land for use. If alternative land is not available and no agreement is reached with the affected persons the Act advises that the provisions of the Land Acquisition Act regarding compensation will apply. This however is vague as question arises around whether the procedure put in place for Specially Gazetted Land (agricultural land) will be used or whether the procedure relating to any other land will be used. Noting this vagueness, it will be the responsibility of the occupier of communal land to quantify his loss and submit the claim to the acquiring authority for payment. The Administrative Court will be the deciding body should there be a dispute.

2.7 International Resettlement Standards

The World Bank policy on involuntary resettlement is established under Operational Policy and Bank Practice 4.12 on Involuntary Resettlement (OP/BP 4.12), which is further defined

through the Bank's Safeguard Policies. These policies were reviewed and updated, and the new Environmental and Social Framework (ESF) published in 2016 [3].

ESF's Environmental and Social Safeguard Policy Standard 5 (ESS5): Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (see Annex 1) establishes the following objectives:

- To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives.
- To avoid forced eviction.
- To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a) providing timely compensation for loss of assets at replacement cost and (b) assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.
- To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure.
- To conceive and execute resettlement activities as sustainable development programmes, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant.
- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected[4].

"Replacement cost" is defined by ESS5 as the method of valuation yielding compensation sufficient to replace assets, plus necessary transaction costs associated with asset replacement. Where functioning markets exist, replacement cost is the market value as established through independent and competent real estate valuation, plus transaction costs.

Where functioning markets do not exist, replacement cost may be determined through alternative means, such as calculation of output value for land or productive assets, or the un-depreciated value of replacement material and labour for construction of structures or other fixed assets, plus transaction costs.

Other pertinent points in ESS5 include:

- The proponent will engage directly with affected communities and persons through a process of stakeholder engagement through the planning, implementation, monitoring, and evaluation of the resettlement process.
- The proponent will establish a grievance mechanism to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion.
- In the development of the LRP, the proponent will be required to conduct a census to determine eligible peoples and an inventory of their assets as a basis of determining their asset holdings. Both will be linked to a suitable development moratorium (i.e. eligibility cut-off date).
- Documentation of ownership or occupancy and compensation payments should be issued in the names of both spouses or single heads of households, and other resettlement assistance, such as skills training, access to credit, and job opportunities, should be

[3] https://www.worldbank.org/en/projects-operations/environmental-and-social-framework accessed 05_12_2018

[4] Guidance Note – ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement page 1

equally available to women and adapted to their needs. Where national law and tenure systems do not recognize the rights of women to hold or contract in property, measures should be considered to provide women as much protection as possible with the objective to achieve equity with men"[(5)].

- Mitigation of economic displacement will be considered complete when the completion audit concludes the affected persons or communities have received all of the assistance for which they are eligible, and have been provided with adequate opportunity to re-establish their livelihoods[(6)].

Critical to the above requirements is the recognition of affected persons with different land tenure status. Displaced persons, under the World Bank include persons:

- With formal legal rights to the land or assets they occupy or use;
- With no formal legal rights to land or assets but have a claim to land that is recognized or recognizable under national customary law; or
- With no recognizable legal right or claim to the land or assets they occupy or use.

Affected persons who fall into the third category are considered eligible for compensation for any lost assets other than land (such as crops, irrigation infrastructure and other improvements to the land) at replacement cost. ESS5 also stipulates that the Borrower provide assistance in 'lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere'.[7]

2.8 Gaps Analysis between National Laws and International Standards

*Table 2.1*compares the national laws in Zimbabwe with World Bank standards pertinent to land acquisition for this component of the Project. The compensation entitlements, livelihood restoration and vulnerable support measures outlined in further chapters of this document are designed to address the gaps between international standards and regulations governing land acquisition and distribution in Zimbabwe.

[(5)] Environmental and Social Framework (2016) page 57

[(6)] Ibid page 59

[(7)] Ibid page 59

Table 2.1 Comparison between National and International Standards Related to Land Acquisition and Resettlement

Project impact/component	Zimbabwe Legislation	World Bank Environmental and Social Standard 5	Measures to address gaps
Compensation for agricultural land	S72 of the Constitution of Zimbabwe Amendment (no. 20) Act 1 (2013) provides that there is no compensation for agricultural land, except for improvements effected on it before its acquisition. Land Acquisition Act stipulates that payment for Gazetted Land will be dependent on the availability of the Fund government have in place for payment of compensation for land.	When land acquisition or restriction on land use (whether permanent or temporary) cannot be avoided, affected persons will be offered compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or livelihood	Refer to Chapter 6 Compensation Principles Table 8 Entitlement Matrix
Compensation for communal land	S12 (1) of the Communal Lands Act (Chapter 20:14) provides for provision of alternative land for communal use. If alternative land is not available the provisions of the Land Acquisition Act regarding compensation to apply (i.e. land occupiers to give quantification for loss suffered and expert valuation to be undertaken)	In cases where affecting persons with legal rights or claims to land that are recognized or recognizable under national law, replacement property (e.g. agricultural or commercial sites) of equal or greater value will be provided, or where appropriate, cash compensation at replacement cost Economically displaced persons who are without legally recognisable claims to land will be compensated for lost assets other than land (i.e. crops, irrigation infrastructure and improvements to land) at replacement cost. Additionally, the borrower will provide assistance in lieu of land compensation sufficient to provide such persons with an opportunity to re-establish livelihoods elsewhere.	Refer to Chapter 6 Compensation Principles Table 8 Entitlement Matrix
Livelihood restoration	No specific provisions for forms of additional livelihood assistance beyond compensation.	Economically displaced persons will be provided with opportunities to improve (or at least restore) their means of income-earning capacity, production levels, and standards of living. Recommends provision of support to displaced persons for a transition period.	Refer to Chapter 7 Livelihood Restoration and Improvement outlines approach and possible programme types

Project impact/component	Zimbabwe Legislation	World Bank Environmental and Social Standard 5	Measures to address gaps
Valuation methods	Asset valuation practice does not make mention of depreciation, but does indicate that compensation does not extend to any 'inconveniences or losses', although the nature of these is not clarified.	Full replacement cost does not take depreciation into consideration.	Refer to Chapter 6 Compensation Principles Table 8 Entitlement Matrix
Stakeholder engagement and consultation	Reference to gazetting and notification, but no specific provisions for stakeholder engagement and consultation.	Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected	Refer to Chapter 4 outlines the Project approach to stakeholder engagement and participation
Vulnerable groups	No specific provisions for vulnerable groups	Where the ESIA of the Project identifies specific individuals or groups as disadvantaged or vulnerable [8], the borrower will propose and implement differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing benefits and opportunities resulting from the Project.	Refer to Chapter 8 outlines the Project approach to identifying and providing support to PAP deemed 'vulnerable'

[8] Disadvantaged or vulnerable refers to those who may be more likely to be adversely affected by the project impacts and/or more limited than others in their ability to take advantage of a project's benefits. Such an individual/group is also more likely to be excluded from/unable to participate fully in the mainstream consultation process and as such may require specific measures and/or assistance to do so. This will take into account considerations relating to age, including the elderly and minors, and including in circumstances where they may be separated from their family, the community or other individuals upon which they depend.

3. EXISTING SOCIOECONOMIC CONDITIONS

This *Chapter* provides an overview of the baseline socio-economic conditions in communities that will be affected by the Project's requirement to access land for the Access Road and Staff Township.

3.1 Methodology

In order to assess the baseline conditions of households within the Access Road servitude and Staff Township, the following methods were applied:

- Open meetings and focus group discussions with affected communities;
- Interviews and consultations with key stakeholders;
- Transect walk;
- Census and Socioeconomic Survey; and
- Asset Inventory.

3.1.1 *Focus Group Discussions*

Open meetings were held in key areas to allow for the participation of affected households as well as the wider community in the land acquisition and livelihood restoration planning process. These meetings were held prior to the start of the census and socio-economic survey to provide community members with an update on the status of the Project, the schedule and procedures of the upcoming surveys, and the implications of the cut-off date.

Participants were then divided into semi-structured focus groups to discuss existing social and economic conditions of the surrounding areas in order to generate a socioeconomic profile for affected villages. Sub-groups included men, women, and youths (ages 18-35) (refer to *Figure 3.1*).

Figure 3.1 Men and Women Participants' Separated into Sub-groups to Discuss Socioeconomic Conditions and Livelihood Activities Outside of Batoka Primary School, July 2019

3.1.2 *Interviews and Consultations with Key Stakeholders*

To inform livelihood restoration technical planning and gather information on broader socio-economic conditions of the area, the engagement was undertaken with key informants knowledgeable of the area including chiefs and village heads / headmen as well as representatives from technical service departments in Hwange District and local NGOs.

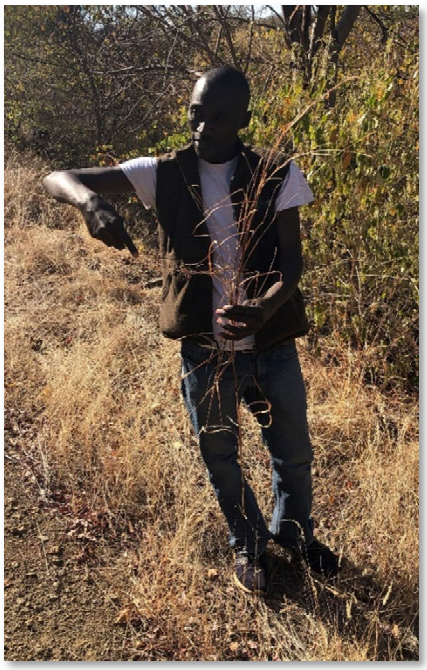
Further information was gathered through informal interviews with households and village heads during the census and asset surveys.

Figure 3.2 Project Representatives Discuss the Survey Process with Village Heads in Jembwe Village, July 2019

3.1.3 *Transect Walk*

A three-hour transect walk through the Staff Township area was held with Mr. Jabulani Moyo, Head of Kasikiri Sub-Village and designated representative of Chief Shana. The transect walk included a systematic walk along the road passing through the Staff Township to gain a deeper understanding of the land's importance to livelihoods for communities within the area. During the walk, participants discussed the different resources encountered with team members facilitating exchanges by asking questions and making direct observations.

Figure 3.3 Thatching Grass Collected in the Staff Township during the Transect Walk, July 2019



The transect walk was complimented by a smaller focus group of six community members in Kasikiri Sub-Village to gain further insight on the use of grazing areas, thatching grass, and medicinal trees.

3.1.4 *Census and Socio-economic Survey and Asset Inventory*

In order to create a comprehensive list of Project component beneficiaries as well gather quantitative socio-economic data on Project-affected households (PAHs), a census and socio-economic Survey was undertaken with of affected households in villages along the Access Road from July 12th to 16th, 2019 [9].

The surveys were conducted with the following objectives:

- Construct a detailed demographic and socio-economic profile of each affected household;
- Identify the specific impacts of land acquisition on each household, including a detailed, legal description of affected immoveable assets;
- Cap beneficiaries and entitlements;
- Inform entitlement planning;
- Provide a baseline for monitoring and evaluation; and
- Serve as the basis for individual agreements.

Households were identified by the relevant village head and their land occupancy verified using village land registers.

Figure 3.4 Survey Teams Trace the Field Perimeters with Affected Owners in Kasikiri Village, July 2019

3.1.5 *Limitations*

Many of the fields infringed upon by the Access Road are located away from affected households' homesteads which resulted in delays to the survey schedule. In order to prioritize the enumeration of affected households and demarcation of their fields the survey team did not administer the more detailed socio-economic survey to some households, the LRP

[9] No permanent or semi-permanent human settlements exist within the Staff Township.

Implementation Team will collect the socio-economic data for these 116 [10] (out of the 222 total) affected households during the verification and sign-off process detailed in *Section 6.5*. No land acquisition will be undertaken until the baseline is complete.

The description of existing conditions below relies on the data collected for the 104 households, information gathered during focus groups and key informant interviews. Statistical reference relies on the original household surveys undertaken 2014.

3.2 Characteristics of the Site

The BGHES will be constructed in the Zambezi River Basin which, in Zimbabwe, is located in the Matabeleland North Province in Western Zimbabwe close to the borders of Botswana and the Republic of Zambia. It is the country's second least populous province, and home to the famous Victoria Falls and Hwange National Park. All Sub-Project components within Zimbabwe will be located within Hwange District.

The Access Road alignment follows the existing road from Victoria Falls towards the proposed Staff Township and BGHES Dam Infrastructure site. Due to the already existing alignment, large stretches of the road contain no social infrastructure and consist primarily of agricultural fields and resting fallow land. Wild trees and brush line the sides of the road, which provides a natural boundary for fields as well as containment for livestock.

Structures adjacent to the existing road include houses, businesses, and communal infrastructure which fall outside of the proposed 40 meter servitude.

Figure 3.5 Rotunda Houses Made of Clay and Thatched Roofing Adjacent to the Access Road, July 2019

The site of the Staff Township is located on the peripheries of Kasikiri and Sidakeni villages within an area that was previously designated as a national park. No structures or signs of human habitation were observed in this area. The terrain consists of undulating hills containing wild trees and shrubs roamed by livestock with steep gorges leading to the Zambezi River.

[10] Two fields were identified where the rightful occupier had deceased and the land turned over to the village head. In addition 8 occupiers were either unavailable or not found during the surveys.

3.3 Socio-economic Description & Categorization of Affected Persons

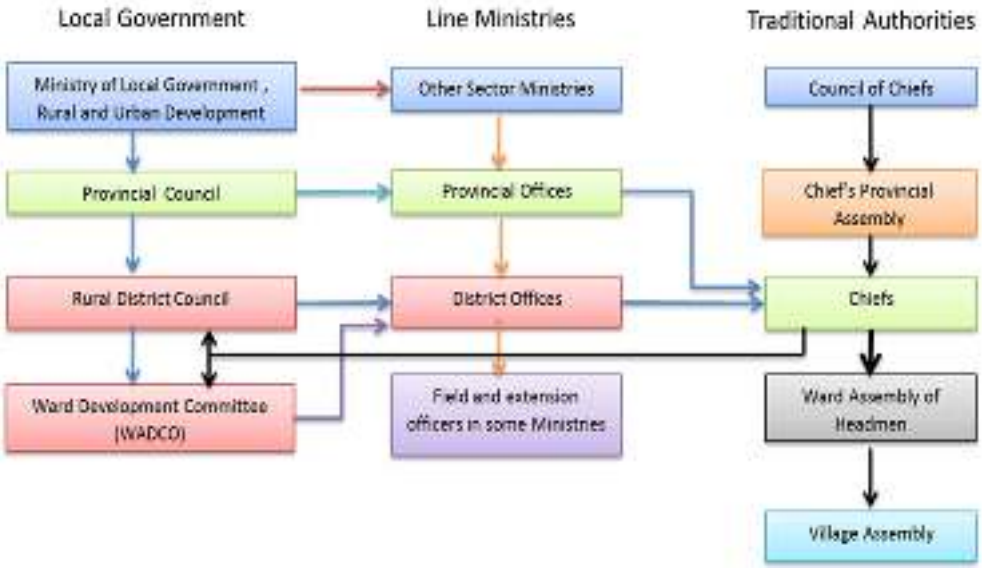
3.3.1 *Governance Structure of the Area Impacted by the Project Components*

3.3.1.1 National Governance

The Government of Zimbabwe works as a Presidential Republic. Administratively, the country is divided into 10 provinces, with presidentially appointed provincial ministers administering each province assisted by district administrators. The provinces are further divided into 59 districts and then 1,200 wards. The nation's parliament holds legislative and rule-making power. Additionally, the country has a judicial branch for matters of the court.

Zimbabwe adopted a new constitution in 2013 (Constitution of Zimbabwe) which, among other things recognises the role of the institution of traditional leadership who operate alongside modern state structures. In parts of the country where the State has a limited presence, traditional leaders deliver various government responsibilities. Their legitimacy, control and influence in rural areas remain widespread [11]. *Figure 3.6*illustrates the existing political and traditional governance structure within Zimbabwe.

Figure 3.6 Governance Structure of Zimbabwe

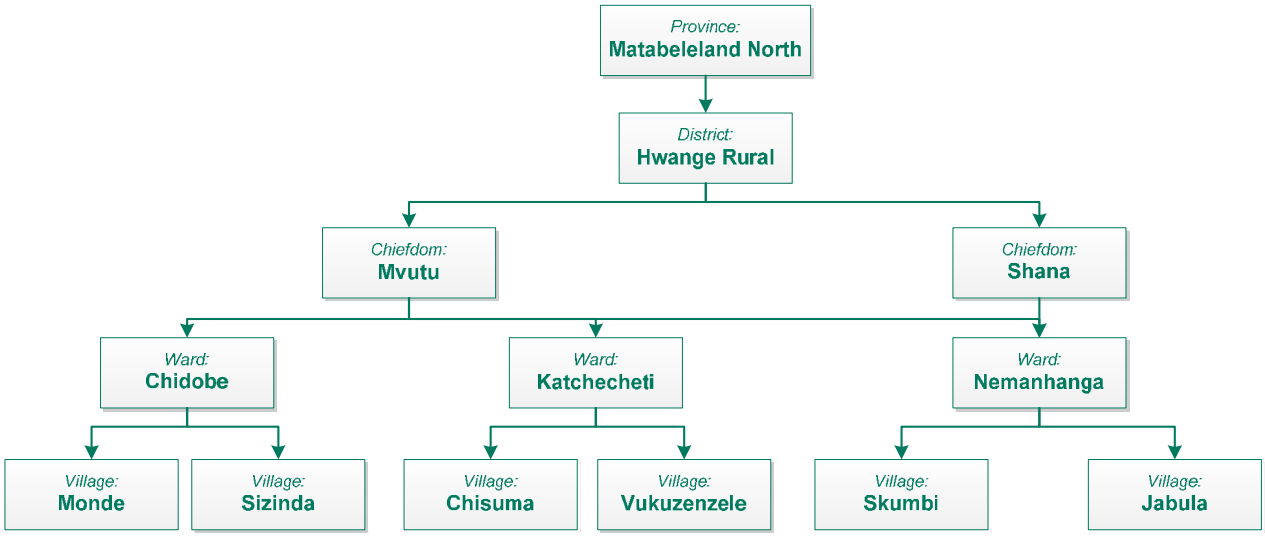


3.3.1.2 Governance within the area of the Sub-Project

Land required for the Project components (Staff Township and Access Road) is located in the following wards: Chidobe, Katchecheti, and Nemanhanga. The affected chiefdoms are Mvuthu and Shana.

[11] http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2077-49072016000100003 accessed 03_12_2018

Figure 3.7 Governance structure of the area impacted by the Project Components [12]



The Ministry of Local Government, Rural and Urban Development (MLGRUD) oversees local government in Zimbabwe, administered through urban and rural district councils. The role of the rural district councils includes planning and implementing local development; providing and managing basic services, including health, education, social welfare, refuse removal, water, roads and sanitation.

Policymaking in rural areas takes place in village and ward assemblies, and the full District Council in ascending order. The Ward Assembly is composed of all headmen, village heads *(sibbuku)* within that particular ward, and the elected councillor for that area. Wards are further divided into villages, each of which has a Village Development Committee chaired by the Village Head. Villages may then be further divided into sub-villages.

The Traditional Leaders Act (1998) provides for the appointment and duties of Chiefs, headmen and village heads. Each plays an important role at the grassroots level in both the distribution and documentation of land access and the resolution of land related disputes. The President appoints chiefs to preside over communities inhabiting Communal Land and resettlement areas.

Their responsibilities include:

- Promoting and upholding cultural values among members of the community under his jurisdiction, particularly the preservation of the extended family and the promotion of traditional family life;
- Supervising headmen and village heads in the performance of their duties; and discharging any functions conferred upon him in terms of the Customary Law and Local Courts Act;
- Overseeing the collection of levies, taxes, rates and charges payable in terms of the Rural District Councils Act by village heads;
- Ensuring that Communal Land is allocated in accordance to the Communal Land Act;

[12] Skumbi Village does not lie directly within the servitude however two households living in Skumbi were identified as having fields in Kasikiri Sub-Village.

- Ensuring that the land and its natural resources are used and exploited within legal boundaries;
- Protection of public infrastructure and services;
- Adjudicating in and resolving disputes related to land in his area; and
- Maintaining up-to-date registers with all villages' names, their inhabitants and copies of land certificates.

The Chief nominates a person to serve as Headman, who presides over the ward council. Key responsibilities of the Headman include assisting in the maintenance of law and order; overseeing the disposal of settlement rights in Communal Land and the admission of new settlers in the area; mediating local disputes over customary law; and keeping up-to-date village records. Village heads assist the Headman in the administration of their duties, and are nominated by the Headmen with approval from the area Chief and the Secretary of the Minister of Local Government, Public Works, and National Housing.

The Hwange Rural District Council (HRDC) is responsible for setting development priorities in the district and outlining budgets and approaches to meeting set targets. It is the HRDC, through the District Administrator's office and in collaboration with the Ministry of Lands, who will assist in land access planning and implementation.

3.3.2 *Gender Roles*

Zimbabwean society continues to have clearly defined gender roles in domestic, productive, and community settings. Women and girls fetch water, cook, clean and take care of children, the sick and elderly. Men tend to dominate both household and community decision-making.

With respect to the Gender Inequality Index (GII), which reflects gender-based inequalities in reproductive health, empowerment, and economic activity, Zimbabwe ranks 116 out of 148 countries. Women hold only 18% of the seats in parliament, and have lower labour force participation rates compared to men. Health facilities report higher rates of women with HIV/AIDS compared with men [13].

In 2005, Zimbabwe established the Ministry of Women's Affairs, Gender and Community Development with the goal of spearheading women's empowerment and gender equality. The ministry has established co-ordinators and development officers at the ward, district and provincial levels throughout the country.

In the Project Area, men are generally responsible for the more demanding physical labour associated with farming (i.e. ploughing), whereas women plant, weed, water and harvest crops. Men also fish and carve curios for sale to tourists.

Although women do not carve the curios, they help with the polishing so that they are more presentable for sale. Women are also engaged in trading activities. During the baseline study focus groups, women reported playing a limited role in community decision-making, local leadership and politics with men generally controlling income from the sale of any crops and/or curios.

3.3.3 *Land Tenure | Land Reform*

All land along the proposed Access Road and Staff Township is Communal Land. In practice, Communal Land is regarded as belonging to an individual after they have used it for many years however there are no formal contracts or deeds. Communal Land can be inherited by a male or female heir, but cannot be sold. Land seekers in communal areas go through chiefs and headmen for a plot allocation, which is maintained in a village land register.

[13] Zimbabwe Statistics (Zimstat), 2011 Zimbabwe DemogLRPhic and Health Survey 2010-11, Zimstat, Harare, Zimbabwe

3.3.4 *Livelihoods and Local Economy*

As a province, tourism and mining (coal) are important contributors to the economy of Matabeleland North. The tourist sector relies heavily on the presence of Victoria Falls, the Zambezi River and Hwange National Park. The World Travel and Tourism Council (WTTC) estimates that Zimbabwe's Travel and Tourism trade contribute US$ 87.9 million or 11.4% of the country's GDP.

The Zimbabwe Vulnerability Assessment Committee (ZIMVAC) 2014 Rural Livelihoods Assessment Results indicates that for the country as a whole, the poverty incidence rate is 62.6%. In spite of the wealth generated by mining and tourism in the province, Matabeleland North has the highest poverty incidence rate of 81.7% against the lowest rate of 34.5% for Bulawayo [14].

3.3.5 *Agriculture*

Despite poor soil conditions, the area of the Staff Township and Access Road is covered by large expanses of land used for cultivating annual crops including major cereal crops such as maize, millet, and sorghum and minor crops of ground nuts and horticultural vegetables. Annual crops are tended to from October to May with harvesting starting in March. Tilling and field preparation is a family activity with little division of labour between men and women.

Cereal crops are produced for both income and household subsistence however low soil fertility, conflict with wildlife, and severe drought have lead households to seek alternative activities to support themselves.

Figure 3.8 Field Left Fallow after Maize Harvest, July 2019

To supplement income from cereal crops, households have begun undertaking small-scale gardens of lettuce, tomatoes, spices, and pumpkins in areas close to water sources such as boreholes and streams. Gardens are tended from March until the rainy season starts in November where limited household labour is diverted back towards preparing agricultural fields. In the absence of formal markets and linkages to Victoria Falls, many households are able to sell garden produce locally through informal relationships established with neighbours. Gardens mainly exist at the household level, in schools and clinics. There is a communal garden area in Monde Village that was abandoned after damage by elephants.

[14] ZimVac (2014). Zimbabwe Vulnerability Assessment Committee, 201 4 Rural Livelihoods Report, Harare, Zimbabwe

Figure 3.9 Agricultural Field Partially Converted to Small-scale Garden, July 2019

In addition to crops, a number of households own small numbers of mango, guava, lemon, and pawpaw trees which are grown within concessions where they can be protected from wandering livestock.

Figure 3.10 Mango Tree Protected within Residential Concession, July 2019

Farmers are highly constrained by a lack of local selling points combined with high transportation costs to reach Victoria Falls as well as a lack of irrigation for crops. An agricultural training centre exists in Sizinda to encourage farmers in agri-business activities and the cultivation of drought resistant crops such as cassava.

Figure 3.11 Agricultural Training Centre and Cassava Pilot Plot in Sizinda, July 2019

3.3.6 *Livestock Rearing*

Livestock rearing represents an important component of peoples' livelihood with increasing significance in the face of reduced reliability of agricultural income. Households typically own a range of livestock including cattle, donkeys, goats, and poultry.

Livestock is primarily reared for household subsistence, draft power, and transport with poultry and other low-value livestock managed mostly by women. Owning cattle represents a sign of wealth and may be used as a form of savings, sold during times of drought when harvests have been poor or to help pay for education fees or a marriage dowry. Goats may also be sold for quick cash when additional money is needed by the household.

Stakeholders described concern with cattle rustling, from people illegally crossing the border via the Zambezi River. In addition, livestock diseases affecting cattle are common including a scabies-like skin disease known locally as *sangobo*. While veterinary extension services provide training and treatments for livestock management, it has been raised by community members that these services do not reach remote villages such as Kasikiri and there are no dip tanks for community members to treat their livestock.

Figure 3.12 Cattle Paddocked Outside of Concessions, July 2019

Figure 3.13 Goats in Kraal Made from Locally Harvested Mopane Poles, July 2019

Figure 3.14 Cow Suffering from Scabies-like Skin Disease, July 2019

Cattle and donkey drawn scotch carts are the most common means of transport along the Access Road in addition to walking and bicycles. Without cheaper alternatives, mobility and transport of agricultural products is limited due to the long distances and threat of wildlife encounters in the area.

Figure 3.15 Donkey-drawn Scotch Carts are a Popular Form of Transportation due to Expensive and Largely Unavailable Local Transportation, July 2019

3.3.7 *Trading (Curios)*

Trading contributes to the livelihoods of 10% of surveyed households. Goods traded include clothing, items made from thatch and palm reeds (i.e. baskets and mats) and curios. Curios include intricately carved wooden animals, bowls, utensils, baskets, mats, instruments, and jewellery. Traders undertake their business within the local communities and report generating a monthly income of on average US$ 125.

Although curio trading was reported as a primary livelihood by only 2% of all surveyed households, it was cited as one of the most important livelihoods activities for men during focus groups in Katchecheti Ward. Additionally, 10% of people in Simakade and 8% in Jabula identify curio carving as their primary livelihood activity. Informal conversations with local wildlife experts revealed that the cutting of trees to make curios poses a serious threat to the forest areas. Trees cut tend to be hardwood varieties, such as Zimbabwean / Zambia teak; known locally as *mukusi* (Baikiaea plurijuga), mopane; known locally also as *mopane* or *mopani* (Colophospermum mopane) and afrormosia; known locally as *mubanga* (Pericopsis angolensis). These trees take a long time to grow (about 100 years) and as a result, some species are now under threat. Markets for the sale of curios are found in key tourist areas, like Victoria Falls.

Figure 3.16 Curio Carving in Sizinda and Mat Weaving from Grass Collected in Staff Township outside of Kasikiri Village, July 2019

3.3.8 *Fishing and Hunting*

Fishing in the Zambezi River is a supplementary livelihood activity undertaken by households. It is a male dominated activity with the majority of the catch used for household consumption. Average monthly incomes from the sale of the remaining fish amount to approximately US$50, though some households reported incomes as high as US$100. Types of fish caught include tiger fish, bream, salmon, chaser, pink lad and conject. Women typically process the fish, either via drying, frying or salting.

In Hwange Rural District big game trophy hunting generates significant income for the area, although revenues (like the species hunted) are on the decline. Key species hunted include elephant, buffalo, lion, and leopard. Hunting provides some employment opportunities for local people and game meat, with revenue generated split into dividends for each ward.

3.3.9 *Tourism*

Approximately 5% of households surveyed reported being formally employed and receiving cash incomes from their job in the tourist industry (i.e. drivers, guides, or casual labourers with safari or white water rafting companies, organizing village tours, as caterers or house cleaners at hotels and lodges or, as staff at retail outlets). In Chisuma, it is considered an important livelihood amongst male youth, and in Chisuma, Dibu Dibu Sub-Village and Sizinda, the impact of BGHES to the white water rafting trade was expressed as a key concern in their communities.

Youth community members reported that their engagement in the rafting industry was predominately as casual labourers tasked with carrying rafting equipment from the riverbed to the top of the canyon. As rafting is seasonal, average earnings during peak seasons was reported to be approximately US$50 per month.

Other activities in the gorge with the potential of being impacted by the Project include birding, angling, hiking and Jet Extreme Boating. Although these activities employ fewer people than the rafting industry, they are nonetheless very popular activities amongst nature- and

adventure-based tourists that are visiting the area specifically for a high quality birding, angling or hiking experience and contribute to direct tourism expenditure [15].

The impacts of BGHES on the tourist industry on both sides of the Zambezi River, including up and downstream from the location of the dam has been examined in great detail as part of a specialist economic assessment study for the ESIA. The findings and their implications are being addressed separate from this LRP.

3.3.10 *Piece Jobs*

In light of poor agricultural yields due to the persistent drought, many households reported in the census survey and focus groups resorting to opportunistic positions or “piece jobs” for additional income. The most common piece job was brick making amongst men and youth to supply local markets which sell for approximately $1 USD / 7 bricks.

Figure 3.17 Local Brick Making using Clay Deposits along the Access Road, July 2019

Other piece jobs include building fences from local materials such as mopane poles, tending livestock, preparing agricultural fields, or providing local transportation with animal-drawn scotch carts.

[15] Batoka Gorge Hydro-Electric Scheme; Economic Assessment Specialist Report, Anchor Environmental

Figure 3.18 Mopane Poles Collected in the Staff Township Area waiting to be transported for use in local construction, July 2019

In some focus groups, youth reported harvesting quarry stones and pit sand to sell however it is illegal to undertake this activity without first purchasing a permit from the Rural District Council may sometimes be a prohibitive cost.

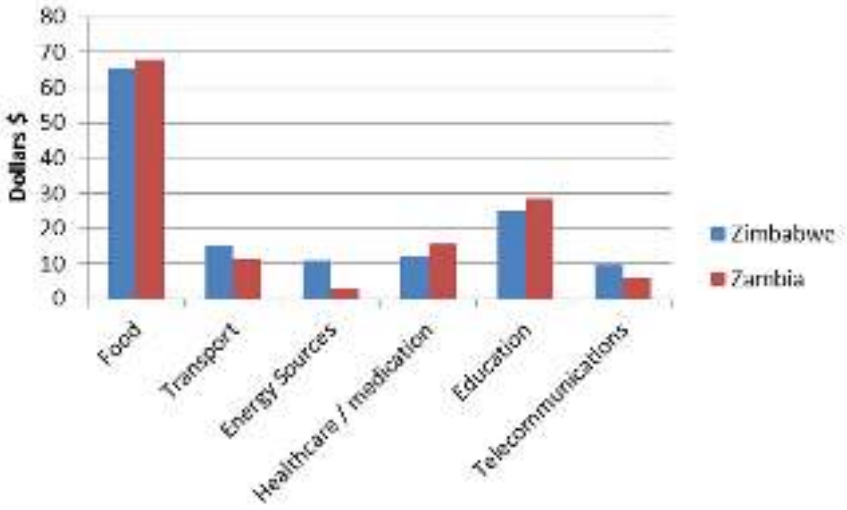
3.3.11 *Household Income and Expenditure*

As previous sections discuss, people in the Project-affected area are principally subsistence farmers, selling what additional crops they produce to generate limited cash income. There is also an active market in curios and trading of forest products (i.e. firewood, grass and forest fruits). Livestock is reared for household consumption and may be sold when necessary.

Establishing an accurate picture of household income and expenditure is a challenging task. Less than 10% of the households surveyed in 2016 reported a monthly income figure. From those who did, figures ranged from less than US $10 / month to $600 / month. The average amount reported amounted to US $2 / day.

*Figure 3.19*illustrates the monthly household expenditure reported by survey respondents. Food accounts for between 48 - 52 % of the monthly household spend (or US $67.78). Items purchased are typically that which cannot be produced or grown by the household (e.g. salt, sugar and oil) however maize is also purchased when harvests have been depleted.

Figure 3.19 Household Expenditures



Source: ERM Household Survey 2014

3.3.12 *Education*

UNESCO indicated that in 2015 the literacy rate in Zimbabwe for those 15 years of age and older was 89%[16]. Literacy amongst Project-affected households surveyed is significantly lower at 76%. Almost half of households surveyed report receiving a secondary school education; however, 8% lack any formal education and just 1% have had tertiary level education.

School facilities in the Project Area are scattered across a wide geography, and include Jabula Primary School, Jabula Secondary School, Kasibo Primary School, Mununa Primary School, Simakade Primary School, Sizinda Secondary School and the Sacred Heart Mission School. There is also Vhulindlela Secondary school, located 7 km from Borehole 126, under construction.

There are no vocational training centres in the area. On average, children walk 5 to 10 km to reach a primary school and up to 20 km to access a secondary school. Focus group participants in the village of Kasibo reported that the 25 km distance to the nearest secondary school presents a major barrier to school attendance. In an effort to address this issue, Lubancho (an NGO) provided bicycles to 563 schoolchildren. In addition to distance, schools fees were reported as a challenge for women in focus groups held in Jembwe (Sub-Village of Vukuzenzele) and Chisuma Villages.

3.3.13 *Health*

The World Health Organization (WHO) reports that life expectancy in Zimbabwe is significantly lower (61 years of age) than the global average of 70 years[17]. The healthcare sector was severely affected by the economic crisis and associated high levels of inflation that afflicted the country throughout early 2000. During this time, public spending on healthcare was dramatically reduced, with limited funds to purchase medication and equipment, pay for wages, and support other activities that would allow for better health service provision. Per

[16] http://uis.unesco.org/country/ZW accessed 29_11_2018
[17] ibid

capita spending on healthcare in 2010 was US$ 9, more than four times below the recommended amount of US34 by the WHO [18].

There are four hospitals that serve Hwange Rural District, including the hospital in Victoria Falls and a private hospital located at Hwange Colliery. Most surveyed households (98%) report accessing local community health posts for their health needs; however the distance they travel is at least an hour by foot. In addition to long distances travelled by foot, many focus group participants reported a lack of medicine and other supplies at community health centres.

These challenges have lead many households to resort to the use of traditional medicines such as devil's claw, moringa, marula, and aloe vera which may also be sold throughout the area. The use of traditional medicines is particularly prevalent in Kasikiri where traditional healers use medicines collected from wild trees in the surrounding communal area to treat community members who are too remote and too ill to travel to a health center.

Matabeleland North has the second highest rate of HIV/AIDS in the country (20% for females and 18% for males). The existence of major tourist attractions coupled with active mining areas in the province are contributing factors. Health workers in the Project Area report that diarrhoea, respiratory infections, skin disease and HIV/AIDS are the most common health issues, with HIV/AIDS and diarrhoea cited as the most common cause of death. The household survey suggest that 8% of households in the Project Area have a least one household member testing positive for HIV/AIDS.

3.3.14 *Vulnerable People*

Vulnerable groups include people who, by virtue of gender, sexuality, ethnicity, age, physical or mental disability, economic disadvantage or social status may be more adversely affected by a project than others, and who may be limited in their ability to take advantage of a project's development benefits.

Existing social services seek to aid vulnerable households including through such measures as food distribution schemes and tuition / scholarship assistance. Food distribution schemes consist of a 50 kg bag of maize that is delivered monthly to vulnerable households which for the moment are limited to elderly headed households (65 years or older) who are identified by the village head. Other services include tuition assistance and scholarships for individuals who are physically and / or mentally handicapped to pursue educational opportunities.

Based on consultations with the Hwange District Ministry of Social Welfare as well interviews with the village heads of affected areas, the groups below were identified as being at a higher risk of experiencing hardship resulting from land access requirements of the Project. Their needs will be considered in resettlement planning and implementation, and an assessment made regarding additional forms of support they may require.

Chapter 8 describes how vulnerable groups listed below will be identified from amongst the Project-affected population and assessed**.**

- **Elderly (65 years of age or more)**: The elderly within a village, particularly those who may be frail, have physical disabilities and/or chronic illnesses, and/or are socially isolated, or with limited family support. Elderly individuals generally lack a stable source of income and depend on food distribution schemes [19] and remittances from household members living outside of the Project Area.

[18] http://www.unicef.org/esaro/5440_investment_in_health.html. Accessed 12.12.2014.

[19] Food distribution schemes are provided by the Hwange District Ministry of Social Welfare. Food distributions are held once a month where eligible households receive one 50 kg bag of maize. Due to resource restrictions, these programs currently prioritize elderly headed households.

- **Female headed-households**: Due to the nature of domestic relations and traditional practices, women's control over resources (physical and financial) is more restricted. Female-headed households may be particularly vulnerable as they face reduced access to income generating opportunities and typically suffer from higher levels of food insecurity.
- **Households with a high number of dependants (i.e. caring for orphaned children)**: Households with a high number of dependent children and/or elderly members may be less able to adapt to change associated with land acquisition and displacement.
- **Households with members who have physical / mental health disabilities, who suffer from a chronic disease and / or have tested positive for HIV / AIDS**: People that lack physical mobility or who have mental health issues are less likely to adapt to changes within their environment. They may not be able to contribute to the financial well-being of the household, and may be reliant on others to care for them straining a household's resources. More than 6% of households surveyed in the Project Area report having a household member who suffers from a physical or mental disability. Households with members who have HIV/AIDS are also particularly vulnerable; they may be socially isolated/stigmatized and lack a support system and resources. Those household with heads who have tested positive for HIV/AIDS are at an even higher risk.
- **Child-headed households (18 years of age or younger)**: child-headed households often face challenges in providing basic necessities for themselves as well as other family members in the absence of an adult caregiver.

4. CONSULTATION AND DISCLOSURE

This *Chapter* describes the engagement activities undertaken for these components of the Project. It highlights the Project's approach to ensuring free, prior and informed consultation of stakeholders and their representative institutions in Project planning and implementation as it pertains to land acquisition and resettlement.

The *Chapter* is divided into three sections:

- **Stakeholder Engagement Approach**: Description of the overall approach to stakeholder engagement, and the specific goals and objectives of the engagement strategy.
- **Stakeholder Identification and Engagement Methods**: Identification of key stakeholder groups and individuals at the affected community, local, district and provincial level, and how they will be involved in resettlement discussions and planning.
- **Engagements to Date:** Summary of engagement activities undertaken during June and July 2019;
- **Key Issues Raised by Stakeholders:** Summary of key issues raised by stakeholders during recent field activities; and
- **Disclosure:** Disclosure of the LRP and description of planned engagements moving forward.

In addition to this LRP, a detailed Stakeholder Engagement Plan (SEP) has been developed. The SEP outlines the roles and responsibilities for keeping all stakeholders appropriately informed of Project progress, and involved in resettlement planning and implementation.

The SEP will identify and map all Project stakeholders with an interest, or ability to influence the land acquisition and resettlement process, and provide for the establishment of Project committees.

4.1 Approach to Stakeholder Engagement

Stakeholder engagement is the broad, inclusive, and continuous process of relationship building between a Project proponent and its stakeholders, in particular those who are directly affected.

The specific approach to stakeholder engagement for the land acquisition associated with the Staff Village and Access Road include the following:

- Establish and maintain a constructive, ongoing relationship with those to be affected, as well as other stakeholders, based on mutual understanding, respect and trust;
- Ensure that engagement activities are undertaken in a manner that is inclusive, culturally appropriate, and tailored to the language preferences and decision-making processes of those displaced, and the needs of vulnerable groups therein;
- Engage with those displaced as a group – via an informed, structured consultation and participation process – to establish the general terms and conditions that will guide the land access and livelihood restoration process;
- Undertake good faith negotiations with individual affected households on the basis of the general terms and conditions established through the group engagement described above;
- Mitigate the risks of asymmetry of information and bargaining power in the engagement / negotiations process through effective disclosure of timely, relevant and understandable, information, capacity building, and third party appointments;

- Ensure that all engagement activities are free of intimidation or coercion, and all participants are fully aware of their rights according to national law and international standards; and
- Work towards creating broad community support for the resettlement and Project as a whole.

The specific individuals and groups affected by access to land and how they will be engaged in livelihood restoration planning is described in the *Section 4.2*.

4.2 Stakeholder Identification

Stakeholders are those individuals, groups and organizations with a legitimate interest in the land access and livelihood restoration process, and in particular those people and households that experience displacement impacts directly.

For this LRP, stakeholders related to land acquisition fall into one of the following categories:

- Government officials and bodies at the national, provincial, district and ward level; relevant to where land will be acquired;
- Traditional leaders, including chiefs, village headmen and village heads of those respective areas;
- Elected officials responsible for the Project area (i.e. ward councillors);
- Individuals / households reliant on the land required for the specific Project components;
- Community based organizations active in the Project Area; and
- National and international interest groups / NGOs.

Table 4.1 lists the main stakeholders relevant for this component of BGHES.

Table 4.1 Stakeholders Related to this LRP

Stakeholder Category	Key Stakeholders
Government officials – Provincial/District	Hwange Rural District Council, Environmental Management Agency; Lands Commission; Department of Veterinary Services, District Administrator, District Development Fund, Department of Physical Planning; Ward Development Committee
Traditional leadership	Chief Mvutuh; Chief Shana; Headmen of the affected wards, and affected Village Heads
Elected officials	Project-affected Ward Councillors, Member of Parliament
Wards/Villages/settlements with residents whose land is affected land (PAPs)	Villages: Jabula, Vukuzenzele, Chisuma, Sizinda, Monde Wards: Jambezi, Nemangana, Kattchecheti, Chidobe, Sidinda
Community-based organizations	CAMPFIRE Project; Chisuma Clinic; Rose of Charity; Intengwe; Sizinda Agricultural Training Center Catholic Development Commission / Caritas, and faith-based organizations

4.3 Engagement Methods

The methods for engaging stakeholders include informal engagement and information sharing (including the use of social media) and formal notifications, as required by national legislation governing land acquisition.

To align more closely with international standards around land acquisition and resettlement, the Project will establish a three-tiered stakeholder engagement approach (refer to Resettlement Policy Framework) to reach collective agreements on key aspects of land acquisition and resettlement, and to steer resettlement planning and implementation moving forward on additional Project components. This will be particularly important for the next phase of the Project (i.e. construction of transmission lines), where land acquisition impacts will be significant and will likely include physical displacement.

The Project will establish a dedicated Resettlement Implementation Team (refer to *Section 11.1.1*) responsible for, among other, conducting additional engagement as well as providing technical advice and support to each stakeholder tier. The Resettlement Implementation Team will work collaboratively with Project stakeholders to ensure land access and livelihood restoration aligns with the Resettlement Policy Framework and the commitments made in this LRP.

Key issues requiring stakeholder participation include:

- Reviewing and finalizing the criteria for Project eligibility and components of the entitlement matrix;
- Preparing for the individual affected household sign-off on compensation and livelihood restoration;
- Management of land acquisition related grievances; and
- Livelihood restoration monitoring and evaluation.

4.4 Engagement to Date

The Project's Environmental and Social Impact Assessment (ESIA) team established a Project stakeholder database, which identifies and registers all interested and affected individuals, groups and organizations. General information about the Project generated by the ESIA process has been widely distributed to stakeholders in person, by regular mail and where feasible, via email.

In 2016, notices were published in newspapers with a wide readership in Matabeleland North, and information meetings were held with traditional leaders, including headmen and village heads, to further encourage the involvement of stakeholders in Project impact discussions, including impacts related to the land acquisition process.

With particular regard to resettlement related to the Project components associated with this LRP (Staff Township and Access Road), as detailed in *Section 3.1* above, field work was undertaken in June and July 2019 including the focus groups, interviews, and surveys.

Table 4.2 below presents a summary of engagement undertaken to date related to the land acquisition process for the Project Staff Township and Access Road in Zimbabwe.

Table 4.2 Summary of 2019 Engagements

Date	Location	Stakeholder Group	Discussion Topic(s)
24/06/2019	Hwange District Office	Hwange Rural District Administrators	Project update, upcoming field activities, cut-off date

Date	Location	Stakeholder Group	Discussion Topic(s)
24/06/2019	Chief Shana's Palace	Representatives of Chief Shana	Project update, upcoming field activities, cut-off date
26/06/2019	Agritex Office, Hwange	Ministry of Lands, Agriculture, Water, Climate and Rural Settlements	Land activities related to agriculture and livestock within the specific areas associated with the project components, administrative responsibilities related to land acquisition
27/06/2019	PSC Offices, Chinotimba Primary School.	District Officer, Public Service Commission (PSC)	Project update, upcoming field activities, cut-off date
	Chief Mvuthu's Palace	Chief Mvuthu	Project update, upcoming field activities, cut-off date
28/06/2019	Ministry Office Headquarters.- Hwange	Ministry of Women's Affairs, Community Development, Small Business	Challenges and opportunities facing women, small business, and community development in Hwange Rural District, considerations for the Project components and future Project developments
	Ministry Office Headquarters.- Hwange	Ministry of Social Welfare	Challenges and opportunities facing vulnerable households as well as existing social services, considerations related to vulnerability for the Project components and future Project developments
	Ministry Office Headquarters.- Hwange	Ministry of Youth, Sports, Arts and Recreation.	Challenges and opportunities facing youth in Hwange Rural District, considerations related to youth for the Project components and future Project developments
01/07/2019	Monde Primary School	Village Heads, Village Headmen, Ward Councillors	Project update, upcoming field activities, cut-off date
	UNICA - Sizinda	Village Heads, Village Headmen, Ward Councillors	Project update, upcoming field activities, cut-off date
	Chisuma Primary School	Village Heads, Village Headmen, Ward Councillors	Project update, upcoming field activities, cut-off date
02/07/2019	Jembwe Sub-Village	Village Heads, Village Headmen, Ward Councillors	Project update, upcoming field activities, cut-off date

Date	Location	Stakeholder Group	Discussion Topic(s)
	Jabula Primary School	Village Heads, Village Headmen, Ward Councillors	Project update, upcoming field activities, cut-off date
	Batoka Primary School	Village Heads, Village Headmen, Ward Councillors	Project update, upcoming field activities, cut-off date
	Victoria Falls Hospital	Victoria Falls Hospital District Medical Health Officer (DMHO)	Project update, upcoming field activities, cut-off date
	Victoria Falls	Batoka Clan Representative	Project update, upcoming field activities, cut-off date
03/07/2019	Monde Primary School	Community members	Sensitization of Monde and surrounding sub-village members on Project update, asset inventory, cut-off date
	UNICA	Community members	Sensitization of Sizinda and surrounding sub-village members on Project update, asset inventory, cut-off date
	Chisuma Village Meeting Place	Community members	Sensitization of Chisuma and surrounding sub-village members on Project update, asset inventory, cut-off date
04/07/2019	Victoria Falls Hospital	Victoria Falls Hospital District Medical Health Officer (DMHO)	Project update, upcoming field activities, cut-off date
	Jembwe Village	Community Members	Project update, upcoming field activities, cut-off date
	Jabula Primary School	Community members	Sensitization of Jabula and surrounding sub-village members on Project update, asset inventory, cut-off date

4.5 Key Issues Raised by Stakeholders

Feedback from community members during these meetings revealed overall support for the Project as many anticipate benefits that will come through increased employment opportunities and an improved road network.

The meetings also highlighted a number of stakeholder concerns, notably including concerns related to the absence of regular updates on Project activities and timelines. Many stakeholders expressed anxiety and uncertainty over the land acquisition process and whether or not they would be given fair compensation or would be forcibly evicted. The lack of consultation and transparency on Project activities was repeatedly raised as a community concern, as was the lack of structured communication channels.

These concerns are particularly relevant in the context of the BGHES Project as the legacy of the Kariba Dam displacement in the late 1950's persists throughout communities. Although the Kariba resettlement was undertaken in a very different time, when the current governments were not in power and the Zambezi River Authority did not exist, some stakeholders in the Project area continue to raise concerns that the mistakes of the past will be repeated.

Other concerns include:

- Fear of accidents as the tarred road will allow traffic to move faster and clearing of trees and fences will make it easier for livestock to wander into the road;
- Fear of additional developments that will require future land acquisition which may cause households to physically relocate;
- Lack of physical ability to reconstruct impacted fences;
- Lack of compensation and forced eviction from land;
- Rise of HIV / AIDS and STIs as outsiders come to the area seeking work;
- Rise of malaria from stagnant water bodies caused by backflow from the dam; and
- Concern over ability to continue accessing grazing land.

4.6 Future Engagement

For the Project components associated with this LRP, additional meetings will be held with key government ministries and departments with responsibility for land acquisition and resettlement including the District Administrator's office, officials from the Department of Agritex, and the Hwange Rural District Council. Additional engagements will be held with traditional leadership and local representatives of affected communities.

The purpose of these consultations will be to facilitate the flow of information and meaningful involvement in the finalization of compensation and livelihood restoration measures for those households who will be directly affected by this component of the Project.

4.7 LRP Disclosure

A summary of the LRP, in the appropriate local language (Ndebele, Shona, and Nambya) will be prepared and distributed to traditional leaders and local government. They will be encouraged to post the summary in affected communities and be provided with Project support in sharing its content in meetings with their constituents.

5. PROJECT IMPACTS

This *Chapter* presents the scope of displacement related to land requirements for the development of the Access Road and Staff Township. It describes the efforts taken to minimize displacement through exploring alternative road designs and the choice of location for the Staff Township.

It should be noted that the following impacts have been analysed for all assets falling directly within the 40 metre servitude with the assumption that there will be no further changes to design.

5.1 Efforts to Minimize Displacement

5.1.1 *Access Road*

As stated in the ESIA Project description, the Sizinda Road will bring vehicles 5 km east of the Jabula School (Victoria Falls - Jabula School, Trunk A and Trunk B), where an existing secondary road leads firstly to Kasikiri Village (Jabula School – Kasikiri Village), secondly to Batoka Airport and, thereafter, to the Batoka dam site (Kasikiri Village – Batoka Airport). The full track will cover a length of approximately 63.5 km.

Two alternatives were examined for the connection between Jabula School and Batoka Airstrip; however, after careful analysis; a third option was proposed which involves upgrading the existing Sizinda road to the BGHES dam site.

This third option takes into consideration a variety of social impacts including minimizing both physical and economic displacement:

- Construction of the Jabula - Batoka Airstrip Trunk A and B will result in physical displacement. Kaskiri village would be most affected by this road; estimated to be made up of 32 households. The need to develop this road is questionable when the existing road could be utilised.
- The construction of new roads (with the exception of the BGHES Site – Dam and BGHES – New Bridge road) will cause economic displacement (most notably due to disruption of crop cultivation) as a result of land take. The degree of economic displacement will be most significant for the Jabula - Batoka Airstrip Trunk A and B and Jabula School Trunk B roads as these areas are more populated and households' use the surrounding land for crop cultivation and grazing of livestock.
- There would be serious community health and safety implications with the development of the Victoria Falls - Jabula School Trunk B; the road would pass through the grounds of Jabula School. Communities also use the area for grazing of livestock; thus vehicle collisions with animals could also occur. Issues of dust and diesel pollution may also impact the health of those living in the surrounding areas.

The full road alignment will require 3.6 km of new road access to the BGHES Dam Wall and associated infrastructure, and 59.9 km of upgrades to existing roads from the main A8 highway.

5.1.2 *Project Staff Township*

Project Staff Townships are planned for both Zambia and Zimbabwe. During the construction phase in each country, an initial labour force of at least 500 workers is required. Following completion of the Access Road and Project infrastructure, this number is expected to increase to 3,000 people to include security and support staff. They will be required for the remainder of the construction phase expected to last up to seven years.

During operation of the BGHES, the construction staff will be replaced (or overlap) with operational staff (i.e. maintenance, security, customs services, government officials), with numbers expected to increase upwards to 9,000 in total.

Townships will be located on each side of the river, in close proximity to the dam. They will include housing and requisite infrastructure (i.e. health, education, social and recreation facilities) to accommodate staff and their families. Three alternative locations in each country were initially explored taking into consideration both social and environmental impacts.

Locating the Staff Township at its current location in Zimbabwe avoids physical displacement, with economic displacement confined mostly to grazing areas.

5.2 Physical and Economic Impacts

5.2.1 *Impacts on Land*

Land take required for the development of the Project components is as follows:

- Access Road: 160 ha; and
- Staff Township: 705 ha.

The 705 hectares designated for the Staff Township is unpopulated and therefore does not impact any agricultural fields or residential plots. Rather, the land is of communal use for grazing livestock such as cattle and goats as well as collecting natural resources including thatching grass and mopane poles used in housing and fence construction. The communities most directly affected by the loss of this area include the approximately 35 households in BH55, Sidakeni and Kasikiri Sub-Villages.

Land take associated with the Access Road will impact 241 agricultural fields and 7 residential plots occupied by 210 PAHs. The servitude of the existing road has largely been respected by populations within the area of the Access Road and thus further reduces the economic impact to households to infringements along field edges facing the road. The average area of an individual property that will be affected is 0.10 hectares, which represents an average of 5% of the entire affected field.

Construction activities along the Access Road may temporarily cause a restriction of access for households to agricultural land who do not live within close proximity to fields.

Figure 5.1 Boundary Infringements in Agricultural Fields along the Access Road

5.2.2 *Impacts on Residential and Annex Structures*

5.2.2.1 Residential Structures

Land-take associated with Staff Township and Access Road will not impact any residential structures.

5.2.2.2 Non-residential Structures

Access Road land take will displace the following non-residential structures:

- Two latrines belonging to a single household in Sizinda;
- Six animal enclosures;
- One personal water main;
- Business centre veranda in Chisuma.

Figure 5.2 Examples of Impacted Animal Enclosures, July 2019

Figure 5.3 Personal Water Tap in Monde Village, July 2019

Figure 5.4 Business Centre Veranda within Servitude, Chisuma, July 2019

5.2.2.3 Fencing and Built Improvements

Of the 248 impacted fields, 64 are demarcated with wire fencing reinforced by a combination of wooden posts, trees, and / or sticks.

Figure 5.5 Fencing within Servitude, July 2019

Other impacts to PAHs include infringements to built-improvements along 31 external field boundaries facing the Access Road. Built improvements are comprised of impenetrable boundaries made from brush and thorns collected from iron wood, acacia, and knob thorn and other wild trees that grow naturally on the roadside. The thorny fences provide fields with a protective barrier against damage from wildlife such as elephants and kudus.

Figure 5.6 Built Improvements to Field Boundaries Outside of Jabula, July 2019

5.2.3 *Impacts on Public and Communal Infrastructure*

A water tower supplying Chisuma Primary School falls within the Access Road servitude, as does the external perimeter fence of the school nutritional garden and portions of the associated irrigation infrastructure.

There are no other public and / or communal built structures (i.e. schools, health facilities, or place of worship) impacted in the Project area and thus access to existing facilities will not be restricted.

Figure 5.7 Water Tower at Chisuma Primary School, July 2019

Infrastructure that is not comprised of built structures includes a village meeting area on the roadside in Chisuma opposite the primary school. The village meeting area includes large rocks that provide seating for village heads and / or community members during public meetings that are shaded and protected by large gum trees.

Figure 5.8 Roadside View of the Chisuma Village Meeting Area, July 2019

Figure 5.9 Rocks Shaded by Gum Trees Provide Seating and Shade for Community Gatherings, July 2019

5.2.4 *Impacts on Cultural Heritage Sites*

The asset inventory confirmed that no graves or other cultural heritage sites will be impacted by the Access Road or Staff Township. The Project will however implement a “chance find” procedure whereby work will be suspended if a grave or cultural site is identified during construction and / or road clearance until there has been additional engagement with the community and affected household.

5.2.5 *Impacts to Crops and Trees*

5.2.5.1 Annual and Perennial Crops

The Asset Inventory was conducted from 12 to 16 July 2019, the dry season in the area of the Project Area. As such, agricultural fields along the Access Road were fallow and there were no standing crops at the time of the survey. As most planted trees are within residential concessions, no perennial crops were found to be planted within the servitude.

5.2.5.2 Wild Tree Species

A mix of wild tree species such as mopane, morula, acacia, iron wood, and knob thorn grow along the sides of the Access Road. While these trees do not play a significant role in household livelihood activities, they do serve to control the movement of livestock such as cattle as well as provide added protection for fields against intruding wildlife by forming dense thickets that are difficult to trample. In the presence of the current draught, these trees also provide supplementary fodder for cattle.

Figure 5.10 Wild Trees Demarcate External Field Boundaries while Providing Fodder for Cattle during the ongoing drought, July 2019

In the Staff Township footprint, wild trees play a more significant role in local livelihoods for surrounding communities and in particular, the households in the Sub-Villages BH55, Kasikiri and Sidakeni. Uses of wild trees includes the production of poles used in construction, roof thatching, and medicinal trees. Medicinal trees are of high importance to households in these communities as they are located further from economic centers and social services.

5.2.6 *Impacts to Village Access Points*

The Staff Township contains village access points and footpaths that are used to access the Zambezi River for fishing.

Figure 5.11 A Net Hung from a Small Tree Marks a Fishermen's Path from the Staff Township Area to the Zambezi River, July 2019

5.2.7 *Impacts to Vulnerable Households*

As discussed in *Section 3.1.5*, constraints regarding the survey timeframe will require additional data collection to support comprehensive quantification of households with pre-existing vulnerability. It has been noted by the Ministry of Social Welfare that the most significant impact to households with pre-existing vulnerability would be the loss of social capital associated with physical displacement as the relocation of family members would result in a reduced ability to continue agricultural activities.

As the project components associated with this LRP do not require any physical displacement and economic displacement related to agricultural land is minimal, the Project components will not result in those with pre-existing vulnerability to be disproportionately affected. Feedback from community members does note however that vulnerable groups, particularly those who are physically and / or mentally handicapped, traditionally feel excluded from these types of developments and particular effort will be made during subsequent Project engagements to engage with them in a way that is culturally and socially appropriate.

6. ELIGIBILITY AND ENTITLEMENT FRAMEWORK

This *Chapter* describes the general principles and policies applied to determine eligibility and define entitlements for compensation resulting from the acquisition of land required for the Access Road and Staff Township.

The objective of the eligibility and entitlement framework is to provide transparent, fair and timely (prior to displacement) compensation for impacts to all PAPs in accordance with Zimbabwean law and World Bank Environmental and Social Safeguard Policy Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.

6.1 Eligibility

Eligible persons include all persons with a formal interest on the land required by the Project – in the form of propriety ownership, co-proprietary, tenants, or any persons with other limited interests. The term is further expanded to include affected persons – persons who gain a benefit or utilise the land or improvements made on that land irrespective of their legal standing.

The immovable assets considered eligible for compensation include the following:

- Land, including cultivated and fallow land, forest, and residential plots;
- Crops, both annual and perennial;
- Common property resources, including wild plants and animals, fuel wood, and timber;
- Structures, including houses, annexes and derelict buildings, along with fences and other built improvements;
- Other infrastructure, either communal infrastructure or private, including wells, roads, and irrigation infrastructure; and
- Public access, including informal roads and footpaths and navigable waterways.

The above immoveable assets are typically held under three types of tenure arrangements:

- Registered ownership, through possession of formal title deeds that are registered;
- Communal ownership, where by the State has authorized local government authorities or traditional leaders to manage the asset on their behalf, which may or may not be formally documented. Individuals, families, clans or villages, or even some combination of these may use communal assets; and
- State owned.

Table 7 outlines the persons eligible for compensation based on the types of assets that the Access Road and Staff Township will affect as registered during the recent Asset Inventory.

Table 6.1 Types of Loss and Eligibility for Compensation

Type of Loss	Eligible Persons	Description
Communal Land	Individual and communal land users, authorized by local gov't / traditional leaders	Land managed by local government or traditional leadership, on behalf of the State. It is common for these entities to give permission for use to people / communities / tribes.
Structures & Other built improvements	Asset-Owner	The person, family, or collective entity with uncontested ownership of any secondary structures or other built assets, irrespective of their tenure status to the land on which the structures or fixed assets are built.

Type of Loss	Eligible Persons	Description
Public / Communal Infrastructure	Community members and / or designated representatives	The person or collective entity with uncontested ownership of any public / communal infrastructure, irrespective of their tenure status to the land on which the structures or fixed assets are built.
Crops and Trees	Crop-Owner	The person, family, or collective entity that solely tends annual and perennial crops on land, irrespective of the type of tenure on that land.
Village Access Points	Communal Users	The communal users who access / utilize village access points and right-of-way to support and maintain livelihoods.

6.2 Eligibility Cut-off Date

The commencement date of the census and asset inventory represents the cut-off date for compensation eligibility. This date defines the assets eligible for compensation and provides an empirical baseline to limit opportunistic activity (i.e., to prove ineligibility, and limit the potential for speculation).

Up to and including that date, immoveable assets are considered eligible for entitlement compensation. Immoveable assets established after the cut-off date are not considered eligible nor are persons occupying the Project Area after the cut-off date eligible for compensation assistance.

Prior to the asset inventory, engagement activities were conducted at the district, ward, and village levels including sensitisation meetings to announce the cut-off date, discuss the survey process, and serve as a forum for collecting qualitative socio-economic data *(*refer to *Table 4.2* on *Page 37)).*

On July 12th, 2019, survey teams began the census and asset inventory of affected households.

The surveys were conducted with the following objectives:

- Construct a detailed demographic and socio-economic profile of each affected household;
- Identify the specific impacts of land acquisition on each household, including a detailed, legal description of affected immoveable assets;
- Cap beneficiaries and entitlements;
- Inform entitlement planning;
- Provide a baseline for monitoring and evaluation; and
- Serve as the basis for individual agreements.

Affected households were identified by the relevant village head and their use of the land verified using village land registers and notified of the surveys through village meetings and by receiving a formal notification letter.

Survey teams administered the census to the asset owner(s) / household head(s), or his / her designated representative, and the immoveable asset inventory in his / her presence, as well as that of the village head or adjacent property holders wherever possible and appropriate.

Survey teams qualitatively and quantitatively assessed and inventoried any structures within the servitude and documented structures and built improvements using photographs and geographic positioning. Survey teams then used GPS enabled tablets to plot field perimeters under the supervision of the owner and village head.

In accordance with standard practice, surveyors were responsible for ensuring that:

- Every crop survey is confirmed by the responsible farmer, or his / her designated representative and documented by the survey team;
- Every land survey is witnessed and confirmed by the responsible landholder, or his/her designated representative and documented by the survey team; and
- Every structure survey is confirmed by the responsible owner, or his / her designated representative.

The asset survey provides a detailed inventory of all immovable assets and forms the basis for calculating compensation entitlements.

A monitoring plan is being developed and will be implemented to ensure people remain informed of the cut-off date and its implications. Any new in-migrants will be informed of the moratorium on establishment of new assets.

Where new assets do appear, they will not be considered eligible for compensation. The owner will be given reasonable notice to remove or salvage the asset, and if they do not, the asset will be removed by Project staff.

6.3 Entitlement Framework

The Entitlement Framework defines the types of compensation or resettlement assistance that will be provided to eligible persons based on the type of asset that will be lost. The framework also establishes the conditions under which eligible persons are granted allowances or access to livelihood restoration programmes. Where possible and reasonable, a range of livelihood assistance options will be provided that allows households to select the type of compensation that best suits their unique conditions.

Entitlement policies define the specific type of compensation to be made available to those affected by specific displacement impacts.

Entitlements generally fall into the following categories:

- In-kind compensation, which involves the planning, design and development of replacement assets and livelihood activities to compensate for those lost to the Project; or
- Cash compensation, which involves the payment of cash to compensate for assets, lost to the Project, at agreed replacement rates of the lost asset.

In accordance with international standards and the Communal Lands Act of Zimbabwe, the Project will favour the provision of in-kind compensation over cash compensation wherever feasible, as it represents a reduced risk – for both the Project and those affected – of entitlement mismanagement, inequitable distribution, and long-term impoverishment. Cash compensation will only be provided under circumstances, for specific types of impacts, and under carefully controlled conditions.

In general, the legitimate owner of a particular asset – whether it be land, structures or crops – will be compensated for its loss in full, whereas users will be compensated for the loss of their specific interest in that asset for a period of time and assisted in their re-establishment.

All compensation rates will be established in consultation with affected communities and local authorities including technical services from the HRDC. Compensation rates will be equal to or greater than full replacement value of the affected asset with no deduction for depreciation.

The entitlement matrix outlined in *Table 6.2* is based on World Bank standards and requirements stipulated by Zimbabwean law. It will be presented together with the eligibility criteria to local stakeholders during LRP disclosure. Based on these discussions, any necessary adjustments will be made and a final version included as an Annex to this LRP.

A key consideration in finalizing the compensation and livelihood restoration programmes to be implemented, and how they will be delivered, is the extent to which they adhere to agree upon principles of sustainability.

Table 6.2 Entitlement Matrix

Project Impact	Eligible Party	Eligibility Criteria	Mitigation Measures
Loss of Land			
Communal Land (including Staff Township Area and associated common property resources as well as portions of properties affected by the Access Road)	Community members utilizing the Staff Township area for livestock grazing and / or collection of natural resources	Permanent loss of communally used land and associated common property resources within Staff Township area	■ Access to equivalent area of equal or greater potential productivity (or grazing capacity) and locational advantages; and ■ Access to Livelihood Restoration Measures (*Section 7.1.4.1*, *Section 7.1.4.2*).
	Community members with permission from local gov't/traditional leaders to use / farm individual plots of land.	Permanent loss of greater than or equal to 0.25 hectares communally used land on individual plots along the Access Road	■ Extension of existing field into unaffected areas; ■ Support for clearing / preparing newly allocated land. **OR** ■ Cash compensation at replacement value
		Permanent loss of less than 0.25 hectares communally used land on individual plots along the Access Road	■ Cash compensation at replacement value or alternative in-kind compensation.
Loss of Structures			
Non-Residential Structures	Structure Owner	Permanent loss of complete or incomplete non-residential structures including boreholes, kraals, and latrines	■ Cash compensation at agreed replacement rates and / or in-kind provision of construction materials; ■ Self-build support; and ■ Right to salvage materials.

Project Impact	Eligible Party	Eligibility Criteria	Mitigation Measures
Fencing and Built Improvements	Structure Owner	Permanent loss of built improvements to field boundaries such as wire fencing and bush / hedge fencing	■ Cash compensation at agreed replacement rates and / or provision of construction materials in-kind; ■ Self-build support; and ■ Right to salvage materials.
Public / Communal Infrastructure	Affected communities	Permanent loss of access to public / communal infrastructure (i.e. Chisuma water tower and village meeting area)	■ Identification of alternative communal meeting space; and ■ Improvements to identified area of a communal nature, if required; and ■ Right to salvage materials.
Loss of Wild Economic Trees			
Wild Trees of Value	Households owning land demarcated by wild trees	Permanent loss of wild trees of economic value located on field boundaries	■ Reforestation of servitude using beneficial agroforestry species; ■ Access to Livelihood Restoration Measures (*Section 7.1.4.2*); and ■ Right to salvage materials.
Loss of Village Access Points			
Access Points and Foot Paths	Communal Users	Loss of foot points and village access routes within the Project area	■ Establishment of alternative paths and access points

6.4 Entitlements

6.4.1 *Loss of Land*

6.4.1.1 Communal Land and Common Property Resources for the Staff Township Area

Communal land and common property resources located in the area designated for the Staff Township totals approximately 705 hectares. This is the maximum area of replacement land that the Project will need to secure for communal users in the surrounding areas. In line with Zimbabwean legislation as well as international standards, the Project will compensate the loss of communal land through the provision of alternative land at a site comparable to the current area.

In order to secure replacement land, the Project will engage with the appropriate technical services (namely Agritex and other designated members of the HRDC) and customary authorities to perform a preliminary identification of suitable replacement site options.

Once suitable options have been identified, the Project will liaise with technical services to conduct a site assessment of the proposed alternatives.

The site assessment will be completed using the following criteria:

- **Geographic Location**:
  - Distance from the location of the original site (km);
  - Distance from the area being replaced (km);
  - Distance to existing water sources (km);
  - Distance from impacted communities (km);
- **Physical Characteristics**:
  - Acceptable and amenable relief / topography;
  - Soil quality appropriate for planned land use and livestock activities;
  - Natural drainage;
  - Absence of natural risks;
- **Land Area**:
  - Availability of sufficient surface area (ha);
  - Social and environmental impact to host communities and existing land owners/users [20];
- **Economic Activities**:
  - Availability of existing pastoral areas;
  - Availability of wild trees of economic and / or medicinal value;
  - Availability of natural resources such as thatching grass;
- **Recommendations for site improvements**.

[20] A key consideration in the selection of replacement land is the potential impact on host communities. Where necessary, the Project will include additional engagement activities with host communities and / or existing landowners to gain a deeper understanding of the social and environmental impacts as well as possible mitigation measures.

A summary of the site assessment will be prepared for each potential site and presented along with photos and maps to authorities and affected communities during LRP Disclosure.

Any differences in access and availability of natural resources as well as recommendations for site improvements will be considered under the Livelihood Restoration and Improvement Programme (LRIP) (*Sections 7.1.4.1* and *7.1.4.2*). Any recommendations for improvements beyond the targeted LRIP scope and budget will be considered for integration into the extended community outreach programmes developed under the Project's Environmental and Social Management Plan (ESMP).

6.4.1.2 Communal Land on Individual Plots along the Access Road

As previously indicated, the land required by the Access Road represents (on average) 5% of the total property area. Within the area of the Staff Township and Access Road, replacement land is typically allocated for areas of three hectares or more for agricultural fields and 1.5 hectares for residential fields depending on availability of replacement land as prescribed by the Hwange District Agritex Office.

As the area of affected land does not meet the minimum requirements for the allocation of alternative land, the Project will consult with the RDC to give PAHs the option of extending existing fields into unaffected portions of land for any loss of areas greater than 0.25 hectares. The Project will assess whether additional measures are needed to clear these areas or otherwise make them suitable for agriculture as well as whether support is needed to move and / or reconstruct fences.

For areas less than 0.25 hectares or where alternative land is not available in close proximity to the affected land, the Project will undertake a valuation study of the affected portions to determine an appropriate cash amount or in-kind alternative such as the provision of measures to increase productivity on remaining land. Options for enhancing land productivity may include receiving improved seed varieties, agroforestry tree saplings, and / or fertilizer.

6.4.1.3 Severance from Land and Other Resources during Construction

Construction activities along the Access Road may temporarily result in a restriction of access to agricultural land or other resources for households who do not live within close proximity to fields.

Management plans should be developed and include provisions to avoid or mitigate temporary severance such as:

- Provision of safe crossing points for pedestrians and livestock in areas close to villages / settlements; and
- Engaging with relevant authorities to ensure crossing points are adequate and their locations properly advertised to community members.

6.4.1.4 Non-Residential Structures

All non-residential structures will be compensated in cash at agreed replacement rates. This includes latrines, animal enclosures, and water infrastructure.

Replacement rates will take into consideration the cost of building materials as well the time and labour associated with re-establishing assets. No depreciation will be applied in the calculation of replacement rates for non-residential structures.

The Project will engage local contractors and, where possible, Project-affected persons to determine the amount of labour required as well as the cost and suitability of materials.

6.4.1.5 Fences and Other Built Improvements

The primary impact to infrastructure along the Access Road will be to fences and other built improvements demarcating field boundaries along the road servitude. The Project will work to re-establish fencing structures outside of the Access Road servitude through the provision of cash-compensation for the value of labour as well as improved materials where it is determined that structures are not able to be moved without damage.

The Project recognizes that brush fences and natural boundaries take longer to re-establish and will be harder to move, potentially disadvantaging those who are not able to afford wire and materials for posts. The Project will therefore provide improved fencing materials for households losing brush fences and natural boundaries due to the development of the Access Road.

6.4.1.6 Self-Build Support

It is the expectation that PAHs will use cash compensation and the in-kind materials provided for fencing and built improvements to reconstruct affected structures and field demarcations. The Project recognizes however that remote locations and high transportation costs might make it difficult for some PAHs to secure construction arrangements or low physical / social capital due to age or handicap may prevent PAHs from undertaking the work themselves.

In addition to compensation for materials and labour, the Project will offer PAHs self-build support to provide logistical and technical assistance for the planning and construction of non-residential structures and re-establishing fencing using village labour and / or local contractors. The number of households requiring self-build support will be finalized during compensation sign-off.

6.4.2 Loss of Public and Communal Infrastructure

The water tower and school garden in Chisuma will be replaced with alternative structures that meet national standards. The loss of communal infrastructure such as the village meeting place in Chisuma will be mitigated through the identification of an appropriate alternative site in consultation with the relevant village heads.

6.4.3 Loss of Crops and Economic Trees

6.4.3.1 Annual and Perennial Crops

Because the asset inventory was conducted during the dry season, there were no standing crops at the time of the surveys. Although the affected land in crop fields is minimal, should land acquisition occur during the planting season, households will be notified in advance of land clearance activities and retain the right to harvest any crops.

6.4.3.2 Wild Tree Species

The Project recognizes the importance of wild trees in forming a protective barrier for external field boundaries and fodder for cattle and other livestock in light of reduced grazing caused by the drought.

The Project will engage in a reforestation campaign to replace the trees cleared along the Access Road servitude with beneficial agroforestry species indigenous to the Project Area to reinforce built fences and re-establish naturally formed boundaries.

Selected species will be easy to establish and fast growing and provide additional benefits to households through fuel, fodder, or food production as well as improvement of soil health (example species that will be considered are included in *Table 6.3* below).

The Project will consult with technical services on the selection of species as well appropriate considerations for planting density. Households will be eligible for cash compensation for the cost of labour which they may choose to undertake themselves under the guidance of technical services.

Table 6.3 Example Agroforestry Species

Agroforestry Practice	Description	Species used
Improved Fallow	Woody Species planted and left to grow during the fallow phase	■ *Sesbania sesban* ■ *Acacia angustissma* ■ *Gliricidia sepium* ■ *Leucaena species*
Alley cropping	Intimate multi-storey combination of various trees, tree components and crops around homesteads	■ *Mango trees* ■ *Citrus species* ■ *Moringa* ■ *Ziziphus mauritiana* ■ *Davialis caffra* ■ *Jatropha carcus*
Trees in Soil Conservation and reclamation	Trees on bunds, terraces for soil reclamation	■ *Ziziphus mauritiana* ■ *Davialis caffra* ■ *Jatropha carcus* ■ *Faidherbia albida* ■ *Tephrosia vogelii*
Live fences	Trees around farmlands	■ *Ziziphus mauritiana* ■ *Davialis caffra* ■ *Jatropha carcus* ■ *Faidherbia albida*

Source: Zimbabwe Forestry Commission, 2019

6.4.4 *Loss of Village Access Points*

Footpaths and communal access points for fishermen and women collecting thatch will be impacted by the construction of the Staff Township. To mitigate this impact and minimize disruption to livelihood activities, the Project will conduct additional focus groups with impacted groups identified by the relevant village head in order to identify and demarcate alternative routes.

6.5 Verification and Sign-Off

PAHs will be given the opportunity to select their preferences for compensation, including a choice between in-kind and in-cash compensation for affected land and self-build support as well as to verify any other information collected in the surveys during a sign-off period organized by the Project.

The objectives of the sign-off procedures are as follows:

- Explain the details concerning compensation and assistance packages and the options available to affected households;
- Enable local authorities to validate the choices made by households;
- Disclose details on livelihood restoration programmes; and
- Guarantee that all information is disclosed in local languages to affected populations.

The sign-off process ensures that each household has made a free and informed choice regarding compensation and that all eligible property has been taken into account. The sign-

off period will also be used to gather complete socioeconomic information for affected households.

Before the sign-off period, a notification will be made to local and customary authorities. In order to guarantee full comprehension and informed decision-making on the part of beneficiaries, sign-off documents are explained in the affected household's language of choice. Sign-off documents are verified by the head of each household and their spouse(s) and countersigned by a Project representative to ensure complete transparency and fairness in the compensation process.

Both PAHs and the Project will retain an original copy of each sign-off form. The Project will document and archive all sign-off forms in paper and electronic formats in the Project database. Sign-off forms may be searchable upon request.

6.6 Payment and Delivery

Financial and in-kind compensation for land, non-residential structures, and built improvements is paid directly to the affected household. All compensation rates, calculations, and payments are made in the legal currency of Zimbabwe however, due to the current changes in the monetary policy, any cash compensation rates will be indexed to the US dollar (USD).

7. LIVELIHOOD RESTORATION AND IMPROVEMENT

International standards define 'livelihoods' as the full range of activities that individuals, families, and communities engage in to make a living. It includes wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

This *Chapter* details the Project's approach to livelihood restoration for economically impacted households so that they are able to demonstrate a continuous and sustainable improvement in their economic activities following displacement. The overarching goal of the proposed Livelihood Restoration and Improvement Plan (LRIP) is to ensure that the livelihood of each household affected by the Access Road and Staff Township is restored and improved to a level equal to or greater than the level preceding impact of the Project.

In addition to the compensation that will be paid for affected structures and land-for-land replacement for the Staff Township area, the Project has developed complementary programmes under the LRIP comprised of additional compensation measures to support economically displaced populations.

The livelihood programmes detailed within this LRP will evolve over time as additional feedback is received from various stakeholders during LRIP disclosure and additional input provided by technical services. Feedback will be integrated into the framework below which will be included as an Annex to this document. Implementation of the LRIP will continue until all PAHs have restored their livelihoods, or have been given sufficient opportunity to do so.

7.1 Livelihood Restoration and Improvement Plan (LRIP)

As noted above, this *Chapter* expands upon the Entitlement Framework and details how the compensation provided will be supported through additional programming to achieve sustainable livelihood restoration and improvement. The LRIP consists of tailored programmes based on the existing livelihood activities of the affected population and the extent to which the Project affects people's livelihood. These measures will be expended to address further impacts resulting from the development of additional Projects components.

The Project will lead the process of establishing LRIP programmes as well as provide the resources needed for implementation. Implementation of the LRIP will be based on a third-party model with in-house coordination from the ZRA LRP Implementation Team working in tandem with selected partners. The Project will also seek to collaborate with technical services, NGOs, and other development partners in the management and implementation of LRIP programmes.

LRIP activities will begin prior to displacement to establish the effective support structures necessary, while post-impact activities will focus on the provision of additional support where necessary and monitoring of impacts.

7.1.1 *Goals and Objectives*

The goal of the LRIP will be to help restore, and potentially improve, the livelihoods and living standards of economically displaced PAHs. The LRIP will assist men, women, youth, and communities in re-establishing and strengthening current livelihood practices in the short and medium term, and develop transferable skills and engender self-reliance in the long term.

The specific objectives of the LRIP include:

- Provide extensive support so that the abilities, resources, and assets of PAHs are effectively deployed in meaningful livelihood initiatives;
- Enable PAHs to benefit from multiple sustainable livelihood activities within the Project Area;

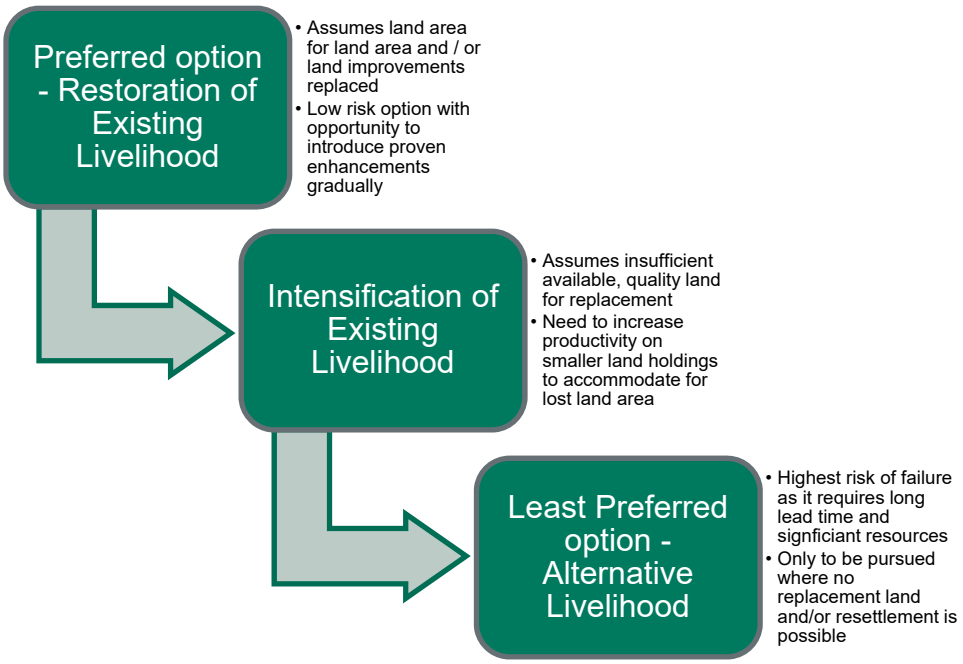
- Meet the compensation commitments – as agreed with PAHs – such that compensation and other displacement related assistance is effectively and sustainably managed by PAHs;
- Support the improvement of commercial skill-based livelihoods to create opportunities for PAHs to benefit from a skills-based economy;
- Deliver training, and provide people with work experience and transferable skills that will help them compete for Project-related jobs and future opportunities; and
- Provide support so that PAHs and communities are able to maintain equal access to broader community, district, and regional development programmes (i.e. government programmes, Project community development activities, etc.).

7.1.2 *Principles*

The following principles have been applied in the design and implementation of the LRIP:

- **Identify Livelihood Impacts Systematically** – Livelihood impacts on local people will be determined systematically through the asset surveys and engagement with those affected. To the extent possible, such impacts will be quantified and the affected people identified individually. Impacts will be considered even if the affected people are not resident in the area, do not own the land, or do not have legal title or access to the resources.
- **Plan and Negotiate Appropriate Measures with Affected People** – The planning of livelihood restoration / improvement is not a purely technical exercise, but requires a high level of interaction with the affected people in order to develop the most feasible and desirable mitigation measures. The agreed measures, in the form of compensation entitlement, will be incorporated into formal collective and/or individual agreements. All three tiers of stakeholders described in *Chapter 4*will provide input and approve the LRIP.
- **Give Preference to Replacement of Existing Livelihood Activities** – Livelihood restoration / improvement measures will be planned according to the hierarchy illustrated in *Figure 9.*

Figure 7.1 Livelihood Restoration Hierarchy



7.1.3 Eligibility & Target Groups

Eligibility for programmes is dependent on the scale and type of impact experienced by the household. The LRIP considers the livelihood support needs of women and youth, and any marginalized and / or vulnerable groups.

7.1.4 Livelihood Restoration and Improvement Programme Types

7.1.4.1 Improvement and Sustainable Management of Grazing Land and Pastoral Resources

In order to create a secure and supportive environment for sustainable livestock production, the Project will seek to improve the quality and management of pastoral resources on grazing land selected as replacement for the Staff Township area.

Improvements will first seek to fill any gaps in access and availability of natural resources between the Staff Township affected area and the selected replacement site. The list of necessary improvements will be dependent upon the results of the site assessment. Further improvements will be considered based on the recommendations of technical services as well as the needs of affected users.

These improvements may include but are not limited to:

- Clearing of land to establish pastoral spaces and delimitation of cattle tracks;
- Improving the quality of grazing / fodder for livestock by planting improved grass species such as *bana grass* and herbaceous legumes;
- Protection of livestock from wildlife (namely lions, hyenas, and elephants) through the installation of predator lights in strategic locations and / or electric fencing;
- Establishment of improved access to water for livestock during the dry season through the construction of solar boreholes;
- Formalisation of a pastoral management committee to promote sustainable and regenerative land management;
- Extension of veterinary services and vaccination campaigns to combat prevalent livestock diseases; and
- Training and capacity building on livestock management and animal husbandry, fodder production, and market linkages for livestock products.

7.1.4.2 Enhancement of Natural Resources and Livelihood Activities

In addition to replacing key resources that support livestock grazing, the Project will also use the results of the site assessment to fill any gaps in other natural resources that play an important role in local livelihoods.

The Project will consider designating portions of replacement land for growing thatching grass as well as a campaign to reforest beneficial trees used for construction materials and traditional medicine.

The Project will follow up with skills training on processing and marketing to promote the use natural resources as an income generating activity. Support will primarily target women in Kasikiri and Sidakeni who are more dependent on both selling and utilizing grass and trees products.

7.2 Optimization of Local Employment

The development of the Project will create a range of employment opportunities, including short-term positions during the construction phase. Although not part of LRP / LRIP activities or budget, local employment will be important in maintaining and enhancing the income of affected households. Where feasible, the Project will give first priority selection of unskilled labour positions to PAHs as part the local employment plan. Candidates will be selected through an independent committee and validated using information in the LRP database.

In continuity with the principles of the BGHES and more broadly the ZRA, local employment will be supported through the Project's community outreach initiatives as a way to extend Project-related benefits to affected communities.

The Project will seek to build upon and strengthen existing training programmes offered through local government to ensure that local candidates have the best opportunity to successfully fill required positions while increasing their broader skill set and retention for skilled jobs during operations.

Due to the nature of the Project, it is envisioned that the majority of jobs will be comprised of construction roles that traditionally disadvantage female candidates and candidates with lower physical capital due to age or handicap.

To ensure that Project-related benefits are inclusive of all categories of people in the Project area, the Project will integrate gender and other social dimensions into existing policies to build and maintain a diverse and gender-balanced work force.

8. VULNERABLE SUPPORT

Vulnerable persons are defined by the World Bank as those who, "by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status, may be more adversely affected by resettlement than others, and who may be limited in their ability to claim or take advantage of resettlement assistance and related development benefits." These standards require that particular attention be paid to the needs of the poor and vulnerable in resettlement planning.

Throughout this LRP and the Project in general, vulnerability will be considered on a household basis rather than at an individual level. The rationale is that where potentially vulnerable (e.g. frail elderly) people are present within a household with people who are not vulnerable (e.g. adult children), then vulnerable members have sources of support and avenues for being represented in resettlement planning and implementation.

Household vulnerability may be either:

- **Pre-existing:** present in a Project area prior to the start of Project activities; or
- **Project-induced:** a result of Project activities.

As a principle, the Project will seek to ensure PAHs identified with pre-existing vulnerability have equal access to the benefits of LRP activities, and take steps such as offering improved fencing materials and self-build support to avoid or mitigate any instances of Project-induced vulnerability.

In addition, it is noted through stakeholder feedback that vulnerable groups, particularly those with physical and / or mental handicaps, feel excluded from project developments and will therefore be engaged during subsequent developments in a way that ensures they are given adequate opportunity to provide input.

8.1 Vulnerable Support Programme (VSP)

For the Project as a whole, a Vulnerable Support Programme has been developed which includes three main components:

- Continuous monitoring, identification, tracking, and follow-up of all PAHs to ensure they have access to, and benefit from, LRP / LRIP activities and Project interventions. This may include special accommodations (i.e. additional individual meetings to ensure they are fully informed, and provision of special assistance in reconstructing fences / non-residential structure).
- Established interventions to ensure that the execution of LRP activities minimises Project-induced vulnerability while accommodating PAHs with pre-existing vulnerability.
- Referral of vulnerable households to existing reputable community service providers (or provision of assistance to access these services) when LRP activities are unable to sufficiently address pre-existing and / or Project-induced vulnerability.

8.1.1 *Vulnerable Support Programme (VSP) Goals and Objectives*

The VSP focuses primarily on monitoring, follow-up, and referral of vulnerable households to the LRP implementation team and / or existing community service providers.

The goal of the VSP is to identify, assess, support, and provide remedial assistance and follow-up for affected households experiencing severe transitional hardship as a result of Project impacts. The specific programme objectives include:

- Ensure that PAHs are provided with supplementary support or assistance so they can participate and benefit from LRP programmes, particularly the LRIP;

- Identify PAHs who may potentially be vulnerable and ensure that they are able to participate in all aspects of the planning, implementation, and monitoring of the LRP(s); and
- Strengthen individual, household, and community support services.

8.1.2 *Identification of Vulnerable Persons*

Any PAHs that exhibit markers of vulnerability will be eligible to participate in the support programming outlined in the VSP.

A three-stage process will be used to monitor, identify, and track vulnerability:

- Inclusion in the Project's Vulnerable Watch List using proxy vulnerability benchmarks;
- Verification through discussion with the Ministry of Social Welfare, traditional leaders, or through a Vulnerable Assessment Home Visit; and
- Approval of eligibility and referral to appropriate assistance and service providers such as the Hwange District food distribution scheme, tuition assistance / loans for the disabled, and / or assisted medical treatment.

8.1.2.1 Vulnerable Watch List

A Vulnerable Watch List will be used to identify potentially vulnerable PAHs using broad proxy vulnerability benchmarks. The main function of the Vulnerable Watch List is to highlight households that may be vulnerable for closer monitoring and support. As such, the Vulnerable Watch List serves as an "early warning system" to identify potential issues with LRP implementation that may result in vulnerability. (While some LRP processes may be changed to accommodate individuals on the Vulnerable Watch List, no direct assistance or benefits will be provided, solely on the basis that a PAH is on the Watch List).

The markers (proxy benchmarks) of potential vulnerability include at least the following, a list that may be expanded as the primary data from LRP surveying is analysed. Proxy benchmarks should align with – but not be limited to – community and government conceptions of vulnerability.

During field work in July 2019, vulnerability benchmarks were discussed with the Ministry of Social Welfare and in interviews with the Village Head of affected communities. These proxy benchmarks will continue to be reviewed and revised by Project-affected communities, their leaders, and local health care workers and teachers.

- Elderly people (including widows) lacking adequate extended family support who do not own means of production;
- Single and adolescent mothers (or soon to be mothers) lacking adequate extended family support and/or means of production;
- Persons with HIV/AIDS or other chronic illnesses or disabilities who are unable to regularly engage in income generating activities;
- Households with limited means of production but a high number of dependants (i.e. orphans); and
- Child-headed households.

8.1.2.2 Confirmation of Vulnerability

During LRP / LRIP implementation, PAHs on the Vulnerable Watch List will be considered for a home visit to determine if they require referral for supplementary assistance. Survey data will be reviewed and leaders consulted regarding whether the PAH may indeed be vulnerable.

If they may be, a home visit will be conducted. As a better understanding of vulnerability emerges, appropriate adjustments will be made to the execution of LRP activities to reflect this – i.e. to promote the participation of vulnerable households in the LRP process and support them in accessing LRP benefits equally.

Where home visits are appropriate, they will be conducted by a representative from the Project, local health care professionals or representative from social welfare, and any relevant community support organisations.

Appropriate, sustainable, support will be designed based on the causes of the PAH's vulnerability, most likely referring them to appropriate community and government care providers. Additional training and mentorship during the provision of LRP entitlements including livelihood restoration support.

9. GRIEVANCE REDRESS MECHANISM

This *Chapter* describes the Grievance Redress Mechanism (GRM) that will be available for the submission and resolution of grievances (complaints or claims) related to the Project's land acquisition and resettlement processes.

Notably, the GRM is not meant to address the collection and collation (reporting on) of stakeholder feedback that does not require an individual response. Other avenues (i.e. Project Offices and Community Liaison Officers) will be available to address general comments or requests for information.

This Grievance Redress Mechanism has been considered in parallel to the Stakeholder Engagement Plan (SEP) due to the inter-relationship between these two planning mechanisms. It has been designed to meet the legal requirements of both Zambia and Zimbabwe and the requirements of the International Finance Corporation (IFC) in relation to grievance management.

9.1 Objectives

This Grievance Redress Mechanism will be applied to stakeholder complaints and grievances, perceived or actual, which relate to the activities of the ZRA and its contractors in relation to the Project components.

Objectives of the grievance redress process are:

- To provide PAPs with accessible procedures for resolving perceived or actual harm done to their well-being or their belongings as a result of Project activities, and for the settlement of disputes, including the possibility of third-party adjudication;
- To identify and implement appropriate and mutually acceptable corrective actions to address complaints; and
- To avoid, wherever possible, the need to resort to judicial proceedings.

9.2 Types of Grievances and Disputes

The following types of grievances are most common in resettlement planning and implementation:

- Complaints about survey activities;
- Complaints about scope / lack of information provided by the Project; and
- Claims of unfair exclusion from engagement activities.

Entitlement processing:

- Misidentification of owner / occupier of eligible property assets;
- Errors in counting or measuring crops and/or other property assets;
- Complaints about compensation entitlement rates; and
- Complaints about the entitlement policy.

Livelihood restoration:

- Complaints about allocation of livelihood opportunities; and
- Complaints about Project training, employment and recruitment opportunities and procedures.

9.3 Grievance Management Process & Resolution Mechanisms

Implementation of the Grievance Redress Mechanism for the BGHES will be the ultimate responsibility of the Grievance Manager (GM) with support from a wider team including the Stakeholder Engagement Manager, ZRA Departments and Contractors, and the ZRA Chief Executive.

The GM will be appointed to coordinate the grievance resolution process. The GM will address and track grievances as they emerge and prepare relevant reports. The grievance process and how to access it will be widely communicated to Project-affected communities.

Experience demonstrates that anyone involved in project development should be prepared to receive grievances from affected stakeholders, either in person or through correspondence. All personnel (Project or contractor staff, local government representatives who are known to be in contact with Project staff, etc.) involved in any public aspect of the Staff Township and Access Road where they may interact with local stakeholders will receive training on how to deal with grievances. Most often the appropriate response will be to direct the complainant to the GM so that they can relay their grievance in person. This means that personnel will always have the contact details of the GM.

Where language or other barriers to submitting a grievance directly exist, the person receiving the grievance may pass it on themselves, along with the contact information for the original complainant.

If the person lodging the grievance is unable to write, the grievance and relevant personal information will be recorded on their behalf and read back to the claimant for their approval. Once the description of the grievance has been approved by the claimant, they will mark the document with their thumbprint.

Upon receipt of a grievance (see *Appendix A* General Project Grievance Form), the GM will confer with the complainant to verify that this is the first time that this particular grievance has been submitted by this complainant. If the grievance is related to a previous submission, the GM will inform the complainant of the status of that grievance and record that the grievance has been re-submitted.

Grievances will be tracked in an overall Resettlement Grievance Database developed for the Project including all of its Sub-Projects. It will constitute a register of all grievances submitted, identifying who received the grievance, and the status of the grievance. If the grievance is new, the GM ‘opens the grievance’ by beginning to fill in a grievance form, and creating an entry in the Grievance Database. This form will track how the grievance is dealt with from submission through to resolution.

Open grievances will be reviewed weekly. Those that are not being resolved in a timely fashion, or have been assessed at a higher level of severity, will be referred to management, as described in *Table 9.1*. People who submit grievances retain their rights to, at any point in the grievance resolution process, refer their grievance to the court system as a formal judicial action.

9.3.1 *Grievance Process*

The Project’s Grievance Redress Mechanism is a simple process whereby stakeholders can submit their complaints free of charge and, if necessary, anonymously or via third parties. The GRM allows complaints to be submitted in more than one format. The process of reporting a grievance is easily accessible and un-intimidating to any stakeholder. The preferable channels for reporting grievances must be confirmed with communities and can be discussed with the community as part of community engagement.

The GRM Process is divided into six key steps as follows:

- Step 1: Receive and log grievance;
- Step 2: Acknowledge grievance;
- Step 3: Assess and Investigate;
- Step 4: Grievance Resolution;
- Step 5: Sign-off on grievance; and
- Step 6: Monitor.

When somebody asks to submit a grievance or upon receipt of a grievance (i.e. by mail or email), the GM opens the case and begins the preliminary investigation. This may begin immediately if the grievance is submitted in person, or may require the GM to locate the claimant. As above, the name of the complainant and their contact details are recorded, as well as the details of the grievance. Complainants will be presented with a standardized written acknowledgment that the grievance has been received. Once the grievance is logged and acknowledged, the significance is assessed, based on the criteria described in *Table 9.1*. For second, third and fourth level grievances, higher levels of management will need to be informed and involved in the grievance process.

Table 9.1 Grievance Significance Levels

Significance Level	Type of Grievance	Responsible Party
Level 1	A grievance that is isolated or 'one-off' and essentially local in nature and restricted to one complainant. Note: Some one-off grievances may be significant enough to be assessed as a Level 4 grievance e.g. when a national or international law is broken (see Level 4 below)	Grievance Manager
Level 2	A grievance that extends to the local community or region and has occurred more than once, which is judged to have the potential to cause disruption to ZRA operations or to generate negative comment from local media or other local stakeholders	Grievance Officer & Stakeholder Engagement Manager
Level 3	A grievance which is widespread and repeated or has resulted in long term damage and/or has led to negative comment from local media, or is judged to have the potential to generate negative media and local stakeholder comments (e.g. damage to a sacred site or flooding of local school)	Stakeholder Engagement Manager & Resettlement Manger
Level 4	A one-off complaint, or one which is widespread or repeated and , **in addition,** has resulted in a serious breach of ZRA policies, Zambian or Zimbabwean or International Law and / or has led to negative national / international media attention, or is judged to have the potential to generate negative comment from the media or other key stakeholders (e.g. failure to pay compensation where appropriate)	Resettlement Manager & Project CEO

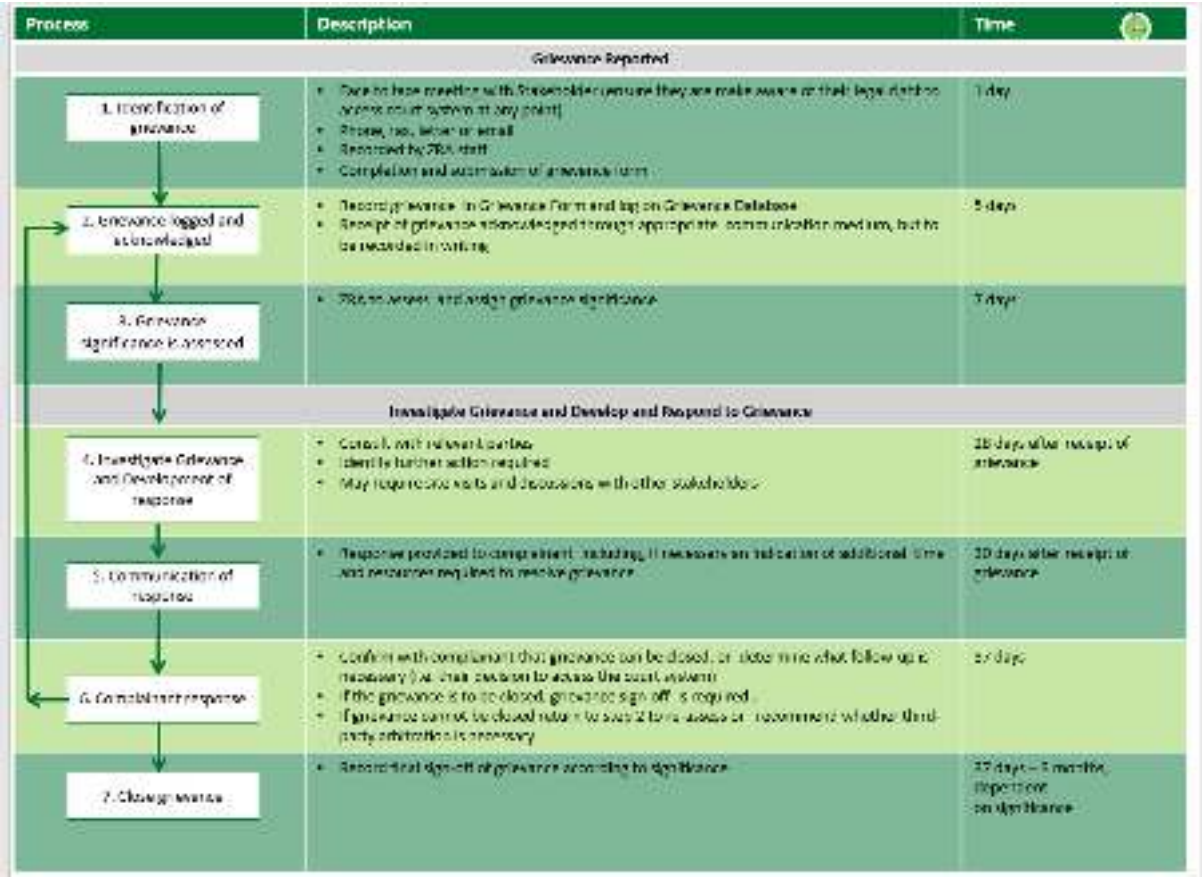
The process and timeframe for resolving grievances is depicted in *Figure 9.1*. The Project commits to recording, assessing and acknowledging receipt of the grievance, within seven days. All grievances submitted will be investigated fully, and will involve other departments, contractors and senior management as required in order to fully understand the circumstances that led to the grievance being raised. The grievance process ill aim to resolve any grievances

within 30 days from the date that it was initially received. This timeframe can be extended to 60 days for more complex grievances (i.e. level 3 or 4 grievances), if required.

The grievance resolution process includes the following steps:

- Obtain as much information as possible from the person who received the complaint, as well as from the complainant to gain a first-hand understanding of the grievance.
- Undertake a site visit, if required, to clarify the parties and issues involved. Gather the views of other stakeholders including ZRA employees, if necessary and identify initial options for settlement that parties have considered.
- Determine whether the grievance is eligible (i.e. relates directly or indirectly to BGHES), and if ineligible, determine the more appropriate vehicle for addressing the issue, a full explanation as to the reasons for its ineligibility will be given to the complainant and recorded in the Grievance Database.
- If the grievance is eligible, determine its severity level using the significance criteria in *Table 9.1*. This will help to determine whether the grievance can be resolved immediately or requires further investigation and whether senior management will need to be informed of the grievance and who specifically.
- If the grievance concerns physical damage, (e.g. crop, house, community asset) take a photograph of the damage and record the exact location as accurately as possible.
- Inform the complainant of the expected timeframe for resolution of the grievance.
- Enter the findings of the investigation in the Grievance Database.

Figure 9.1 Grievance Management



9.3.2 *Grievance Settlement and Resolution Approach*

All grievances will be dealt with on a case by case basis. Where possible, they will be addressed directly by the GM. The resolution proposal shall be respectful and considered, including the rationale and any data used in developing the proposed resolution. If wider consultation is necessary, grievances will be forwarded to a neutral, external third party.

The third party could be an existing body or one established for this purpose (i.e. grievance review committee). It would need to be well-respected, and agreed upon by both Project management and the affected parties. It could include public defenders, legal advisors, local or international NGOs, or technical experts. In cases where further arbitration is necessary, appropriate government involvement will be requested.

9.3.3 *Monitoring and Reporting*

Grievances will be monitored routinely as part of the broader management of the Project. This entails good record keeping of complaints raised throughout the life of the construction and operation of the Project. On receipt of grievances, electronic notification to management must be distributed. Grievance records must be made available to management at all times, and the appropriate protocols established and followed for high level grievances.

Monthly internal reports will be compiled by the Grievance Officer and distributed to the management team. These grievance reports will include:

- The number of grievances logged in the proceeding period by level and type.
- The number of stakeholders that have come back after 30 days stating they are not satisfied with the resolution.
- The number of grievances unresolved after 60 days by level and type.
- The number of grievances resolved between ZRA and complainant, without accessing legal or third party mediators, by level and type
- The number of grievances of the same or similar issue
- ZRAs' responses to the concerns raised by the various stakeholders.
- The measures taken to incorporate these responses into project design and implementation.
- These reports and other records will be made available for external review if required.

An appropriate grievance report will be included in ZRA's annual reporting. Annual reports will be made available to the public. A hard copy will be located at the ZRA offices [21], and an electronic copy will be made available online.

The grievance database will allow for the relative success of the grievance resolution process outlined above to be regularly monitored and evaluated. Internally, grievance resolution timeframes will be monitored through weekly meetings between the GO and Resettlement Manager. Open grievances will be reviewed, and emergent and recurring issues discussed. Where grievances remain open beyond the established timeframe, the GO will be responsible for providing the given claimants with an explanation and an assurance that their grievance has not been lost or forgotten.

Lastly, reporting on grievances will be provided to external auditors as a component of the regular evaluations that will be conducted for the resettlement process overall.

[21] At the writing of this document the location of the ZRA office in Zimbabwe has not yet been finalized.

9.3.4 *Recourse to the Judicial System*

Although it is hoped that all grievances will be resolved internally and through the aforementioned process, it will be communicated to stakeholders that at any time during the grievance resolution process, they retain their rights to refer their grievance to the appropriate arbitrative or legal body within the Zimbabwean judicial system.

In the event that a grievance becomes a case presented by the claimant's legal counsel, the Project's Legal Advisor will be directly responsible for responding to the claim.

10. MONITORING AND EVALUATION

Monitoring and Evaluation (M&E) of land access activities will be carried out to ensure commitments made in the RPF and LRP / LRIP are met and implemented in accordance with Project objectives, Zimbabwean Law, and international resettlement standards. M&E provides Project management, lenders and other key stakeholders with timely, concise, indicative information on whether resettlement and land acquisition initiatives are on schedule, as well as on track to achieve sustainable restoration of livelihoods and living conditions, or if adjustments are required.

M&E is firmly rooted in a participatory approach that involves the direct and active participation of displaced persons and stakeholders, and the incorporation of their feedback into the Project's land acquisition and resettlement activities.

The tiered engagement and consultation approach described in *Section 4.3* has been designed to facilitate community participation in the planning and implementation of the overall compensation and resettlement process, including monitoring and evaluation activities to define what is tracked and monitored and how success will be defined.

Monitoring of compensation activities is conducted both internally within the Project and the LRP Implementation Team, and by external third parties. Internal monitoring focuses on inputs and outputs, observing the short-term changes in different indicators. External evaluation focuses on processes and outcomes, using the findings of internal monitoring, as well as investigations completed by external, third party organisations.

M&E activities continue until it can be demonstrated that displaced persons have successfully re-established their livelihoods and restored their quality of life. This is confirmed through a completion audit.

10.1 Internal Monitoring

An internal performance and impact monitoring system will be developed to regularly track and report on the following:

- Progress against the detailed implementation schedule such as:
  - Number of individual household sign-offs completed;
  - Number of affected households receiving full cash/in-kind compensation entitlements; and
  - Livelihood restoration measures initiated and completed.
- Alignment with overall Project schedule and budget;
- Verification that identified vulnerable households have received agreed additional assistance;
- Review of grievances submitted including analysis of trends which may require programme adjustments; and
- Stakeholder engagement milestones achieved.

Internal progress monitoring reports will be prepared at regular intervals (e.g. monthly, quarterly and annually) beginning with the commencement of implementation activities. The frequency of reporting will depend on the stage of the implementation of the LRP(s), with more frequent reporting likely during the earlier phases to ensure implementation is on track.

Outcome monitoring assesses the effectiveness of the LRP and associated LRIP programmes in supporting Project-affected people in re-establishing their livelihood. It requires a different approach, typically involving surveys of affected households and focus groups to collect

information, which can be compared with baseline data prior to resettlement in order to better understand:

- Changes in quality and quantity of agricultural production, access to grazing areas, compared with pre-Project levels;
- Changes in household income levels;
- Changes in household expenditure patterns;
- Changes in asset ownership / quality / size; and
- Satisfaction of affected communities with livelihood restoration activities.

The timing of the outcome monitoring takes into consideration the implementation schedule, and assists the Project LRP Implementation Team in making programme adjustments and preparing for external evaluations.

10.1.1 *Monitoring of Livelihoods Restoration*

Post-impact monitoring will follow up with economically affected households participating in the Project's livelihood restoration and improvement programmes beginning two years after compensation payments have been made and livelihood assistance delivered. The purpose of the monitoring is to assess their socio-economic quality of life, as well as to identify PAHs who may have restored their livelihoods after impact mitigation activities have ended, but for whom residual effects may persist. Based on the analysis of data collected within the livelihood restoration programmes an assessment can be made whether PAHs have been given a reasonable opportunity to restore their livelihoods. This mid-term assessment will help to identify general trends as to whether or not the livelihoods programmes are having success, and whether or not PAPs are on course to restore their livelihoods. This will guide the course for taking corrective action, as needed.

In order to document whether PAHs' livelihoods have been fully restored, a long-term evaluation should take place typically 5 to 7 years after displacement. If the livelihoods of the vast majority of PAHs have been restored, LRP implementation can be considered complete.

10.1.2 *Vulnerability Monitoring*

The primary objective of vulnerability monitoring is to avoid the occurrence of Project-induced vulnerability, and if it occurs, to mitigate this through support measures and follow-up monitoring. It is important to monitor effects on PAHs who are especially vulnerable to negative impacts and who, without special consideration, may not receive a proportionate share of Project benefits.

International standards stipulate that:

- Project proponents identify individuals and groups that may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status.
- Project sponsors assess potential impacts on these individuals and groups and propose as necessary, specific measures and accommodations to address potential impacts.
- Project monitoring track the well-being of these individuals and/or households on a disaggregated basis.

Data collected from all households will be analysed periodically to continuously identify households whose pre-existing vulnerable status may be exacerbated as a result of the Staff Township and Access Road, or who may become vulnerable due to displacement due to these Project components.

10.2 External Monitoring and Completion Audit

External land acquisition and compensation monitoring and evaluation supports and strengthens a Project's internal monitoring system, and is conducted by an independent third party. The key objective is to determine whether Project efforts to restore / improve the living standards and livelihoods of the affected communities have been properly conceived and executed. The audits verify that all physical inputs committed to in the LRP have been delivered and all livelihood restoration measures provided. In addition, the audits evaluate whether the mitigation measures prescribed in the LRP and any corrective actions developed and implemented since the LRP have had the desired effect.

BGHES will have a third-party auditor undertake annual reviews during Project implementation to assess compliance with the LRP. The audits will provide the Project Implementation Team with recommendations for improving LRP implementation and addressing any gaps. They will also determine when the final LRP completion audit should be undertaken to determine the following:

- Assess the effectiveness of measures to avoid and minimise displacement impacts by comparing those identified in the LRP with actual impacts on people and land;
- Verify that implementation complies with applicable international policies;
- Verify that all entitlement and commitments described in the LRP/LRP have been delivered;
- Assess the fairness, adequacy and promptness of the compensation and resettlement procedures as implemented;
- Determine whether the measures identified in the LRP/LRP have been effective in restoring and enhancing affected peoples' livelihood and quality of life, particularly for those households deemed vulnerable;
- Check on any systemic grievances that may be outstanding; and
- Identify any corrective actions necessary to achieve completion of LRP/LRP commitments.

11. IMPLEMENTATION RESPONSIBILITIES AND FUNDING

This *Chapter* describes the responsibilities, budget and time schedule for implementing this LRP and LRIP.

11.1 Organizational Arrangements

There are three main bodies with responsibility for the development and implementation of the LRP(s): the ZRA; local government and traditional leaders in the Project Area; and the Government of Zimbabwe.

The ZRA will be the primary responsible party in terms of adherence to this LRP, consistent with its legal obligations under current environmental regulations. This will include the management and financing of all required studies, negotiation on entitlements, stakeholder engagement, provision of resettlement assistance, and payment of compensation.

The financing for the Project and the resettlement will however be sourced from a range of international private and public financiers (i.e. World Bank, African Development Bank). The conditions for securing international financing includes ensuring that the resettlement process conforms to international good practice (as framed in the World Bank Environmental and Social Safeguard Policies, 2016).

Figure 11.1 presents the full resources required to implement the LRP for the BGHES Staff Township and Access Road in Zimbabwe, as well as support the development and implementation of the RAPs / LRPs associated with other Project components.

The role of the LRP Implementation Team, made up of a mix of ZRA staff, government staff and third party service providers, will be to lead the stakeholder engagement process, undertake technical work in support of the land acquisition process, and check that international standards are met. Proposed roles and responsibilities are outlined in the following sections.

11.1.1 *Management*

A Resettlement and Livelihood Restoration Manager will manage the Livelihood Restoration Implementation Team's activities, guiding the engagement process and technical work streams and overseeing finalization and implementation of the Project component's LRP.

11.1.2 *Data Management Groups*

- Data Management Coordinator and GIS Specialist, who will be responsible for managing the database / GIS, reporting on surveyed data, and supporting the engagement and negotiations process.
- Data Entry Clerks, who will enter gathered data into the database / GIS.

11.1.3 *Stakeholder Engagement Group*

- Engagement Coordinator, who will manage the RSC, the leadership forum and community feedback forums, and administer the grievance management system.
- Sign-off and Verification Coordinator, who will plan household sign-off and verification of compensation forms in accordance with international and national standards, and oversee the QA/QC process.
- Community Liaison Officers, who will support the Engagement Coordinator in the above.
- Grievance Manager, who will manage the grievance management system.

11.1.4 *Livelihood & Vulnerable Support Group*

- Livelihood Restoration Coordinator, who will assist the Resettlement and Livelihood Restoration Manager in coordinating the Team's activities and in documenting and reporting on the process.
- Sector Specialists (e.g. agricultural and livestock specialists), who will support the Livelihood Restoration Coordinator in planning appropriate programmes and activities in support of land-based livelihoods as per the LRP/LRP.
- Vulnerable Support Officer, who will lead delivery of Project vulnerable support and monitoring measures.

11.1.5 *Financial Management Group*

A Finance Manager will be responsible for ensuring a reliable system of calculating and processing cash compensation payments is established and appropriate checks and balances are in place.

11.2 Work Plan

Table 11.1presents an indicative work plan, the outcome of which will be a finalized LRP endorsed by Project stakeholders and completed preparations for an individual household sign-off of compensation preferences needed before acquiring land.

Figure 11.1 Livelihood Restoration Implementation Team

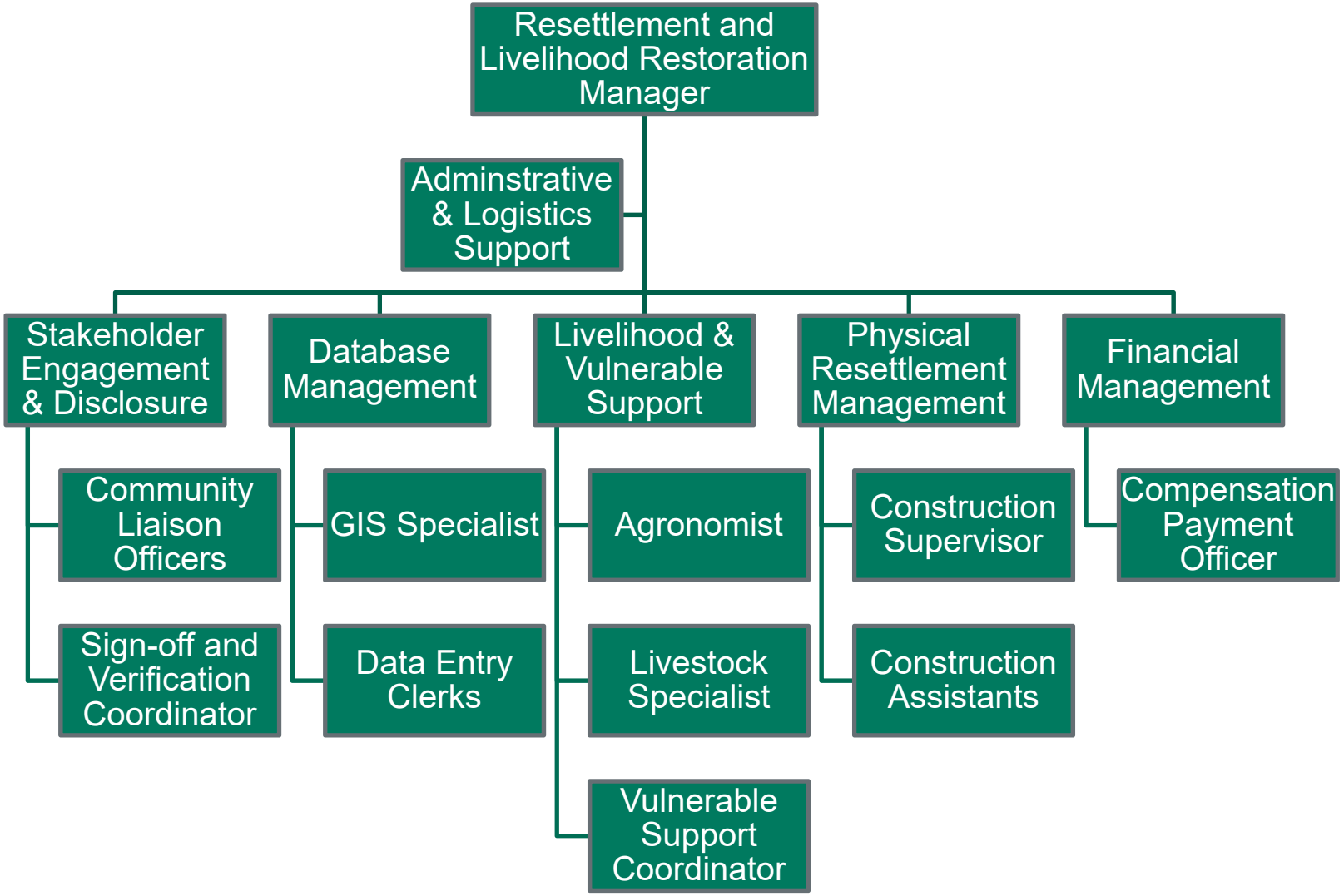


Table 11.1 Indicative Work Schedule

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
1.0	**LRP Planning**									
1.1	Develop Stakeholder Engagement Plan specifically for LRP Disclosure and Implementation									
1.2	Mobilize Livelihood Restoration Team and related staff appropriate for the implementation of this LRP									
1.2	Operationalize Grievance Management System									
1.3	Finalize in-kind entitlements and compensation rates									
1.4	Conduct preliminary identification and assessment of Alternative Communal Land									
1.5	Establish LRP Database									
2.0	**LRP Disclosure**									
2.1	Present LRP and Solicit Feedback									
2.3	Finalize LRP Annexes and budget									
2.4	Prepare for Household Sign-off									
3.0	**Implementation and Sign-off**									
3.1	Household sign-off on compensation/livelihood restoration preferences									
3.2	Delivery / payment of compensation and chosen livelihood inputs									
3.3	Secure and improve alternative communal land									
4.0	**Access to Project Land**									
5.0	**Monitoring and Evaluation**									

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
5.1 Internal Monitoring*									
5.2 External Monitoring**									

*Continuous

**To continue at one and a half and three years post compensation / livelihood restoration

12. CONCLUSION

This LRP details the policies, procedures, methodology, entitlements, and livelihood restoration measures that will be implemented to support economically displaced households to restore their standard of living and livelihoods. It also describes the activities that will be undertaken throughout the delivery of compensation and other entitlements as well as supports procedures to monitor the effectiveness of the LRP in delivering its intended outcomes so that necessary adjustments can be made.

It is noted that this LRP is a living document and therefore will be updated throughout the development of continued technical planning and subsequent consultations with Project stakeholders.

Next steps in technical planning will be harmonized with other Project activities undertaken as part of ESIA disclosure activities, which are proposed to take place in November 2019. Next steps also include the establishment of relevant committees detailed in the Resettlement Policy Framework (2019).

APPENDIX A GRIEVANCE FORMS

To be completed by ZRA personnel (if grievance being submitted in person) or person submitting complaint

Grievance Record	
Reference No: (for official use)	
Full Name	
Contact Information **Please mark how you wish to be contacted (letter, telephone, e-mail).**	☐ **Address/village/traditional authority and ward:** _____ _____ _____ _____ _____ _____ ☐ **Telephone:** _____ ☐ **E-mail:** _____
Preferred Language for communication	
Description of Incident or Grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?
Date of Incident/Grievance	
	☐ **One time incident/grievance** **(date _____)** ☐ **Happened more than once** **(how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	
Additional Comments:	

APPENDIX B GRIEVANCE RECORD

To be used as part of the database

Grievance Record			
Grievance Number:	Date Submitted:	Target Date for Resolution:	
Name:			
Address and Contact Details			
Grievance Received By:			
Name of Grievance Coordinator:			
Description of Grievance:			
Assessment of Grievance Level:		Notification to CEO or other senior management?	Y/N
Actions to Resolve Grievance			
Delegation to:			
Action	**Who**	**When**	**Completed Y/N/Date**
Response/Resolution:			
Strategy to Communicate Response:			
Sign-Off:			
Date:			
Conclusion			
Is complainant satisfied?	Y/N	Comments from Grievance Coordinator	
Grievance Closed?	Y/N	Grievance Resubmitted?	Y/N
Signature of CEO:		Date:	
Date:		New Grievance Number:	

APPENDIX C GRIEVANCE RECEIPT FORM

To be used to acknowledge grievances submitted

Grievance Receipt Form		
Grievance Number:	Date Submitted:	Target date for initial meeting to address grievance:
Name:		
Address and Contact Details		
Grievance Received By:		
Name of Grievance Coordinator:		
Contact details of Grievance Coordinator	Telephone: Email: Address:	

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