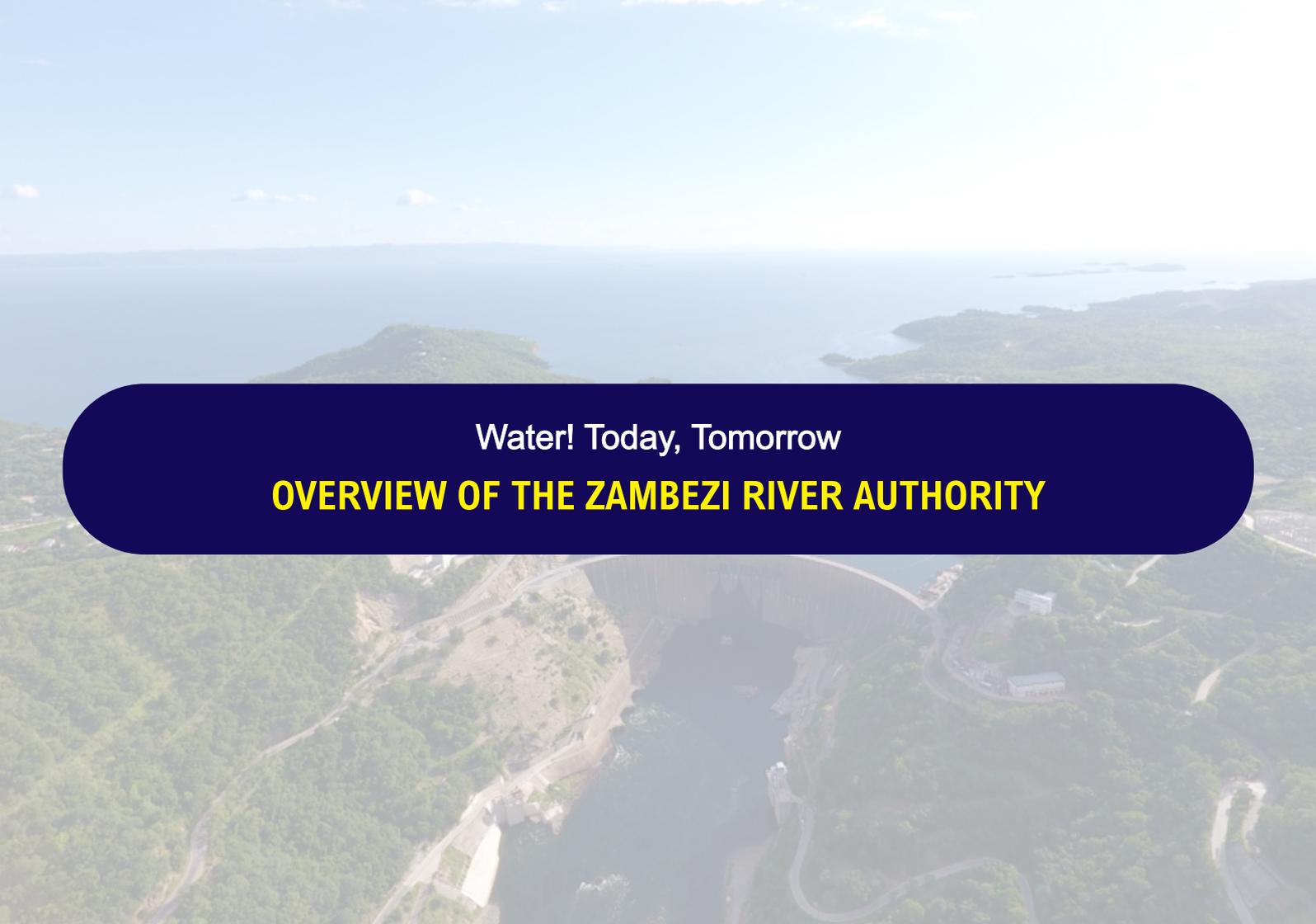




ZAMBEZI RIVER AUTHORITY

CORPORATE BROCHURE

An aerial photograph of a large dam and reservoir, likely the Kariba Dam, with a blue overlay for text. The dam is a large concrete structure with a curved crest, situated in a lush green valley. The reservoir is a large body of water behind the dam. The surrounding landscape is hilly and covered in dense green vegetation. In the background, a large body of water, possibly Lake Kariba, stretches towards the horizon under a clear blue sky with a few clouds. A dark blue rounded rectangle is overlaid on the center of the image, containing white and yellow text.

Water! Today, Tomorrow

OVERVIEW OF THE ZAMBEZI RIVER AUTHORITY

ABOUT ZRA

The Zambezi River Authority (the Authority) is a binational organization mandated to contribute to the economic, industrial, and social development of the Republics of Zambia and Zimbabwe.

This mandate will be achieved by obtaining the greatest possible benefits from the natural advantages offered by the waters of the Zambezi River, through the most economical and effective means of providing water for generation of electricity and for other purposes which the Contracting States may decide upon.

It was established as a corporate body on 1st October 1987 by parallel legislation in the Parliaments of Zambia and Zimbabwe under the Zambezi River Authority Acts (Acts No. 17 & 19, respectively) to be responsible for the management of the section of the Zambezi River which flows between their common Borders (Kazungula to Luangwa in Zambia and Kazungula to Kanyemba in Zimbabwe).

The Authority is responsible for maintaining the Kariba Dam complex ('Kariba Complex') and any future dams or infrastructure on the river forming the border between the two countries.

Our Mission

To encapsulate safety, professionalism, and respect in harnessing the water resource for socio-economic development, exhibiting integrity through honesty.

Our Vision

To be the model organisation in dam and water resources management in the Zambezi River basin.

Our Values

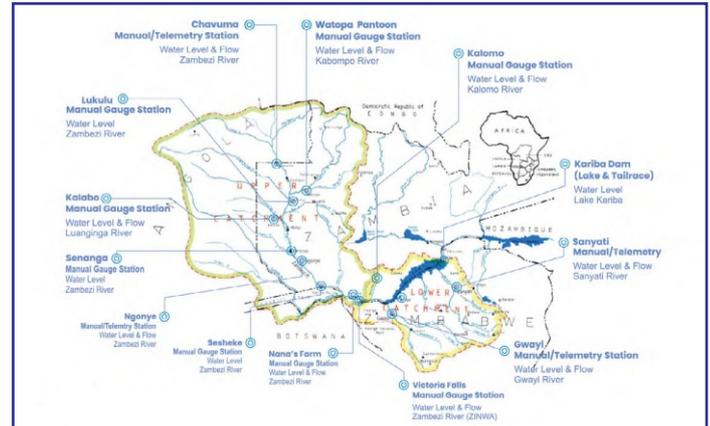
- **Safety** - Protection anchored on care, wellness, health, and peace of mind.
- **Honesty** - Trust premised on accountability and transparency.
- **Integrity** - Fairness encompassing justice as well as responsibility.
- **Professionalism** - Innovation for adaptability rooted in diligence, commitment, communication, and self-improvement.
- **Respect** - Love for teamwork and family with empathy.

KARIBA DAM OPERATIONS



Management of the Kariba reservoir is mainly influenced by factors such as rainfall over the Zambezi Basin, inflows from the Zambezi River and its tributaries, outflows which include discharges through turbines, spillway gates and evaporation.

A network of 13 gauging stations operated and maintained by ZRA, in the Upper and Lower Zambezi catchments, is used for inflow forecasting and flood management at Kariba.



Zambezi River Upper and Lower catchment



KARIBA DAM REHABILITATION PROJECT (KDRP)



After over 60 years of serving the people of Zimbabwe and Zambia, routine monitoring of the Kariba Dam identified the need for rehabilitation works to ensure its continued contribution to energy security and economic prosperity in both countries and the region. The Kariba Dam Rehabilitation Project (KDRP) comprises the reshaping of the plunge pool to limit the likelihood of scouring and preferential erosion particularly along the weak fault zone towards the dam foundations. On the other hand, the refurbishment of the spillway upstream control facility should improve the operation in accordance with international dam safety standards and prevent potential failure of the facility.

What is the objective of the KDRP?

To improve the safety and reliability of the Kariba Dam.

Cost of Kariba Dam Rehabilitation Project USD 294million

Why is the Spillway being refurbished?

To manage the reservoir water levels, the Kariba Dam spillway comprises six sluice gates in the upper part of the concrete wall. Over time, the cement has swelled due to Alkali Aggregate Reaction (AAR), a condition under which the aggregates in the concrete reacts with alkaline in the cement.

This swelling can affect the smooth opening and closing of the gates and could possibly cause the spillway gates to jam in either open or closed position.

Since the impoundment of the dam in 1958, the Zambezi River Authority has monitored the performance of the dam infrastructure in accordance with the Standing Operating Procedure (SOP). This routine monitoring and management of the spillway system has resulted in the recommendation that the six spillway gates be refurbished to ensure their continued full operability in the long term.

An emergency gate that can close off the sluices under flow conditions was also recommended for installation upstream of the dam.

Commencement Year

2019

Completion Year

2025

A new gantry crane with a capacity to handle this gate will also be installed. The works to replace the Built-In-Parts for the stop-beams on all water passages, new emergency gate that closes against water flow and the new gantry crane effectively forms the scope of the Spillway Rehabilitation Project.

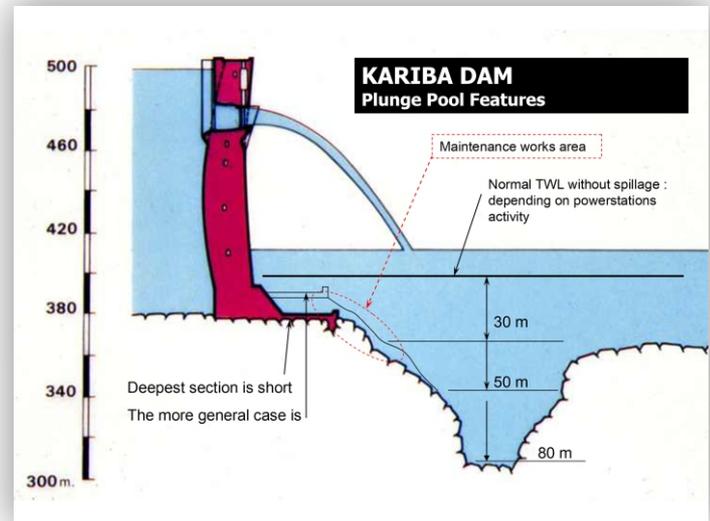
Who is funding the Spillway Works?

The Spillway Rehabilitation Project is being funded by the World Bank, African Development Bank, the Government of Sweden and the Zambezi River Authority on behalf of the Governments of Zambia and Zimbabwe, through a combination of grants and loans.

Development of the Plunge Pool

The natural riverbed downstream of the dam has eroded over time as a result of the heavy spillage of flood waters, particularly in the dam's early years, to form a deep plunge pool. The Zambezi River Authority has monitored the performance of the dam infrastructure, including the plunge pool, since its impoundment in 1958.

The Authority has implemented routine interventions to slow the expected erosion of the plunge pool's natural rock floor. This includes controlling the volume of spillage by not opening more than three adjacent spillway gates out of six but could be forced to open all gates in the case of potentially disastrous floods. The construction of the second power station in the late 1970s also reduced the spillage as more water was diverted for power generation than before. As a result, the natural erosion has slowed and no significant changes to the plunge pool floor have been recorded in the last 15 years.



Why Reshape the Plunge Pool?

Excavating the downstream end of the plunge pool will increase its size and reduce the pressure that the water spilling into the plunge pool exerts on its base thereby slowing the erosion of the natural rock floor. Reshaping of the plunge pool through excavation of the rock from the downstream face, north and south bank sides of the pool will create a new stepped profile that will decrease the amount of swirling, improve energy dissipation and guide the spilling water in the downstream direction, away from the dam foundations. The replacement of the weak rock in fault zone with high performance abrasive resistant reinforced concrete will prevent scouring in the direction of the dam foundation.

Who is funding the Plunge Pool Works?

The plunge pool reshaping is wholly funded by the European Union through a €72 million grant to the Government of the Republic of Zambia.

What do the Plunge Pool Reshaping Works Entail?

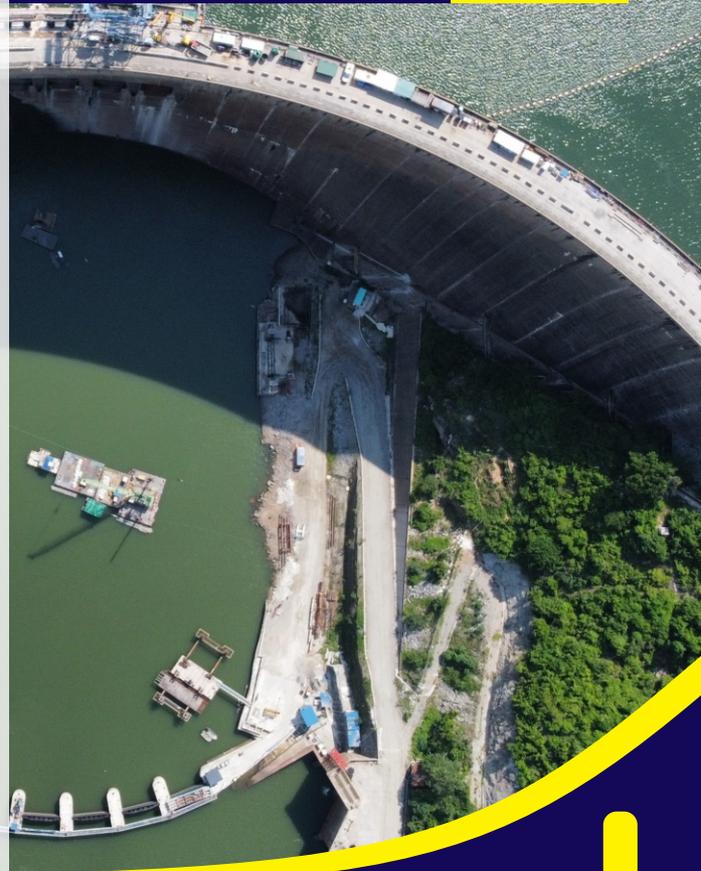
The measures required to reshape the plunge pool include construction of a downstream cofferdam to enable the controlled blasting and excavation of an estimated volume of 300,000 m³ of rock from the downstream face, that is, north and south bank sides of the pool under dry conditions.

Commencement Year

2017

Completion Year

2024



BATOKA GORGE HYDRO-ELECTRIC SCHEME (BGHES)



Batoka Gorge Hydro-Electric Scheme site

Project Background

The Batoka Gorge Hydro Electric Scheme (BGHES) is a proposed hydro power project being undertaken by the Zambezi River Authority.

Several studies and analyses were conducted in 1981; 1992-93; 1998 and 2019 which established the BGHES as the most economically viable option for immediate development because it offered the lowest specific generation cost and minimal negative environmental impacts. In February 2012, a

Memorandum of Understanding was signed between Zambia and Zimbabwe, paving way for the development of the BGHES Project.

Project Location

The proposed Batoka Gorge Hydro-electric Scheme (BGHES) is located within the Batoka Gorge, about 47km downstream of the Victoria Falls along the Zambezi River on the common border between Zambia and Zimbabwe.

Project Description

Dam

Roller Compacted Concrete Arch Gravity dam. The wall will be 175m high, with a crest length of 720m. Radial gated central crest type spillway;

Power Houses

- Two surface power plants, one on either side of the riverbank, each with a capacity of 1,200MW, giving a combined capacity of 2,400MW;
- 6 x 200MW Francis turbines in each powerhouse;
- Four water intakes delivering water through 4 tunnels (each approximately 1km in length) to the two surface power plants downstream the dam;
- Diversion tunnel;
- Switchyards for both power plants;

Transmission Lines - Batoka North:

- BGHES to Mukuni Substation (2x330kV x 22km)
- BGHES to Muzuma in Choma (1x330kV x 151 km)
- Muzuma Substation in Choma to Nambala Substation in Mumbwa (2x330kV x 230)

Transmission Lines - Batoka South:

- BGHES to Hwange (2 x 400kV x 70km)
- BGHES to Chakari (2 x 400kV x 400km)

Housing

- Construction of the staff residential areas with social amenities and office complex.

Road Network

- Road infrastructure for the Authority and Power Utilities on Batoka North (26.2km) and Batoka South (54km);

Project Benefits

- Conjunctive operation of BGHES with Kariba Dam and other power plants will result in significant reduction of the cost of operating the power system.
- BGHES will significantly increase the renewable energy sources share in the energy mix, thereby moving Zambia and Zimbabwe towards a carbon emission compliance position.

- The BGHES project will use sustainable renewable hydropower energy which does not emit carbon dioxide and other environmentally toxic gases and waste which is in line with the greener world theme of the anti-global warming and pollution campaign.
- The reservoir will be fully contained in the gorge.
- There will, therefore, be no human displacements arising from the creation of the reservoir.
- The on-going planning follows a process of Integrated Environmental Management to ensure the least negative environmental and social impact.

Project Status

- 2019 - completed Engineering Feasibility Studies
- 2021 – completed Environmental and Social Impact Assessment (ESIA) studies and the Legal and Financial Transaction Advisory (LFTA) services.
- 2021 - Developer completed updating the Feasibility studies in
- Discussions with the developer are currently ongoing to pave way for the negotiations.

ZAMBEZI VALLEY DEVELOPMENT FUND (ZVDF)



Overview

The Zambezi Valley Development Fund (ZVDF) is a Corporate Social Responsibility initiative. It is aimed at improving the well-being of the communities that were displaced during the construction of the Kariba Dam. The fund was set up by the Zambezi River Authority in 1997 to finance the implementation of sustainable infrastructural and developmental projects.

This was meant to alleviate the impact of the displacement of the Tonga/KoreKore people on both sides of the Zambezi River in Zambia and Zimbabwe.

ZVDF Objectives

To raise funds for specific and sustainable projects meant to alleviate the impact of the displacement of people of the Zambezi River basin in Zambia and Zimbabwe who were displaced during the construction of Kariba Dam.

To address issues pertaining to ZVDF project financing, human resources training and project administration for the communities in Zambia and Zimbabwe.

To implement, administer and supervise the said specific and sustainable projects.

Projects Funded to date

- Procurement and installation of grinding mills
- Sinking of boreholes
- Construction of schools and houses for support staff in respective project sites
- Construction of clinics and houses for support staff in respective project sites
- Construction and rehabilitation of Irrigation Schemes
- Supply of medical equipment
- Construction of bridges
- Rehabilitation of dams
- Rehabilitation of water reticulation systems.

ZVDF has implemented projects in the following districts:

Zambia	Zimbabwe
Chirundu	Binga
Gwembe	Gokwe North
Kalomo	Hurungwe
Siavonga	Kariba
Sinazongwe	
Zimba	



School Project



Water Reticulation System Project



Health Centre Project

WATER RESOURCES AND ENVIRONMENTAL MANAGEMENT (WREM)

The Authority maintains 13 gauging stations; 10 in Zambia, 3 in Zimbabwe and 1 station at Lake Kariba. The river flow and lake level data collected is used to:

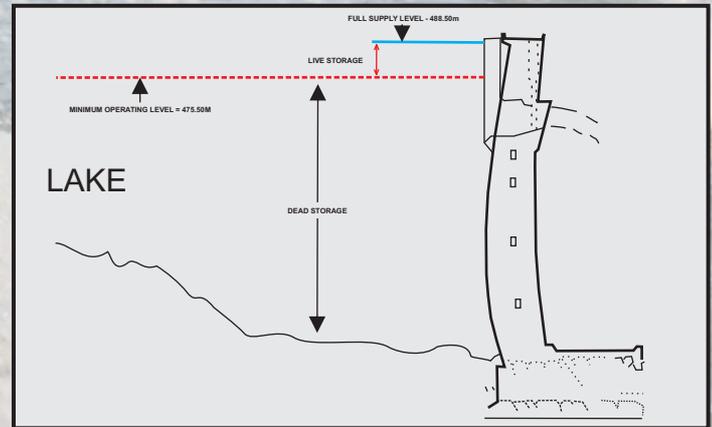
1. Provide forecasts and guidance in spillway gate operations.
2. Provide annual forecasts of availability of water in the Kariba catchment for hydropower generation.
3. Assists in water allocation for electricity production at the Kariba complex to the power utilities in Zambia (ZESCO Limited) and Zimbabwe (Zimbabwe Power Company).



Features of the Kariba Reservoir

1. Storage - 181 billion cubic meters
2. Spill Capacity - 9000 m³/s (when all 6 gates are open at full capacity)
3. Live Storage FSL: 64.8 BCM / 36% reservoir capacity
4. Lake surface area at full capacity: 5,580km²

The Zambezi River is the lifeline to its Riparian Countries as it provides water for electricity production, agriculture, and reliable water supply to the communities immediately adjacent to the river.



Environmental Monitoring Programme

The Authority implements a Comprehensive Environmental Monitoring Programme (EMP) aimed at monitoring the water quality and the weed within the Zambezi River and its tributaries.

The Environmental monitoring activities includes:

1. In-situ measurements of physical parameters within the waterbody,
2. Laboratory analyses of chemical and bacteriological parameters
3. Physical and morphological monitoring of weeds
4. The EMP is divided into three monitoring programs implemented at different times of the year.
5. The upper catchment monitoring programme carried out quarterly.
6. The lake-wide monitoring programme implemented bi-annually.
7. The Monthly monitoring programme targeting the Eastern Basin (downstream of the lake) & Victoria Falls



DAM SAFETY MANAGEMENT PROGRAMME



The Zambezi River Authority Dam Safety Programme constitutes various activities that are performed for the purpose of detecting and remedying any abnormal behaviour before they translate into safety performance deficiencies or causes of dam failure/collapse.

The Kariba Dam Safety Programme activities are, therefore, structured to ensure that the health or fitness-for-purpose of dams is maintained and therefore, minimising the risk of undetected/unplanned dam failures. The activities include surveillance and monitoring, operations and

maintenance, inspections, risk assessments and dam safety reviews.

a). Surveillance and Monitoring (S&M)

Surveillance and monitoring activities are focussed on collection, processing, and evaluation/interpretation of the engineering meaning of data that is recorded from various instruments installed to monitor behaviour of the Kariba dam. The instruments monitor and record specific parametric data about the health of the dam. It is based on this information that the engineers are able to evaluate whether the dam is safe or not.

Several instruments are installed at various locations in and around the dam. Data is collected from these instruments and analysed on a daily and continuous basis. Certain actions may have indeed been prescribed to correct certain dam safety concerns, but these actions do not mean the dam is not safe.

Based on expert knowledge and experience of the Kariba Dam and also results of the surveillance and monitoring processes, the dam is very safe.

b). Operations and Maintenance (O&M)

This aspect is devoted to operations and upkeep of the dam. Various operations and maintenance activities are periodically performed primarily on preventive basis that seeks out to address safety concerns before they deteriorate to require major repairs. O&M activities include among others, the replacement of seals and condition testing of the floodgates, cleaning of drainages, maintenance of the monitoring instruments and surface sealing on the right bank/south bank of the dam. Such maintenance activities have been ongoing since construction of the dam and on a general basis.

c). Dam Safety Inspections

In addition to the S&M and O&M activities, visual inspections of the dam and foundation are also carried out on a frequent basis by the Authority's dam engineers. The inspections look out to check for signs of the development of potential dam safety concerns. Depending on the depth of the inspection, they are performed routinely/daily by the dam safety and maintenance employees, monthly by experienced dam engineers, annually and every five years by senior engineers and external consultants as per the international best dam management practices and recommendations of the International Commission on Large Dams (ICOLD). The

inspections together with results of the surveillance and monitoring processes form the basis upon which the dam safety programme is reviewed and recommendations for improvements are made if necessary.

d). Risk Assessment and Dam Safety Reviews

Risk assessments and dam safety reviews are specialised strategies that systematically review and evaluate all the available information of aspects of how the dam was designed and constructed, external factors such as flooding and earthquakes, how the dam has been operated and maintained over its life.





CONTACT US:

Lusaka Head Office

Kariba House
32 Cha Cha Cha Road
P.O. Box 30233
Lusaka, Zambia
Tel: +260 211 226950, 227970-3
Fax: +260 211 227498

e-mail: info@zambeziara.org

Harare Office

Club Chambers
Nelson Mandela Avenue
P.O. Box 630
Harare, Zimbabwe
Telephone: +263 24 2704031-6
VoIP: +263 8677008291 +263 8688002889

e-mail: info@zambeziara.org

Kariba Office

Administration Block
21 Lake Drive Pvt. Bag 2001,
Kariba, Zimbabwe
Tel: +263 261 2146140/179/673/251
VoIP: +2638677008292/3
e-mail: info@zambeziara.org

Web: <http://www.zambeziara.org>