Zambezi River Authority

Kariba Dam Rehabilitation Project (KDRP)

Environmental and Social Impact Assessment (ESIA)

Revised – October 14, 2020
Zambezi River Authority
Kariba

Table of Contents

Acronyms

AAR	Alkali Aggregate Reaction
ADF	African Development Fund
AfDB	African Development Bank
BID	Background Information Document
BP	Bank Policy
EDF	European Development Fund
EPP	Emergency Preparedness Plan
ESIA	Environmental and Social Impact Assessment
ESMPs	Environmental and Social Management Plans
ESMS	Environmental and Social Management System
EU	European Union
GBV	Gender-based Violence
GHG	Greenhouse Gas
GoZ	Government of the Republic of Zimbabwe
GRZ	Government of the Republic of Zambia
GWh	Gigawatt Hours
ha	Hectares
HCB	Hidroelectrica Cahora Bassa
HES	Hydro-Electric Scheme
IBAT	Integrated Biodiversity Assessment Tool
IBRD	International Bank for Reconstruction & Development
IDA	International Development Association
IMS	Information Management System
IPCC	Intergovernmental Panel on Climate Change
ISO	International Standards Organization
KDRP	Kariba Dam Rehabilitation Project
kWh	Kilowatt Hours
masl	Meters above sea level
MW	Megawatt
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Standard
O&M	Operation and Maintenance
OP	Operational Policy
OS	Operational Safeguard
PoE	Panel of Experts
RPF	Resettlement Policy Framework
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SEA	Strategic Environmental Assessment
SEA	Sexual Exploitation and Abuse
ToRs	Terms of Reference
TS&S	Technical Services & Supervision
USD	United States Dollars
ZESCO	Zambia Electricity Supply Corporation
ZETDC	Zimbabwe Electricity Transmission and Distribution Company
ZPC	Zimbabwe Power Corporation
ZRA	Zambezi River Authority
ZVDF	Zambezi Valley Development Fund

Executive Summary

ESIA Preparation and this Update

The present document is the original ESIA prepared for the Kariba Dam Rehabilitation Project financed by the World Bank, the African Development Bank, the European Development Fund, and the Swedish Government, with updated information to reflect changes during project implementation. ZRA prepared this updated Environmental and Social Impact Assessment (ESIA), incorporating an updated Environmental and Social Management Plan (ESMP), in October 2020. This built upon and updated an ESIA and ESMP prepared for licensing purposes in 2016. The main purpose of the update was to align the ESIA and ESMP with the prevailing conditions at KDRP, incorporating changes to the project and updated management plans made since the time of the earlier ESIA. The works in the plunge pool started in 2018 and are ongoing now (October, 2020). The works in the spillway has not yet started and these are expected to start at the end of 2020.

The Kariba Dam is a double curvature concrete arch dam located in the Kariba Gorge of the Zambezi River Basin between Zambia and Zimbabwe. The arch dam was constructed between 1956 and 1959 and supplies water to two underground hydropower plants located on the north bank in Zambia and on the south bank in Zimbabwe. Water is released from the reservoir through six sluice gates.

In the first 20 years after the dam was constructed there were sustained heavy spillage episodes resulting in erosion of the bedrock to 80 m below the normal water level. If left unchecked, this presents a risk to the stability and safety of the dam wall in the long term. The six sluice gates that make up the spillway have been distorted over the years due to an advanced alkali-silica reaction in the concrete. Without functional sluices, the reservoir level cannot effectively be managed to take into account the flood regime of the Zambezi River.

The Kariba Dam Rehabilitation Project (KDRP) will allow for the continuing safe operation of the dam and avoid possible catastrophic dam failure in the future. Such failure, if it were to occur, would result in a major loss of life (approximately three million people). In addition, it would result in significant downstream environmental damage and a loss of a main source of power to the Southern Africa Development Community.
KDRP involves rehabilitation work to the plunge pool (anticipated to take 4 years to complete – i.e. 2017 to 2021) and rehabilitation of the six sluice gates (anticipated to take 4 to 5 years to complete – i.e. 2020 to 2024).

Plunge Pool Rehabilitation Works

The rehabilitation of the plunge pool aims to address downstream erosion that could undermine the stability of the dam. Rehabilitation will be in the form of an excavation and reshaping of the plunge pool profile. This will limit erosion towards the foundations of the dam wall along zones of weak rock and allow for the continuing safe operation of the dam and generation of electricity from the hydropower plants in the long term.

- The rehabilitation of the plunge pool will include: The construction of a cofferdam just downstream of the plunge pool, which will block off the plunge pool from the downstream river;
- The pumping/dewatering of the plunge pool;
- The excavation of the plunge pool;
- The deposition of excavated rock material in the existing quarry on the north bank; and

- The reshaping of the excavated plunge pool into terraced steps.

Spillway Rehabilitation

Spillway rehabilitation will enable the ongoing use of the spillway to safely manage reservoir levels. The main works associated with spillway refurbishment includes the assemblage and transport of a floating cofferdam that will be used for the dewatering of the sluice gates prior to the commencement of rehabilitation. The following activities will be required for the spillway rehabilitation:
Installation of a floating cofferdam and rehabilitation of sluices gates 1, 3, 4, 5 and 6;
Upgrading of a slipway for assembly of floating cofferdam;
Rehabilitation of sluice gate 2; and
Installation of a new emergency gate and gantry.

Reshaping and stabilization of the Kariba Dam plunge pool and rehabilitation of the spillway is estimated to cost US$ 100 million and US$ 125 million respectively.

Project Proponent

The Zambezi River Authority (ZRA), a corporation jointly and equally owned by the governments of Zambia and Zimbabwe, is the project proponent for the proposed Kariba Dam Rehabilitation Works. ZRA was formed by the Zambezi River Authority Act of 1987 (Act No. 17 and 19 Zambia and Zimbabwe respectively) and is governed by a Council of Ministers consisting of four members, i.e. the Ministers of Energy and Finance in the Government of the Republic of Zambia the Government of Zimbabwe. The functions of ZRA (amongst many others) include operating, monitoring and maintaining the Kariba Dam and reservoir, all telemetering stations relating to the Kariba Dam, any other installations owned by ZRA.

EIA country requirements and preparation

KDRP is not a scheduled activity under the Zambian and Zimbabwean Environmental Legislation (the legislation lists the construction of dams, but not the rehabilitation of dams). However, ZRA committed to undertake a full ESIA, agreed with the Zambian Environmental Management Agency (ZEMA) and Environmental Management Agency (EMA) of Zimbabwe to meet Environmental Management Acts using a single harmonized ESIA, and apply international standards and guidelines, including those of the World Bank and African Development Bank.

The regulatory ESIA process began in 2015 and reported in 2016. The steps undertaken to prepare the ESIA and associated plans, including an Environmental and Social Management Plan, were:

- **Scoping.** A joint Scoping/Prospectus Report, fulfilling the Zambian requirements for a Scoping Report and Zimbabwean requirements for a Prospectus report, was submitted to both environmental authorities, and was approved by the ZEMA on 27 February 2015 (reference number: ZEMA/INS/101/04/1) and EMA on 02 March 2015 (reference number: 17/1/1/3A);
- **Stakeholder engagement.** Detailed public participation started during the scoping phase and continued through upon the draft ESIA, and announcement of ZEMA and EMA's approval or rejection, ensuring that stakeholder concerns were addressed in the assessment;
- **Baseline data collection.** Collection of suitable data on the physical, biophysical and social environment, in order to understand what receptors and resources may be significantly affected; This update of the ESIA includes updated data on the social environment.

- **Assessment of impacts and identification of mitigation measures.** A detailed analysis of the potential environmental and social impacts, supported by objective and defendable scientific studies;
- **Preparation of the Environmental and Social Management Plan** to provide the detailed plans that ZRA, and its sub-contractors, will apply to avoid, minimise and mitigate the impacts identified through the impact assessment; and
- **Reporting and disclosure.** The ESIA and ESMP were disclosed physically in March 2015 in Kariba and Siavonga Districts of Zimbabwe and Zambia respectively.

Objective of the ESIA

The main objective of this ESIA is to assess the potential environmental and social impacts associated with the rehabilitation of the Kariba Dam. Its specific objectives are to present: a detailed description of the proposed Project; the ESIA process; legal and policy requirements (both national and international); the outcomes of stakeholder engagement; the physical, biological and social characteristics of the project area; an assessment of physical, biological and social impacts; and the measures that will be taken to avoid, minimize, and mitigate identified impacts.

KDRP will be carried out in compliance with the World Bank Safeguards Policies triggered during project preparation

In relation to the OP/BP 4.37 on Safety of Dams with the Project aimed at ensuring appropriate measures are implemented and sufficient resources provided to ensure the continued safety of the dam. As per OP/BP 4.37 an independent Panel of Experts has been appointed to review the investigations, design, and implementation of the rehabilitation works. In the event that the proposed Project undergoes any substantive design / technology changes that might potentially alter its impacts, such substantive changes and their predicted impacts will be submitted to ZEMA and EMA as an addendum to the original ESIA, and will need to go through an approval process in accordance with Section 105 of the Zimbabwean Environmental Management Act, (Chapter 20:27) and the Zambian Environmental Impact Assessment Regulations No 28 of 1997. The present update of the ESIA does not involve any change in the proposed designs and works agreed with the World Bank.

Public Participation and Consultation

The ESIA used a range of events and communication methods to ensure public participation and the gathering of potentially-affected stakeholders' concerns. Communication with stakeholders (including consultation materials) were usually undertaken in three languages, English, Shona (Zimbabwe), and Tonga (and sometimes in Bemba or Nyanja) in Zambia. A formal Project background and purpose presentation was given at each public and authorities' meeting, posters used where electricity was not available, a total of 1,500 background documents distributed, and various site notices posted in public places.

Issues and concerns related to employment opportunities and working conditions dominated the consultation process (25% of the issues logged). This was followed by concerns related to the plunge pool rehabilitation works (20%), safety concerns about the potential collapse of the Kariba Dam and the availability of the emergency response procedures for the downstream population (16%).

Significant Impacts

The ESIA identifies and assesses a range of potential environmental and social impacts associated with KDRP, as presented in the following table. Provided that the social and

environmental mitigation/management measures provided in this ESIA are implemented, the majority of the impacts identified will be reduced to residual impacts with a minor to negligible level of significance.

Impact	Significance (Pre-mitigation)	Residual Impact Significant (i.e. post-mitigation)
IMPACTS ON THE PHYSICAL ENVIRONMENT		
Increased flow volumes downstream due to dewatering of plunge pool	Negligible	Negligible
Interrupted flow in tributaries crossed by new of upgraded access roads	Minor	Negligible
Risk of Weakening Rock Foundations	Major	Negligible
Reduced Water Quality and Increased Sediment Mobilisation in the Zambezi River and Tributaries	Moderate	Minor
Visual and physical impact of disused project infrastructure	Moderate	Minor
Accidental Deposition of Debris from Project Sites in the Zambezi River	Moderate	Negligible
Loss of Land Due to Wastes Disposal	Moderate	Minor
IMPACTS ON THE BIOPHYSICAL ENVIRONMENT		
Direct fish kills due to dredging, blasting and dewatering	Moderate	Minor
Loss of aquatic biota due to hazardous substances, reduced water quality and sediment	Moderate	Negligible
Fisheries decline or loss in species of conservation importance due to increased fishing	Negligible	Negligible
Loss of natural habitat in the direct project footprint	Negligible	Negligible
Reduction in the Abundance of Terrestrial Species of Conservation Concern	Negligible	Negligible
Impacts on Protected Areas, under the consideration of only the proposed works and potential risks due to dam break	Negligible	Negligible
IMPACTS ON THE SOCIAL ENVIRONMENT		
Unfair Working Conditions	Moderate	Minor
Unsafe Working Conditions	Major	Moderate
Transmission of COVID-19 in the Workforce	Major	Moderate
Transmission of other zoonotic related diseases (malaria, etc)	Major	Moderate
Creation of Employment Opportunities	Positive	
Creation of Opportunities for Local Enterprises	Positive	
Loss of Income Upon Demobilisation	Moderate	Minor
Injury to the Public on Work Sites and at the Quarry	Major	Negligible
Community Transmission of Covid-19 and Other Communicable Diseases	Major	Moderate
Increased Incidence of Sexually Transmitted Infections (STIs) including HIV/AIDS	Major	Minor
Increased Risk of Road Traffic Accidents	Major	Moderate
Influx of Opportunistic Job-seekers and Camp-followers	Minor	Negligible
Employee Harassment and Abuse of the Local Community including GBV and SEA	Moderate	Negligible
Lower Access to Health Services Due to Demand from Project Employees	Moderate	Minor
Health Impacts of Consumption of Explosive-contaminated Fish	Negligible	Negligible
Physical and Economic Displacement Due to Land Acquisition	Negligible	Negligible
Reduction in Tourism-based Livelihoods	Negligible	Negligible
Decline in Fisheries-based Livelihoods	Moderate	Negligible

The ESIA also assessed impacts of associated facilities, and some general cumulative impacts with other developments. The Kariba Dam and the North and South Bank Power Stations and

associated transmission lines are associated with KDRP, and are far larger infrastructural projects in their own right. ZRA and the operators of the power stations ZESCO and ZPC, are preparing and implementing environmental and social management systems, dam break analysis, and an emergency preparedness plan either as part of KDRP or on an ongoing basis. In general cumulative impacts with other developments were considered minimal but really a detailed CIA in the original ESIA was not fully prepared.

Environmental and Social Management Plan (ESMP)

The ESIA presents a detailed ESMP, including: objectives; organizational structures, with roles and responsibilities and staffing requirements; requirements for reporting, inspections and supervision; and a range of sub-plans, work method statements, and procedures.

Overall responsibility for ESMP implementation lies with ZRA. A further three main organizations are responsible for the implementation and delivery of the ESMP: the Technical Services and Supervision (TS&S) Consultant, Plunge Pool Contractor, and the Spillway Rehabilitation Contractor. In addition, ZEMA and EMA, in their roles as the national regulators, will monitor the performance of the Project.

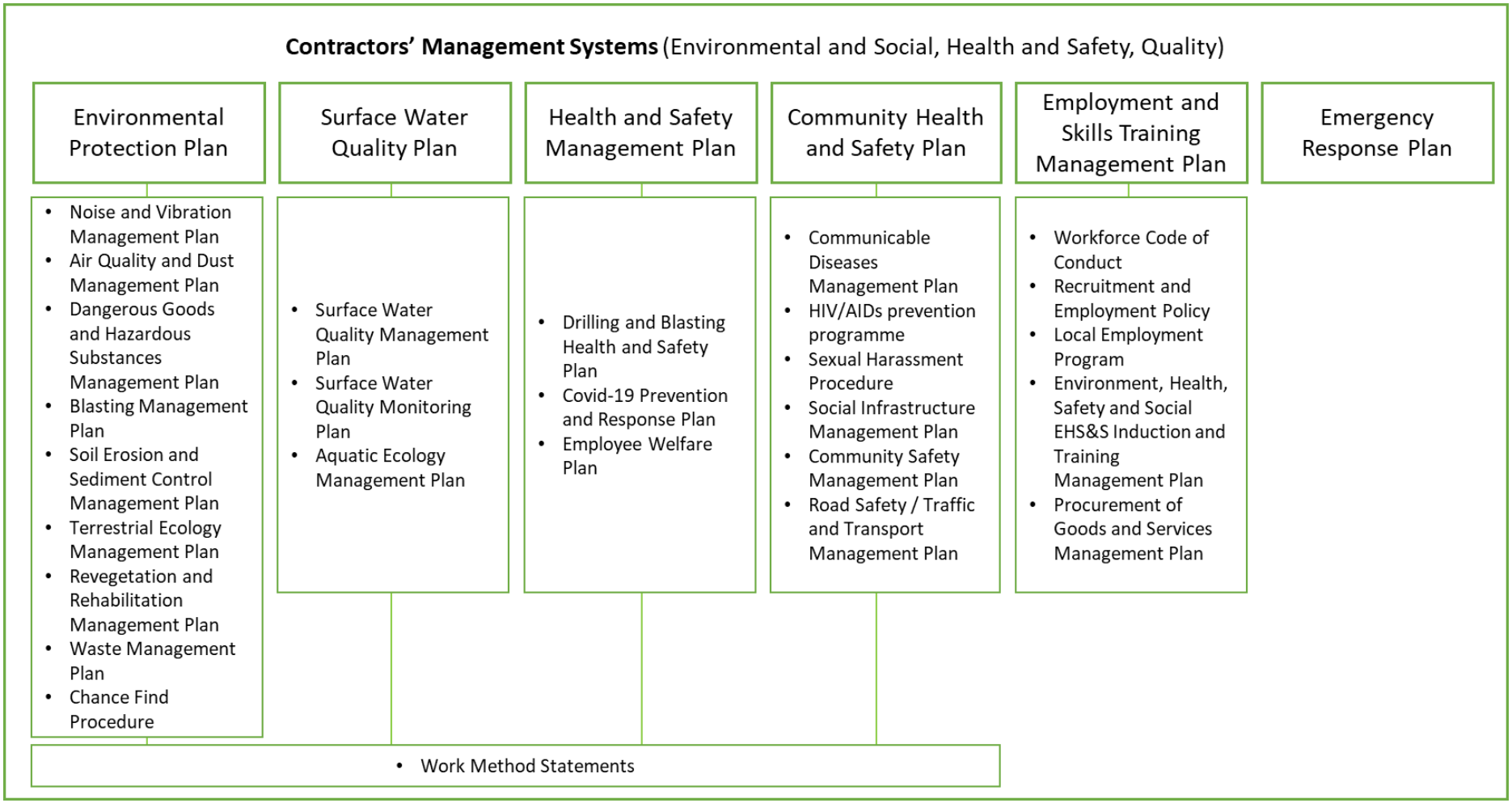
ZRA will implement the following plans, as part of the ESMP, and others are considered necessary to reduce, mitigate and compensate for direct, indirect and cumulative impacts. Many of these plans are already in place and being put into practice through the quality management system of Plunge Pool Contractor. The Spillway Rehabilitation Contractor will operationalize its plans upon mobilization later in 2020 or early in 2021.

- Resettlement Policy Framework, to use in the unlikely event that it is necessary to acquire additional land;
- Gender-based Violence Management Plan;
- Social Values Management Plan including Community Engagement Management Plan;
- Grievance Management and Incident Reporting Plan, used for all grievances and incidents including those related to contractors;
- Tourism Management Plan; and
- Emergency Preparedness Plan (EPP), a significant plan, under preparation using technical assistance, building on Dam Break Analysis, to put in place fully comprehensive protocols, communications, and simulations for emergency events including dam break.

Some of the plans that the contractors will implement includes:

- Biodiversity Monitoring
- Health and safety
- Waste and Pollution management
- Covid 19 monitoring system

The Plunge Pool Contractor and the Spillway Rehabilitation Contractor will implement a wide range of mitigation measures and monitoring, under a range of plans, as presented in the following summary diagram.


Contractors' Management Systems (Environmental and Social, Health and Safety, Quality)
Environmental Protection Plan
Surface Water Quality Plan
Health and Safety Management Plan
Community Health and Safety Plan
Employment and Skills Training Management Plan
Emergency Response Plan
Noise and Vibration Management Plan
Air Quality and Dust Management Plan
Dangerous Goods and Hazardous Substances Management Plan
Blasting Management Plan
Soil Erosion and Sediment Control Management Plan
Terrestrial Ecology Management Plan
Revegetation and Rehabilitation Management Plan
Waste Management Plan
Chance Find Procedure
Surface Water Quality Management Plan
Surface Water Quality Monitoring Plan
Aquatic Ecology Management Plan
Drilling and Blasting Health and Safety Plan
Covid-19 Prevention and Response Plan
Employee Welfare Plan
Communicable Diseases Management Plan
HIV/AIDs prevention programme
Sexual Harassment Procedure
Social Infrastructure Management Plan
Community Safety Management Plan
Road Safety / Traffic and Transport Management Plan
Workforce Code of Conduct
Recruitment and Employment Policy
Local Employment Program
Environment, Health, Safety and Social EHS&S Induction and Training Management Plan
Procurement of Goods and Services Management Plan
Work Method Statements

1 Introduction

ESIA Preparation and this Update

The present document is the original ESIA prepared for the Kariba dam rehabilitation project financed by the World Bank and other financial institutions, with some updated information to reflect some changes included during project implementation. ZRA prepared this updated Environmental and Social Impact Assessment (ESIA), incorporating an updated Environmental and Social Management Plan (ESMP), in October 2020. This built upon and updated an ESIA and ESMP prepared for licensing purposes in 2016. The main purpose of the update was to align the ESIA and ESMP with the prevailing conditions at KDRP, incorporating changes to the project and updated management plans made since the time of the earlier ESIA. The works in the plunge pool started in 2017 and are on going now (October, 2020). The works in the spillway has not yet started and these are expected to start at the end of 2020 or early 2021. Contractor was selected in May 2019.

The Zambezi River Authority (ZRA), a corporation jointly and equally owned by the governments of Zambia and Zimbabwe, is the owner of the Kariba Dam and the responsible agency for the KDRP. KDRP is financed, at a total cost of US$ 292.2 million, by ZRA (US$ 19.2 million), the World Bank (US$ 75 million), African Development Bank (US$ 75 million), European Development Fund (US$ 100 million), and the Swedish Government (US$ 25 million).

The Environmental and Social Impact Assessment (ESIA) of the Kariba Dam Rehabilitation Project (KDRP, or 'the Project') and associated Environmental and Social Management Plan (ESMP) and annexes were prepared for the rehabilitating works of the plunge pool and the spillway of the Kariba Dam, located on the border of Zambia and Zimbabwe.

The original ESIA and ESMP were prepared by the Environmental Resources Management Southern Africa (Pty) Ltd (ERM) consultant firm in 2016 to obtain the environmental licensing of KDRP from the Zambian Environmental Management Agency (ZEMA), and the Environmental Management Agency (EMA) of Zimbabwe.

The main purpose of the update was to align an updated the original ESIA and ESMP with the prevailing conditions at KDRP now under implementation as opposed to what was initially envisaged and foreseen during the ESIA process, consider different conditions (like Covid19) influencing project implementation, whilst also providing further details of KDRP activities and the management plans and procedures of the main contractors.

The update of this ESIA does not include a comprehensive update of the baseline information, but some social data has been updated. Some of the changes are focused mainly on the project description (Chapter 2; providing a more accurate description than in the originals), improved project rationale (Chapter 3) and analysis of alternatives (Chapter 5), additional impacts (in Chapter 8) and measures on health and safety, biodiversity and social aspects (e.g. Covid-19, gender-based violence), and the ESMP (Chapters 9 to 11) to reflect the roles and responsibilities, management systems, plans, and work method statements of the appointed contractors). Chapters on legislation, public consultant, and the baseline have been restructured to be more concise, but rely on the information gathered at the time of the original ESIA and ESMP.

1.1 Project Background

Kariba Dam is a double curvature concrete arch dam, located on the Zambezi River on the border between Zambia and Zimbabwe and is managed by ZRA. The dam was constructed between 1956 and 1959 and supplies water to two underground hydropower plants located on the north bank in Zambia and on the south bank in Zimbabwe, providing a significant proportion of southern Africa's power generation.

When water is discharged through the spillway, it falls into a plunge pool, downstream of the dam, before it continues its flow along the Zambezi River. After 50 years of operation serving the southern African region, the Kariba Dam now requires a series of urgent rehabilitation works for its continued safe operation. Over the last 20 years, the plunge pool downstream of the dam has eroded, and the concrete surface of all sluices have been distorted over the years due to an advanced alkali-silica reaction. Undercutting of the dam foundations due to erosion in the plunge pool, and failure of the spillway gates in a closed position leading to dam overtopping, presents a risk of dam failure. This would release a flood event of up to 181 km^3 resulting in a highly significant loss of life.

The Kariba Dam Rehabilitation Works consists of excavation works within the plunge pool to stabilize the foundation of the dam wall, as well as refurbishment works to the spillway. Rehabilitation of the plunge pool began in 2019 and will continue for three years. Rehabilitation of the spillway will begin in 2020 and continue for several years.

1.2 Project Objectives

KDRP has two main objectives. The first objective is to improve the stability of the plunge pool through reshaping its profile. This will limit the preferential erosion towards the foundations of the dam wall along zones of weak rock and allow for the safe operation of the dam and continued generation of electricity from the hydropower plants. The second objective of the project is to rehabilitate the six sluice gates of the spillway, enabling the ongoing use of the spillway function to safely manage reservoir levels.

1.3 Project Proponent

ZRA was formed by the Zambezi River Authority Act of 1987 (Act No. 17 and 19 Zambia and Zimbabwe respectively) and is governed by a Council of Ministers consisting of four members: two are Ministers in the Government of the Republic of Zambia; and two are Ministers in the Government of Zimbabwe. The Ministers are those holding portfolios of Energy and Finance in the respective countries.

The functions of ZRA are set out in the schedule to the Act, and are as follows:

- Operate, monitor and maintain the Kariba Complex ("Kariba Complex means: the Kariba Dam and reservoir, all telemetering stations relating to the Kariba Dam, any other installations owned by the Authority").
- In consultation with the National Electricity Undertakings, investigate the desirability of new dams on the Zambezi River and make recommendations thereon to the Council.
- Subject to the approval of the Council, construct, operate, monitor and maintain any other dams on the Zambezi River.
- Collect, accumulate and process hydrological and environmental data of the Zambezi River for the better performance of its functions and for any other purpose beneficial to the Contracting States.
- In consultation with the National Electricity Undertakings, regulate the water level in the Kariba reservoir and in any other reservoir owned by the Authority.
- Make such recommendations to the Council as to ensure the effective and efficient use of the waters and other resources of the Zambezi. Liaise with the National Electricity

Undertakings in the performance of its functions that may affect the generation and transmission of electricity to the Contracting States.
- Subject to provisions of Article 13 of the Act, recruit, employ and provide for the training of such staff as may be necessary for the performance of its functions under the Agreement.
- Submit development plans and programmes to the Council for approval.
- Give effect to such directions, as may from to time, be given by the Council.
- Carry out such other functions as are provided for the Agreement or are incidental or conducive to the better performance of its functions.

1.4 Purpose of this Report

The main objective of this ESIA is to assess the potential environmental and social impacts associated with the rehabilitation of the Kariba Dam, and examine how KDRP will lead to a measurable difference in the quality of the environment and the quality of life of affected individuals and communities.

Its specific objectives are to present the following:
- A detailed description of the proposed Project and relevant Project alternatives;
- The ESIA process and a detailed legal register of legislation, guidelines and strategies (both national and international) pertinent to the proposed Project and associated ESIA;
- The outcomes associated with stakeholder engagement activities carried out to-date;
- A detailed baseline review of the physical, biological and social characteristics of the Project Area of Influence and surrounds;
- An assessment of impacts to the physical, biological and social environments related to activities associated with the proposed Project;
- Mitigation measures and associated management plan that aims to avoid, minimise, and mitigate identified impacts;
- A short and general assessment on potential cumulative impacts associated with other planned, existing developments in the broader area of the proposed Project; and
- The ESMP, including organizational roles and responsibilities, requirements for reporting and supervision, and a series of specific management plans.

1.5 International and Regulatory Requirements for ESIA

This ESIA and associated plans were prepared to meet both international guidelines and standards, and Zambian and Zimbabwean environmental regulatory requirements. These include:
- The requirements of the African Development Bank, the World Bank Group, the International Finance Corporation (IFC) and the Equator Principles;
- Other international guidelines and standards directly applicable to dam-building and hydropower projects such as the World Commission on Dams (WCD), the International Hydropower Association (IHA) guidelines and the Southern African Power Pool (SAPP) environmental and social impact assessment guidelines
- The Zambian Environmental Management Act (Act 12 of 2011) and the Environmental Impact Assessment Regulations (No. 28 of 1997);
- The Zimbabwean Environmental Management Act (Chapter 20:27), No. 13 of 2002 and the Environmental Management (Environmental Impact Assessment and Ecosystem Protection) Regulations No. 7 of 2007.

The Kariba Dam Rehabilitation Works Project is not considered as an scheduled activity under the Zambian and Zimbabwean Environmental Legislation. Zambian legislation S.I 28 of the 1997 Second Schedule and Zimbabwean environmental management act 20:27 first schedule provides lists of activities that require an EIA. The lists in both Zimbabwean and Zambian

Legislation includes dam projects, but not projects on existing dams. As KDRP is rehabilitation of an existing dam, it is not a scheduled activity.

However, the extent of activities involved in this rehabilitation project warrants an ESIA, and so ZRA agreed in a meeting held with the Zambian and Zimbabwean Environmental Management Authorities, on 24 November 2014 at the ZRA Administrative Block in Kariba, that a harmonised ESIA Report must be submitted to both Environmental Authorities for review. The 2016 ESIA and ESMP prepared by ERM provided the basis on which environmental licenses were issued.

1.6 ESIA Methodology

ZRA appointed Environmental Resources Management Southern Africa (Pty) Ltd (ERM) in partnership with Black Crystal Consulting (Pvt) Ltd (Zimbabwe), as independent environmental consultants to undertake an Environmental and Social Impact Assessment (ESIA) process for the proposed KDRP over 2014 to 2016. This followed the Zambian and Zimbabwean ESIA process, as prescribed in the Zambian EIA Regulations under the EPPCA (Statutory Instruments No. 28 of 1997) and in the Zimbabwean Environmental Impact Assessments and Ecosystems Protection Regulations under the Environmental Management Act (No. 13 of 2002).

The stages that ERM and Black Crystal Consulting undertook to prepare the ESIA and associated plans, including an Environmental and Social Management Plan, were:

- Scoping;
- Stakeholder engagement;
- Baseline data collection;
- Project description and interaction with design and decision-making bodies;
- Assessment of impacts and identification of mitigation measures;
- Preparation of the Environmental and Social Management Plan; and
- Reporting and disclosure.

1.6.1 Scoping

The objective of scoping was to:

- Present a description of the proposed Project, the ESIA process; relevant legislation and standards, and the physical, biological and social characteristics of the Project Area of Influence and surrounds;
- Identify the key sensitivities and those activities with the potential to contribute to, or cause, potentially significant impacts to environmental and social receptors and resources
- Evaluate siting, layout and technology alternatives for the proposed Project;
- Identify interested and affected parties and key stakeholders, obtain stakeholder views through consultation, and provide them with an opportunity to raise any initial comments, concerns or queries that they may have with the proposed Project;
- Prepare the Terms of Reference (ToR) for the various specialist studies to assess the identified environmental and social issues, to ensure that the ESIA process focused on the key issues.

The Terms of Reference for the ESIA (the Scoping/Prospectus Report), formed the basis for the ESIA. The Scoping/Prospectus Report fulfilled the Zambian requirements for a Scoping Report and Zimbabwean requirements for a Prospectus report, and was approved by the Zambian Environmental Management Agency (ZEMA) on 27 February 2015 (reference number: ZEMA/INS/101/04/1) and the Zimbabwean Environmental Management Agency (EMA) on 02 March 2015 (reference number: 17/1/1/3A). The approved Scoping/Prospectus report was presented in Annex B of Part II of the ESIA.

1.6.2 Stakeholder Engagement

The key principle of consultation is to ensure that the views of stakeholders are taken into account and reported throughout the ESIA process. The objective was to ensure the assessment is robust, transparent and has considered the full range of issues or perceptions, and to an appropriate level of detail.

Detailed public participation started during the scoping phase and continued throughout the assessment ensuring that legislative requirements and international standards were met, that stakeholder concerns were addressed in the assessment and that sources of existing information and expertise were identified. Issues that were raised by stakeholders during the scoping phase were taken into account in the ESIA ToR.

The overall public participation process was designed to correspond to the ESIA stages, namely scoping, draft ESIA, and announcement of ZEMA and EMA's approval or rejection (i.e., Environmental Authorization) regarding the Project.

Full details of the methodologies used in public participation and consultation, and the findings, are presented in Chapter 6.

1.6.3 Baseline Data Collection

One of the main objectives of the ESIA process was to collect suitable data on the physical, biophysical and social environment, in order to understand what receptors and resources may be significantly affected by the proposed KDRP. Chapter 8 presents the methodologies used in baseline data collection, and the baseline information that was used to assess both environmental and social impacts.[1]

1.6.4 Interaction with Design

The interaction between the ESIA team and the design and decision-making process is one of the key areas in which an ESIA can influence how a project develops. It includes involvement in defining the Project and identifying those activities with the potential to cause environmental and social impacts (e.g. physical presence, downstream aquatic impacts, workforce, traffic, local employment, procurement). Project planning, decision-making and refinement of the Project description continue throughout the assessment process in response to the identified impacts.

During the ESIA process, there was liaison between ZRA and ERM with regard to identifying impacts and potential mitigation measures. An example of this was the development of early design criteria so as to ensure that the high level siting of significant construction activities (viz. the dumping of waste rock) avoids undisturbed areas and takes place in areas that are already disturbed.

1.6.5 Assessment of Impacts and Identification of Mitigation Measures

The impact assessment provided a detailed analysis of the potential environmental and social impacts, supported by objective and defendable scientific studies. The impact assessment stage comprised a number of steps that collectively assess how the Project will interact with elements of the physical, biological and social environments to result in impacts on receptors. The methodology for assessing impacts is described at the beginning of Chapter 8.

1.6.6 Preparation of the Environmental and Social Management Plan

[1] This update of the ESIA-ESMP of Kariba rehabilitation works did not update such baseline information.

The Environmental and Social Management Plan (ESMP) presented in Volume III of the ESIA was prepared to provide the detailed plans that ZRA, and its sub-contractors, will apply to avoid, minimize and mitigate the impacts identified through the impact assessment.

1.6.7 Reporting and Disclosure of original ESIA

The ESIA report together with the ESMP was disclosed physically over a period of one week from 3rd to 8th March 2015 in Kariba and Siavonga Districts of Zimbabwe and Zambia respectively. The reporting and disclosure process involved public meetings and workshops targeting government officials at national, provincial and district levels, communities that would be directly affected, local civic, religious and political organizations, universities and local business enterprises.

1.7 ESIA and ESMP Update

In 2020, ZRA prepared this updated ESIA and ESMP, building on and updating the information presented in the original 2016 reports. The purpose of the update was to (i) align the ESIA and ESMP with the prevailing conditions at KDRP, incorporating changes to the project and updated management plans made since the time of the ESIA was prepared, (ii) address comments on the ESIA and ESMP made by the Dam Safety Panel of Experts; and (iii) incorporate the actual details of personnel, management plans and procedures etc, put in place by ZRA and its Contractors in the opening stages of KDRP.
This updated ESIA and ESMP and annexes will be disclosed at the World Bank website as the World Bank Safeguard Policy on Environmental Assessment (OP 4.01) requires.

1.8 Structure of updated Kariba ESIA-ESMP

This document consists of the following Chapters:

- Chapter 1 – Introduction (this Section);
- Chapter 2 – Project Description, providing a description of the components of the KDRP;
- Chapter 3 – Project Rationale, providing the reasons for undertaking the project;
- Chapter 4 – Policy and Legal Requirements;
- Chapter 5 – Assessment of Alternatives;
- Chapter 7 – Public Participation and Consultation;
- Chapter 8 – Baseline;
- Chapter 9 – Impact Assessment and Mitigation;
- Chapter 10 – Environmental and Social Management Plan;
- Chapter 11 – Monitoring;
- Chapter 12 – ESMP Implementation Schedule and Budget; and
- Chapter 13 – Conclusion.

2 Project Description

This section provides a description of the Kariba Dam Rehabilitation Project. The information in this section is based on the Plunge Pool Reshaping Detailed Design Report (2014) and the Emergency Gate and New Gantry Detailed Design Report (2012) prepared by Tractebel Engineering / Coyne et Bellier which are contractors of the ZRA.

2.1 Project Background and Location

the Kariba Dam is located in the Kariba Gorge of the Zambezi River, on the border between Zambia and Zimbabwe (Figure 2.1 and Figure 2.2). It lies 130 km (in a straight line) south-south-east of Lusaka (Zambia), and 280 km (in a straight line) north-west of Harare (Zimbabwe). The Kariba dam was constructed from 1956 to 1959 with the support of the World Bank and other financial institutions.

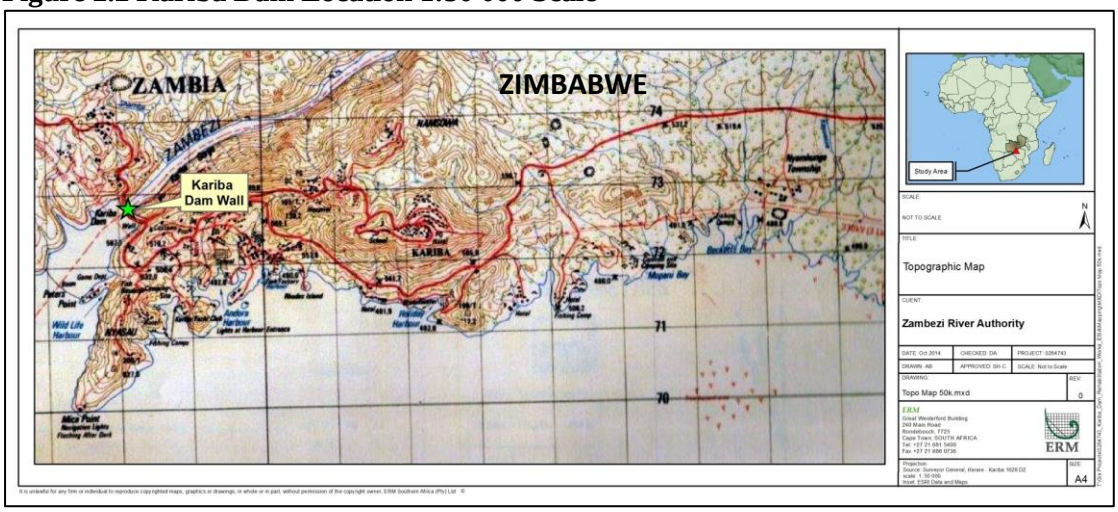
The Kariba Dam forms one of the largest reservoirs in the world, Lake Kariba, with an area of 5400 km^2. It supplies water to two underground hydropower stations located on the North (left) bank in Zambia and on the South (right) bank in Zimbabwe, operated by the respective national power utility. The two power stations have a combined capacity of 2130 MW, generating approximately 10,035 GWh annually under normal operating conditions. Details of the scheme are summarized in Table 2.1, and the layout of the dam and power stations in Figure 2.3.

Table 2.1 Details of the Kariba Hydropower Scheme

Kariba Dam		
Location	16° 31’ 18” S, 28° 45’ 41” E	
Structure	Double curvature concrete arch dam	
Dam height	128 m	
Dam crest length	617 m	
Lake Kariba		
Reservoir Area	5400 km^2	
Length	280 km	
Full Supply Level (FSL)	488.5 masl	
Minimum Operating Level (MOL)	475.5 masl	
Reservoir volume at FSL	181 km^3	
Active storage volume	64.5 km^3	
Catchment area at dam	663,820 km^2	
Power station	**North (Zambia)**	**South (Zimbabwe)**
Capacity	1080 MW	1050 MW
Operator	ZESCO	ZPC
Commissioned	1977	1960
Turbines	6 Francis	6 Francis

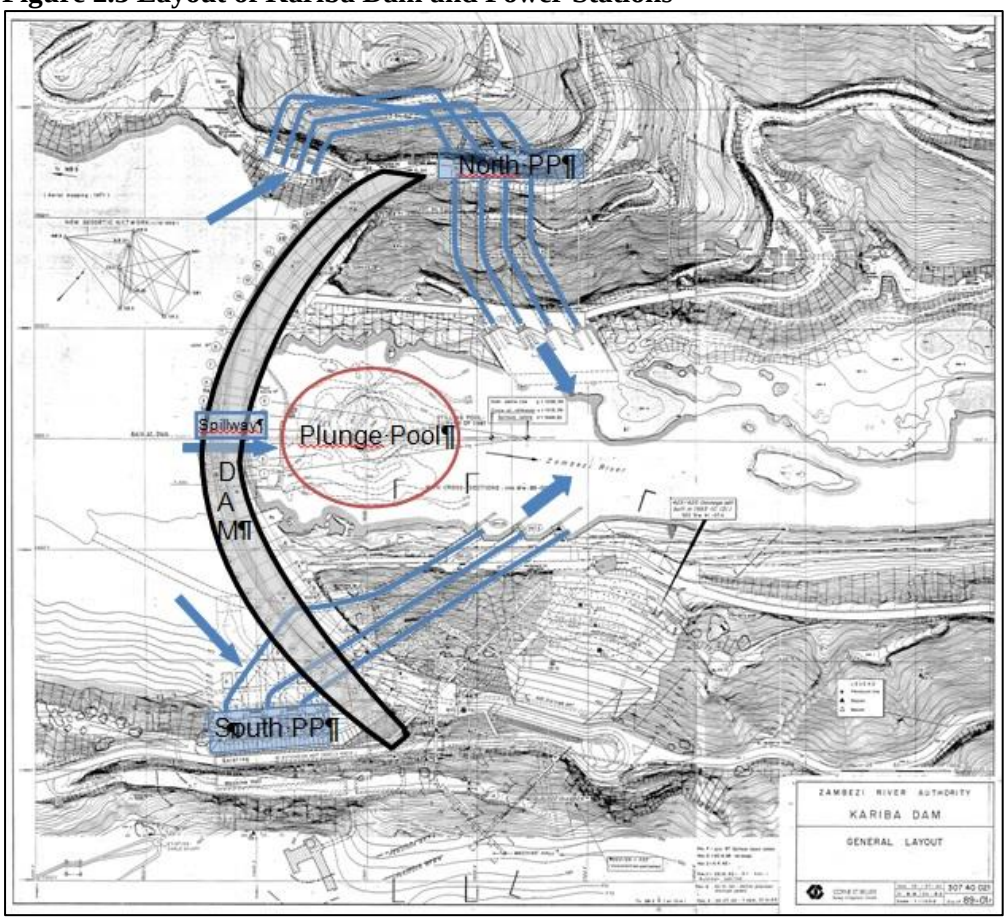
Figure 2.1 Kariba Dam Location. Source Google Earth, consulted in October 9, 2020.

Figure 2.2 Kariba Dam Location 1:50 000 Scale



Source: Surveyor General, Harare- Kariba 1628 D2
Scale: 1:50 000
Inset: ESRI Data and Maps

Figure 2.3 Layout of Kariba Dam and Power Stations



2.2 Plunge Pool and Spillway Rehabilitation

All dams require a spillway, through which water is spilled from the reservoir when inflows exceed the volume of water that can be passed through the power station turbines. The Kariba Dam spillway is located in the central part of the dam wall below the reservoir full supply level. With six gates that are 9.1 m in height and 8.8 m in width, the spillway has a total discharge

capacity of 9,000 m^3/s. The highest recorded discharge from the dam was 7,300 m^3/s in 1978 (the combined outflow through four fully open gates and the power stations).

When water is discharged through the spillway, it falls into a plunge pool, downstream of the dam, before it continues its flow along the Zambezi River. After 50 years of operation serving the southern African region, the Kariba Dam now requires a series of urgent rehabilitation works for its continued safe operation to international design standards and practices:

- **Plunge pool.** Water falling from the spillway has scoured the plunge pool to a much deeper level than originally anticipated – an 80 m deep scour hole has formed in the bedrock immediately downstream of the dam foundations. This scouring could possibly progress to the upstream toe area of the dam and affect the foundation rock supporting the dam. Fault/shear zones crossing the dam foundation and plunge pool have been greatly affected. In order to control scouring, ZRA has introduced a rule not to open more than three non-adjacent spillway gates, but it could be forced to open all six gates in the case of very large floods.
- **Spillway.** An Alkali-Aggregate Reaction (AAR) has swollen the concrete walls of the spillway, affecting the functioning of the spillway gates and other equipment that enables inspection, emergency use, and repairs. There is a possibility that the gates could be jammed in the middle position and could not be fully opened when necessary to pass the highest river flows. Without a fully functional spillway, the reservoir level could not be raised to store water for generation or lowered to create volume for the containment of flood flows, and inspections and repairs cannot be undertaken without lowering the reservoir level to such an extent that it would be more than a year before generation could resume. The progressive distortion of the concrete and the built-in parts (BIP) resulting from AAR has caused and is still causing considerable problems for the safe and reliable operation of the spillway.

This work is unprecedented in dam history and is urgently needed to prevent any potential further regression and protect Kariba Dam from catastrophic failure due to lack of foundation support. Further details on the rationale for KDRP are provided in Chapter 3 Project Rationale.

2.3 KDRP Components

KDRP began in 2017 and will be implemented over 7 years. It consists of three components, as follows:

- Component 1: Institutional Project Support (estimated cost US$69.6 million);
- Component 2: Plunge Pool Reshaping (estimated cost US$100.0 million); and
- Component 3: Spillway Refurbishment (estimated cost US$124.6 million).

2.3.1 Component 1: Institutional Project Support

This component encompasses consultants' services and enhanced project implementation, management and monitoring, including:

- Technical Services and Supervision (TS&S) Consultant. The TS&S Consultant will serve as the Owner's Engineer during the works, including a review and confirmation of the initial designs, assisting with procurement, and supervision of the works;
- Dam Break Analysis. A detailed dam break analysis to inform the future emergency preparedness for all operators and national authorities in the Zambezi River. The Dam Break Analysis was completed in 2020, determining the extent of flooding in downstream river stretches and the effects on downstream infrastructure, most notably the Cahora Bassa Dam. The results will provide the basis for updated emergency preparedness plans, including inundation mapping and identification of vulnerable downstream settlements; and

- Panel of Experts (PoE). An independent Panel of Experts with considerable experience in the rehabilitation of large dams, to review KDRP progress and provide advice. The PoE will include dam safety experts (Civil Engineering Expert; Hydrology, Hydraulics and Scour Expert; Concrete Technology Expert; Hydro-Mechanical/Electrical Expert; Geotechnical Expert) and an environmental and a socio-economic expert. [2]

2.3.2 Component 2: Plunge Pool Reshaping

Civil works are being undertaken to excavate and reshape the downstream face and north and south bank sides of the plunge pool. This will create a stepped profile to increase the energy dissipation and guide the spilling water in the downstream direction, away from the foundations of the dam and zones of weak rock. It will reduce dynamic pressures in the pool and reduce flow recirculation towards the dam toe. Figure 2.4 and

[2] The Panel of Expert was created and its fully operational at October 2020 and includes experts on dam safety, environment and social aspects.

Figure 2.5 illustrate the works to be carried out, including the terraced slopes that will be constructed to rehabilitate the plunge pool.

Figure 2.4 Plunge Pool Reshaping (with upstream strengthening of fault zone)

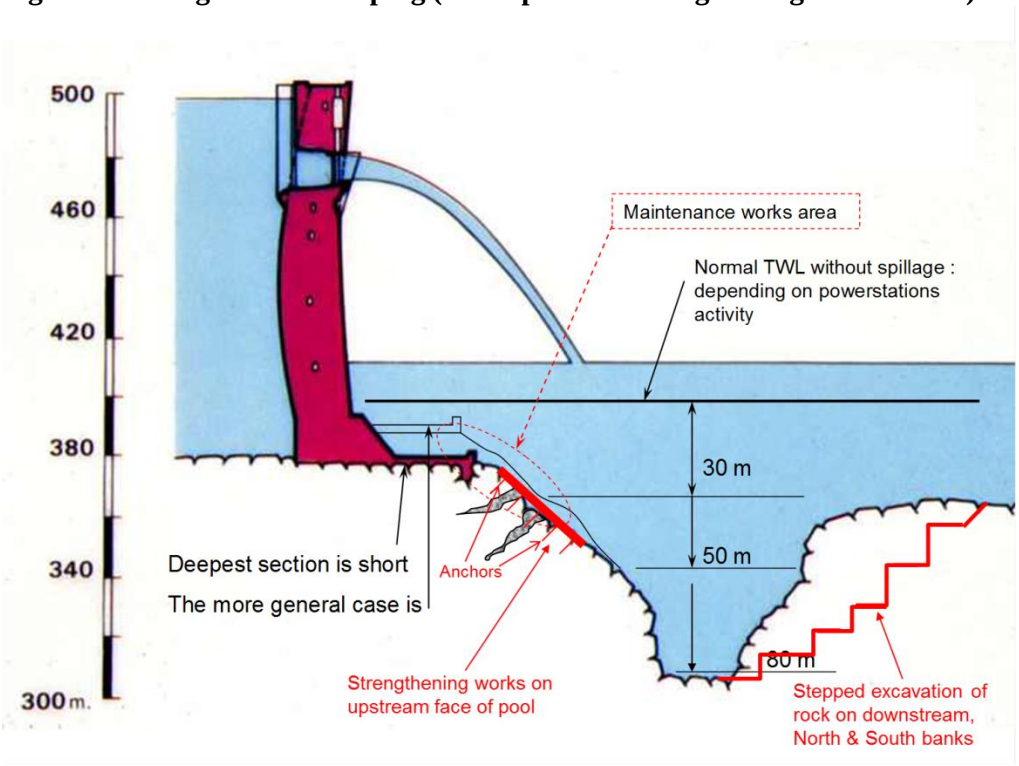
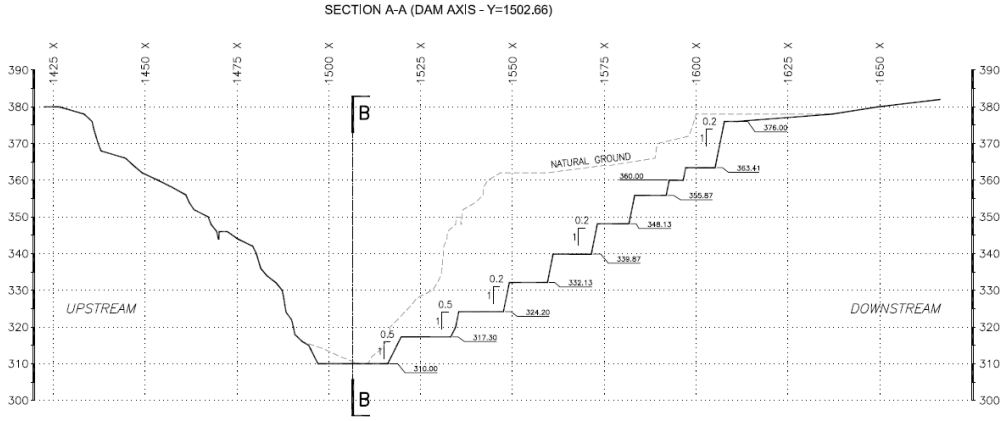
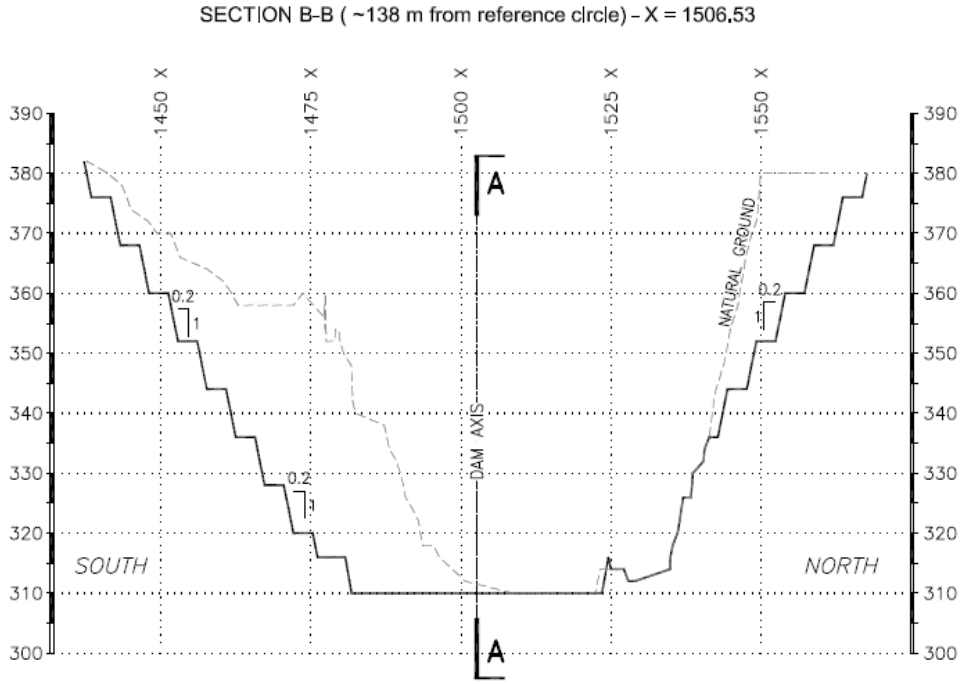


Figure 2.5 Plunge Pool Reshaping

Vertical Cross Section A-A in the Axis of the River



Vertical Cross Section B-B from Right to Left Banks:



In order to arrive at the solutions described below, ZRA undertook: a multi-beam bathymetric survey of the pool; plunge pool geotechnical investigations; and plunge pool hydraulic modelling.

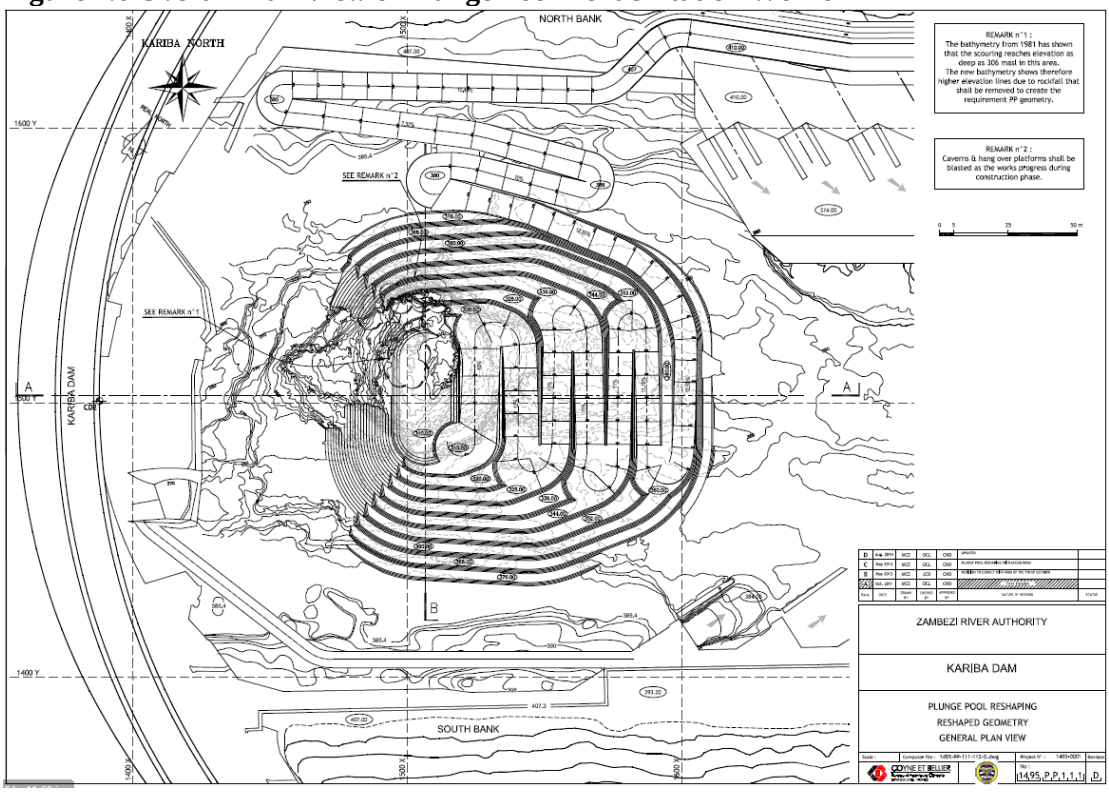
The rehabilitation of the plunge pool will include:

- Access road construction;
- Construction of a coffer dam immediately downstream of the plunge pool, which will block off the plunge pool from the downstream river;
- Underwater excavations and concreting;
- Pumping/dewatering of the plunge pool;
- Excavation and reshaping of the plunge pool into terraced steps;
- Fault zone treatment;
- Deposition of excavated rock material in an existing disused quarry on the north bank;
- Annual removal of the coffer dam during high floods, reinstallation and dewatering;
- Final removal of the coffer dam.

2.3.2.1 Access Road

Access to the plunge pool will be from the existing M15 national road on the north bank, and then the existing tarred road from the M15 down to the north bank turbine outlets. From the turbine outlets a permanent new road approximately 100 m in length and 10 m wide (with additional 5 m safety margin) will be constructed behind the north bank powerhouse to facilitate the rehabilitation works. It will be necessary to excavate the slope to free a 15 m wide band of flat ground for its construction. Figure 2.6 below shows the overall plan view of the proposed plunge pool rehabilitation works and access road from the north bank.

Figure 2.6 Overall Plan View of Plunge Pool Rehabilitation Works

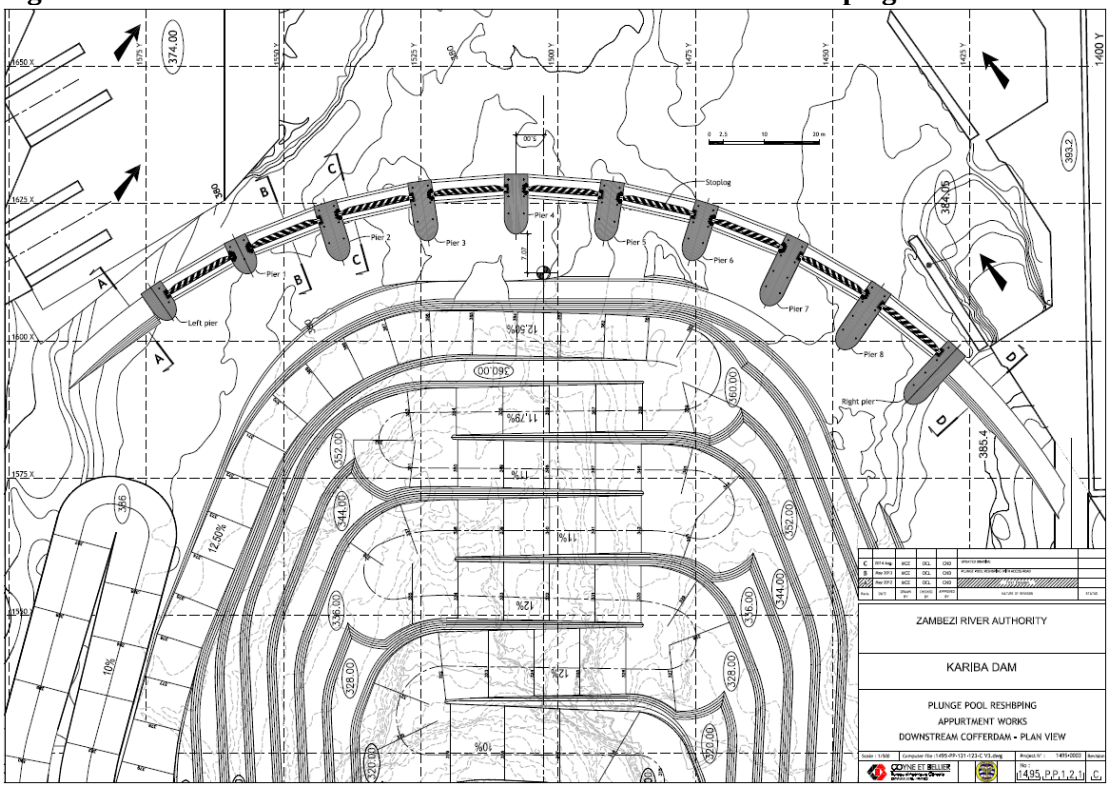


2.3.2.2 Coffer dam

The coffer dam is a temporary enclosure that will be built across the river downstream of the Kariba Dam wall, upstream of the power station tailrace outlets. It will prevent the waters in the downstream Kariba River from reaching up to the Kariba Dam wall, and allow waters in the enclosed area between the coffer dam and the dam wall to be pumped out, thereby creating a dry work environment for the excavation of the plunge pool to proceed.

The coffer dam will consist of 9 piers (7 placed on the riverbed, and 2 consisting of modified abutments on left and right banks), spaced 13 m apart. Stoplogs (37 in total, of dimensions 2 or 2.2 m by 13.5 m) will be placed between the piers to create the coffer dam, which has an average height of 10.5 m. On both banks, a gravity dam will connect the last pier with the bank. The crest of the cofferdam will be at 391 masl.

Figure 2.7 Plan View of Downstream Cofferdam with Piers and Stoplogs



2.3.2.3 Underwater excavations and concreting

Excavation will be required to flatten the natural ground level and a sill will be constructed between the piers to ensure flat watertight contact between the stoplog and the foundation. This will require some underwater excavations and concreting, prior to the installation of the coffer dam. The total area for the piers, sills, abutments and the concrete foundation for piers 6-8) is 2315 m^2. The total volume of material to be excavated for the coffer dam is 16,468 m^3. This is a significant increase on the volume expected during project preparation because the riverbed in the position piers 6 to 8 was later found to consist of loose materials and boulders that must be excavated to provide sound rock foundation for the coffer dam.

2.3.2.4 Pumping/dewatering of the plunge pool

After the coffer dam is in place, water will be pumped out of the plunge pool in stages. The total volume of water to be pumped from the plunge pool is approximately 625,000 m^3.

Pumping will only be undertaken when both power stations are discharging. It will be undertaken in three pumping stages: between coffer dam closure and the beginning of excavation works, estimated to take one month; during excavation works when the pumping will be adapted to work progress, in order to manage bank stability; and when the plunge pool water level is at its minimal (around 310 masl), when the pumped volume will match seepage from the main dam, so the water level is kept constant. A separate pumping system will be used to discharge seepage from the cofferdam.

2.3.2.5 Excavation and re-shaping of the plunge pool

Excavation and pumping will be carried out simultaneously. While excavations are being carried out on one of the plunge pool steps, pumping will continue to lower the water level. This will lower the water level below the next step, so that excavation can proceed continuously from one step to the next one situated below.

Blasting will take place for approximately six months, every year.[3] Trial blasts will be carried out, i.e. increasing charges of explosives will be fired and the impacts of the vibrations on the surrounding sensitive structures will be measured. The choice of explosives to be used will be considered carefully: while ammo-nitrate fuel oil (ANFO) is commonly used as it is inexpensive and has sufficient strength, its water sensitivity is high, and surface bulk emulsions may be used.

Rehabilitation of the Plunge Pool involve a significant volume of rock to be excavated, an estimated 300,000 m3. Such works are similar to those performed in an extraction quarry, and are at the scale of large dam excavation works in rocky banks. However, they are unusual in the sense that the excavation depth is below the current tail water level, and that several critical structures are adjacent to the works, such as the dam wall, the power stations' outlets and the unstable South Bank.

Existing structures and surroundings will be monitored to ensure that they are not damaged by the plunge pool works, specifically from dewatering and blasting. This will include: vibration monitoring; surveillance of the pore pressure in the rock foundation around the pool; and the surveillance of the movement of the dam, its toe and the banks.

2.3.2.6 Fault Zone Treatment

Following the completion of the plunge pool excavation works, some concreting works will be performed to reinforce the weak areas of the plunge pool. In particular, a geological fault in the plunge pool requires special treatment as it presents an area with a high density of joints. A concrete slab will be installed to cover the fault zone along the axis of the fault, with an anchoring system, minimising the area that has a point of weakness. The anchoring is required to ensure the stability of the concrete slab and will take into consideration the uplift capacity, anchor capacity, rock stability and bond strength in its design.

2.3.2.7 Deposition of excavated rock material

An estimated 295,000 m³ of rock will be excavated from the plunge pool below the current Tail Water Level (TWL). Material will be removed from the plunge pool and transported to and stockpiled on the north bank in an existing dis-used quarry. This is located approximately 2.5 km from the plunge pool. The location of the quarry is discussed in further detail in Section 5.5.

2.3.2.8 Annual removal of the coffer dam

From January to August, water may be spilled from the reservoir, through the spillways and into the plunge pool. The timing of spilling does not correspond exactly to the timing of the highest in-flows (February to April), because reservoir levels may be at a lower level at the end of the dry season or, if it is not low, ZRA actively lowers the reservoir level to create a volume (23.2 km^3 of flood control capacity) at the beginning of each flood season (February to April) for flood attenuation. Limited amounts of water are usually spilled occasionally from January to August in order to follow the reservoir level rule curve.

Therefore the coffer dam stop logs will be removed at the end of the dry season, and re-installed at the beginning of the following dry season, and water pumped out so that work can be resumed. The coffer dam design allows for mobilization and demobilization between potential

[3] A blasting management plan has been prepared and it will revised as needed to comply with WB safeguards policies and avoid unintended direct and indirect impacts on people, infrastructure and fauna. The ppv levels will be monitor do not exceed national limits or WB acceptable limits.

flood events. This means that the work will be conducted over three phases, corresponding to three dry seasons.

ZRA conducted several simulations to find optimised scenarios that increase the non-spillage period, whilst limiting consequences for energy production and water availability. Three alternative scenarios, based on a series of assumptions, were considered further (discussed in Section 5.2), and the preferred option allows for plunge pool rehabilitation works to be carried out over a period of 7 months.

2.3.2.9 Final removal of the coffer dam

Once the excavation of the plunge pool is complete, the cofferdam will be removed. The stop logs will be salvaged, and controlled blasting will be used to demolish the concrete piers.

2.3.3 Component 3: Spillway Refurbishment

Spillway rehabilitation will be conducted at one gate at a time, in a sequenced manner starting with the gates that today show the largest need for rehabilitation. Because the spillway gates are located below the minimum operating levels, the works will have to proceed without emptying the reservoir, in order that the power stations may continue to generate. This will be enabled through a floating cofferdam that will enable the draining of each spillway gate one at a time.

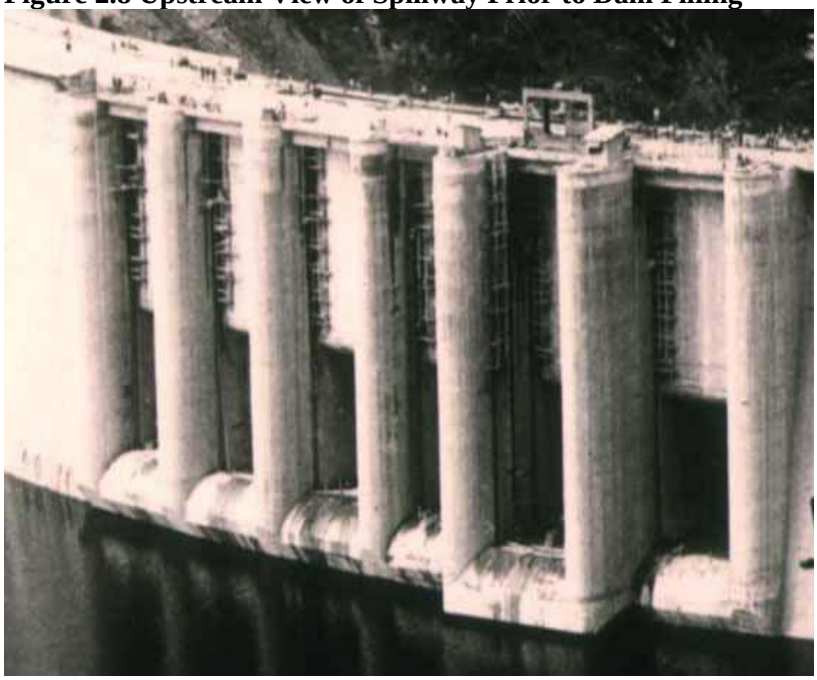
Figure 2.8 shows a view of the underwater spillway, taken from upstream prior to reservoir filling.

Spillway rehabilitation will include: the refurbishment of built-in-parts within the spillway gates (i.e. sluice gates); refurbishment of the stop beams in the upstream guide slots of the sluice gates; further refurbishment of one sluice gate that has been most affected; the design, fabrication and installation of an emergency gate, which was not included in the original design; and a new gantry on the dam crest above the spillway. The new stop beams will enable the dewatering of sluices for maintenance works, and will be operated individually by means of the new gantry.

The following activities will be undertaken:

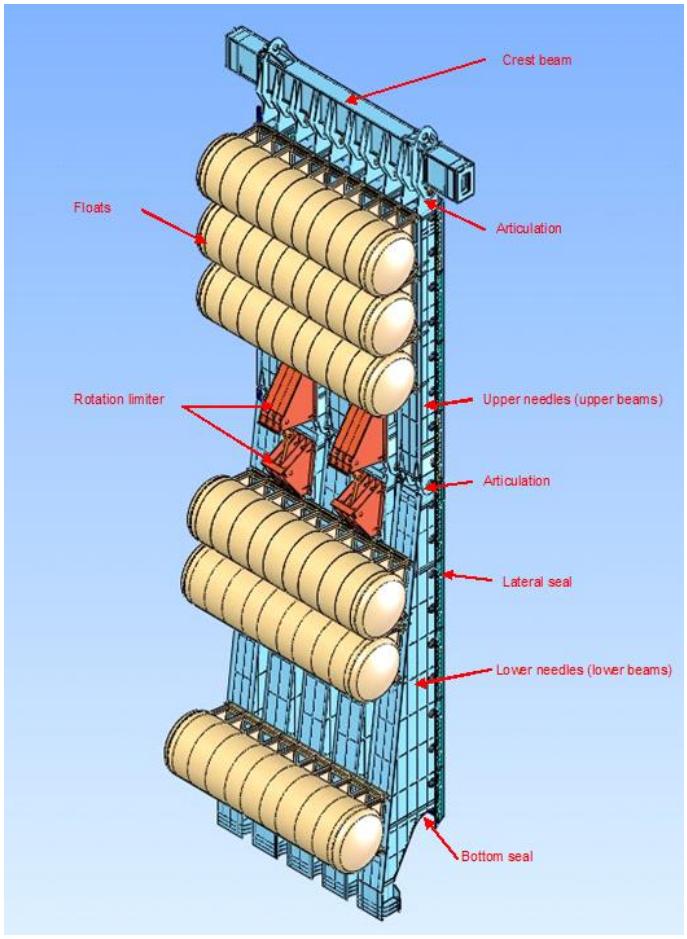
- Installation of a floating cofferdam and rehabilitation of sluices gates 1, 3, 4, 5 and 6;
- Upgrading of a slipway for the assembly of the floating cofferdam;
- Rehabilitation of sluice gate 2;
- Installation of a new emergency gate; and
- Installation of a new gantry.

Figure 2.8 Upstream View of Spillway Prior to Dam Filling



2.3.3.1 Installation of a Floating Cofferdam and Rehabilitation of Sluices Gates 1, 3, 4, 5 and 6

Figure 2.9 Floating Cofferdam



and Figure 2.10 illustrate the floating coffer dam and its installation onto a spillway gate. A floating cofferdam will allow for the dewatering and subsequent rehabilitation of sluices one, three, four, five and six. It will be installed in front of the upstream face of each spillway and allow access of workers and equipment/materials. It has a total estimated weight of 540 tonnes, height of 39.8 m, width of 14.2 m, and depth of 6.8 m.

The following activities will be undertaken to install the coffer dam and de-water each sluice:

- Divers will visually inspect the sluices to detect and report on potential defaults on the upstream concrete faces of the spillway, and carry out underwater grouting (to seal cracks and construction joints);
- Divers will anchor the steel supports for the cofferdam (surface preparation of anchoring areas by scrubbing, chipping off and pouring mortar between the concrete face and the steel anchor plate; installation of an anchorage system, which consists of an injection mortar made of epoxy resin and reinforcement bars that are threaded at their outer end);
- Assembly of the floating cofferdam onshore and transport to the dam sluice gates, by means of a barge, across the reservoir;
- Positioning of the coffer dam in front of the sluice to be refurbished by means of hitch lines installed between the crest beam of the floating cofferdam and two lifting strand jacks on the crest of the Kariba Dam;
- When the crest beam has been positioned at the correct level, the cofferdam is secured;
- Filling with ballast water, to prevent the accumulation of pressure and reduce mechanical stress on the structure;
- Dewatering of the sluice is emptied by slowly opening the floodgate. Once the sluice is totally empty, leaks are located from downstream and blocked from upstream.

Figure 2.9 Floating Cofferdam

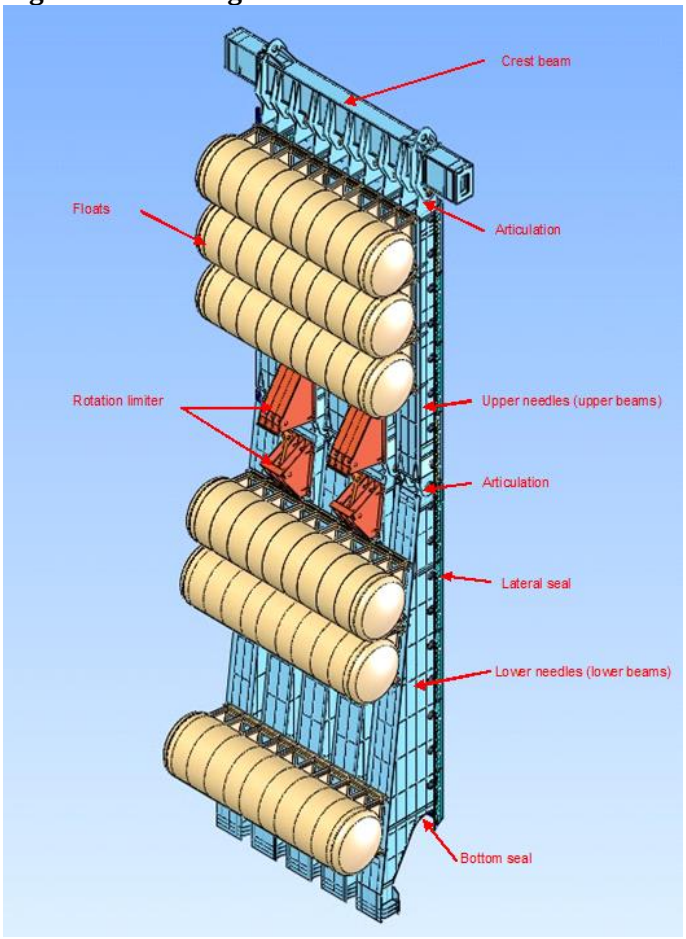
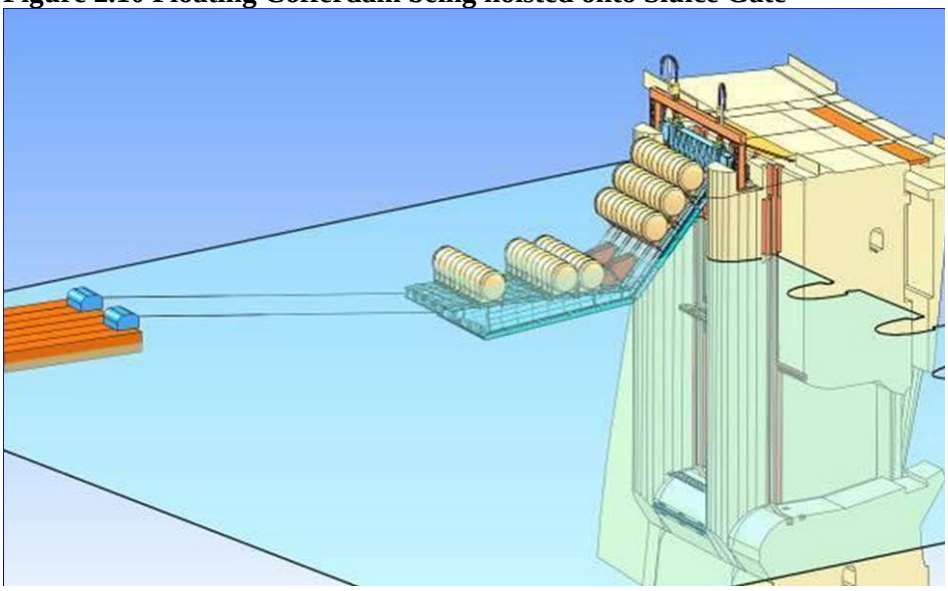


Figure 2.10 Floating Cofferdam being hoisted onto Sluice Gate



Built-in-parts within the sluices will be replaced and refurbished. The outer layer of concrete will be removed, after which the new stainless steel sills and lintels will be installed, and

established with new high strength concrete. Grooves will be rebuilt to adapt to the new emergency gate. New concrete will be anchored and reinforced on the old concrete to resist the load of new built-in-parts, and control cracking.

Following rehabilitation of the sluices, new stop beams will be installed inside the refurbished grooves, upstream of the spillway. The 55 year-old stop beams will be removed. The new stop beams weigh approximately 119 tonnes, and have a height of 14.1 m, width of 11.3 m, and depth of 1.7 m. The stop beams will be installed in the refurbished grooves by a mobile crane and divers will be required to connect and disconnect the stop beam to the crane.

The floating cofferdam will be withdrawn from each sluice in the reverse sequence from its installation. Once the floating cofferdam is back in flotation, it can be stored (in water) and stowed on the bank, or it can be installed on another sluice. Anchorages will be cut and supports and bottom seal casing will be removed by divers from each sluice gate after the floating cofferdam's removal.

2.3.3.2 Upgrading of a Slipway for Assembly of Floating Cofferdam

The floating cofferdam will be transported by barge on Kariba Lake from a slipway. The preferred slipway location is located about 2 km south west from the Kariba Dam wall (see Figure 2.21). The existing slipway site will be upgraded to allow for the assembly of the floating cofferdam and the area will be slightly sloped in the lake direction to launch the cofferdam. The slipway will be comprised of a hoist, rails and lorries, as well as a mobile crane to assemble the floating cofferdam. The length of the slipway will be approximately 138.5 m, to keep a 10 m water depth at the minimum lake level, and the assembly area will be 32 m x 50 m.

2.3.3.3 Rehabilitation of Sluice Gate 2

Sluice gate 2 has a different structure to the other sluice gates, and the floating cofferdam will not fit. Sluice gate 2 currently has a set of stop beams towards the bottom of the sluice, but additional stopbeams are needed to fill the height of the trash disposal grooves (refer to Figure 2.22), and it is proposed that a second set of stopbeams is installed. The proposed new stopbeams weigh 254 tonnes, and are 33.4 m in height, 11.3 m in width, and 1.7 m in depth. Stopbeams that will be used after refurbishment are fitted with a specific and removable guiding pad structure that can be changed to fit either the existing upstream grooves of sluice gate 2 or to the new refurbished grooves (with a new geometry).

Stopbeams will be handled with a mobile crane positioned on the crest of the dam. During installation, divers will monitor all the operations, to ensure smooth running and no jamming. Divers will also disconnect the stopbeam from the spreader attached to the mobile crane when the stopbeam has reached its underwater position. The major difficulty of the works lies in the localization of the existing structural rebars - which should not be damaged.

2.3.3.4 Installation of a New Emergency Gate

A new emergency gate will allow closure of the upstream gates in case a downstream flood gate is jammed in an open position during spilling. The new emergency gate will be installed with the following functions:

- Closure by simple gravity against full water flow in event of problem with a sluice gate (emergency gate function);
- Dewatering of the sluice in a balanced condition to inspect and work in the spillway / sluice gate sluice (this function is already available via the existing set of stopbeams);
- Opening of a sluice in a balanced condition under normal operations;

- Opening of a sluice in flow to control lake level with this sluice should the floodgate be unavailable and in open position (accidental situation).

The total weight of the emergency gate is 145.8 tonnes, with a height of 14.1 m, a width of 11.4 m and a depth of 1.8 m. The gate will be designed as a five-part fixed-wheel gate with downstream skin plate, and so it can be assembled and disassembled easily. The gate will be assembled at the top of the groove and lowered in one block by the new gantry fitted on the crest.

2.3.3.5 Installation of a Gantry System

An existing gantry does not have the functionality necessary to serve the refurbished spillway, as its lifting capacity is insufficient. The new gantry will be used to:

- Install/remove the emergency gate and stop beams into/from the sluice gate;
- Transfer stop beams from their storage position to the sluice gate; and
- Move the emergency gate elements between sluice gates during assembly.

The new gantry will have a weight of 165 tonnes, with a normal lifting capacity of 400 tonnes, an accidental lifting capacity of 740 tonnes, and a total lifting stroke of approximately 38 m.

2.3.3.6 Current Status (October 2020)

The Spillway contractor has been mobilizing over the past few months and it has established offices on the Zimbabwean bank of the river, within the security area between the two border posts. Spillway works are scheduled to commence in October 2020.

2.4 Project Land, Materials and Labour Requirements

2.4.1 Land Acquisition

The ZRA have confirmed that there are no land acquisition issues for any land associated with Kariba Dam Rehabilitation Project.

2.4.2 Materials Supply and Access Routes

Aggregate material for both plunge pool rehabilitation and spillway rehabilitation will be sourced from established quarry sites.

The international road M15 crosses the Zambia-Zimbabwe border on the Kariba Dam crest. Therefore, the site can be reached from both banks, i.e. from Zambia and from Zimbabwe. All necessary equipment and material for the works will likely be brought on site by way of these two major roads. However, at this stage the exact transport route to import all equipment is unknown.

2.4.3 Disposal Site and Access

The spoil disposal site is a disused Sinohydro (contractor worked in a 300 MW expansion of the Kariba power plant) quarry site, established as a quarry during the extension of the North Bank Power Station around 2014. Details are provided in Section 5.5. Access is firstly along the public road (M15) leading from the dam to the border, and then along a short road diverting from this public road. The current Razel-Bec contractor will be responsible to control erosion, contamination and implement a restoration plan.

To date, in October 2020, the disposal site has been used for relatively small volumes of waste rock excavated for the foundation of the coffer dam piers. Increased excavations,

hauling and dumping is expected upon after dewatering of the Plunge Pool, and the Plunge Pool Contractor is considering opening a direct link road so that heavy trucks can avoid using the public road to enhance public safety. The contractor will implement a road safety plan to prevent road accidents for workers and locals.

Workforce Requirements

The workforce for plunge pool and spillway rehabilitation will reach a peak of over 300 workers: 275 skilled; 50 unskilled. Two hundred and thirty (230) are already on-site (October 2020). Workforce numbers for each contractor and the locations in which they are expected to be housed are shown in Table 2.2.

This update provides the number of workers that have been contracted by the project up to now. Workers are living at the project dam area (Siayonga Lodge) and also in nearby towns (Table 2.2). The updated ESMP includes action to ensure contractor comply with the bidding document, this ESIA-ESMP and national regulations for labor, housing and health and safety.

Table 2.2 Workforce requirements (these are estimates of ZRA up to October 2020). Numbers of workers living inside the project dam area and outside in nearby twons is also presented.

	Year	Siavonga Lodges	Siavonga Town in Zambia - Rented Houses	Kariba Town in Zimbabwe - Rented Houses	Total
ZRA	2020	0	7	5	12
	2021	0	8	6	14
	2022	0	10	6	16
	2023	0	10	6	16
TS&S Consultant	2020	5	7	0	11
	2021	6	7	0	13
	2022	11	7	0	18
	2023	11	7	0	18
Plunge Pool Contractor	2020	22	167	1	189
	2021	19	135	0	154
	2022	19	130	0	149
	2023	19	105	0	124
Spillway Contractor	2020	4	5	5	14
	2021	7	10	30	47
	2022	7	10	30	47
	2023	7	8	25	40
Underwater excavations subcontractor (sub-contracted by both)	2020	20	10	0	30
	2021	40	30	0	70
	2022	30	20	0	50
	2023	25	15	0	40
Total	2020				256
	2021				298
	2022				280
	2023				238

2.5 Schedule and Costs

2.5.1 Work Schedule

The on-site works to reshape the plunge pool are estimated to last approximately 3.5 years to complete, inclusive of three five-month spilling seasons. The exact work schedule will depend on the spilling duration governed by the specific hydrological conditions during the works.

The rehabilitation of the spillway will last approximately 7 years.
The refurbishment of each sluice gate will last for 1 year, from the installation of the temporary cofferdam to its removal. The commissioning order would follow the refurbishment order for sluices number six to four, commissioning taking place within two years of each sluice's refurbishment.

2.5.2 Cost Estimates

The estimated costs for the components of the project are in Table 2.2 below.

Table 2.3 Project and Component Costs (US$ millions)

	Project Cost	ZRA	EDF	AfDB ADF		AfDB FSF		IDA		Sweden
				National	Regional	National	Regional	National	Regional	
1. Institutional Project Support	**69.6**	19.2	0	4.3	6.2	3.2	6.5	6.7	13.5	10.0
2. Plunge Pool Reshaping	**100.0**		100.0							
3. Spillway Refurbishment	**124.6**			11.7	16.8	8.8	17.5	18.3	36.5	15.0
Total Costs	**294.2**	19.2	100.0	16.0	23.0	12.0	24.0	25.0	50.0	25.0

2.6 Area of Influence

Figure 2.11below indicates the currently defined AoI boundaries of the Project.
The definition for "Area of Influence" (AoI) used in this Report is from the African Development Bank's Integrated Safeguards System.[4] According to the African Development Bank, the AoI encompasses the following, as appropriate: the area likely to be directly affected by the project; related or associated facilities dependent on the project that are not funded by the project and that would not have been implemented if the project did not exist; and areas, including the communities within them, potentially affected by unplanned but technically predictable activities likely to be induced by the project.

2.6.1 Direct AoI

The Direct AoI was defined to be areas falling inside 5 km of the Kariba Dam. This is limited to 5 km because the vast majority of KDRP impacts will be felt in very close proximity to the

[4] The World Bank's definition is similar: Project area of influence: The area likely to be affected by the project, including all its ancillary aspects, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, and construction camps, as well as unplanned developments induced by the project (e.g., spontaneous settlement, logging, or shifting agriculture along access roads). The area of influence may include, for example, (a) the watershed within which the project is located; (b) any affected estuary and coastal zone; (c) off-site areas required for resettlement or compensatory tracts; (d) the airshed (e.g., where airborne pollution such as smoke or dust may enter or leave the area of influence; (e) migratory routes of humans, wildlife, or fish, particularly where they relate to public health, economic activities, or environmental conservation; and (f) areas used for livelihood activities (hunting, fishing, grazing, gathering, agriculture, etc.) or religious or ceremonial purposes of a customary nature.

area of the works and its immediate surrounds. However, there are some aspects of the Project that may have a direct impact greater than 5 km:

- The transport of construction materials to the site. To address this, recommendations as to the safe transport of construction materials will be included in the ESMP;
- Contamination of water in the Zambezi River, the effects of which may be felt far downstream, depending on the extent of contamination. This is discussed in further detail in the Impact Assessment Chapter.

Impacts due to the potential failure of the Kariba dam wall are not included in the scope of this ESIA, and therefore the AoI does not extend as far as the impact of such dam failure, which would affect the lives of millions of people as far downstream as Cahora Bassa dam and beyond, affecting protected areas, public infrastructure, etc.

ZRA is responsible to apply the World Bank Dam safety policy (OP 4.37) in a new dam, the project will have had to prepare :

a. Plan for construction supervision and quality assurance
b. Instrumentation plan
c. Operation and Maintenance Plan
d. Emergency Preparedness Plan

ZRA has already instrumentation installed, and an O&M plan exists. Therefore, for the proposed works to be financed by this project, ZRA will undergo review and analysis of existing dam safety plans and update the existing Emergency Preparedness Plan, which among other things will incorporate stakeholder engagement from downstream areas in the event of a catastrophic dam failure; coordinate communication and assessment risks in case an emergency occurs during the project.

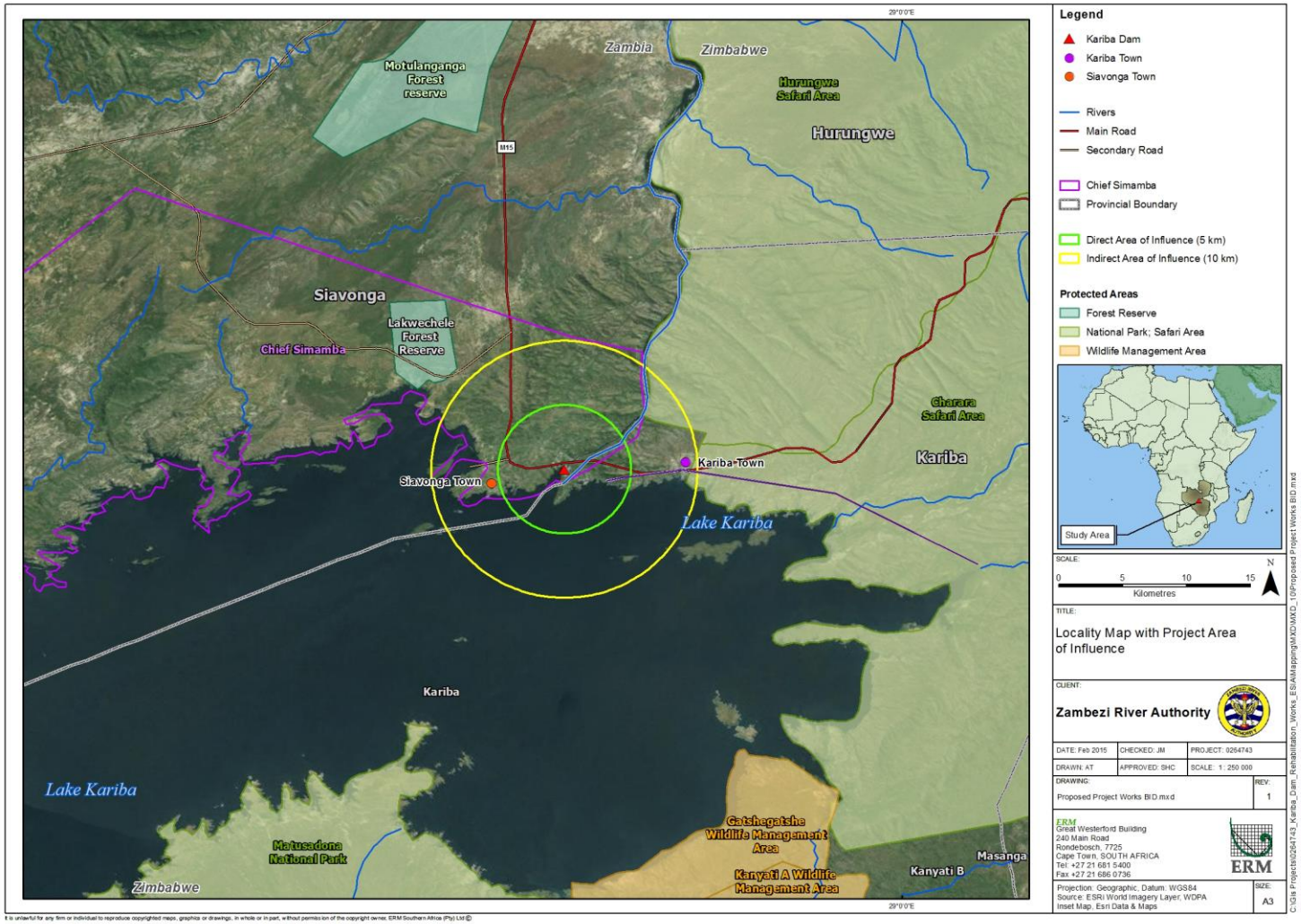
This ESIA has considered the potential impact of blasting and the dewatering of the plunge pool on the integrity of Kariba Dam.

2.6.2 Indirect AoI

The Indirect AoI was defined to be areas falling inside 10 km of the Kariba Dam. [5]

[5] This update of the ESIA – ESMP does not make changes in this assumption of areas of impacts because it will required to do a whole new ESIA and this is not the intention of this updated document.

Figure 2.11 Locality Map with Project Area of Influence



3 Project Rationale

This Chapter describes the rationale for KDRP. This is discussed in two sections:

- Avoidance of catastrophic dam failure; and
- Maintenance of renewable generation capacity.

KDRP will deliver timely rehabilitation of the plunge pool and spillway that is required to maintain dam safety, and to uphold the Kariba Dam's functioning to international standards.

3.1 Avoidance of Catastrophic Dam Failure

The current threats/risks to the safety of Kariba Dam are related to:

- Undercutting of the dam foundations due to erosion in the plunge pool, resulting in failure of the dam due to a lack of foundation support;
- risk of failure of the spillway gates and stop beams, resulting in an inability to close spillway gates, meaning that additional flows will fall into the plunge pool (as well as losing water that should be available for generation, see below); currently it is impossible to close one of the sluices under flow if needed during an emergency; and
- risk that spillway gates will fail in a closed position, leading to dam overtopping.
- Other potential failure modes are related to ageing, alkali-aggregate reactions, corrosion, internal erosion, dam deformation, overtopping due to extreme floods, electro mechanical components failure, among others.

According to an earlier dam break analyses for the Zambezi River, a failure at Kariba could reach a distance of 150 km downstream within seven hours. It would release a flood event of up to 181 km³ resulting in a highly significant loss of life – the flood plain is home to approximately three million people – as well as loss of livelihoods and impoverishment, destruction of infrastructure, and environmental degradation. There is also the risk of cascade failure, i.e. the subsequent failure of the downstream Cahora Bassa Dam due to the flow from Kariba Dam failure.

Plunge pool and spillway rehabilitation are classified as Category I interventions, which are acknowledged as severe deficiencies where urgent and immediate responsive action is required. The rehabilitation of the Kariba Dam plunge pool and spill way will be carried out in compliance with the World Bank OP/BP 4.37 on Safety of Dams. As per OP/BP 4.37 an independent Panel of Experts has been appointed to advise and review the investigations, design, and implementation of the rehabilitation works.

3.2 Maintenance of Renewable Generation Capacity

Kariba Dam Hydro-Electric Scheme contributes significantly to the security of energy supply in the SADC region, and specifically to Zambia and Zimbabwe. Kariba Dam and Cahora Bassa Dam account for 40% of the South African Power Pool (SAPP) generation capacity (excluding South Africa). This region has a rapidly increasing demand for power, and specifically for secure and stable renewable power.

The failure of Kariba Dam would result in a significant collapse of SAPP generation capacity, and if it resulted in cascade failure with Cahora Bassa Dam, an even greater collapse.

The risk of inability to close spillway gates lowers the storage capacity of the reservoir, meaning that less water is available for power generation.

In addition, there is a possibility that the current lower spillway capacity will reduce generation capacity. To ensure compliance with safety standards, ZRA may be required to lower the rule curve by 3.5 m to adjust for lower spilling capacity, i.e. 31% of the reservoir's live storage. This may limit the water available for power production, for example towards the end of the dry season.

4 Policy and Legal Requirements

This chapter describes the policy and legal mandatory requirements applicable to KDRP, and the ESIA process. It is complemented by a more detailed review of the administrative and legal framework in Zambia and Zimbabwe, presented in Appendix A. Tables are provided showing how the requirements have been addressed in the ESIA and ESMP. It includes:

- Applicable National legal requirements for the ESIA process;
- Key applicable National legislation and permitting requirements for KDRP;
- International Regulations
- Zambezi River Authority (ZRA) Mission, Vision, Values and Policy; and
- World Bank Bank and African Development Bank Safeguards Policies

It is also recommended some international hydropower standards and guidelines.

4.1 Applicable Legal Requirements for ESIA

The extent of activities involved in the rehabilitation project warranted an environmental impact assessment under ZEMA/EMA legislation, as agreed among ZRA, EMA and ZEMA. ZRA contracted ERM to undertake an independent Environmental and Social Impact Assessment (ESIA), fulfilling the requirements of Zambian and Zimbabwean EIA regulations.

4.1.1 Zambia

Zambia's Environmental Impact Assessment (EIA) Regulations provide the framework and requirements for conducting and reviewing environmental impact assessments for any project.

The Zambia Environmental Management Agency (ZEMA, an agency of the Environment and Natural Resources Management Department of the Ministry of Lands, Natural Resources and Environmental Protection) has the following role in EIA:

- Assisting the developer to determine the scope of EIA studies;
- Reviewing project briefs, terms of reference, and environmental impact statements (EIS) and decision-making;
- Disclosure of the EIS to the public through the media;
- Holding public hearing meetings to discuss the EIS with stakeholders;
- Conducting verification surveys of the affected environment;
- Monitoring the project once implemented;
- Conducting compliance audits of the project between 12 and 36 months after implementation; and
- General administration of all the Regulations under the Environmental Management Act.

4.1.2 Zimbabwe

The Zimbabwe Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations address the regulation of the EIA process and the protection of ecosystems. Part 11 of the Act stipulates that no industrial project shall be implemented without an EIA having been done.

The developer has to submit a prospectus, including details of the environmental impacts of the project and the measures to be taken to contain or mitigate such impacts, to the Zimbabwean Environmental Management Agency (EMA, under the Ministry of Environment, Water and Climate), which will issue a licence if satisfied by the contents of the prospectus. The EMA will not issue a licence if it is not satisfied that the developer consulted with all stakeholders in the preparation of the prospectus.

In 1997, the then Ministry of Mines, Environment and Tourism published the Environmental Impact Assessment Policy, and accompanying EIA Guidelines in 10 volumes. These guidelines facilitate the implementation of the EIA process.

The ZRA have contracted ERM to undertake an independent Environmental and Social Impact Assessment (ESIA) Process. The ESIA process compliments and fulfils the requirements of Zimbabwean EIA regulations.

4.2 Key Applicable Legislation and Permitting Requirements

4.2.1 Zambia Regulations

The Zambian Environmental Management Act (EMA) (Act 12 of 2011) is the principal law on integrated environmental management in Zambia. The Zambian EMA was enacted in April 2011 to repeal and replace the Environmental Protection and Pollution Control Act. It includes wide-ranging requirements from air quality to invasive species.

The Environmental Management (Licensing) Regulations were published under the Zambian EMA and provide for licensing requirements pertaining to specific subject areas, including: air and water pollution; waste management; hazardous waste; pesticides and toxic substances; and ozone depleting substances.

A range of regulatory acts with relevance to KDRP are summarized in Appendix A and Table 4.1. The government of Zambia and ZRA accepts to implement and apply these regulations in the works to be performed during the project. Some of the most pertinent to KDRP are:

- The Water Resources Management Act, No 21 of 2011. Part V (Water Quantity and Quality Management), concerning discharges into a water resource;
- Part IV of EMA, No.12 of 2011, Section 68 concerning noise and vibration, stating that persons shall not emit noise in excess of the noise emission standards established;
- Explosives Act (No 10 of 1974) Regulations (in draft stage) applying to the, storage, use, possession and transportation of explosives;
- Factories Act (Chapter 441 of the Laws of Zambia) (as amended by Statutory Instrument (S.I.) No. 165 of 1989, No. 75 of 1990, and Act No. 13 of 1994, on the regulation of the conditions of employment and the safety, health and welfare of employees;
- Part II of the Citizens Economic Empowerment Act No 9 of 2006 providing measures for economic empowerment including the prohibition of discrimination, skills development, education and training, preferential procurement, regional development, and codes of good practice; and
- The Employment Act, the Minimum Wages and Conditions of Employment Act, the Workers' Compensation Act of 1999, and the Occupational Health and Safety Act of 2010 amongst others;
- The Employment Act Cap 268, concerning the employment of persons on contracts of service and for the form of and enforcement of contracts of service, appointment of officers of the Labour Department and for the conferring of powers on such officers and upon medical officers and protection of wages of employees.
- Anti-Gender-Based Violence Act (Anti GBV Act No. 1 of 2011) Enacted in April 2011. The Anti-GBV Act is considered as the most comprehensive law on gender-based violence in the Southern African Development Community (SADC) region. This is because the act offers a comprehensive framework for protection from all forms of gender-based violence as well as providing a means of survival for victims and survivors of gender-based violence, and prosecution of perpetrators.
- Gender Equity and Equality Act (No. 22 of 2015). Established in 2015, the Gender Equity and Equality Act aims to domesticate the Convention on the Elimination of all Forms of Discrimination against Women (CEDAW) and SADC protocols on Gender and

Development into Zambian Law. It is an affirmative framework for gender parity as it strives to eliminate all barriers which prevent women and men from participating meaningfully in all spheres of undertakings. The act obligates both public and private institution to undertake gender mainstreaming.

4.2.2 Zimbabwe Regulations

The Zimbabwean Environmental Management Act (the Act) enacted in 2002 and amended on 17 May 2011, includes provisions for aspects including (amongst others) water, air, waste, hazardous wastes, noise, toxic substances, wetlands and control of invasive plant species.

The government of Zimbabwe and ZRA accepts to implement and apply these regulations in the works to be performed during the project. A range of acts with relevance to KDRP are summarized in Appendix A.
Some of the most pertinent to KDRP are:

- Water Act, 2003 including requirements for permits for discharges or disposal into a water course, and provisions on the safety of dams;
- Air Pollution Control Regulations SI 72, 2009, providing for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air;
- Draft Air Quality and Emission Standards (not enacted), providing ambient air quality standards, and limit values for vehicle emissions;
- Effluent and Solid Waste Disposal Regulations SI 6, 2007 concerning the disposal of effluent and solid wastes;
- Hazardous Waste Management Regulations SI 10, 2007, providing for the licensing for generation, storage, use, recycling, treatment, transportation or disposal of hazardous waste;
- Explosives Act (Chapter 10:08), including provisions for the storage of explosives;
- Regulation 10 and Regulation 12 of the 2007 Environmental Management Act (Hazardous Substances, Pesticides and other Toxic Substances) on the handling of hazardous substances at the workplace, conditions for transporting hazardous substances, procedures for accidental spillage of hazardous substances; the collection, storage, treatment and transportation is strictly prohibited unless under a license issued by EMA;
- The Labour Act and its amendments (16/1985, 12/1992, 20/1994, 22/2001, 17/2002) and amendments in 2005 and 2006, addressing matters of occupational health and safety, unfair labour practices, general conditions of employment (dismissal, retrenchment, wages, sick leave, death, maternity leave etc.). and defining the fundamental rights of employees, including entitlement to be a member of a trade union, protection against discrimination, the right to fair labour standards and the right to a democratic workplace.

4.2.3 Permit Register

In the first quarter of 2020, KDRP had the following permits in place and valid:
- Waste Transportation License;
- Hazardous Waste Management License;
- License for incinerator;
- License for diesel tanks;
- ZICTA – Land Mobile Radio Station License;
- Authorization for a motor vehicle for the transportation of explosives;
- Explosive Magazine License;
- Open permit to purchase, acquire and possess explosives and accessories for 2019; and
- EPB for emission license for incinerator.

The above permits have been obtained from Zambian regulators because that is where most products, services and activities will be conducted (including waste disposal, fuel supply, explosives source, etc.). Note that because the regulatory ESIA and ESMP were jointly approved by ZEMA and EMA, it is envisaged that a single permit from one state (either Zambia or Zimbabwe) is sufficient to meet regulatory requirements, even where there may be exposure in both Zambia and Zimbabwe (e.g. pollution of the shared river). When spillway activities commence, some permits may be obtained from the Zimbabwean side depending on activities, products, and services in terms of sourcing and location.

Table 4.1 Zambian Legal Requirements and Standards required to be applied by the Government of Zambia and ZRA in the rehabilitation works agreed for the project

The following table indicates the most relevant regulations applicable to the rehabilitation works agreed for Kariba in this project. The G**overnment** of Zambia and Zimbabwe and the ZRA commits to apply fully these regulations and others relevant to the project (indicated in section 4.2 and in Annex A of this ESIA-ESMP) and made mandatory its application also to its staff, consultants, contractors and subcontractors hired for the agreed works in the project legal agreement with the World Bank. This updated ESIA-ESMP informs of the inclusion of regulation requirements in the project ESMP but careful supervision and monitoring must be apply by the supervision consultants, ZRA and environmental authorities of both countries to ensure compliance by contractors and subcontractors of all applicable regulations.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
General Environmental Management	The Zambian Environmental Management Act (Act 12 of 2011)	Section 4 mentions that every person living in Zambia has the right to a clean, safe and healthy environment and should a person is threatened or is likely to be threatened as a result of an act or omission of any other person, bring an action against the person whose act or omission is likely to cause harm to human health or the environment. Moreover, Section 5 states that every person has a duty to safeguard and enhance the environment. Part IV (Division 1) contains provisions for pollution control including protection of the atmosphere (Section 31), environmental emergency preparedness (Section 41) and regulations around pollution control (Section 43). This ESMP has taken these provisions into account. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulation by the application of ESMP and specific protocols and plans to comply with this regulation.
	The Environmental Impact Assessment (EIA) Regulations, which fall under the EPPCA (Statutory Instruments No. 28 of 1997)	These Regulations provide the framework for conducting an Environmental Impact Assessment (EIA) and requires that an Environmental Management Plan (EMP) be developed that is in support of the EIA. In this respect an ESMP (this document) has been developed. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulation by the application of ESMP and specific protocols and plans to comply with this regulation.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
Permits	The Environmental Management (Licensing) Regulations, S.I. No. 112 of 2013	The Regulations were published under the Zambian Environmental Management Act (Act 12 of 2011) and provide for licensing and management requirements for – • **Air Pollution Monitoring Permits** – under the Air Pollution Control (Licensing and Emission Standards) Regulations, 1996 • **Water Effluent Discharge Permits** – under the Water Pollution Control (Effluent and Wastewater) Regulations, 1993 • **Waste Management Licenses** – under the Waste Management (Transporters of Waste/Operation of Waste Disposal Sites) Regulations, 1993 Hazardous Waste Management Regulations, 2001 • **Pesticides and Toxic Substances Licences** – under the Pesticides and Toxic Substances Regulations, 1994 These specific permits/licenses must be obtained by ZRA and its contractors . ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation. .
Water	Water Resources Management Act, No 21 of 2011	Part V (Water Quantity and Quality Management), Section 46 mentions that discharge into a water resource shall be done in accordance with the Environmental Management Act, 2011. According to Section 71 (activities where water permits may be required), a person who intends to carry out activities identified in this Section shall apply for a permit and pay such charges, for the use of the water, as may be prescribed. It is the understanding of this process that a water permit will not be necessary for this Project. In accordance to Section 149 (Part XIV), all significant spills to a water course must be reported to the police, appropriate authorities (including conservation authorities), catchment council and local authority. Such management measures have been considered in this ESMP, particularly to the Zambezi River downstream of Kariba Dam. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
	The Zambian Environmental Management Act (Act 12 of 2011)	Division 2, Sections 45 to 48 of the Act make considerations for water resources. More specifically, Section 46 states that a person shall not discharge or apply any poisonous, toxic, eco-toxic, obnoxious or obstructing matter, radiation or other pollutant, or permit any person to dump or discharge such matter or pollutant into the aquatic environment in contravention of water pollution control standards. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
Terrestrial Ecology	Zambia Wildlife Act, No. 12 of 1998	Part VI (Game Animals and protected Animals) includes provisions for game and protected animals. More specifically Section 31 of Part VI states that any person who hunts any game or protected animal, except under or in accordance with the conditions of a valid license issued under Part VII of this Act, shall be guilty of an offence. This is further reiterated in Section 67 of the Act. Notwithstanding anything of the contrary of the Act, Section 78 of Part IX states that a person may kill any wild animal in defence of himself or in defence of any other person if it is necessary – provided that nothing in the Act shall exonerate any person, who at the time of killing any wild animal in self-defence or in defence of any other person, was committing an offence under the Act. Should such a kill take place, the person who killed the animal shall, within a period of forty eight hours, make a report of the facts to the nearest proper officer. In accordance with Section 80 of the Act, any person who kills any game animal or protected species through accident or error shall within a period of fourteen days make a report of the act to nearest proper officer. As the Kariba Dam Rehabilitation Project will be in relatively close proximity to Protected Areas, management/mitigation commitments for the protection of terrestrial fauna are included in *Section 9.3.3.17*. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
	The Zambian Environmental Management Act (Act 12 of 2011)	Section 77 (2) of Division 8 of the Act states that no person shall place any invasive alien species into any element or segment of the environment. Moreover, Section 78 states that an occupier of any land shall take such measures as are prescribed and are reasonably necessary for the eradication or prevention of the spread of invasive alien species. The control of alien species has been considered in *Section 9.3.3.17*of this ESMP. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
Aquatic Ecology	National Policy on Wetlands Conservation, September 2001	This Policy was formulated in response to the fragmented sectoral policies and Acts. It aims to provide a holistic programme of action to promote the conservation and wise use of wetland ecosystems. It acknowledges the importance of wetland ecosystems in Zambia in providing major fisheries and as important habitats for various wildlife species. The management of surface water quality, aquatic environments (including aquatic vegetation) and terrestrial ecology (including fauna utilising wetland habits) is provided in *Sections 9.3.3.14 and 9.3.3.16 and 9.3.3.17*, respectively. These plans have considered the provisions of this National Policy. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
Noise	Part IV of Zambian Environmental Management Act (Act 12 of 2011)	Section 68 of Division 6 (Part IV) of the Act states that person shall not emit noise in excess of the noise emission standards established. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
	Zambian Noise Standards	There are no Zambian standards yet for noise and the World Health Organisation, World Bank or donor country standards apply. The Authorities are still developing noise standards, and regulations are in draft. A noise and vibration management plan is presented in *Section 9.3.3.10.* This plan has taken this into consideration. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
Air Quality	Part IV of Zambian Environmental Management Act (Act 12 of 2011)	Section 52 of Division 3 (Part IV) of the Act states that ambient air quality standards and guidelines shall be established under this Division and published. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
	Section 37, 46 and 96 – The Air Pollution Control (Licensing and Emission Standards) Regulations, S.I. 141 of 1996	This regulation provides a table of guideline limits for ambient air quality pollutants including Sulphur Dioxide, Total Suspended Particulate, Particulate Matter, Carbon Monoxide, Ambient Lead and Dust Fall. An air quality management plan is presented in *Section 9.3.3.11****Error! Reference source not found.*** This plan has considered these regulations and associated ambient air quality standards. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
Explosives	Explosives Act (No 10 of 1974) Regulations are in draft stage.	Section 3 of the Act states that the Act shall apply (amongst others) to the, storage, use, possession and transportation of explosives. Part I of the Act provides general measures for the storage, handling and use of explosives. Part III includes provisions for the transportation of explosives by waterway, road, rail or air; and Part IV includes provisions for the transportation of explosives around the work site. Part V includes provisions for the storage of explosives at the work site and Part VIII includes requirements for the use of explosives. *Section 9.3.3.13* presents blasting management measures. The development of these measures and detailed design around blasting management for the Kariba Dam Rehabilitation Project has and will take these requirements into consideration. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
Health	Factories Act (Chapter 441 of the Laws of Zambia) (as amended by Statutory Instrument (S.I.) No. 165 of 1989, No. 75 of 1990, and Act No. 13 of 1994).	The Factories Act is intended to make further and improved provision for the regulation of the conditions of employment and regards the safety, health and welfare of persons employed therein. Part V (Health: General Provisions) of the Act includes provisions around cleanliness, overcrowding, ventilation, lighting and sanitary requirements for employees and Part VI (Safety: General Provisions) includes provisions for the use of machinery, training, facilities, precautions for the use of explosives, emergency drill training requirements for employees. Moreover, Part IX includes provisions for the welfare of employees, including provisions for drinking water, washing facilities, accommodation and change rooms, first aid and resting facilities. Section 71 of Part X includes requirements for provision of Personal Protective Equipment (PPE) and additional health and safety and welfare measures. *Section 9.3.3.4* (Worker Health and Safety) has considered the provisions included in this Act. In addition, new plans relating to COVID-19 and Employee Welfare further meet the requirements of this Act. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
Roads and Traffic Safety	Roads and Road Traffic Act (Cap 464)	Part III and IV of this Act include provisions for the registration and licensing of motor vehicles and trailers. Such provisions include ownership details, vehicle/trailer specifications, etc. Moreover, Part V includes the requirements for the licensing of drivers of motor vehicles and Part VII includes the provisions for third part insurance. The Act stipulates that no person shall drive a motor vehicle on a road unless he is the holder of a valid licence issued to him in respect of motor vehicles of the class concerned. The Act provides the minimum age limits associated with driving of vehicles on roads. Part VI includes the provisions for motor vehicle insurance against third party. Part XI includes the provisions for road safety and driving offences (speed limits, reckless driving, driving under the influence, driving behaviours, vehicle emissions, littering etc.). *Sections 9.3.3.19* presents the Road Safety Management Plan and Traffic and Transport Management Plan. The provisions of this Act have been included in these. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.

Aspect	Legislation, Standard and/or Guideline Document	Application of the regulation in the Kariba Dam Rehabilitation and its ESMP
Cultural Heritage	National Heritage and Conservation Act, 1989	Part V of this Act (Conservation of Heritage) states that (Section 35) any person who wishes to destroy, demolish, alter or remove from its original site any monument, relic or ancient heritage shall apply for permission to the Commission. Moreover, Section 37 states that any person who desires to excavate any ancient heritage or collect relics shall apply to the Commission for permission. In accordance with Section 42, any person who discovers a potential ancient heritage or relic shall report the find to the commissions and suspend operations in the immediate vicinity to the discovery. *Section 9.3.3.24* presents the Cultural and Heritage Chance Find Procedure, which has considered the provisions of this Act. ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.
Employment	Citizens Economic Empowerment Act No 9 of 2006	Provides for the encouragement and support of citizens of Zambia to get involved in business activities for wealth creation and support of livelihoods. More specifically, Part II of the Act provides measures for economic empowerment including (amongst others) the prohibition of discrimination, skills development, education and training, preferential procurement, regional development, codes of good practice and mechanisms for measuring progress. This ESMP provides measures to ensure that the Kariba Dam Rehabilitation Project provides opportunities to Zambian citizens. These provisions are included in the Procurement of Good and Services Management Plan (*Section 9.3.3.8*) and the Employment and Training Management Plan (*Section 9.3.3.7*). ZRA will ensure its staff, consultants, contractors and subcontractors comply with this regulations by the application of ESMP and specific protocols and plans to comply with this regulation.

Table 4.2 Zimbabwe Legal Requirements and Standards, required to be applied by the Government of Zimbabwe and ZRA in the rehabilitation works agreed for the project

The following table indicates the most relevant regulations applicable to the rehabilitation works agreed for Kariba in this project. The G**overnment** of Zambia and Zimbabwe and the ZRA commits to apply fully these regulations and others relevant to the project (indicated in section 4.2 and in Annex A of this ESIA-ESMP) and made mandatory its application also to its staff, consultants, contractors and subcontractors hired for the agreed works in the project legal agreement with the World Bank. This updated ESIA-ESMP informs of the inclusion of regulation requirements in the project ESMP but careful supervision and monitoring must be apply by the supervision consultants, ZRA and environmental authorities of both countries to ensure compliance by contractors and subcontractors of all applicable regulations.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
General Management Requirements	Constitution of Zimbabwe Amendment Act (No. 20 of 2013), Section 73 (Environmental Rights)	According to Section 73 of the Constitution of Zimbabwe, every person has a right to an environment that is not harmful to their health or well-being and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures. Other than Section 73, the current Constitution has no specific clause that provides for the protection of the environment. The objective of this ESMP is to ensure for the protection of the environment and associated key natural socio-environmental resources.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
	The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002	This Act aims to provide for the sustainable management of natural resources and protection of the environment; [and] the prevention of pollution and environmental degradation. Section 4 the Act affords all citizens of Zimbabwe the right to live in a clean environment that is not harmful to their health; access to environmental information; the right to protect the environment for the benefit of present and future generations; and the right to participate in the implementation of legislation and policies that prevent pollution and environmental degradation and promote the sustainable management and use of natural resources, as well as justifiable economic and social development. The Act also includes provisions for aspects including (amongst others) water, air, waste, hazardous wastes, noise, toxic substances, wetlands and control of invasive plant species. These provisions will be discussed in the relevant sections below. This ESMP has taken these provisions into account.
	Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations, SI No. 7 of 2007	The Environmental Management Regulations deal with the regulation of the EIA process and the protection of ecosystems. Part 11 of the Act stipulates that no industrial project shall be implemented without an EIA having been done. In this respect an ESIA and associated ESMP (this document) has been developed. The Project will not go ahead until approval is sort from the Zimbabwean and Zambian Environmental Management Agencies.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
Water	Water Act, 2003 (Chapter 20:24)	Section 67 of the Act states that water resource management needs to be consistent with environmental approaches and due consideration should be given to the protection, conservation and sustenance of the environment; and the right of access by members of the public to places of leisure or natural beauty related to water or water bodies. According to Section 69, a person who intends to discharge or dispose into a water course shall apply for a permit and pay such charges, for the use of the water, as may be prescribed. It is the understanding of this process that a water permit will not be necessary for this Project. Part IX includes provisions on the safety of dams. Namely Section 109 and 110 include requirements around procedures for emergency for any sudden or unprecedented flood or alarming or unusual circumstance or occurrence, whether anticipated or existing, which may adversely affect the dam. Such management measures have been considered in this ESMP, particularly in the Surface Water Quality Management Plan (*Section 9.3.3.14*).
	The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002	Section 57 of the Act mentions that any person, who discharges or applies any poison or toxic, noxious or obstructing matter, radioactive waste or other pollutants or permits any person to dump or discharge such matter into the aquatic environment in contravention of water pollution control standards shall be guilty of an offence. This provision has been duly noted in this ESMP.
Terrestrial Ecology	Forest Act, 1948 (Chapter 19:05)	Provides for demarcating and conserving forests and nature reserves. More specifically, Part VI (conservation of timber resources) governs the removal of indigenous trees. Prior to the removal of indigenous trees, notice of intention must be provided to the appropriate Commission. Management/mitigation commitments for the protection of terrestrial flora are included in *Section 9.3.3.17*. This section has considered management of forest habitats.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
	Parks and Wildlife Conservation Act, 1975 (Chapter 20:14)	Provides for the conservation and control of wildlife, fish and plants; and designates specially protected animals and indigenous plants. More specifically, Part IX (specially protected animals) (Section 45) and Part XII includes provisions around the hunting, removal of animals and animal products. Part X and Part XI of the Act include provisions for protected plants specified in the Seventh Schedule (insertion by Act 19 of 2001 with effect from the 1st June, 2002) and provisions for the control of picking of indigenous plants. The Terrestrial Ecology Management Plan (*Section 9.3.3.17*) and Revegetation and Rehabilitation Management Plan (*Section 9.3.3.18)* have considered the provisions of this Act.
	The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002	Part XIII of the Act includes provisions for the control of alien plant species. Essentially, every person has the responsibility to clear or cause to be cleared any invasive alien species growing or occurring on the land in respect of which he is responsible. The Terrestrial Ecology Management Plan (*Section 9.3.3.17)* and Revegetation and Rehabilitation Management Plan (*Section 9.3.3.18*) have considered the provisions of this Act.
Aquatic Environment	GN 380 of 2013 (Protection of Wetlands) per Section 113 of the Environmental Management Act	This Section of the Act includes provisions for the protection of wetlands in Zimbabwe. Such controls include the preservation of beds, banks; controlling stormwater; restrictions of removing clays and deposits from wetlands; reducing pollution of any kind to wetlands and restoration of wetlands. The management of surface water quality, aquatic environments (including aquatic vegetation) and terrestrial ecology (including fauna utilising wetland habits) is provided in *Sections* 9.3.3.14, *9.3.3.16 and 9.3.3.17* respectively. These plans have considered the provisions of this Section of the Act.
Air	Air Pollution Control Regulations SI 72, 2009	Provides for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The provisions of these regulations have been considered in the Air Quality and Dust Management Plan (refer to *Section 9.3.3.11*).
	The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002	Section 63 of the Act mentions that ambient air quality standards need to be established.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
	Draft Air Quality and Emission Standards (draft number EN 005 - D977/2)	These have not been enacted; however, Section 4 of these draft standards provides ambient air quality in Zimbabwe. Moreover, Section 7 provides limit values for vehicle emissions.
Noise	The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002	Sections 79 to 81 (in Part IX of the Act) provide requirements around noise management. More specifically, the Act mentions the need for standards to be established for the emissions of noise and vibration pollution. Section 80 mentions that any person who emits noise in excess of the noise emission standards prescribed in terms of section seventy-nine shall be guilty of an offence. No reference to noise standards could be sourced and it appears as if these do not yet exist. This said, a Noise and Vibration Management Plan has been produced (refer to *Section 9.3.3.10*).
Waste	Effluent and Solid Waste Disposal Regulations SI 6, 2007	This regulation concerns the disposal of effluent and solid wastes. Persons are prohibited from disposing waste into public water courses without initially acquiring permission. Moreover, a generator of waste (other than domestic households) is now required to produce a Waste Management Plan. The plan should deal with sound environment management of wastes. *Section 9.3.3.20* of the ESMP presents a Waste management Plan. Moreover, *Section 9.3.3.18* presents a Rehabilitation and Revegetation Plan. These plans have considered the provisions of these Regulations.
	Hazardous Waste Management Regulations SI 10, 2007	Provides for the licensing for generation, storage, use, recycling, treatment, transportation or disposal of hazardous waste. Generators of hazardous waste are also required to prepare waste management plans and targets. Regulates waste collection and management by local authorities. In addition, regulates the importation and exportation of hazardous waste and waste oils. According to this regulation, generators of hazardous waste are required to prepare waste management plans. The Waste Management Plan and Hazardous Materials Handing Plan (*Section 9.3.3.20 and 9.3.3.12*) take into account the management of hazardous waste.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
	Plastic Bottles and Plastic Packaging Regulations, SI No. 98 of 2010	This regulation encourages a reduction in the use of certain types of plastics. According to Article 3(1), it is prohibited to produce, import or distribute plastic packaging with a thickness of less than 30 microns. The Waste Management Plan (*Section 9.3.3.20*) encourages minimisation of waste generation and maximisation of reuse and recycling of waste products.
	Environmental Management (Hazardous Waste Management) Regulation 10 of 2007	Regulates the handling of hazardous waste. The Waste Management Plan (*Section 9.3.3.20*) takes into account the management of hazardous waste.
	The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002	Section 69 of Part IX of the Act mentions that no person shall discharge or dispose of any wastes, whether generated within or outside Zimbabwe, in such a manner as to cause pollution to the environment or ill health to any person. Moreover, Section 69 includes provisions for the transport and disposal of waste. Section 73 of the Act prohibits the discharge of hazardous substances, chemicals and materials or oil into the environment. The appropriate management of waste has been included in the Waste Management Plan (refer to *Section 9.3.3.20*).
Explosives	Explosives Act (Chapter 10:08)	Part IV of this Act includes provisions for the storage of explosives. No person shall keep explosives in or on any premises unless the premises are licensed. Moreover, Part V of the Act governs the use of explosives. Part VI provides restrictions and provisions for the transport of explosives. *Section 9.3.3.13* presents blasting management measures. The development of these measures has taken this Act into consideration. Moreover, detailed design around blasting management for the Kariba Dam Rehabilitation Project has and will take these requirements into consideration.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
Hazardous Substances	Regulation 12 of 2007 Environmental Management Act (Hazardous Substances, Pesticides and other Toxic Substances)	The Regulation provides for the labelling, packaging, repackaging and sale of hazardous substances or articles containing hazardous substances in Zimbabwe. The Regulations prescribe conditions that employers have to observe in the handling of hazardous substances at the workplace, conditions for transporting hazardous substances, and procedures to be followed when there is an accidental spillage of hazardous substances. The Agency is empowered to issue spot fines to any person who violates the law. In addition, any person whose substances affect the environment is liable to pay for the cost of restoring the environment (i.e. the polluter pays principle). The offender is also liable to pay compensation for any damage that the offence caused to any person. The provisions of this Regulation have been considered in the Dangerous Goods and Hazardous Substances Management Plan (*Section 9.3.3.12*) and Emergency Response Plans (*Section9.3.3.9*).
Road and Traffic	Road Motor Transportation Act, 1997	The proposed Kariba Dam Rehabilitation Project will require the transport of materials and machinery into the Project Area. Part III (Section 7 to 16) of the Road Motor Transportation Act details the requirements for goods vehicles on all roads and that these vehicles/drivers need to hold an operator's license. The operator's license application needs to be assigned for a specific route. Part IV of the Act provides the requirements for the operation of foreign vehicles on Zimbabwean roads. Requirements include the provision of a foreign license. Part V includes the provisions for the inspection of vehicles and the issuance of a certificate of fitness for vehicles. *Section 9.3.3.19* presents the Road Safety Management Plan and Traffic and Transport Management Plan. The provisions of this Act have been included in these.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
	Road Traffic Act (Chapter 13:11)	Part II of this Act includes the provisions for the licensing of drivers of motor vehicles and the requirements for licenses (age limits, medical examinations, etc.). The Act stipulates that no person shall drive a motor vehicle on a road unless he is the holder of a valid licence issued to him in respect of motor vehicles of the class concerned, and complies with the conditions, if any, subject to which the licence was issued. Section 7 of the Act provides the minimum and maximum age limits associated with driving of vehicles on roads. Part III makes provision for the issuing of international driving permits. Section 17 states that any person who is an ordinarily resident in Zimbabwe; and the holder of a driver's licence or foreign drivers licence and who wish to drive a motor vehicle outside Zimbabwe, he must apply for an international driving permit. Part IV through to V (and VA) includes the provisions for motor vehicle insurance against third party. Part VI includes the provisions of traffic signs and police directions and the requirements around conformance. *Section 9.3.3.19* presents the Road Safety Management Plan and Traffic and Transport Management Plan. The provisions of this Act have been included in these.
Immigration	Immigration Act (Chapter 4:02)	Part III of this Act includes provisions for the entry of persons to Zimbabwe (*viz.* compliance with the directions of immigration officers, travel document requirements, entry refusals, etc.). Part V of the Act includes the provisions for departure of Zimbabwe. These provisions have been included in the Worker Health and Safety Plan (*Section 9.3.3.4*).
Access Control	Protected Place and Areas Act (Chapter 11:12)	This Act includes the provisions for the control of entry of persons into certain places, for the protection of the premises. The control of access to work areas associated with the Kariba Dam Rehabilitation Project will be undertaken in accordance with the provisions/requirements in this Act.
Cultural and Heritage	National Museums and Monuments Act (Chapter 25:11)	Makes provision for the preservation of ancient, historical and natural monuments, relics and other objects of historical or scientific value or interest. Section 21 of the Act requires that the appropriate board be notified of any ancient monument or relic. Moreover, Section 24 states that no person may excavate and ancient monument or national monument without obtaining written permission by the appropriate Board. *Section 9.3.3.24* presents the Cultural and Heritage Management Plan including a Chance Find Procedure, which has considered the provisions of this Act.

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
Employment	Labour Act (Chapter 28:01) as amended by Labour Act [Chapter 28:01] amended 2006 and the Labour Amendment Act, 2005 (Act 7/2005)	An Act to declare and define the fundamental rights of employees. Part II (Sections 4 to 7) provides the fundamental rights of employees, including entitlement to be a member of a trade union, protection against discrimination, the right to fair labour standards and the right to a democratic workplace. Part III of the Act provides provisions safeguarding employees to unfair labour practices and Part IV provides the general conditions of employment (*viz.* dismissal, retrenchment, wages, sick leave, death, maternity leave etc.). This ESMP makes provision for the rights of employees (refer to Worker Health and Safety Management Plan in *Section 9.3.3.4*).

4.3 International regulations and treaties

Both the Governments of Zambia and Zimbabwe have signed/ratified different international treaties that are applicable to the Kariba dam rehabilitation project (Annex A). Among these:

- Cartagena Protocol on Biosafety
- Convention on Certain Conventional Weapons
- Chemical Weapons Convention
- Convention on the Rights of the Child
- CITES
- UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property
- Kyoto Protocol
- Labour Relations (Public Service) Convention, 1978
- Paris Agreement
- Nagoya Protocol
- Others

International Labour Organisation (ILO)

Zambia and Zimbabwe are members of the International Labour Organisation (ILO), which means that they subscribe to the following:

- Definition of unfair labour practices;
- Regulate conditions of employment and related matters;
- Provide for control of wages and salaries;
- Provide for the appointment and functions of workers' committees;
- Provide for the formation, registration and functioning of trade unions, employers' organizations and employment councils;
- Regulate the negotiation, scope and enforcement of collective bargaining agreements;
- Provide for the establishment and functioning of a labour court;
- Provide for the prevention of trade disputes and unfair labour practices;
- Regulate and control collective bargaining;
- Regulate and control employment agencies; and
- Provide for matters connected with or incidental to the aforementioned.

4.4 Zambezi River Authority (ZRA) Mission, Vision, Values and Policy

The development of the ESMP has been guided by the overall ZRA mission, vision, values and social corporate policy (refer to the box below). These are high-level corporate statements of intent and establish the principles to be followed in the management of environmental and social issues. The ZRA mission, vision, values and social corporate policy therefore constitute the framework against which all related activities should be judged. This ESMP and management plans support the commitments made by the ZRA.

ZRA MISSION, VISION AND VALUES

Mission – the ZRA commits themselves to satisfying all stakeholders through purposefully and sustainably exploiting the natural advantages offered by the Zambezi River.

Vision – to be a dynamic and vibrant organization, inspired by the passion to harness and manage the Zambezi waters for socio-economic development.

Values – fairness, transparency, integrity, respect, health and safety and professionalism.

ZRA SOCIAL CORPORATE RESPONSIBILITY

As part of its Social Corporate Responsibility, ZRA has a social contract with the society in which it is operating. As a corporate citizen, ZRA defines this social contract by giving back to the community in which it operates and resides. As an institution, the ZRA believes that a satisfied human resource translates into multiplied productivity. The authority has therefore a policy to integrate social and environmental concerns in its business operations and also in its interaction with the stakeholders (both internal and external) and on a voluntary basis. As such, the Authority is cognizant of its stakeholders' welfare through enhanced health, social and economic programmes which benefit all stakeholders.

4.5 Mandatory Environmental and Social Safeguards Policies

The Kariba dam These are set out below, in the following sections, and a description of how their requirements have been met through this ESIA and ESMP is provided in Table 4.4:

- World Bank Safeguard Policies;
- African Development Bank Group's Integrated Safeguards System and Operational Safeguards;

4.5.1 World Bank Safeguard Policies

At the time of the preparation of KDRP, the World Bank applied ten environmental and social Safeguard Policies to manage environmental and social risks in its lending operations. These safeguard policies include the following: Environmental Assessment (OP 4.01); Natural Habitats (OP 4.04); Forestry (OP 4.36); Pest Management (OP 4.09); Cultural Property (OP 4.11); Indigenous Peoples (OP 4.11); Involuntary Resettlement (OP 4.12); Safety of Dams (OP 4.37); Projects in International Waters (OP 7.50); and Projects in Disputed Areas (OP 7.60) The following four safeguard policies were triggered by the World Bank for KDRP at appraisal stage.[6]

4.5.1.1 Environmental Assessment OP/BP 4.01

Operational Procedure 4.01 Environmental Assessment (EA) requires that a borrower: evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. This safeguard is not limited to environmental assessment, and encompasses the assessment and management of broad social issues such as labour and GBV issues.

[6] https://documents.worldbank.org/en/publication/documents-reports/documentdetail/798521508523777491/appraisal-integrated-safeguards-data-sheet-isds

The original and this current update of the ESIA/ESMP of the Kariba Dam Rehabiltaition Project have been prepared to meet the requirements of this safeguard policy and the national EIA regulations of the countries of Zambia and Zimbabwe.

4.5.1.2 Physical Cultural Resources OP/BP 4.11

This safeguard addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community. Any project activities involving significant excavations, demolition, movement of earth, flooding of land or existing structures, or other must apply this policy.

The World Bank triggered this safeguard because KDRP includes civil works that may unearth physical cultural resources, requiring chance find procedures, which were incorporated into the original and maintain in this update of the Environmental and Social Management Plan of Kariba dam rehabilitation works.

4.5.1.3 Involuntary Resettlement OP/BP4.12

This safeguard is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.

KDRP is not expected to require any physical relocation and only limited, if any, land acquisition leading to involuntary resettlement and/or restrictions of access to resources or livelihoods. However, this safeguard was triggered and a Resettlement Policy Framework prepared, to provide procedures for the management of land acquisition, in the event that any land acquisition is required for ancillary facilities such as waste dumps, access routes or construction sites, etc. To date, no land acquisition has been necessary outside of ZRA land.

4.5.1.4 Safety of Dams OP/BP 4.37

Operational Policy 4.37: Safety on Dams requires that experienced and competent professionals design and supervise construction, and that the borrower adopts and implements dam safety measures through the project cycle. The policy also applies to existing dams where they influence the performance of a project. The policy also recommends, where appropriate, that Bank staff discuss with the borrowers any measures necessary to strengthen the institutional, legislative, and regulatory frameworks for dam safety programs in those countries.

The nature of this project is directly connected to this policy, since the works been finnacied by the project are to reduce risk to downstream communities in case of dam failure. All project activities will comply with the requirements of this policy. As per OP/BP 4.37 an independent Panel of Experts was appointed and continue to be engaged (October 2020) in the review of project actions, investigations, design, and implementation of the rehabilitation works. The ZRA carries out five yearly inspections of the dam by internationally-reputable consultants and the rehabilitation works will be carried out in compliance with this OP/BP. ZRA has Standing Operations Procedures of the Kariba Dam and reservoir that are address the provisions of the policy and cover the reservoir operation procedures, instrumentation plan, operation and maintenance procedures for equipment, etc. KDRP is also preparing a dam break analysis and the preparation of an updated Emergency Preparedness Plan (EPP).

4.5.1.5 Projects on International Waterways OP/BP 7.50

Operational Policy 7.50: International Waterways applies to any river or body of surface water that flows through, two or more states, whether these states are World Bank members or not. This policy applies to irrigation systems, dams and flood control measures. If such a project is proposed, the World Bank requires the beneficiary state to formally notify the other riparians states of the project and its Project Details.

Notification were made by the ZRA in accordance with provisions of the ZAMCOM Agreement along with the Revised SADC Protocol on Shared Watercourses in compliance with OP/BP 4.37. KDRP will adversely change the quality or quantity of water flows to other riparians in the Zambezi River basin, nor will it adversely affect water use by the other riparians. The rehabilitation works will not exceed the original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme.

4.5.2 African Development Bank Group's Integrated Safeguards System and Operational Safeguards

The African Development Bank (AfDB) adopted its Environmental Policy in 1990, a set of Environmental and Social Assessment Procedures (ESAPs) in 2001, the Involuntary Resettlement Policy in 2003 and a revised Policy on the Environment in 2004. These previous policies provided the basis for the AfDB's current environmental and social safeguards, which set out the requirements for an appropriate level of environmental and social assessment and management measures to mitigate project-related risks.

The AfDB has further cross-cutting and sector policies that contain commitments to promote environmental and social sustainability in AfDB operations: policies on health (1996), integrated water resources management (2000), agriculture and rural development (2000), gender (2001), co-operation with civil society organizations (2001), involuntary resettlement (2003), poverty reduction (2004), and the environment (2004), as well as the Civil Society Engagement Framework (2012).

The AfDB has developed an Integrated Safeguards System (ISS) to update its safeguards policies and consolidate them into a set of Operational Safeguards (OSs) supported by revised ESAPs and Integrated Environmental and Social Impact Assessment (IESIA) Guidance Notes. The ISS supersedes the provisions in previous policies on environmental and social safeguards and compliance aspects.

As the Kariba Rehabilitation Works Project is being co-funded by the African Development Bank, the relevant Operational Safeguards will need to be complied with by the Project. The African Development Bank Operational Safeguards and each of their objectives, are outlined in Table 4.3.

Table 4.3 African Development Bank Operational Safeguards

Performance Standards	Objectives
Operational safeguard 1 – Environmental and social assessment	Overall objective is to mainstream environmental and social considerations—including those related to climate change vulnerability—into AfDB operations and thereby contribute to sustainable development in the region.
Operational safeguard 2 – Involuntary resettlement: land acquisition, population displacement and compensation	This Operational Safeguard (OS) aims to facilitate the operationalization of the AfDB's 2003 Involuntary Resettlement Policy in the context of the requirements of OS1 and thereby mainstream resettlement considerations into Bank operations.

Performance Standards	Objectives
Operational safeguard 3 – Biodiversity, renewable resources and ecosystem services	This OS outlines the requirements for borrowers or clients to (i) identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and (ii) observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. The OS reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote the sustainable management and use of natural resources. It also aligns with the Ramsar Convention on Wetlands, the Convention on the Conservation of Migratory Species of Wild Animals, the Convention on International Trade in Endangered Species of Wild Flora and Fauna, the World Heritage Convention, the UN Convention to Combat Desertification and the Millennium Ecosystem Assessment. The OS's recommendations also align with the International Plant Protection Convention.
Operational safeguard 4 – Pollution prevention and control, hazardous materials and resource efficiency	This OS outlines the main pollution prevention and control requirements for borrowers or clients to achieve high-quality environmental performance, and efficient and sustainable use of natural resources, over the life of a project. This OS aligns AfDB operations with existing international conventions and standards related to pollution, hazardous materials and waste, and related issues. I t al s o requires compliance with internationally accepted environmental standards, particularly the World Bank Group Environmental Health and Safety (EHS) Guidelines.
Operational safeguard 5 – Labour conditions, health and safety	This OS outlines the main requirements for borrowers or clients to protect the rights of workers and provide for their basic needs.

4.5.3 International Standards and Guidelines

There are very important international hydropower standards, protocols and guidelines that are not mandatory for this project but recommended to apply.

4.5.3.1 ICOLD dam safety guidelines.

ICOLD has developed very important guidelines for large dams like Kariba which are considered Best industrial practoces. It is important for ZRA to become part of ICOLD and be exposed to the recommendations, procedures and knowledge exchange ICOLD does with dam operators globally.

4.5.3.2 World Commission on Dams Strategic Priorities and Guidelines

The World Commission on Dams (WCD), established in May 1998 in response to the escalating local and international controversies over large dams, reported in 2001, identifying seven strategic priorities, and 26 guidelines. These seven strategic priorities are based on a set of policy principles, and the guidelines set out actions for meeting the strategic priorities at five key stages of project development.

4.5.3.3 Hydropower Sustainability Assessment Protocol

The International Hydropower Association (IHA) launched the Hydropower Sustainability Assessment Protocol in 2010, as a set of methodologies for assessment of hydropower projects, based on definitions of good international industry practice (GIIP) and best practice. IHA has more recently developed this into a body of related standards and tools to define and measure sustainability in the hydropower sector.

There are three complementary tools:

- Hydropower Sustainability Guidelines on Good International Industry Practice (HGIIP);
- Hydropower Sustainability Assessment Protocol (HSAP); and the
- Hydropower Sustainability ESG Gap Analysis Tool (HESG).

The HGIIP act as the key document that defines the processes and outcomes for GIIP. Performance against the guidelines can be measured through two complementary tools: the HSAP and the HESG. HSAP measures performance compared to defined basic good practice and proven best practice, enabling projects to benchmark their performance in a comprehensive way. HESG can be used to check for gaps against good practice on relevant environmental, social and governance topics, and includes a gap management plan to improve processes and outcomes.

The HSAP for operation will be a useful too to apply in Kariba at some point and it is recommended to consider showing overall power plant performance against best international practices.

4.5.3.4 Southern African Power Pool (SAPP) Environmental and Social Impact Assessment Guidelines for Hydroelectric Projects and Transmission Infrastructure in the SAPP region

Southern Africa's power market is integrated through the SAPP. SAPP is a regional body formed in 1995 through a Southern African Development Community (SADC) treaty, with the objective of optimizing the use of available energy resources in the region and for SADC members to support one another during energy emergencies. SAPP has developed ESIA guidelines for transmission infrastructure, and hydropower. The purpose of these guidelines is to assist stakeholders in southern Africa participating in or undertaking ESIAs, recognizing the need for a more streamlined ESIA process and improved co-ordination amongst SAPP members.

Table 4.4 Application of the World Bank Safeguard Policies thorugh this ESIA and ESMP and current project compliance

Aspect	Legislation, Standard and/or Guideline Document	Applicability to the Kariba Dam Rehabilitation ESMP
WORLD BANK GROUP SAFEGUARD POLICIES		
General Environmental Management	World Bank Group Operational Policies – Operational Procedure (OP) 4.01: Environmental Assessment	This OP amongst other requirements requires that environmental assessments prevent, minimise, mitigate, or compensate for adverse environmental impacts and enhance positive impacts, and that it must include a process of mitigating and managing adverse environmental impacts throughout project implementation. The ESMP has been prepared to cover the activities associated with the Kariba Rehabilitation Works and includes measures associated with post-rehabilitation revegetation and rehabilitation. The purpose of this ESMP is to outline appropriate management strategies and actions in order to meet acceptable levels of environmental and social performance for the proposed Kariba Dam Rehabilitation Project.
Involuntary Resettlement	World Bank Group Operational Policies – Operational Procedure (OP) 4.12 Involuntary Resettlement	This OP aims to avoid involuntary resettlement to the extent feasible, or to minimise and mitigate its adverse social and economic impacts. KDRP is not expected to require any land acquisition leading to involuntary resettlement and/or restrictions of access to resources or livelihoods. However, a Resettlement Policy Framework has been prepared, to provide procedures for the management of land acquisition, in the event that any land acquisition is required for ancillary facilities.
Cultural Heritage	World Bank Group Operational Policies – Operational Procedure (OP) 4.11: Physical Cultural Resources	This OP promotes addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Any project involving significant excavations, demolition, movement of earth, flooding, or other environmental changes are to take cognisance of this OP. This OP has been considered in the Cultural Heritage Chance Finds Procedure(*Section 9.3.3.24*).
Dam Safety	World Bank Group Operational Policies – Operational Procedure (OP) 4.37: Safety of Dams	This OP requires that experienced and competent professionals design and supervise construction, and that the borrower adopts and implements dam safety measures through the project cycle.
International Waterways	World Bank Group Operational Policies – Operational Procedure (OP) 7.50: Projects on International Waterways	This OP applies to any river or body of surface water that flows through, two or more states, whether these states are World Bank members or not. OP 7.50 is triggered by the Kariba Rehabilitation Works Project and according to the ZRA notification has been made in accordance with provisions of Southern African Development Community (SADC) Protocol / Zambezi Watercourse Commission (ZAMCOM) Agreement and meeting the requirements of OP 7.50.
WORLD BANK GROUP ENVIRONMENTAL, HEALTH AND SAFETY (EHS) GUIDELINES		

Air Quality	IFC Environmental, Health and Safety (EHS) Guidelines - 1.1 Environmental Air Emissions and Ambient Air Quality	Includes the general principles of assessing impacts to air quality. In addition to the air quality standards set out, emission limits and guidelines for specific technologies and operations are also specified. The guidelines included in this EHS Guideline have been considered in the Air Quality and Dust Management Plan (*Section 9.3.3.11*).
Water	IFC Environmental, Health and Safety (EHS) Guidelines - 1.3 Wastewater and Ambient Water Quality	This EHS guideline specifies that discharges should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality. Water quality management measures (together with performance criteria) have been provided in the Surface Water Quality Management Plan (*Section 9.3.3.14*).
Noise	IFC Environmental, Health and Safety (EHS) Guidelines - 1.7 Noise	This is an internationally recognised guideline document containing information for the assessment and management of noise. It also presents noise level criterion values applicable to sites such as the proposed Project. The guidelines make reference to noise from facilities and stationary noise sources, and are commonly applied as design standards for industrial facilities, and whilst this may imply they relate to some threshold of noise effects in a general sense, the IFC has indicated that they are not directly applicable to transport or mobile noise sources. Measurements are to be taken at noise receptors located outside the project property boundary. The guidelines included in this EHS Guideline have been considered in the Noise and Vibration Management Plan (*Section 9.3.3.10*).
Community Health and Safety	IFC Environmental, Health and Safety (EHS) Guidelines – 3.1 to 3.7 Community Health and Safety	These EHS guidelines address aspects of project activities taking place outside of the traditional project boundaries and deal with communal issues (amongst others) around water quality and availability, traffic safety, transport of hazardous chemicals, disease prevention and emergency preparedness and response. The guidelines included in these EHS guidelines have been considered in the Community Health and Safety Plan (*Section 9.3.3.21*) and Emergency Response Plans (*Section 9.3.3.9*).
Construction	IFC Environmental, Health and Safety (EHS) Guidelines – 4.1 to 4.3Construction and Decommissioning	These EHS guidelines provides additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life-cycle, or due to expansion or modification of existing project facilities. The guidelines included in these EHS guidelines have been considered in the Community Health and Safety Plan (*Section 9.3.3.21*) and Worker Health and Safety Plan (*Section 9.3.3.4*).
AFRICAN DEVELOPMENT BANK GROUP'S INTEGRATED SAFEGUARD SYSTEM AND OPERATIONAL SAFEGUARDS		
Environmental and Social Assessment	African Development Bank Operational Safeguard (OS) 1 – Environmental and Social Assessment	This OS provides mainstream environmental and social considerations. An objective of this OS is to avoid or, if avoidance is not possible, minimise, mitigate and compensate for adverse impacts on the environment and on affected communities. The ESMP has been prepared to cover the activities associated with the Kariba Rehabilitation Works and includes measures associated with post-rehabilitation revegetation and rehabilitation. The purpose of this ESMP is to outline appropriate management strategies and actions in order to meet acceptable levels of environmental and social performance for the proposed Kariba Dam Rehabilitation Project.

Involuntary Resettlement	African Development Bank Operational Safeguard (OS) 2 – Involuntary resettlement: land acquisition, population displacement and compensation	This OS aims to facilitate the operationalization of the AfDB's 2003 Involuntary Resettlement Policy in the context of the requirements of OS1 and thereby mainstream resettlement considerations into Bank operations. KDRP is not expected to require any land acquisition leading to involuntary resettlement and/or restrictions of access to resources or livelihoods. However, a Resettlement Policy Framework has been prepared, to provide procedures for the management of land acquisition, in the event that any land acquisition is required for ancillary facilities.
Biodiversity	African Development Bank Operational Safeguard (OS) 3 – Biodiversity, Renewable Resources and Ecosystem Services	This OS outlines the requirements for borrowers or clients to (i) identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and (ii) observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. The protection of biodiversity (aquatic and terrestrial) has been considered in the Surface Water Quality Management Plan (*Section* 9.3.3.14), Aquatic Ecology Management Plan (*Section 9.3.3.16*), Terrestrial Ecology Management Plan (*Section 9.3.3.17*) and Revegetation and Rehabilitation Management Plan (*Section 9.3.3.18*). The management of surface water quality, aquatic environments (including aquatic vegetation) and terrestrial ecology (including fauna utilising wetland habits) is provided in *Sections, and* respectively
Pollution and Prevention Control	African Development Bank Operational Safeguard (OS) 4 – Pollution Prevention and Control, Hazardous Materials and Resource Efficiency	This OS outlines the main pollution prevention and control requirements for borrowers or clients to achieve high-quality environmental performance, and efficient and sustainable use of natural resources, over the life of a project. More specifically, the outlines requirements for borrowers to reduce pollutants resulting from the project—including hazardous and non-hazardous waste—so that they do not pose harmful risks to human health and the environment. The provisions included in this OS have been considered in the Noise and Vibration Management Plan (*Section 9.3.3.10*), Air Quality and Dust Management Plan (*Section 9.3.3.11*), Waste Management Plan (*Section 9.3.3.20*), Dangerous Good and Hazardous Substances Management Plan (9.3.3.12) and Emergency Response Plans (*Section 9.3.3.9*).
Labour Health and Safety	African Development Bank Operational Safeguard (OS) 5 – Labour Conditions, Health and Safety	This OS outlines the main requirements for borrowers or clients to protect the rights of workers and provide for their basic needs. The provisions included in this OS have been considered Worker Health and Safety Plan (*Section 9.3.3.4*).

5 Assessment of Alternatives

This Chapter compares the environmental and social issues and impacts of key alternatives considered for the Kariba Dam Rehabilitation Project. It first compares KDRP with the 'No Project' alternative, and secondly compares alternative approaches and siting within KDRP.

5.1 No Project Alternative

As described in Chapter 3, the rational for KDRP is the:

- Avoidance of catastrophic dam failure; and
- Maintenance of renewable generation capacity.

The No Project alternative, i.e. of not undertaking rehabilitation of the plunge pool and spillway of Kariba Dam, would mean that catastrophic dam failure would be a continuing and increasing risk in the future. The environmental and social risks and impacts of the No Project alternative are therefore very highly significant and exceed the impacts of KDRP by several orders of magnitude: catastrophic dam failure would release a flood event of up to 181 km^3 resulting in a highly significant loss of life of up to three million people, loss of livelihoods and impoverishment, destruction of infrastructure, destruction of natural habitats of significant biodiversity value, and present the risk of cascade failure of the downstream Cahora Bassa Dam.

In addition, in the No Project alternative, the risk of failure of Kariba Dam is a risk for the security of energy supply in the SADC region, as Kariba Dam and Cahora Bassa Dam account for 40% of the South African Power Pool (SAPP) generation capacity (excluding South Africa), and an even greater proportion of renewable capacity.

In the No Project scenario, ZRA would be forced to lower Kariba reservoir levels to lower the risk of collapse, resulting in lower renewable power generation, and specifically renewable storage capacity which could not be compensated by intermittent solar or wind alternatives. This would result in a higher greenhouse gas (GHG) emissions intensity (gCO_2e emitted per kWh generated).

A variation of the No Project scenario is to decommission the Kariba dam, thereby removing the risk of dam failure, and offering the opportunity to restore the natural flow and flooding regime to the downstream area which may have biodiversity benefits. However, the environmental and social impacts of decommissioning a large dam would be highly significant. They would be many times more significant in terms of waste volumes, hazardous wastes, sediment releases into the river, reduced water quality, and community safety risks, etc. than KDRP. Decommissioning would also remove a significant component of SADC's renewable generation capacity, and storage capacity, resulting in higher greenhouse gas (GHG) emissions. Developing alternative renewable projects would bring additional environmental and social impacts, fail to meet SADC's growing power demand, and still have higher GHG emissions due to a lack of storage capacity. A better alternative to decommissioning for biodiversity of the downstream river and floodplain would be to review and adjust flow releases from Kariba to restore some of the ecological functions of the pre-Kariba natural regime.

5.2 Reservoir Management Alternatives

As the rehabilitation works associated with the plunge pool are located right under the spillway gates, the reshaping works can only be done when the reservoir is not spilling. Normal spilling occurs from January to the end of August, leaving September to December for works. The non-spilling period could be increased by lowering the reservoir level and creating a buffer volume that can be used to capture and store an incoming flood.

Simulations were undertaken by Tractebel (2012) to find an optimized scenario that increases the non-spilling period, while limiting the reduction in power generation during and after works. Simulations were carried out with two purposes of:

- Protecting the active working area against floods during the whole period of works; and
- Lowering the risk of decreased lake levels during drier years and the subsequent impact on power generation.

5.2.1 Alternatives

Three alternative scenarios, based on a series of assumptions, were retained depending of the duration made available for works:

- Alternative Scenario 1: Allows 16 months for works, and the cofferdam and the excavation works can be done in one non-spilling period, allowing completion of works in the shortest time;
- Alternative Scenario 2: Allows 11 months for works, requiring the cofferdam to be partly constructed in advance and completed just before the excavation works;
- Alternative Scenario 3: Allows 7 months for works each year, and each year the cofferdam will be rapidly mobilized and demobilized and all materials and equipment will have to be dismantled, while limiting the loss of water for generation.

ZRA is able to forecast the start of the wet season by only a month in advance, and the start of the dry season by five months. As such, it is not possible to predict the inflows that will come into the Kariba reservoir during the whole period of works and to adapt the lake level accordingly. Accordingly, it is necessary to choose a protection level on an a priori criterion, without knowing the hydrological situation. The usual criterion for works protection is the 50 years return period flood; it is therefore recommended to follow this criterion.

5.2.2 Conclusion

The results of modelling of the alternatives are summarized in Table 5.1. Alternative Scenario 1 would result in a significant loss of power generation during rehabilitation works (22.2 km^3 of water would not run through the turbines). Alternative Scenario 3 is the technically preferred alternative as it would require the lowest reservoir level drawdown (1.9 m), which is beneficial to the hydropower facility for future power generation.

Table 5.1 Results of Reservoir Management Scenario Models

	Alternative Scenario 1	**Alternative Scenario 2**	**Alternative Scenario 3 (technically preferred)**
Period available for works (months) annually	16	11	7
Maximum possible loss of turbined water during a dry year (km^3)	22.2	0	0
Maximum reservoir level drawdown at the end of the simulation compared to normal operation (m)	5.20 (min op level)	5.20 (min op level)	1.90
Maximum reservoir level end of April the first year to be protected against a 50 years return period flood	477	481	484.15

The potential environmental and social impacts of Alternative 3 are compared with the shorter Alternatives 1 and 2 in Table 5.2. Alternative 3 has environmental advantages by enabling a less hurried schedule with a smaller workforce, and therefore safer conditions for workers and the environment, while also not altering the current flow regime. Impacts of materials use and waste are likely to be similar between the alternatives, whilst any greater community health risk and water quality risks presented by Alternative 3 can be minimized and mitigated with an

effective Worker Code of Conduct, traffic management, and the strict cleaning up of the plunge pool site at the end of each work season.

Table 5.2 Environmental and social issues of Alternatives 1, 2 and 3

Issue	Alternatives 1 and 2	Alternative 3 (technically preferred)
Environmental management	A schedule of completing the works in 1 period will be a more intense work period, meaning that environmental requirements are more likely to be overlooked, or work conducted in a hurried manner.	Completing the works through four seasons of 7 months provides for a less intense or hurried schedule.
Labour and working conditions	A shorter schedule may mean that OHS risks are more likely to be overlooked, or work conducted in a hurried manner. It may require a larger workforce, bringing greater risk of transmission of communicable diseases among the workforce, and requiring additional accommodation	Completing the works through four seasons of 7 months provides for a less hurried schedule, and a smaller workforce.
Water quality	The plunge pool will be flooded only once, after excavations works are complete.	Allowing the plunge pool to flood annually will increase the movement of sediment from the work site, and potentially hazardous substances.
Materials use and hazardous materials	The volume of materials and hazardous materials used by either alternative is likely to be similar.	
Wastes	The volume of wastes generated by either alternative is likely to be similar.	
Community health	A shorter overall schedule will shorten the length of time that the local community are exposed to health and safety risks, including traffic accidents, risks of communicable diseases introduced by the workforce, gender-based violence (GBV) and sexual harassment and exploitation (SEA).	A longer overall schedule will lengthen the time of this exposure. The annual demobilisation of employees will also maximise risks of GBV, SEA, and communicable disease transmission with the community.
Biodiversity - flow regime	The flow regime would be altered, but only temporarily, before reverting to the current operating regime. This may alter conditions for downstream biota.	The flow regime is not altered from the current regime which downstream biota have adapted to since Kariba's development.

5.3 Plunge Pool Cofferdam Alternatives

5.3.1 Alternatives

Three alternative cofferdam designs were considered:

- Alternative 1 – A cofferdam built from one bank to the other, i.e., continuously, built at the start of the works and demolished at the end. However, removal at the end of the works is costly and time-consuming.

- Alternative 2 – Installing a sheet pile cellular cofferdam at the beginning of the works and removing it at the end of each dry season. This is however not a possible option as the removal and reconstruction time is too long before and after each spilling episode.

- Alternative 3, the technically preferred alternative – Establishment of a cofferdam at the beginning of the works, removing it at the end of the dry season and then re-installing it at

the beginning of the following dry season. The cofferdam will comprise of 10 piers spaced 13 m apart, with nine stoplogs between.

A comparison of construction and mobilisation/demobilisation durations for each alternative is presented in Table 5.3.

Table 5.3 Cofferdam Alternatives Schedule

(in months)	**Construction (Previous year)**	**Mobilised**	**De-mobilised**
Alternative 1	0	5.5	1.5
Alternative 2	4	2	2
Alternative 3	4	1	0.5 - 1

Source: Tractebel Engineering France /Coyne et Bellier, 2014

5.3.2 Conclusion

Alternative 3 is technically preferred, as it can be quickly mobilised and de-mobilised once constructed, allowing for demobilization for the spilling season, over a three-phase work programme. Alternative 2 is not technical viable.

The environmental and social advantages of each alternative are similar to those for the reservoir management alternatives, discussed in Table 5.2. Alternative 3 has environmental advantages by enabling a less hurried schedule with a smaller workforce, and therefore safer conditions for workers and the environment, while also not altering the current flow regime. However, it creates the need for the removal and storage of the coffer dam stop logs at the end of each works season. This will create greater risks of surface water contamination during removal, and land use requirements during storage, but these can be managed effectively.

5.4 Slipway Site Alternatives

As described in Chapter 2, the slipway will allow assembly of the floating cofferdam on the reservoir bank above the water level and launching of the floating cofferdam onto the reservoir.

5.4.1 Alternatives

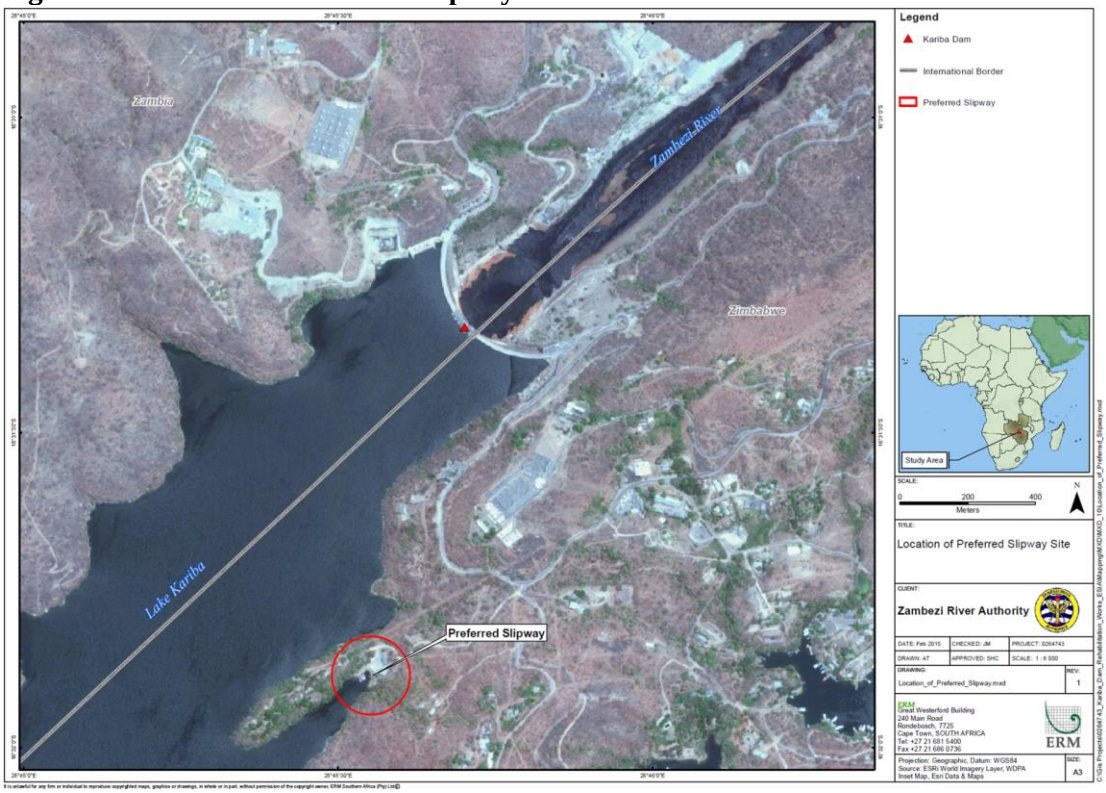
During feasibility studies, the possibility of using a dry-dock instead of a slipway was examined. However, due to the reservoir level fluctuation range, this solution was found not feasible. Two engineering site visits were undertaken in December 2011 and April 2012, resulting in the identification of three possible sites for the construction of a slipway. The key characteristics associated with these slipway sites are presented in Table 5.4.

Table 5.4 Characteristics of Identified Alternative Slipway Sites

Site	**Location**	**ZRA Property**	**Geology**	**Boat Distance to Spillway**
Alternative 1: DDF (**preferred site**)	16^0 31’ 52.98” S 28^0 45’ 33.41” E	No	Sandy/gravel	~2.0km
Alternative 2: Wild Site	16^0 31’ 51.51” S 28^0 45’ 28.49” E	No	Rock outcrop + sandy/gravel	~1.2km
Alternative 3: ZPC Sports and Social Club	16^0 32’ 5.58” S 28^0 46’ 6.95” E	No	Sandy/gravel	~6.8km

Source: Tractebel Engineering France /Coyne et Bellier, 2014

Figure 5.1 Location of Preferred Slipway Site



5.4.2 Conclusion

The technically preferred slipway site (Alternative 1: DDF Site) is located about 2.0 km southwest of the Kariba Dam wall, as shown in

Figure 5.1, and is currently owned and operated by the Zimbabwean District Development Fund (DDF). The site was selected as the preferred site for the following reasons:

- The site is flat and large enough to cater for the construction of the floating cofferdam;
- The site is a short boat distance (2.0 km) to the spillway;
- The site has an existing slipway which can be upgraded; and
- There is an existing road to the site.

Alternative 1: DDF Site will have lower environmental and social impacts than Alternatives 2 and 3 for the following reasons:

- Alternative 2: Wild Site requires the conversion of natural habitat for a new access road and shoreline for the slipway, and it will also require materials and present environmental and health and safety risks during construction; Alternative 1 does not require a new access road and is an upgrade of an existing slipway;
- Alternative 3: ZPC Sports and Social Club is 4.8 km more distant from the spillway, i.e. the site of works, than Alternative 1, thereby presenting greater environmental and safety risks during transport.

5.5 Waste Rock Dump Site Alternatives

5.5.1 Alternatives

Four alternative sites were considered for the disposal of waste rock from plunge pool excavations.

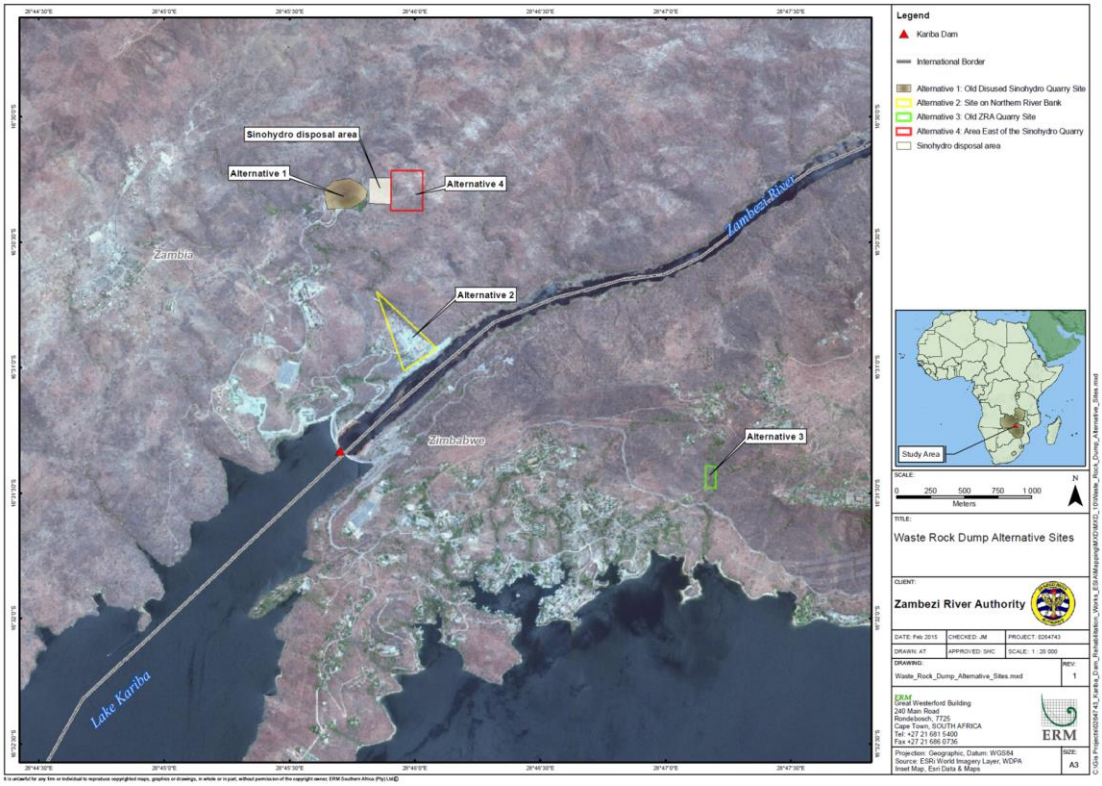
5.5.1.1 Alternative 1: Old Disused Sinohydro Quarry Site

The Sinohydro quarry site is located at GPS co-ordinates 16030’20.58”S 28045’45.34”E (depicted as “Sinohydro disposal area” in Figure 5.2). This area is the old quarry site used during the construction of the Kariba North Power Station, during the 1970s.

5.5.1.2 Alternative 2: Site on Northern River Bank

This site runs perpendicular to the Zambezi River about 1 km downstream of the Kariba Dam wall on the northern (Zambian) bank (depicted as “Alternative 2” in Figure 5.2). This valley has been disturbed through previous works associated with the Sinohydro Contractor for their activities related to the Kariba North Bank Extension Project.

Figure 5.2 Waste Rock Dump Alternative Sites



5.5.1.3 Alternative 3: Old ZRA Quarry Site

The old ZRA quarry is accessible through an asphalted road leading to the Caribbea Bay Resort in Zimbabwe (depicted as "Alternative 3" in Figure 5.2). On the left hand side of the road, a rough track of about 200 m in length leads to the old quarry site.

5.5.1.4 Alternative 4: Area East of the Sinohydro Quarry Site

This site alternative ("Alternative 4" in Figure 5.2) is accessible by an unpaved road and the estimated distance from the plunge pool is about 2.5 km. The site is located immediately east of the existing disused Sinohydro quarry at GPS co-ordinates 16°30'20.30"S 28°45'51.11"E, at elevation 593 masl in an area of typical escarpment woodland. The area is forested and rather flat over some hundreds of meters towards the east and is currently owned by the Zambian Government.

5.5.2 Conclusion

All of Alternatives 1 to 3 are previously used, either as quarries or for the North Bank Extension Project, and therefore have lower environmental impacts than Alternative 4, which would result in the destruction of natural habitat.

Alternative 1 is preferred to Alternatives 2 and 3 because the volume of the quarry at Alternative 1 is large enough to accommodate almost all the excavation material, meaning that no other additional sites will be required. At Alternative 2, large volumes of mucking/waste rock are already stocked at the toe of the slope forming a platform, and a batching plant is also in operation, so the site is already largely occupied. Alternative 3 is
too small to receive the volume of waste rock.

Alternatives 1 and 3 are also preferred to Alternatives 2 and 4 as they will have no significant visual impacts.

Alternative 2 is closest to the plunge pool, lowering potential traffic impacts, Alternatives 1 and 4 are further, while Alternative 4 is most distant (approximately 5 km from the Project site).

- Environmentally, the preferred order of the alternatives assessed is, from most preferred to least preferred, as follows:
- Alternative 1: Old Disused Sinohydro Quarry Site
- Alternative 3: Old ZRA Quarry Site
- Alternative 4: Area East of the Sinohydro Quarry Site
- Alternative 2: Site on Northern River Bank.

Alternative 1 is the preferred alternative as the Sinohydro quarry is the most suitable site for dumped waste rock, and it will have the least visual and terrestrial ecology impacts. There is no human activity in the area.

5.6 Alternatives Blasting Technologies Considered

A critical aspect that needed to be considered as part of the Project design is the explosive material to be used (Tractebel 2012, Plunge Pool Reshaping Detailed Design Report). Generally, for rock extraction inside large open pits, bulk explosive ANFO (ammo-nitrate fuel oil) is used because it is a cost-effective option and has sufficient blasting strength. However, the water sensitivity of ANFO is very high, which ultimately means that the risk of frequent misfires, as a result of water seepages, is high, with significant OHS and environmental risks.

As a result, a more effective solution in using modern adequate explosives materials (such as surface bulk emulsions) was deemed as the preferred blasting technique. These explosives have a good water resistance and have a velocity of detonation (strength) better than that of ANFO. They are presently commonly used for very large excavation works, for example the third set of locks project of the Panama Canal. Moreover, these surface bulk emulsions are locally available.

Accordingly, the preferred order of the alternatives assessed for blasting is as follows:

- Modern adequate explosives materials (such as surface bulk emulsions) – most preferred.
- Bulk explosive ANFO (ammo-nitrate fuel oil) – least preferred.

6 Public Participation and Consultation

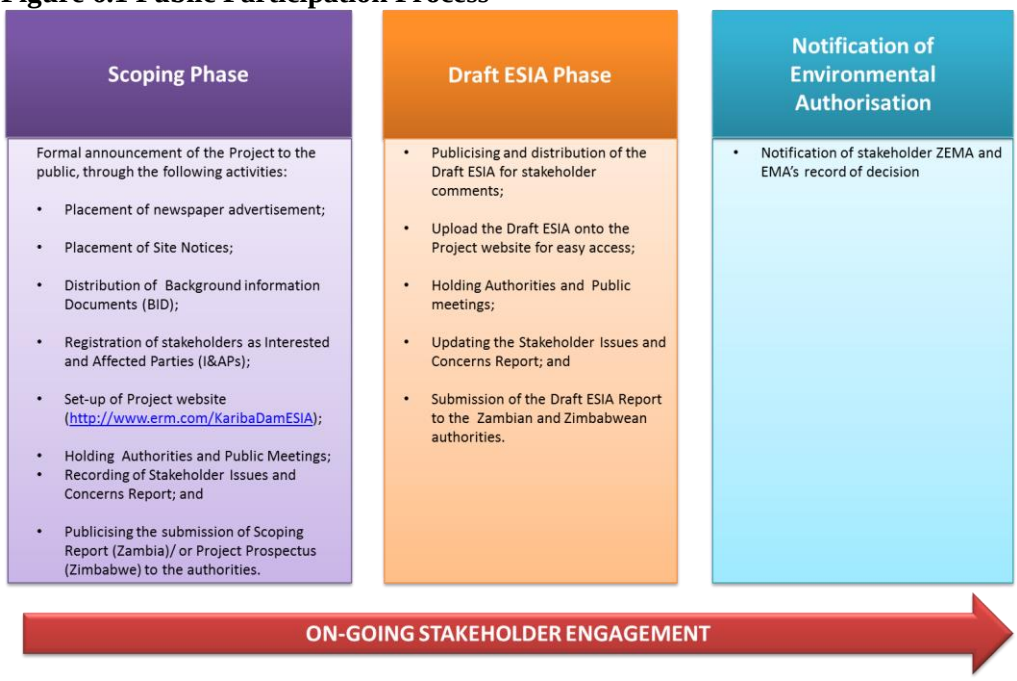
This Chapter describes the process and findings of public participation and consultation during the preparation of the original ESIA/ESMP. It presents the key issues and concerns raised during consultation events. Most of these meetings occurred in 2014 and 2015.

The Appendix B "Consultation Materials" includes evidence of the materials used during consultation for the ESIA, including: Background Information Documents (BIDs); site notices; proof of site notices; proof of advertisements; project presentation; issues and concerns log; attendance registers; photolog; stakeholder database; record of environmental and social impact assessment -engagements; non-technical summaries (English, Shona, and Tonga); meeting attendance registers; pictures taken at meetings; updated issues log; comment sheets; and notification of additional stakeholders.

6.1 Public Participation Process

The public participation process was designed to comply with Zimbabwean and Zambian regulations and requirements; as well as with international requirements such as the International Finance Corporation (IFC), the World Bank and African Development Bank (AfDB) requirements. The IFC Good Practice Handbook was followed to ensure free, prior and informed participation (IFC, 2007, Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets). The process is shown in Figure 6.1.

Figure 6.1 Public Participation Process



6.1.1 Stakeholder Identification

Stakeholder identification took place through a social scan followed by stakeholder recording and categorization. During the stakeholder identification, individuals, groups and local communities that may be interested and affected by the Project, as well as the broader stakeholders who may be able to influence the outcome of the Project, were identified. Elected and non-elected community representatives and leaders were also identified. Care was taken to consult with vulnerable groups such as the elderly and women during this process.

At present, there are no Chiefs within the Project affected area. I**n Zimbabwe the complete Project Area is owned by the State and managed by the Zimbabwe National Parks,** and is therefore not legally under the any Chief's jurisdiction.
However, this said, the following Chiefs are in close proximity to the proposed Kariba Dam Rehabilitation Project:

- Chief Mola;
- Chief Negande;
- Chief Musambakuruma;
- Chief Nebiri; and
- Chief Nyamhunga

These Chiefs were provided with a copy of the Non-technical Summary and a cover letter describing the Project and ESIA process being followed.

The ESIA stakeholder database consisted of approximately 600 stakeholders representing the different sectors of society. The stakeholder contact details were captured on an electronic database and categorized. Each stakeholder's attendance of consultation activities were recorded. Key stakeholder groups are listed in Box 6.1 below.

Box 6.1 Key Stakeholder Categories

Stakeholders were identified in the following categories.

- **National Government:** These stakeholders are of primary national importance to the Project and the ESIA process.
- **Provincial/Regional/District Government:** These stakeholders are of district, regional and local importance to the Project.
- **Directly Affected Communities:** Local level communities will be directly impacted (positive and/or negative) by the Project.
- **Academic Institutions:** These include universities, colleges and research organisations which may have an interest in the Project and may be able to provide useful baseline information related to the culture, history, or environment of the Project area.
- **Other Interest Groups:** These comprise, for example, the media (local, national and international) and political parties/groups as well as religious organisations.
- **Economically-interested Parties:** Organisations, businesses and individuals with a direct commercial interest in the project e.g. selling their services or providing supplies to the Project.

6.1.2 Overview of Public Participation during the Scoping Phase

During the Scoping Phase, stakeholder consultations were focused on achieving the following outcomes:

- To meet key stakeholders and introduce them to the Project and ESIA process;
- To identify the issues, needs and expectations of the interested and affected stakeholders;
- To provide opportunity for stakeholders to contribute to the debate with their local knowledge and experience;
- To refine the terms of reference of specialist work on the basis of stakeholder comment received;
- To gather issues of concern and through this identify a list of potential impacts;
- To gather primary data informing the social impact assessment;
- To verify that stakeholders' issues and concerns have been captured; and
- To assist ZRA in strengthening its relationships with existing and future stakeholders.

During the Scoping Phase, the meeting Attendance Registers show that 580 people attended public meetings. This number does not include engagements through ad hoc face-to-face

meetings, focus group discussions and people who took BIDs without completing the attendance register.

6.1.3 Consultation Activities

The ESIA public participation team announced the opportunity to participate in the Project widely and via a range of communication methods as described in Table 6.1 below. Communication with stakeholders (including consultation materials) were usually undertaken in three languages, namely English, Shona (Zimbabwe), and Tonga (and sometimes in Bemba or Nyanja) in Zambia. Local facilitators were used during all community meetings. A formal Project background and purpose presentation was given at each public and authorities' meeting. Where electricity was not available; posters were used to illustrate Project details.

A total of 1,500 BIDs were distributed (of which 1,000 in English, 250 in Shona and 250 in Tonga). Various size site notices were posted in public places in Zambia (Micho compound, Siavonga Fish market, Siavonga Market and Bus Rank, and Siavonga District Hospital) and Zimbabwe (at Marineland Harbour, Mahombekombe, Kariba Heights, and Nyamunga).

A summary of all public participation activities undertaken is provided below in Table 6.2, a map of their locations in Figure 6.2 and a selection of pictures taken in Figure 6.3.

Figure 6.2 Map Showing the Location of Site Notices and Meeting Venues

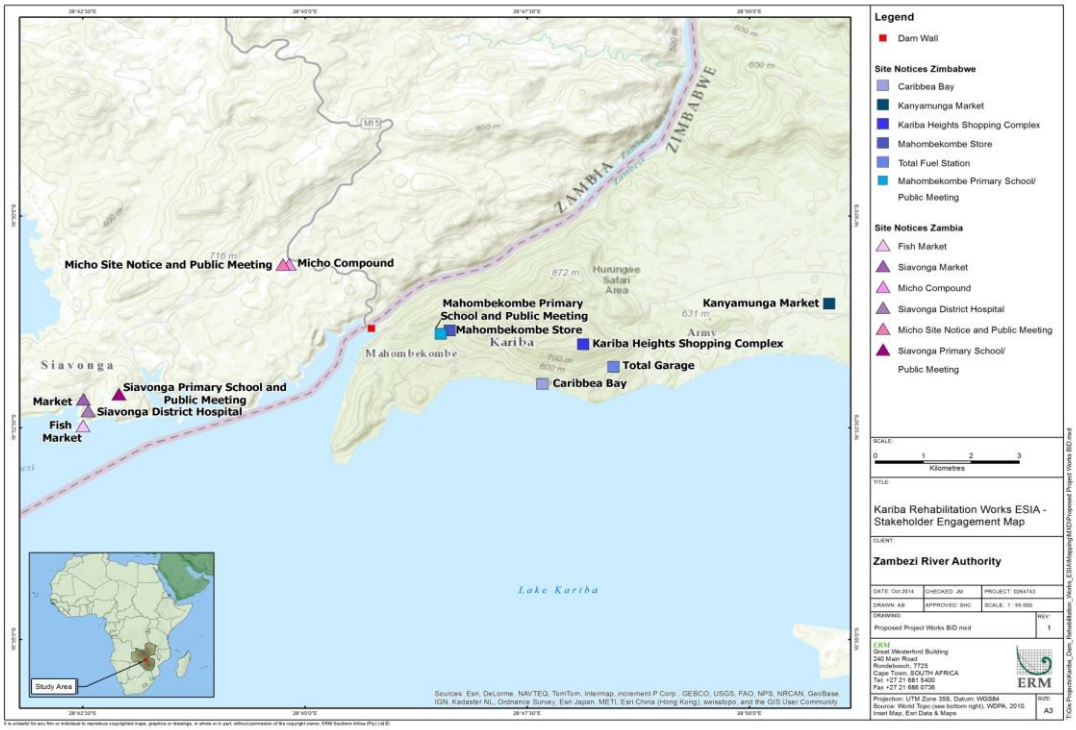


Table 6.1 Communication Methods for Engagement

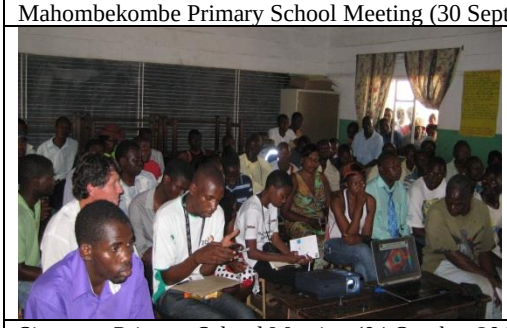
Communication Methods	Objective(s)	Activities
Dedicated Project webpage	• To establish a dedicated ESIA webpage on the ERM website, designed to engage with all affected and interested stakeholders with internet access. • To provide electronic links to available documents such as the Scoping and ESIA Reports and supporting materials, as it becomes available. • To provide a point of contact to stakeholders where they are able to provide comments and ask questions regarding the Project.	Establishment of webpage with address: http://www.erm.com/KaribaDamESIA
Media (newspaper); Site Notices; and Radio Announcements.	• To publish and distribute announcements regarding the proposed Project and ESIA process. • To encourage stakeholders to register as interested and affected parties for the ESIA Process. • To inform stakeholders of scheduled meetings or the availability of Project information.	Newspaper advertisements were placed in: • The Herald in Zimbabwe Published 03/10/2014 in English • The Daily Mail in Zambia Published 02/10/2014 in English
Social Media	• To notify stakeholders of public meetings, applicable dates, venues and times. (Only operational in Zimbabwe.)	Use of Facebook, *WhatsApp* and bulk SMSs (? Whats app did not exist at this time, I think check)
Site notices	• To notify people of the project.	Approximately 20 site notices (A2 and A3 size) were erected in public places
Background Information Document (BID)	• To distribute the Project Background Information Document as widely as possible. • To provide stakeholders with Project information and an indication of the ESIA process to follow.	Printing and distribution of 1,500 BIDs. • 1,000 English BIDs; • 250 Tonga BIDs; and • 250 Shona BIDs.
Face to face meetings and other social engagement tools: • Authorities' meetings • Public meetings • Focus Groups Discussions (FGDs) • Participatory Rural Appraisal (PRA) • Livelihoods Survey • Key Informant Interviews (KII)	• To communicate information about the Project and ESIA process and reinforce two-way communication. • These methods have been employed as part of the socio-economic study of the ESIA.	• 5 x National Government Stakeholders • 4 x Provincial Government Stakeholders • 2 x District Government Stakeholders • 3 x Public Meetings • Multiple face-to-face meetings, FGDs and KII Meetings • 40 x Livelihoods Survey Interviews

Table 6.2 Consultation Activities

Date	Venue	Communication Method	Stakeholder
Zambia			
24-Sep-14	Various venues	Face-to-face meetings. Focus Group Discussions. Livelihoods Surveys.	Fisheries Department. Fish mongers (women). General Traders.
01-Oct-14	Various venues	Face-to-face meetings. Focus Group Discussions. Livelihoods Surveys.	General Traders. Fishermen.
02-Oct-14	Lake Kariba Inn	Authorities' Meetings. Distribution of BIDs.	District Officials
03-Oct-14	Micho Compound	Face-to-face meetings. Focus Group Discussions. Livelihoods Surveys.	District Health and Education officials. Commercial Fishers (Lake Harvest). Artisanal Fishers.
04-Oct-14	Siavonga Primary School	Public Meetings. Distribution of BIDs.	General Public
	Micho Compound		
06-Oct-14	Provincial Government Offices	Face-to-face meetings. Distribution of BIDs.	Provincial Planners
07-Oct-14	National Department of Water and Energy	Authorities' Meetings. Distribution of BIDs.	National Department of Energy Officials. National Department of Water Officials.
Zimbabwe			
26-Sep-14	Various venues	Face-to-face meetings. Distribution of BIDs.	Lake Kariba Stakeholders.
26-Sep-14	Lake Kariba Fisheries Research Institute Office	Face-to-face meetings. Distribution of BIDs.	Researchers and Manager.
	Zimbabwe National Parks – Kariba Office	Face-to-face meetings. Distribution of BIDs.	Parks Officials.
29-Sep-14	Various venues	Face-to-face meetings. Focus Group Discussions. Livelihoods Surveys. Distribution of BIDs.	Fishermen. Tourism Operators. CBOs. Traders. Women.
30-Sep-14	Mahombekombe Primary School	Public Meeting. Distribution of BIDs.	General Public.
01-Oct-14	ZTA	Face-to-face meetings. Focus Group Discussions. Livelihoods Surveys. Distribution of BIDs.	Traders. ZTA officials.
	Provincial Government Office	Face-to-face meetings. Distribution of BIDs.	National Parks and Wildlife Authority. Provincial Administrator.
02-Oct-14	Kariba District Office	Authorities' Meetings. Distribution of BIDs.	District Heads of Departments.
08-Oct-14	Zimbabwean Commissariat Offices	Interest Group Meetings. Distribution of BIDs.	Zimbabwean Commissariat Directors.
15-Oct-14	National Department of Water and Energy	Authorities' Meetings. Distribution of BIDs.	National Department of Water and Energy.

Figure 6.3 Selected Consultation Events Held

Mahombekombe Primary School Meeting (30 September 2014)



Siavonga Primary School Meeting (04 October 2014):

Micho Compound Meeting (04 October 2014):

Site notice at Total Garage-Kariba:

Site notice at Micho Compound Market

6.2 Issues and Concerns Raised

The issues and concerns raised by stakeholders were captured in an Issues Log, which was used to inform the social baseline study, as well as the impact identification and assessment process.

Issues and concerns related to employment opportunities and working conditions dominated the consultation process (25% of the issues logged). This was followed by concerns related to the plunge pool rehabilitation works (20%), safety concerns about the potential collapse of the Kariba Dam and the availability of the emergency response procedures for the downstream population (16%). The issues and concerns raised are summarised in Figure 7.1 and further analysed in Table 7.1 below.

Figure 6.4 Raised Issues and Concerns per Broad Category in Percentages

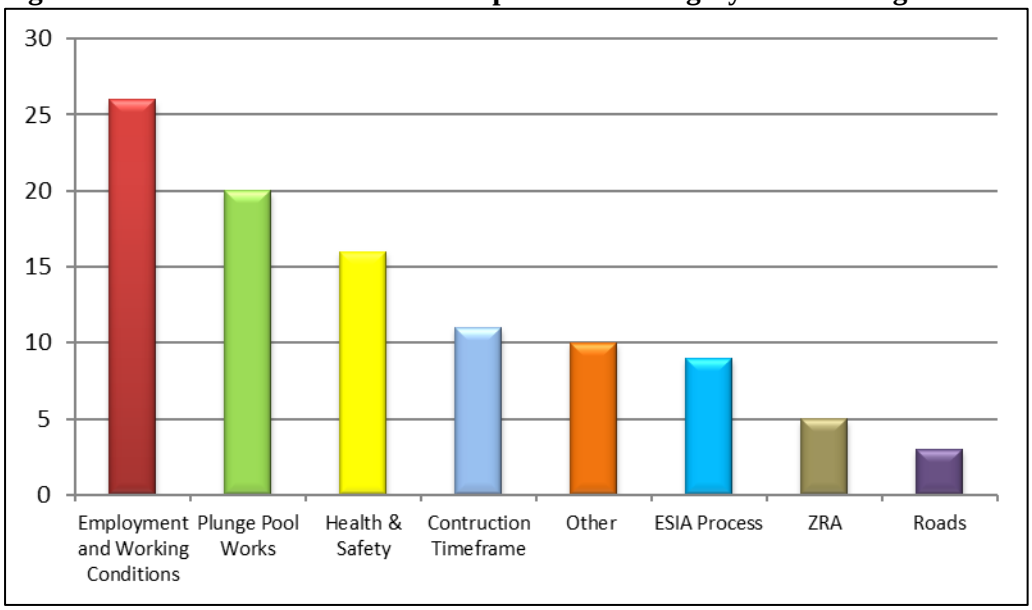


Table 6.3 Summary Analysis of Stakeholder Issues and Concerns

Main Category	Sub-Category	Description
Employment and Working Conditions	Employment opportunities	• There should be equal distribution of employment opportunities between the two affected countries. • Indicate the number and type of employment opportunities to be created as part of the works, both temporary and permanent. • Ensure employment of local people by contractors rather than employees from outside the immediate project area. • Male and female job applicants should be considered equally and women should not be discriminated against based on their sex. • Request to provide advanced/early readiness training to allow local employees to secure skilled positions in addition to unskilled positions.
	Employment procedures	• Request that recruitment should be done through traditional leaders. • Request that recruitment should not be done through traditional leaders due to nepotism; ZRA's "raffle" employment method is unjust. • The workforce representatives will need to be elected to represent the interests of the workforce and to ensure that the contractors do not abuse the local workforce. • The nature of the proposed project works is dangerous. Therefore the ZRA will need to make sure that all employers have workforce compensation and insurance in place in case of an injury.
	Contractors and working conditions	• Concerns raised over the treatment of workers by Chinese contactors particularly.

Main Category	Sub-Category	Description
	Contractors and wages	• Concerns raised over differences in remuneration for similar work between workers employed by ZRA and workers employed by ZRA's contractors.
Refurbishment of Plunge Pools	Plunge pool construction works	• Request to understand plunge pool design alternatives. • Request behind the logic of commencing with plunge pool refurbishment rather than spillway refurbishment. • Effectiveness of the plunge pool monitoring activities currently used. • Query on how and if plunge pool refurbishment will impact on power generation. • Query on what anticipated impacts of dam spilling during the construction of the plunge pool would be. • Queries on what the likely impacts of draining the water out of the plunge pool would be. • The plunge pool has been there for more than 50 years If ZRA drains plunge pool it might have adverse effects on the surrounding area. Has detailed research been done on the effects of the drainage of the plunge pool? • Recommendation was made that the design engineers need to consider the following issues; the drainage of the plunge pool will create instability in the surrounding area, due to over time, water from the plunge pool has seeped into the cracks of the riverbed rock and has created a "cushion". When water is drained, the vacancies between the rocks might cause the collapse of the bedrock. • It is believed that the water in the plunge pool stabilises the dam and therefor people are concerned about the stability of the dam during construction. • It was recommended that ZRA must appoint engineers and a workforce that has experience working in wet conditions such as Konkola Mine in Zambia. • What impacts is the construction of the cofferdam likely to have further downstream.
	Excavated rock dump	• Anticipated impacts of dumping excavated rock from the plunge pool at identified quarry site. • Possible donation of waste rock to local government for use on small project.
Health and Safety	Safety of Embankment / Dam	• ZRA should open up the sluice gates to release the pressure off the dam/embankment. • Queried whether the proposed construction activities will not weaken the dam further? • Will there be a disaster (such as dam collapse) if water is not released from the dam soon? • Is it true the dam will collapse as is reported in the media? • Will the blasting required to refurbish the plunge pool, affect the integrity of the embankment/dam?
	Cracking of the embankment /dam	• Is it true that the embankment/dam is cracked?
	Emergency response procedures	• What emergency measures are in place to ensure the safety of downstream residents in case of a disastrous event? • Request for ZRA to install early warning systems downstream in case of an emergency. • Is there an emergency response plan in place in case the dam collapses?
	Movement of southern slope	• Care should be taken when blasting in the plunge pool area as the southern slope is moving towards the river.

Main Category	Sub-Category	Description
Construction Timeframe	Construction timeframe	• Expected duration of construction activities for the plunge pool and the sluice gates. • Expected start date of construction. • What will happen to the workforce during the months when no construction will take place? • Will the workforce receive payment during the months with no construction activities?
General	General issues	• Consultation with the local population should be handled with great sensitivity due to the historical issues linked to the historical resettlement issues from the 1950s. • Will the proposed project include the construction of a new bridge or dam/embankment? • Reminder that all levels of government and local, regional and national should be provided with project information. • Query whether there are other dams globally that have the same technical challenges as Kariba?
ESIA Process	Process issues	• Request for stakeholder feedback sessions to be held after conducting the scoping meetings. • Planned completion date of the ESIA. • Queries on what the purpose of the scoping meetings is. • Requested clarity on the extent of the geographical area in which project consultations will take place.
	Specialist Studies	• Questioned the expected impacts on fish resources upstream of the embankment due to the construction activities. • Requested that the Aquatic Ecology report should be made available when complete.
ZRA	Provision of Water	• Stated that ZRA made a historical undertaking to provide the population around the Kariba Dam with water. This has not happened.
	Inaccessibility of ZRA to Stakeholders	• ZRA does not have an office in Siavonga, only in Lusaka and Kariba. Thus to be able to apply for employment, people have to incur expenses to cross the border. ZRA should consider providing an employment application facility on both sides of the river. • It is alleged that ZRA is not very successful in communicating project information to the local communities.
	Inadequate Feedback	• Alleged that ZRA is not sharing project information with local people and that they have to get access to project information via the media.
Roads	Construction of access roads	• Will any access roads be constructed and or rehabilitated on the Zimbabwean side of the site? • Will the road between Makuti and Kariba be used to transport construction material and plant? The road is already not coping with its current traffic load.

6.3 ESIA Disclosure

A series of meetings were held to disclose the original ESIA and ESMP during the week beginning 2nd March 2015.

The objective of this phase of engagement was to:

- Present the key social and environmental impacts identified in the ESIA report, and proposed mitigation;
- Involve stakeholders in assessing the efficacy and appropriateness of the proposed mitigation measures;
- Capture stakeholder concerns and opinions on the identified impacts; and
- Identify revisions or additions to the ESIA report where necessary.

The process targeted national, provincial, and district level government officials, local communities, and other interested parties as described in Table 6.4. The ESIA engagement process included:

- Public meetings (for the local communities, general public as well as interest groups/ or people);
- Workshops with the national, provincial and district level government officials;
- Formal PowerPoint Presentation (that were presented to stakeholders at the meetings);
- Updating of the existing Issues and Concerns Log (to capture and respond to stakeholder issues and comments); and
- The use of an ESIA Non-Technical Summary (NTS) in English, Shona and Tonga.

Table 6.4 ESIA Disclosure Schedule

Day	Date	Activity
ZAMBIA		
Tuesday	03-Mar	Meeting with National Government Stakeholders
Wednesday	04-Mar	Meeting: Southern Provincial Govt. Stakeholders
Thursday	05-Mar	Meeting: Siavonga District Officials
Friday	06-Mar	Meeting: Micho Community
Saturday	07-Mar	Meeting: Siavonga Town Community
Sunday	08-Mar	Meeting: Downstream Users (TBC)
ZIMBABWE		
Tuesday	03-Mar	Meeting: National Government Stakeholders
Wednesday	04-Mar	Meeting: M. West Provincial Government Stakeholders
Thursday	05-Mar	Meeting: Kariba Dam Steering Committee
Friday	06-Mar	Meeting: Mahombekombe Community
Saturday	07-Mar	Meeting: Kariba Heights Community
Sunday	08-Mar	Meeting: Downstream Users (TBC)

In addition to the above, ERM consulted with five Chiefs in Zimbabwe, whom the EMA believed needed to be included as stakeholders in the ESIA and associated Public Participation Process. These Chiefs included His Royal Highnesses Chief Mola, Chief Negande, Chief Musambakuruma, Chief Nebiri, and Chief Nyamhunga. ERM contacted the Assistant District Authority (ADA) in Kariba District to assist with the distribution of a copy of the Non-technical Summary (NTS) and personalised letter to the above mentioned Chiefs. The NTS' and personalized letters were couriered to the ADA office on the 21st April 2015, which was acknowledged as being received on the 20 May 2015. The personalized letters detailed the proposed Project and associated ESIA process being undertaken. Moreover, the letters presented and explained the purpose and layout of the NTS and provided the contact details for where comments regarding the ESIA process or Project proposed could be directed to. The ADA then distributed the NTS' and associated letters at the General District Authorities meeting in May 2015.

In addition to the above, EMA requested that ERM consult with the following National Government Ministries in Zimbabwe: Ministry of Finance and Economic Development; Ministry of Home Affairs; Ministry of Transport and Infrastructural Development; Ministry of Mines and Mining Development; Ministry of Tourism and Hospitality Industry; Traffic Safety Council of Zimbabwe; UNESCO; and Zimbabwe Tourism Authority. These Ministries were notified of the proposed Project and associated ESIA process being undertaken via email and fax communication on 09 April 2015. As with the Chiefs, Ministries received a copy of the NTS and personalized letters explaining the Project and process being undertaken.

PUBLIC DISCLOSURE: Per OP 4.01 requirements, the original and revised ESIA-ESMP and any other safeguard documents of the Kariba Dam Rehabilitation works have been or will be-published in the ZRA website:

http://www.zambezira.org/kdrp/media/project-updates/environmental-and-social-management-plan-kariba-dam-rehabilitation-project

6.4 Ongoing Consultation During Construction To-date

Consultation with the community and the stakeholders has been ongoing during the construction stage to date but with some limitations due to the lack of communication experts. ZRA has hired recently communication staff that will implement a communication plan to strengthen communication and dissemination of the project progress and maintain transparency channels with the affected communities from the dam, the new affected communities from this works and interested stakeholders.

Radio Programs with the two local radio stations on either side of the KDRP (Zambia and Zimbabwe have been conducted and will continue for all remaining period of the project). These focused on updating the communities and stakeholders on the Project progress and related issues of stakeholder interest.

Furthermore, the KDRP Grievance Redress Mechanism system has been instrumental in community engagement during the construction phase of KDRP. The system provides a platform for stakeholders to express their grievances opinions and commendations because of the KDRP. Three official meetings have been held to date with the community representatives and with the appointed GRM committee members.

Technical and professional consultation is another component enhanced through the biannual Joint Missions held by ZRA, Financiers, NAO, Consultants, Contractors, etc.

6.5 Disclosure of the Updated ESIA and ESMP

This updated ESIA and ESMP are disclosed on the World Bank website and infoshop as well as onto the Zambezi River Authority Website.

7 Baseline Information

The Baseline information was gathered depending of the location of civil works and the area of influence of the project upon natural resources, people, public or private infrastructure, etc. Below the definitions included in the original ESIA-ESMP of Kariba dam Rehabilitation project.

Area of Influence (AoI) can be defined as an area likely to be impacted by the Project activities during execution of rehabilitation works. The effects of these can be positive or negative, short or long term or permanent, as well as direct, induced and in-direct.

The AoI is described as:

- The primary Project site(s) and related facilities that the Project Proponent develops or controls (such as temporary secondary roads, disposal areas, and construction camps) and the additional areas in which aspects of the environment could conceivably experience significant impacts.
- Associated facilities that are not developed and funded as part of the Project but are essential for the Project and without which the Project cannot proceed, and the associated additional areas in which aspects of the environment could conceivably experience significant impacts.
- Areas potentially affected by cumulative impacts resulting from other developments known at the time of the impact assessment, further planned phases of the Project or any other existing circumstances.
- Areas potentially affected by impacts from predictable (but unplanned) developments as a result of the Project (i.e. induced activities), occurring at a later stage or at a different location.

7.1 Introduction

This following Chapter is copy from the original ESIA and describes the physical, biological and social characteristics of the environment in 2014 and 2015. The majority of the baseline information comes from the original ESIA-ESMP of Kariba dam rehabilitation project -only in a few areas where ZRA had available new data (geology) has been included.

The description of the baseline aims at providing sufficient detail to meet the following objectives:

- Identify the key conditions and sensitivities in areas potentially affected by the Project;
- Provide a basis for extrapolation of the current situation, and development of future scenarios without the implementation of the Project;
- Provide data to aid the prediction and evaluation of possible impacts of the Project;
- Understand stakeholder concerns, perceptions and expectations regarding the Project;
- Allow the Project to develop appropriate mitigation measures later in the ESIA process; and
- Provide a benchmark to assess future changes and to assess the effectiveness of mitigation measures.

The description of the baseline environment therefore provides a description of the current or status quo environment against which social and environmental impacts of the Project can be assessed and future changes monitored. The information presented in this Chapter was collected from desktop studies and supplemented with site visits to the Project Area of Influence. The objective of primary data is to address data gaps identified during the secondary data collection process.

The chapter is organized as follows:

- Physical Environment:
  - Physiography;
  - Geology;
  - Soils;
  - Air and Noise;
  - Climate; and
  - Hydrology.

- Biological Environment:
  - Terrestrial Flora;
  - Terrestrial Fauna;
  - Levels of Habitat Modification;
  - Aquatic Ecology; and
  - Protected Areas.

- Social Environment:
  - Social Area of Influence;
  - Governance and Administrative Structure of Zambia and Zimbabwe;
  - Land Tenure and Land Use;
  - Demographic Profile;
  - Vulnerable Groups;
  - Education;
  - Health;
  - Economy and Livelihoods;
  - Employment Levels;
  - Public Infrastructure and Services;
  - Energy; and
  - Cultural Heritage.

7.2 Physical Environment

7.2.1 Physiography

The Zambezi River Basin is located in Southern Africa and drains an area of almost 1.4 million square kilometres extending across eight countries; Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe (Figure 7.1). It covers almost all of the territory of Malawi, over 70 percent of Zambia and almost half of Zimbabwe and is the fourth-largest river basin in Africa.

The river rises at an elevation of over 1,500 metres above sea level in the high plateau between Zambia and the Democratic Republic of Congo (DRC), and flows for a distance of some 2,700 km to where it enters the Indian Ocean about 250 km north of Beira in Mozambique.

The middle Zambezi flows through a series of narrow gorges and fault-defined valleys and has been extensively modified by two hydroelectric dams, namely Kariba and Cahora Bassa. Together, these two dams have impounded more than half of the length of the main river. Floodplains are limited, there are no extensive wetlands, and the ecology of the river is now dominated by the regulating effects of the dams (Timberlake, 1997). At present, the generation of hydropower and agricultural activities are the major water users in the basin and it is believed that agriculture could become increasingly important in terms of water consumption in the future (Beck, 2010).

The Zambezi annual runoff at Kariba comes from a 664,000 km² catchment area. Upper catchment, upstream of Victoria Falls, accounts for 76 percent of it. Lower catchment, between Victoria Falls and Kariba dam, has a more irregular run-off pattern. The cumulative net inflows over the last 50 years have varied over a wide range of 15 to 94 km^3 with an average of 43 km^3 per year. Evaporation from the 5000 km² reservoir surface is estimated at around 8 km^3 per year.

7.2.2 Geology

The Zambezi escarpment is an extension of the Rift Valley and the present day Kariba Dam. The Kariba Dam covers the section of the Rift Valley known as the Gwembe Trough. The steep sided escarpment is composed of Pre Cambrian gneisses, paragneisses and schizts, rising over 500 m above the floor of the valley. The geology of the flat valley floor is predominantly Karroo sediments (sandstones, grits, and mudstones) with isolated patches of basalt downstream of Chirundu. Lining the Zambezi River are alluvial deposits, and further inland (where some of the larger tributaries exit the escarpment) there are alluvial fans and superficial (colluvial) deposits.

The Kariba Gorge is a narrow (200 m wide), straight, steep sided gorge of approximately 22 km length. At a point known as Nyamuomba, the gorge opens out into the valley floor and the Zambezi River changes from a fast flowing river into a wider, slower one with sandy islands and braided channels. Downstream of Chirundu the Zambezi River widens further and enters the flood plain area of Mana Pools.

Directly downstream of the Kariba Dam, the north and the south bank of the Zambezi River are dominated by sheared and weathered metasedimentary rocks of the Katanga Supergroup. However, the south bank (on the Zimbabwean side) is overlain by steeply dipping micaceous quartzites whose structural integrity deteriorates downstream (Porada & Berhorst, 2000; Knill & Jones, 1965). The main foliation and lithological trends associated with the Kariba Dam wall are orientated north-west to south-east (Knill & Jones, 1965). Approximately 20 km downstream of the Kariba Dam wall, the river broadens out as the course of the Zambezi River cuts through the rocks of the Katanga Supergroup, and floods out into the downward faulted graben of the Neoproterozoic Zambezi Belt (Interconsult, 1985), which consists of strongly deformed and resistant basement gabbro-anorthosite intruded gneisses.

Figure 7.1 Zambezi River Basin

Source: Zambezi River Basin: Atlas of the Changing Environment (SARDC, 2012)

The Zambezi River in the area of the plunge pool is lithologically constituted by good quality biotite gneiss. Ground investigations of a core drilled down to 72 m in the middle on the riverbed, downstream of the actual plunge pool scour hole, appears constituted by generally good quality biotite gneiss. This area is quite heterogeneous lithologically in the sense that it has massive passes of quartz-rich material alternating with weaker ferromagnesian micaceous minerals (biotite). However, within the first weathered nine metres, the rock quality designation (RQD, a rough measure of the degree of jointing or fracture in a rock mass) for the foundation rock is fair to good (Tractebel Engineering France / Coyne et Bellier, 2014).

The top upstream edge of the plunge pool is intersected by a major north east trending fault with subsidiary parallel faults dipping 70° to 80° towards the north west. These shear planes, filled with soft infilling as the major structures show an aperture of about 15 to 20 cm. Their occurrence is only up to an elevation of 356.6 m (Tractebel Engineering France / Coyne et Bellier, 2014).

Other shear planes extend along the right edge of the plunge pool with attitudes of 110°/90° and 320°/70° to 80°. Some ten meters downstream three other parallel faults with 15 to 20 cm soft infilling and with similar attitudes have been mapped (Tractebel Engineering France / Coyne et Bellier, 2014).

7.2.3 Soils

The escarpment and sides of the Kariba Gorge are covered in very shallow gravelly and rocky soils (skeletal soils). Further down the side of the gorge, the soils become colluvial and are deeper, reaching to the alluvial deposits along the banks of the Zambezi River.

The Zambezi Valley floor is a mosaic of sandy (siallitic) soils interspersed with areas of clay and sodic / saline deposits. The alluvial soils along the Zambezi River are a complex of varying deposits of age, depth, texture and colour that mirror the past alterations in the river channel.

7.2.4 Air and Noise

No measurements were taken of air quality and noise for the baseline. This was for two reasons: (i) at the time of the ESIA preparation, air quality and noise in the Project area were influenced by activities associated with the upgrading of the Kariba South Bank Power Station; (ii) the proposed Project is situated in a valley away from sensitive human receptors, so significant impacts of atmospheric and noise emissions associated with the proposed Project are unlikely.

However, the ESMP (Section 9) does include provisions for the management of general atmospheric and noise emissions that are associated with construction activities (Sections 9.3.3.10 and 9.3.3.11). In addition, the ESMP makes provision for a grievance mechanism, which will be used by communities in the area surrounding the Project Area to voice any concerns they may with the Project (including air quality and noise concerns).

7.2.5 Climate

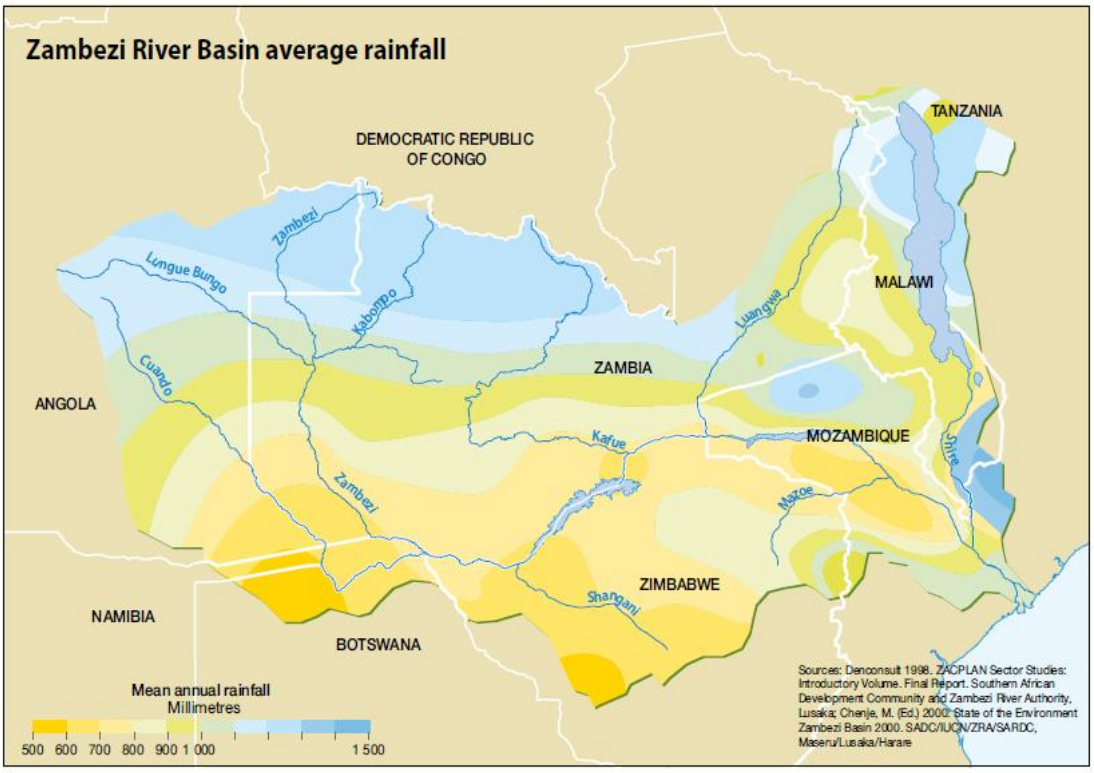
The climate of the Zambezi River Basin is typically sub-tropical (i.e. the climate is influenced by the annual movement of the Inter-tropical Convergence Zone [ITCZ]), with the following seasonal patterns:

- A hot season from late August through the beginning of the main rains;
- A main rainy season, lasting from October/November through to March/April;
- A post rainy (transitional) season in April/May; and
- A cool season from June through to early August.

The main rainfall season (or austral summer) is generally longer in the northern-most extremities of the basin, and can last for up to six months; whereas, the southern-most extremities can be as short as four months. The cool season (or austral winter) is generally characterised by dry weather across the entire basin, although some rainfall can occur in southern and eastern areas as a result of an influx of cool maritime air (known as the Guti in Zimbabwe, and Chiperone in Malawi).

Rainfall is higher in the northern parts of the basin (i.e. the upper highland reaches and the areas around Lake Malawi/Niassa/Nyasa) and can reach levels of up to 1,400-1500 mm per year, and lowest in the southern parts of the basin, (e.g. within Zimbabwe), where it can fall to 500 mm per year (Figure 7.2). In the upper catchment above Victoria Falls there is a general gradation of mean annual rainfall from 1,500 mm in the north to 700 mm in the south near the Chobe Swamps. Average rainfall intensities are typically of the order of 35 mm per hour due to the predominance of convective storms, and can reach as high as 70 mm per hour for short periods in severe storm conditions (Batoka HES Feasibility Study, BJVC, 1993).

Figure 7.2 Zambezi River Basin Average Rainfall



Average temperatures in the Zambezi Basin vary with elevation. During the cool season mean temperatures can fall to 130 °C in the higher elevation areas in the south of the basin, and overnight ground-frosts can occur. Mean daily temperatures during the warmest months can reach 310 °C in the lower reaches of the Zambezi Valley, and around 230 °C in the higher elevation areas. Correspondingly, mean annual evaporation is highest in a belt running east-west across the basin, varying from about 200 mm per month in the October to March period, and 125 mm per month in the cooler months of June and July.

7.2.6 Hydrology

Inflows to Kariba reservoir are shown in Figure 7.3. Inflows vary considerably with seasons, with peaks typically occurring from February to April, and lower inflows during September, October and November. There is relatively large variation in reference peak and low flows, as shown by the differences between the 10th, 50th and 90th percentiles for the 1962-2010 period.

Following the construction of Kariba Dam, flows downstream of the dam are highly regulated, illustrated by the red line in Figure 7.3. This has affected the downstream ecosystems and river ecology forever, the trapping of sediment in the reservoir and the dam presenting a barrier to the natural movement of fauna, organic matter, nutrients, etc. Also fluviomorphological characteristics and flow regime has been changed, downstream of Kariba Dam to Chirundu, the river bed has lowered by 2 m and the channel has widened between Kariba and Mupata gorges an average of 200 m; floodplain inundation is more infrequent due to this, and the regulation of flows (Khan et al., 2014; Mwelwa-Mutekenya, 2014). Channel widening coincided with spill events, and little widening has occurred post-1981 (Nugent, 1988; Magadza 2000; Basson, 2005), suggesting that downstream sediment balance probably remains stable under the current discharge regime.

Figure 7.3 Inflows at Kariba Dam (1962-2010) and Total Discharges from North and South Power Stations (1993-2013)

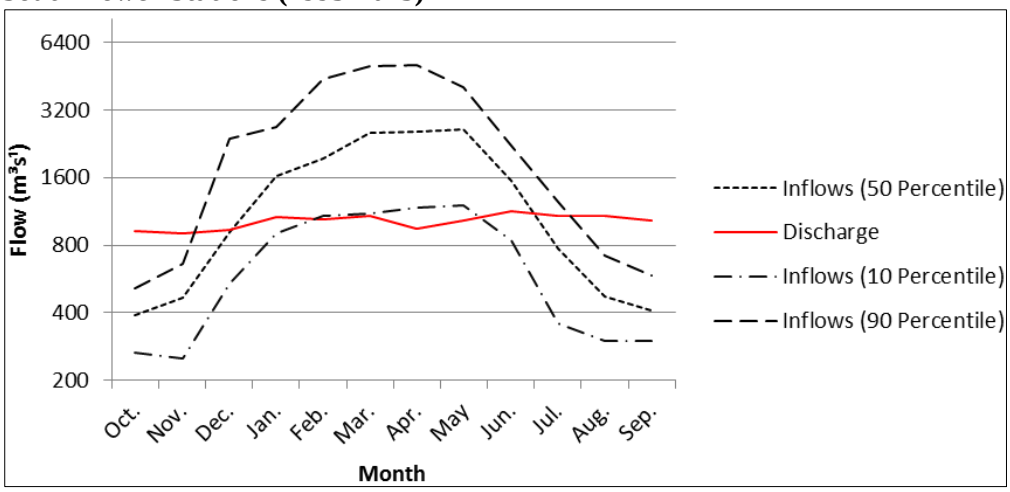
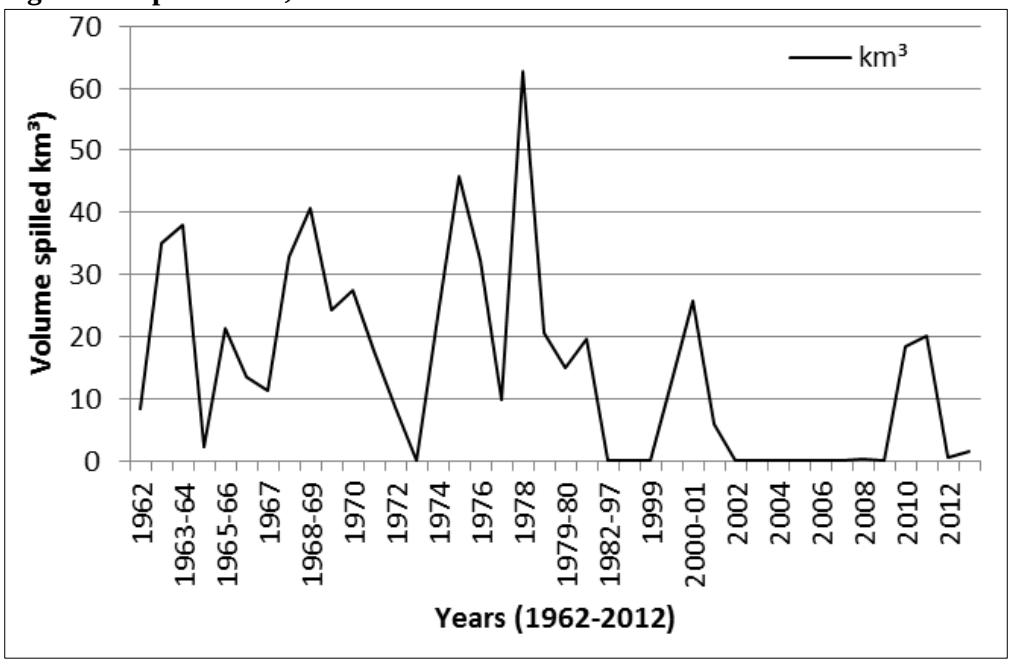


Figure 7.4 Spill Events, 1962 to 2012



7.2.7 Water Quality

Water quality, discussed in more depth in the aquatic ecology section below, falls within threshold values for sustaining aquatic ecosystems. Results from both the September 2014 (low flow) and February 2015 (high flow) field assessments were consistent with the water quality data provided by the Zambezi River Authority. Water from this reach was characterized by circumneutral pH values and relatively low electrical conductivities. Conversely, water sampled within the old disused North Bank ZESCO Quarry Site (the preferred site for the waste rock dump) reflected a high alkalinity and salt loads. This water is contaminated and should remain isolated from aquatic environments, ZRA is responsible to manage properly this site.

7.3 Biological Environment

7.3.1 Methodology

The baseline assessment focused on:

- Determination of a Direct Area of Influence (AoI), as described above;
- Mapping and classification of the broad habitats within the direct AoI:
- Floral and faunal sensitivity assessment of the AoI;
- Defining the broader sensitivities downstream of the dam, based on available desktop data in an indirect area of influence (indirect AoI).

Area of Influence

The Direct Area of Ecological Influence (Figure 7.5) is defined as the spillway gate construction site and the slipway upstream of the dam wall, the plunge pool and coffer dam downstream of the dam wall, the access roads and the waste rock dump site, and slipway site. The sites of sand extraction and quarries for construction materials are not included as some materials are sourced from far beyond the site, e.g. Chinhoyi and Lusaka.

The vegetation of the AoI was classified and used as the basis for the assessment and mapping of habitats, covering both the Zambian and Zimbabwean terrestrial environments. These habitats were assessed during a single season of fieldwork to confirm the conformance of the adopted classification system, species determination and diversity within the AoI and the presence of plant species of importance (threatened and rare species). Fieldwork did not only focus on vegetation, but also include faunal observations on mammals, birds and other faunal groups of importance in the area. Observations relied on direct sightings, evidence of presence and consultation where appropriate with people knowledgeable on the ecology of the area.

The Floral and Faunal Sensitivity Assessment determined the current state of the identified habitats in the AoI, based on levels of transformation, alien species presence, faunal and floral species diversity and species of importance.

The Indirect Area of Ecological Influence (Figure 7.6) is defined as the Kariba Gorge from the Kariba Dam wall to Nyamuomba and downstream from there to include the upper river terraces on both sides of the river as far as the eastern boundary of Mana Pools National Park. The indirect AoI included the riparian zones of a number of prominent protected areas on both banks of the Zambezi River. It includes the alluvial areas in Chiawa Game Management Area and Lower Zambezi National Park in Zambia, and the alluvial areas in Urungwe Safari Area and Mana Pools National Park in Zimbabwe. *This is a highly extensive Indirect Area of Ecological Influence, based on the potential reach of a dam failure the water release of the reservoir will be catastrophic and could affect downstream villages and protected areas sucha Mana Pools National Park is more than 150 km downstream of Kariba.*

7.3.1.1 IBAT search, July 2020

As part of the updating of the ESIA in July 2020, a proximity report was generated using the Integrated Biodiversity Assessment Tool (IBAT) based on the Kariba Dam location, and a buffer zone of 5 km (i.e. a little more than the Direct Area of Influence). The report identified 4 protected areas and 1 key biodiversity area in the 5 km zone, and 30 IUCN Red listed species potentially present within 50 km. The results of this search are presented in Appendix C and are integrated into the following sections.

7.3.2 Terrestrial Flora

In broad terms the Project Area is covered in woodland, the various types being dependent on the soils and other edaphic factors. The flora of the project area is part of the great Zambezi river basin which is one of the most important regions in Africa for flora biodiversity. Many plant families evolved in this region and radiated to others in Africa.

7.3.2.1 Escarpment Habitats

Generally the escarpment hill tops support open Miombo Woodland that is dominated by *Julbernardia globiflora* and *Brachystegia* sp. These hilltops grade into a Mixed Deciduous Woodland type dominated by *Kirkia acuminata*, *Sterculia quinqueloba* and *Commiphora* sp. further down the escarpment slopes and down the sides of Kariba Gorge. In areas where there is a high density of elephant, an increased grass cover and fuel load, coupled with late dry season hot fires, the woodland has degenerated and become more open shrubland on the Zimbabwean side. In Zambia, tree felling for firewood and construction of houses together with clearing of land for cultivation has also led to a degeneration of the woodland into open shrubland in areas around the urban centres of Siavonga and Chirundu.

Figure 7.5 Direct Area of Ecological Influence

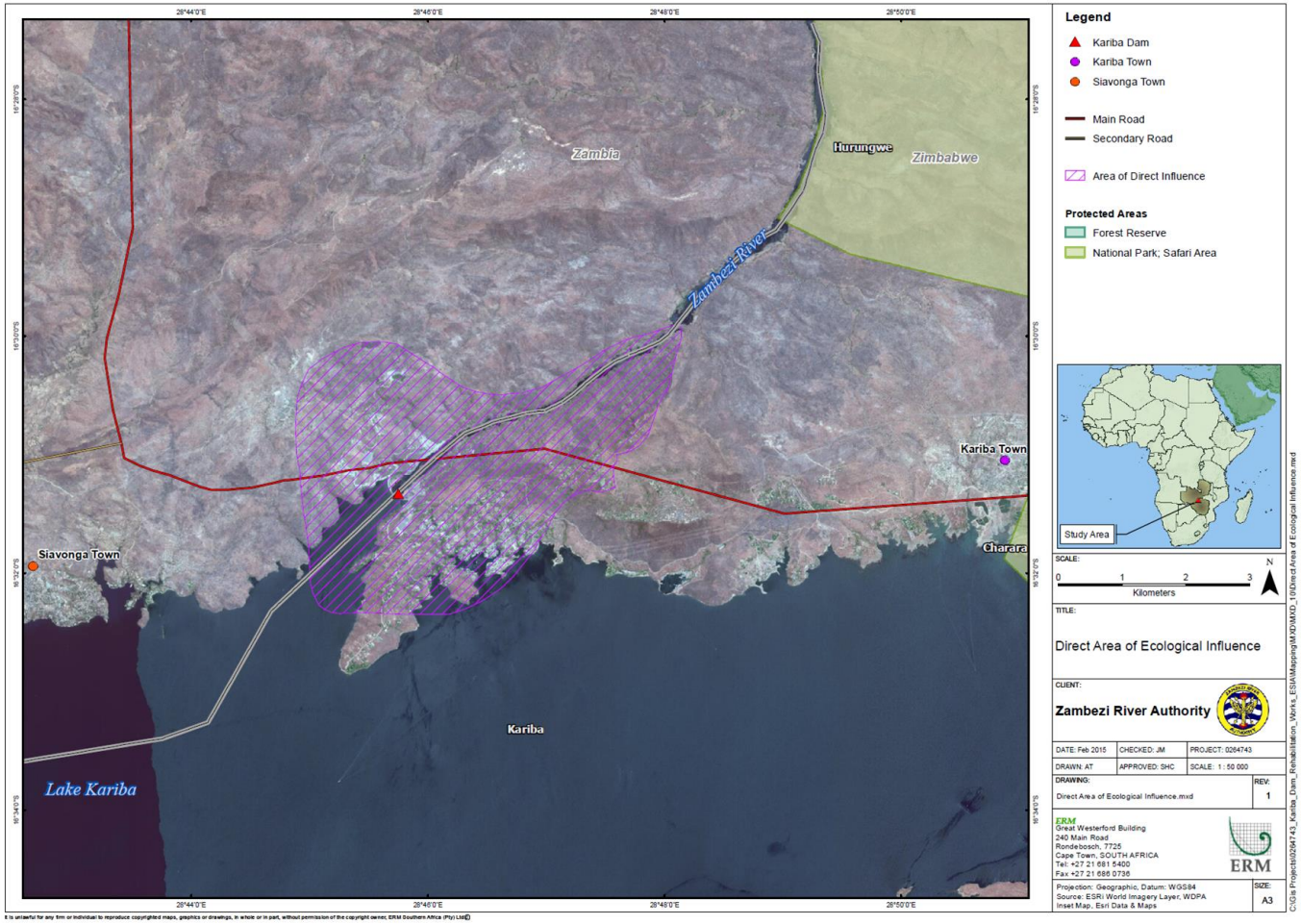


Figure 7.6 Indirect Area of Ecological Influence

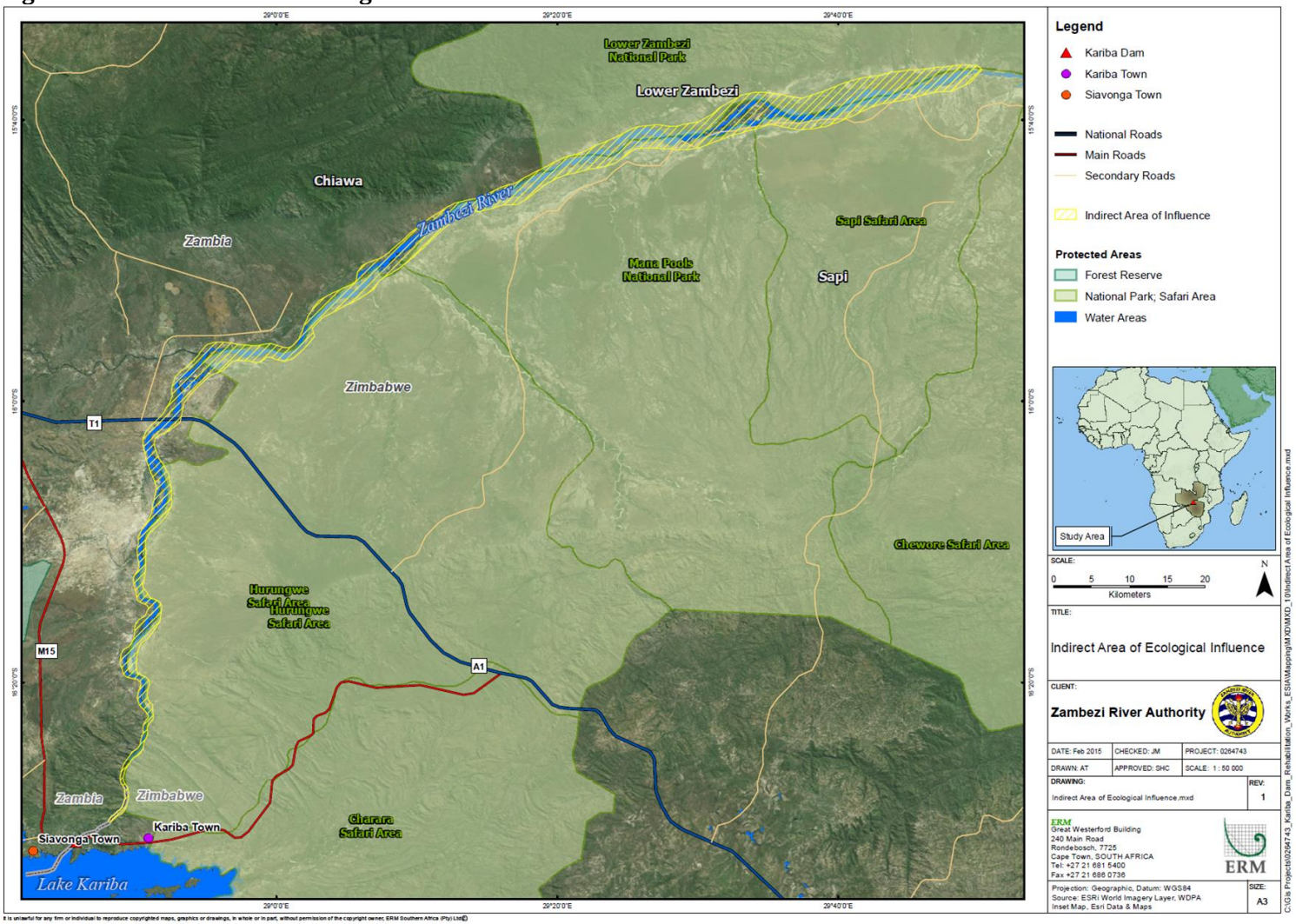


Table 7.1 Important Plant Species associated with the Escarpment Habitats

Species Name	English Common Name	Local Names	IUCN Threatened Status
Acacia nigrescens	Knob Thorn	Chinanga (Shona) Isinanga / Katopa (Ndebele)	NE but common and widespread
Brachystegia sp.	Msasa (tree)	Igonde (Ndebele) Msasa / Mutatsa (Shona)	-
Caloptropis procera	Sodom's Apple		Alien invasive species
Colophospermum mopane	Mopane	Iphane (Ndebele) Mupane / Musharu (Shona) Chanye / Mpane (Nyanja)	NE but common and widespread
Combretum apiculatum	Red Bushwillow	Bonda / Tsingidzi (Shona) Umbhondo (Ndebele)	NE but common and widespread
Combretum microphyllum	Riverine flame-creeper / Burning-bush Combretum	Bambangwenya (Hlengwe) Ganwa-musero / Mupfurura / Mutsiwa Mutzutsu (Shona)	NE but common and widespread
Combretum mossambicense	Shaving brush Combretum / Knobbly bushwillow	Marorwe / Mubondorokoto (Shona)	NE but common and widespread
Commiphora sp.	Corkwood	-	-
Diospyros kirkii	Large-leaved Jackal-berry	Muchenje (Shona)	NE but common and widespread
Ficus sycamorus	Sycamore Fig	Mukuyu / Muonde (Shona) Umkhiwa (Ndebele) Mkuyu (Nyanja)	NE but common and widespread
Hyparrhenia sp.	Thatching Grass		-
Julbernardia globiflora	-	Munondo / Mutondo (Shona) Umtshonkwe (Ndebele)	NE but common and widespread
Kirkia acuminata	White Syringa	Mubvumira (Shona) Umvumile (Ndebele) Mzumba (Nyanja)	NE but common and widespread
Sterculia quinqueloba	Large-leaved Star-chestnut	Kukubuyu (Shona), Umkukubuyu (Ndebele) Mgoza / Msambamfu (Nya)	NE but common and widespread
Tamarindus indica	Tamarind Tree	Musika (Shona)	NE but common and widespread
NE = Not evaluated on the IUCN Red List of Threatened Species			

7.3.2.2 Waste Rock Dump Site, North Bank

Chapter 5 of this report considers the key alternatives relevant to the ESIA, including siting alternatives for the waste rock dump.

"Preferred" Site for the Waste Rock Dump - Existing Disused Sinohydro Quarry

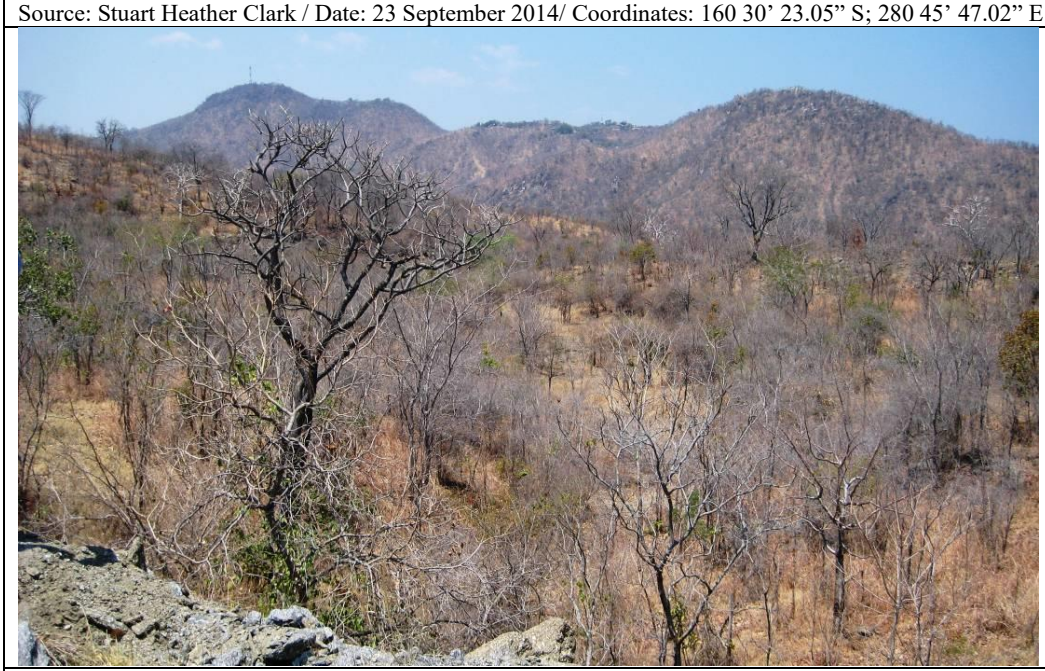
The area that was identified as the preferred waste rock dump site (refer to Section 6.1 of this report) is in the existing disused Sinohydro quarry (refer to Figure 7.7) at GPS co-ordinates 16030'20.58"S 28045'45.34"E. This area was used as a quarry during the construction of the Kariba North Power Station in the 1970s and has since been abandoned. This alternative is preferred as the capacity of the quarry is large enough to accommodate almost all the excavation material (an estimated 295,000 m³ of rock) that will be generated through rehabilitation of the plunge pool. Moreover, the site is already highly disturbed.

"Alternative" Site for the Waste Rock Dump – Immediately East of the Existing Disused Sinohydro Quarry

A second less preferred alternative waste rock dump site is located immediately east of the existing disused Sinohydro quarry at GPS co-ordinates 16°30'20.30"S 28°45'51.11"E at elevation 593 masl in an area of typical escarpment woodland. The alternative site is considerably less disturbed, although there were signs wood cutting and fire and the area is grazed by livestock.

Figure 7.7 Preferred and Alternative Waste Rock Dump Sites

View of the Existing Disused Sinhydro Quarry (Preferred Waste Rock Dump Site)
Source: Stuart Heather Clark / Date: 23 September 2014/ Coordinates: 160 30' 23.05" S; 280 45' 47.02" E



Mixed Deciduous Woodland near Sinohydro Quarry (Alternative Waste Rock Dump Site)
Source: Susan Childes / Date: 24 September 2014/ Coordinates: 160 30' 26.05" S; 280 45' 40.16" E
Note: photo taken late dry season and trees are leafless.

The underlying geology for both sites is gneissic rock with very shallow, sandy and gravelly soils. Dominant woody species include *Julbernardia globiflora*, *Combretum apiculatum* and *Diospyros kirkii*. Grasses were only identified to genus level, including: *Hyparrhenia* sp., Aristida sp. and *Schmidtia* sp. No rare or endangered plant species were noted. Weedy species such as *Caloptropis procera* were noted, also indicative of disturbance.

"Alternative" Site for the Waste Rock Dump – Ephemeral Stream Adjacent to Access Road

A third less preferred alternative waste rock dump site is located at GPS co-ordinates 16°30'24.72"S 28°45'37.20"E and elevation of 567 masl. This stream drains from the high ground north and west of the quarry site down a ravine to empty into the Zambezi River just downstream of the north bank turbines. The area is a typical example of tributary riparian woodland. The stream bed was dry at the time of sampling but judging from the structure and nature of its banks, is subjected to periods of high flows of short duration. The stream is fringed by a narrow strip of tall (10-12 m) *Ficus sycamorus*, *Acacia nigrescens* and *Tamarindus indica* trees with an understorey of *Combretum mossambicense* shrubs and *Combretum microphyllum* creepers. No rare or endangered plants were found at the site although these may occur further down the ravine and in other patches of this woodland type elsewhere along the Kariba Gorge.

7.3.2.3 Preferred Slipway Site

Chapter 5 of this report considers the key alternatives relevant to the ESIA, including siting alternatives for the slipway site.

The area that was identified as the preferred slipway alternative site is located on Zimbabwe Parks and Wildlife Management Authority (ZPWMA) land, immediately below the office and housing complex at Peter's Point, at approximate GPS co-ordinates 16°31'52.59"S 28°45'33.60"E. The area constitutes an existing slipway that is used by both ZPWMA and District Development Fund (DDF) as a boat launching site and workshop. Consequently, there is a high level of disturbance and little natural terrestrial vegetation remaining on the site. The access road to the site passes through typical Mixed Deciduous Woodland, co-dominated by *Combretum*, *Sterculia* and *Commiphora* species with some *Colophospermum mopane* (Figure 7.8).

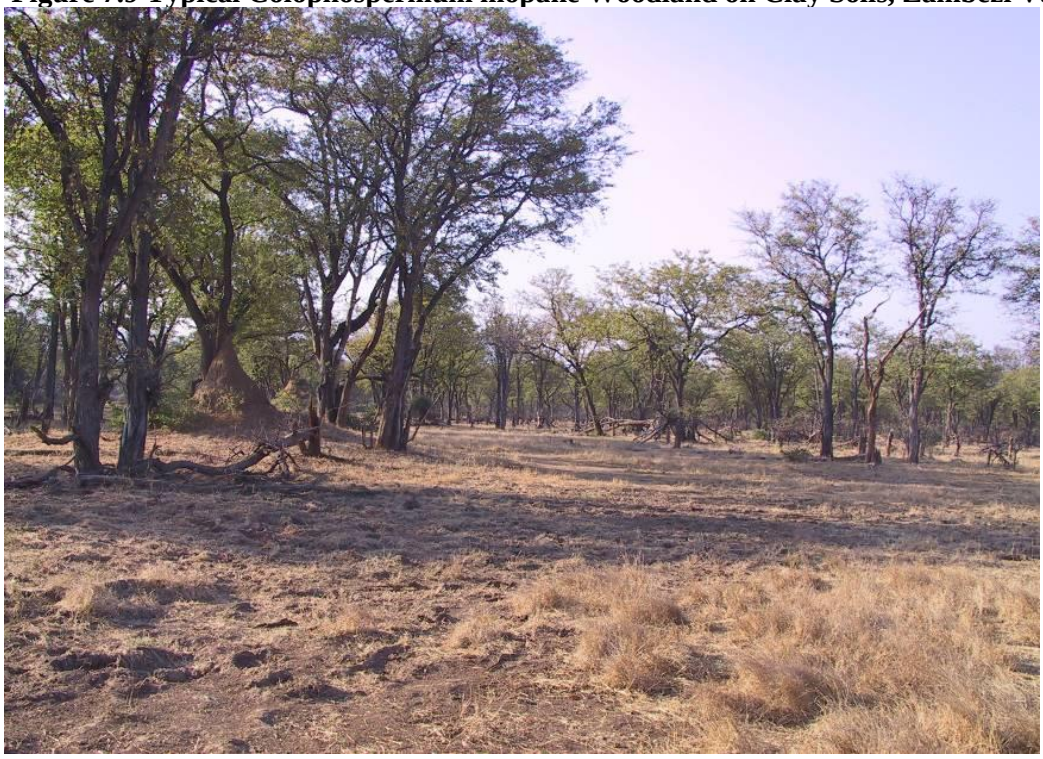
Figure 7.8 Vegetation Adjacent to Slipway at Peter's Point

Source: Susan Childes / Date: 24 September 2014/ Coordinates: 16°31'52.59"S; 28°45'33.60"E
Note: Green trees are C. mopane, pale whitish trees are Sterculia. No riparian fringing vegetation.

7.3.2.4 Valley Floor Habitats

The predominant vegetation type is *Colophospermum mopane* Woodland on the heavier soils, with patches of "jesse", a dry forest /dense thicket community of *Combretum* and *Acacia* shrubs with tall emergent *Xeroderris stuhlmannii* and *Pterocarpus lucens* trees on the deep sandy soils (Figure 7.9). Although the jesse thickets are markedly deciduous, they are highly productive areas, providing refuge and browse to a variety of wildlife. The important plant species in this habitat are listed in Table 8.2.

Figure 7.9 Typical Colophospermum mopane Woodland on Clay Soils, Zambezi Valley



Source: Stuart Heather-Clark / Date: 25 September 2014/ Coordinates: Unknown
Note: Dried out pan and spoor of wildlife.

Table 7.2 Important Plant Species associated with the Valley Floor Habitats

Species Name	English Common Name	Local Names
Acacia nigrescens	Knob Thorn	Chinanga (Shona) Isinanga / Katopa (Ndebele) Mkunku / Nyamamponombwe (Nya.)
Acacia robusta subsp. *clavigera*	Splendid thorn	Umgamanzi / Umhlabunga (Ndebele)
Combretum imberbe	Leadwood	Monzo / Mutsviri (Shona) Umtshwili (Ndebele) Chilusa /Nyonja (Nyanja)
Diospyros mespiliformis,	African ebony /Jackal Berry	Mchenja / Mvimbe (Nyanja)
Faidherbia albida	Ana-tree / Apple-ring	Musangu / Musenga (Shona) Umpumbu (Ndebele) Nsangusangu / Mtubetube (Nya.)
Kigelia africana	Sausage Tree	Mubveve /Musonya / Muvhumati (Shona) Umvebe (Ndebele)
Ludwigia sp.	Aquatic plant	-
Panicum repens	grass	-
Philenoptera violacea [Lonchocarpus capassa]	Apple Leaf / Rain Tree	Mumerafodya (Shona) Ichithamuzi (Ndebele) Chimpakasa (Nyanja)
Phragmites sp.	Reeds	-
Tamarindus indica	Tamarind	Museka (Shona)
Trichilia emetica	Natal Mahogany	Muchichiri (Shona)

7.3.2.5 Alluvial Soils: Sandbanks, Islands and Riparian Habitat

The alluvial soils are a complex mixture of loose sands, and layers of silt and clays of variable thickness and depths. There is a succession of vegetation types as one moves from the Zambezi River up a series of river terraces and four fairly distinct types determined by the physical composition, age and height above the Zambezi River can be distinguished (Muller & Pope, 1982 in du Toit, 1982):

- The most recently deposited alluvium are clean white sands with thin bands of grey silt that edge the present river channel. These form sandbanks and sandy islands that become colonised by semi aquatic vegetation such as *Ludwigia* sp., *Panicum repens* and *Phragmites* reeds (Figure 7.10). In the drier areas, moving away from the water's edge, *Vetiveria* grass predominates.

- *Faidherbia* (*Acacia*) *albida* Woodland which colonises the relatively loose sandbanks and lower unstable river terraces (Figure 7.11). It comprises almost pure stands of *F.albida* trees of variable ages with no understorey of woody plants.

- *Falbida*-dominated Woodland is developed from the previous type and has other tree species such as *Trichilia emetica*, *Kigelia africana* and *Philenoptera violacea* (*Lonchocarpus capassa*) present, together with patches of shrubs.

Mixed Riparian Woodland is derived from the above type, where *F.albida* is generally absent whilst those trees adapted to heavier textured soils such as *Acacia nigrescens*, *A.robusta* subsp. *clavigera*, *Diospyros mespiliformis*, *P.violeacea*, *C. imberbe*, *Tamarindus indica* are present, with a well-developed shrub layer and climbers. This type has the highest flora species diversity.

Within the Kariba Gorge, the riparian woodland is a narrow strip of trees of generally Mixed Riparian Woodland (type (d)), that grades into Mixed Deciduous Woodland higher up the slopes.

Figure 7.10 Sandbanks with Riparian Thicket and Faidherbia albida

Source: Stuart Heather-Clark / Date: 25 September 2014/ Coordinates: Unknown

Figure 7.11 Grassy Channel between F. albida Woodland on River Terraces, Mana Pools National Park

7.3.2.6 Cultivated, Urban and Industrial Areas

Cultivated and urban areas are zones of high disturbance and are characterised by a decrease in biodiversity and indigenous plants and an increase in weedy and invasive species. The peri-urban zones around Siavonga and Chirundu towns, and to a lesser extent, Kariba town were observed to be mostly denuded of tree species, possibly chopped down for firewood.

On the Zambian (north) bank the alluvial areas between Nyamuomba and Chirundu are intensively cultivated. Sugar cane, bananas and a variety of vegetable crops are grown by both subsistence and commercial farmers. On the Zimbabwean bank, immediately downstream of Chirundu are patches of land that was previously under sugar cane and is now under banana plantations.

7.3.2.7 IUCN Red Data, Rare and Endangered Flora

The original ESIA-ESMP of the project did not performed field taxonomic work and the information presented is from the literature and desk review. There are many species that are endemic to Zambia or endangered that were not investigated in the ESIA. For example, *Nymphoides tenuissima* is an endangered freshwater plant reported in the project area (IBAT 2020) and that is not know how could be affected by the project or in case of a dam failure. Another important plant species is Adenia karibaensis a small succulente tree which is endemic to the Kariba gorge and reported for both countries (Zambia and Zimbabwe).

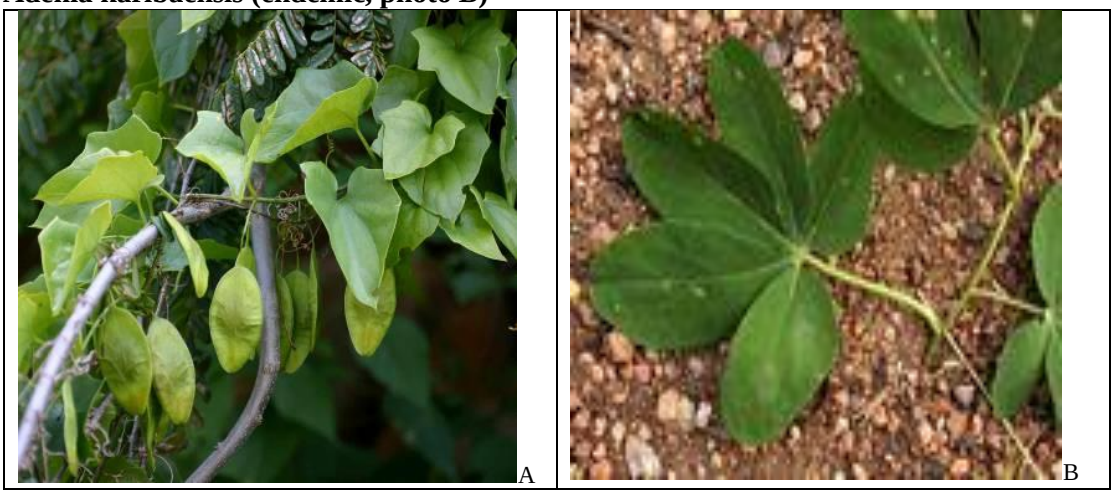
The checklist of Zambian and Zimbabwean vascular plants (Mapaura and Timberlake, 2004) was analyzed for all species recorded from the north of the country. The IUCN status of those species that are known to occur in the study area and those that are likely to occur, were examined according to the Southern African Plant Red Data Lists Database (Golding /SABONET, 2002). Given that there has not been any comprehensive survey of the flora in the Kariba Gorge, by taxonomic experts in flora and specific families, it is not possible to be sure which is the flora value of the area. Table 7.3 below summarizes the findings of a general desktop review.

In Zimbabwe all *Aloe* sp. species and all epiphytic orchids are Specially Protected Species (Parks and Wildlife Act Chapter 20:14, 1996). When trees are cut, these plants which like attached to trunks and branches are loss.

Table 7.3 IUCN Red Data Plant Species (SABONET, 2003)

Species	Growth Form (& English Name)	IUCN Threat. status	Habitat / Comment
Asplenium sebungweense	Mesic fern	LR-nt	May occur, not confirmed. Limited distribution in dry forests of Zambia and Zimbabwe
Adenia karibensis	Succulent climber	LR-nt	Endemic. Found in rocky habitat of Kariba Gorge.
Cyclantheropsis parviflora	Creeper	VU	Found in Kariba Gorge.
Rhus lucens	Shrub	LR-nt	Found in Kariba Gorge.
Euphorbia cooperi var.calidicola	Succulent	LR-lc	Found in Zambezi Valley
Afzelia quanzensis	Tree (Pod Mahogany)	LR-lc	Mixed Deciduous Woodland. Threatened by logging and wood carving; agriculture
Dalbergia melanoxylon	Tree (Zebra Wood)	LR-nt	Mixed Deciduous Woodland. Threatened by wood carving
Pterocarpus angolensis	Tree (Mukwa)	LR-nt	Escarpment /Mixed Deciduous Woodland. Threatened by logging.
Key to IUCN Threatened Status: LR-lc = Lower Risk Least Concern; LR-nt = Lower Risk Near Threatened; VU = Vulnerable			

Figure 7.12 Leaves and Fruit of *Cyclantheropsis parviflora* (VU; photo A) and Leaves of Adenia karibaensis (endemic, photo B)



A B

Source: B Wursten, Zimbabwe Flora website (http://www.zimbabweflora.co.zw/speciesdata/species.php?species_id=141070)

7.3.3 Terrestrial Fauna

There are two contrasting land uses between the Zambian and Zimbabwean sides of the river and this is reflected in the animal populations. This report only examines wildlife and does not include any domestic animals.

With the exception of the immediate surrounds of the dam wall, and around Chirundu town, the entire stretch of river from Kariba to Mupata Gorge in Zimbabwe is Parks Estate, where all wildlife is protected, and can only be hunted under licence in one of the Safari Areas. Wildlife populations on the Zimbabwean bank are generally healthy and there is a high diversity of species.

In contrast, the section of Zambian riverbank from the dam wall to south of the Kafue River is open land and there is widespread agriculture. Wildlife habitat is reduced and there is human wildlife conflict, particularly with crop raiding elephant and hippopotamus. The wildlife

populations in Lower Zambezi National Park and Chiawa Game Management area are contiguous with those in Mana Pools, Zimbabwe and there is undoubtedly movement of the larger animals across the border and between the two National Parks. Both countries are experiencing high poaching pressure, especially for ivory.

7.3.3.1 Large Mammals

Hippopotamus: Since hippopotamus are closely associated with the riparian habitat, these animals can be affected by changes in river flow as flooding or drying out of the sandbanks will alter the availability of grazing. Hippos are fairly sedentary and form family units or pods that are fiercely defended by the breeding male. Territorial conflicts between rival males occur under times of stress due to food shortage or loss of habitat.

A combined boat and aerial survey by Fergusson in 2006 gave a population estimate of 3654 adult hippo for the section of river from Nyamuomba to Kanyemba. The greatest proportion of these (81.75 %) are found in the protected areas.

Elephants: Elephants are much more mobile, moving inland away from the river during the rains, returning to the river when the smaller rivers and pans dry out in winter. As with many other animals, they feed extensively on the *F.albida* pods on the Mana Pools floodplain during the late dry season.

IUCN Red Data Species and CITES Species. Of the 13 mammal species on the IUCN Red Data List, three are listed as Specially Protected Species under the Zimbabwe Parks Act (1996) and four under Zambian legislation. Nine species are also protected under the Convention for International Trade in Endangered Species (CITES) which controls the export of these animals and their products.

Table 7.4 IUCN Red Data List Species, Specially Protected Species and CITES Species

Family	Species	Common Name	IUCN Status	Specially Protected Species	CITES Appendix Species	IBAT Proximity Report
MANIDAE	*Smutsia (Manis) temmincki*	Temminck's Pangolin	VU	Both	Yes	Yes
CANIDAE	*Lycaon pictus*	African Wild Dog	EN	Zambia	Yes	Yes
FELIDAE	*Acinonyx jubatus*	Cheetah	VU	Both	Yes	Yes
FELIDAE	*Panthera leo*	African Lion	VU		Yes	Yes
FELIDAE	*Panthera pardus*	Leopard	NT		Yes	Yes
FELIDAE	*Felis silvestris*	Wild Cat	LC		Yes	
HYAENIDAE	*Crocuta crocuta*	Spotted Hyaena	LC			
HYAENIDAE	*Proteles cristata*	Aardwolf	LC	Both	Yes	
MUSTELIDAE	*Mellivora capensis*	Honey Badger	LC			
BOVIDAE	*Kobus ellipsiprymnus*	Waterbuck	LC			
BOVIDAE	*Syncerus caffer*	African Buffalo	LC			
HIPPOPOTAMIDAE	*Hippopotamus amphibius*	Hippopotamus	VU		Yes	Yes
ELEPHANTIDAE	*Loxodonta africana*	African Elephant	VU		Yes	Yes
	Diceros bicornis	Black Rhino	CR			Yes
	Diceros bicornis ssp *minor*	South-eastern Black Rhino	CR			Yes
Key to IUCN Threatened status: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Lower Risk / Least concern Key to Protected Species: Zambia implies protected in Zambia; Both implies protected in Zambia and Zimbabwe						

7.3.3.2 Small Mammals

Small mammals that are reported to occur within the riparian zone of the Zambezi are rodents such as Canerats (*Thryonomys swinderianus*) and Water rats (*Dasymys incomtus*) that inhabit dense reed beds and semi aquatic grasses.

Although primarily associated with evergreen forests, Sun squirrel (*Heliosciurus rufobrachium*) were reported to occur in the riverine forest fringes on the Zambian bank of Lake Kariba (Smithers, 1983) and in isolated patches of riverine thickets and forest on the Zimbabwean bank, along the Ruckomeche river (K.Dunham, pers.comm).

Samango monkeys (*Cercopithecus albogularis*) are known to occur on the riverine forest fringing the Zambian bank near Mupata Gorge (own observation).

7.3.3.3 Reptiles

Cycloderma frenatum, the Zambezi Snapshell turtle (IUCN category EN) was the only reptile species identified in the IBAT Proximity Report on IUCN-Redlisted species potentially present within 50 km of the project site.

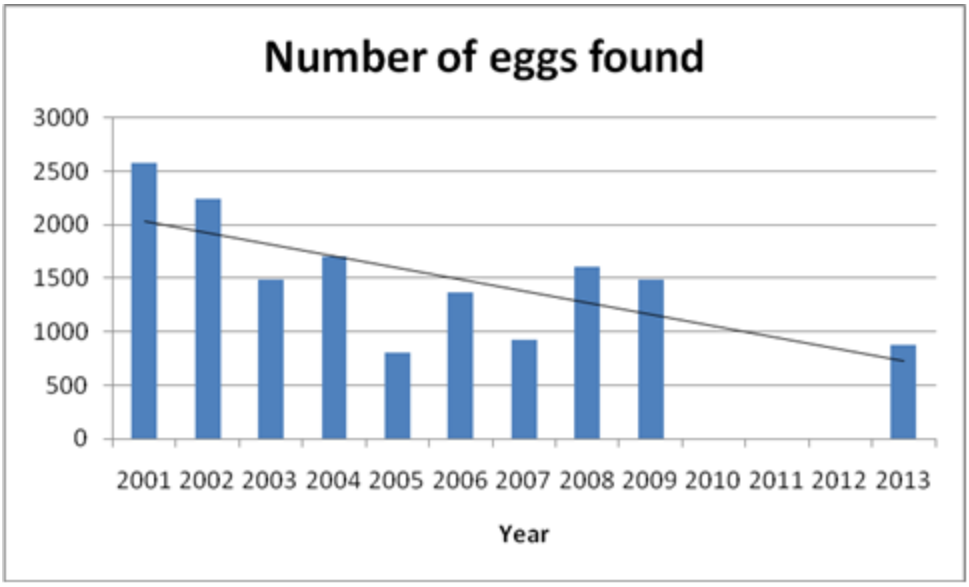
Python natalensis (*P. sebae*). The Southern African Python is a Specially Protected Species in Zimbabwe. It frequents riparian habitats and rocky outcrops.

Varanus niloticus (Nile Monitor) and *V. albigularis* (Savanna Monitor) both occur in the project area. These are listed species on Appendix 2 of CITES.

Pelusios subniger (Pan hinged Terrapin) and *P.sinuatus* (Serrated hinged Terrapin) are largely aquatic, only coming onto land to nest and sunbathe. The Pan Terrapin, as its name suggests, is associated more with the inland pans, whilst *P.sinuatus* is commonly found along the river banks.

Crocodylus niloticus (Nile Crocodile) occurs throughout the Zambezi River system and is an apex predator in the aquatic and riparian zone, feeding on fish, mammals and birds. In Zimbabwe, crocodiles are listed on CITES Appendix 2, meaning that export trade is regulated and monitored. In keeping with the concept of conservation through sustainable utilization, crocodile eggs are collected in Zimbabwe under a Parks and Wildlife Management permit for the section of the river from Kariba Dam wall downstream to the western boundary of Mana Pools National Park.
The numbers have declined in recent years due to changes in collection effort and the increase in human disturbance (refer to Figure 7.13). Crocodiles are caught in fishing nets and their nests are raided by local villagers. There were no collections undertaken for the years 2010-2012, but the data still show a decline in numbers. Fergusson's estimate for crocodiles from Nyamuoba to Kanyemba was 1984 animals, of which 90.6% were found in the protected areas.

Figure 7.13 Crocodile Egg Collection from Kariba to Mana Pools (Zimbabwean Bank) 2001-2013



Source: Crocodile Farmers Association of Zimbabwe

7.3.3.4 Amphibians (Frogs)

Frogs are one of the most vulnerable groups to pollution and habitat change and are therefore useful bio-indicators. Frog skin is highly permeable to water and hence any dissolved chemicals. Since the early part of their life cycle is aquatic and the adult stages more terrestrial, frogs are affected by changes in both environments. Frogs eat a wide variety of invertebrates and in turn are an important food source for a range of other predators.

The frog species in this section of the Zambezi River have not been well documented but the following information was obtained from a professional natural history guide, I Riddell (see Table 7.5) in conjunction with a review of du Preez & Carruthers (2009). Riddell recorded a total of 21 species from the Zambezi Valley in general, of which 12 were found at Rifa Camp and 14 species at Mana Pools. None of these are considered to be endangered or threatened, although habitat loss and potential pollution from agriculture on the Zambian bank will undoubtedly have a negative impact.

Table 7.5 Checklist of Frogs Recorded in the Middle Zambezi Valley

Species (and Common Names)	Rifa Camp	Mana Pools	Zambezi Valley
Xenopus laevis (Common Platanna)	•	•	•
Phrynomantis bifasciatus bifasciatus (Banded Rubber Frog)	•		•
Hemisus marmoratus (Marbled Snout-burrower)	•	•	•
Hemisus guineensis broadleyi (Guinea Shovelnose Frog)			•
Arthroleptis stenodactylus (Common Squeaker)			•
Pyxicephalus adspersus edulis (African Bullfrog)		•	•
Tomopterna cryptotis (Common Sand Frog)			•
Tomopterna marmorata (Marbled Sand Frog)			•
Hildebrandtia ornata ornata (Ornate Frog)			•
Ptychadena anchietae (Plain Grass Frog)	•	•	•
Ptychadena mascareniensis (Mascarene Grass Frog)		•	•
Ptychadena mossambica (Broad-banded Grass Frog)	•	•	•
Phrynobatrachus natalensis (Dwarf Puddle Frog)	?	•	•
Phrynobatrachus mababiensis (Snoring Puddle Frog)	•	•	•
Chiromantis xerampelina (Foam Nest frog)	•	•	•
Kassina senegalensis (Bubbling Kassina)	•	•	•
Hyperolius marmoratus marginatus (Painted Reed Frog)		•	•
Ametiophrynus (Bufo) gutturalis (Guttural Toad)	•	•	•
Ametiophrynus (Bufo) garmani (Olive Toad)	•	•	•
Ametiophrynus (Bufo) maculatus (Flat-backed Toad)	•	•	•

Species (and Common Names)	Rifa Camp	Mana Pools	Zambezi Valley
Schismaderma carens (Red Toad)	•		•
Total count of species	**12**	**14**	**21**

7.3.3.5 Birds

With the wide range of habitats from sandbanks and mudflats to thicket, forest and woodlands, there is a great diversity of birdlife in the Middle Zambezi Valley. The river itself is a major migration route for birds moving up and down from the lowland forests and plains of Mozambique, as well as being a seasonal refuge for many species from the highlands of Zambia and Zimbabwe (Irwin, 1981).

A large area downstream is the Middle Zambezi Valley Important Bird Area (IBA), recognised by BirdLife International. It is also a Key Biodiversity Area, identified in the IBAT Proximity Report. The area qualifies for IBA status on the basis of the high avian diversity and the fact that the site is thought to hold more than 1% of a biogeographic population of congregatory waterbird and terrestrial species (categories A3 Biome-restricted species and A4 Congregations, Fishpool, 1997). Among waterbirds, the species richness in the valley is very high, at c.90 species, although relative abundances are lower. The banks of the Zambezi provide nesting habitat for c.10,500 *Merops nubicoides*, with unknown extra numbers in tributaries along the valley floor. The sandbanks and sandy islands form equally essential habitat for *Rynchops flavirostris*, and in 1986 a survey estimated 136 birds on the stretch of river in the valley. In the same year, about 320 *Glareola nuchalis* were counted in the Kariba and Mupata gorges. This information is drawn from BirdLife International (2020) Important Bird Areas factsheet: Middle Zambezi Valley. Downloaded from http://www.birdlife.org on 09/07/2020.

The following table lists the number of species in each of the main groups of birds associated with the river and riparian habitat. It is drawn from the Rifa Camp checklist of Bird Life Zimbabwe (2014). In addition, Table 7.7 lists the bird species potentially present within 50 km of the project site, identified in the IBAT Proximity Report.

Table 7.6 Bird Species associated with the Middle Zambezi River and Riparian Habitats

Group	Number of species	Comments: diet, status, threats
Cormorants, Darter	3	Open water; fish
Herons and Egrets	16	riverbank; Frogs, fish, insects
Hammerkop (SP)	1	riverbank; frogs
Storks, Ibises, Spoonbill	12	Molluscs and other invertebrates in mudflats and water's edge, frogs, fish
Ducks and Geese	8	Aquatic plants, grasses, seeds, insects
Crakes, Moorhens, Coot	8	Insects and aquatic plants
Jacanas	2	Insects on floating waterplants.
Stilt, Painted-snipe, Water Dikkop, Pratincoles	5	Insects and other invertebrates along shoreline. Rock Pratincole breeds within the Kariba and Mupata Gorges.
Plovers, Lapwings, Sandpipers	25	Insects and other invertebrates along shoreline.
Gulls	3	Fish, frogs.
Kingfishers	8	3 of these species are mostly aquatic feeding on small fish, the others are inland species feeding on terrestrial insects
Piscivorous (fish eating) Raptors	3	Osprey is a seasonal migrant; Pel's Fishing Owls roosts and nests in dense canopy of evergreen trees along river banks
Other significant raptors associated with riparian habitat	1	Southern Banded Snake Eagle is closely associated with riparian habitat and nests in tall trees in the riverine woodlands and ravines. This habitat is under threat from clearing for cultivation on the Zambian side, and from high densities of elephants on the Zimbabwean side.

Group	Number of species	Comments: diet, status, threats
Sandbank nesting birds	3	African Skimmer. Intra African migrant. Endangered in sub region. Nests on low exposed, un-vegetated sandbanks. See text for more details. Southern Carmine Bee eater and White fronted Bee eater both nest in cliffs along riverbanks. Significant colonies along the Middle Zambezi and tributary rivers. Martins, Swifts: several species nest in the cliffs along river banks. None are threatened or endangered species.

Table 7.7 IUCN Red-listed Bird Species Potentially-present within 50 km of the Project (IBAT Proximity Report)

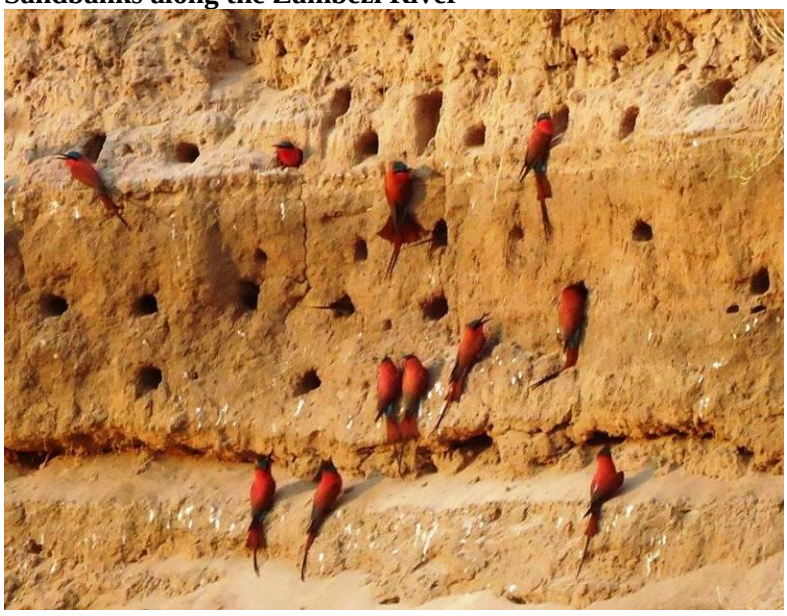
Species name	Common name	IUCN Category
Aquila nipalensis	Steppe eagle	**EN**
Aquila rapax	Tawny eagle	VU
Ardeola idea	Madagascar pond-heron	**EN**
Balearica regulorum	Grey crowned crane	**EN**
Bucorvus leadbeateri	Southern ground-hornbill	VU
Bugeranus carunculatus	Wattled crane	VU
Egretta vinaceigula	Slaty egret	VU
Falco fasciinucha	Taita falcon	VU
Gyps africanus	White-backed vulture	CR
Gyps coprotheres	Cape vulture	**EN**
Necrosyrtes monachus	Hooded vulture	**CR**
Oxyura maccoa	Maccoa duck	VU
Polemaetus bellicosus	Martial eagle	VU
Sagittarius serpentarius	Secretary bird	VU
Torgos tracheliotos	Lappet-faced vulture	**EN**
Trigonoceps occipitalis	White-headed vulture	**CR**

Birds of Conservation Concern

Southern Carmine Bee Eater (*Merops nubicoides*)

The banks of the Zambezi provide nesting habitat for an estimated 10,000 Carmine Bee eaters which is a significant population and higher than the threshold for congregatory terrestrial species (category A4ii *sensu* Fishpool 1997).

Figure 7.14 Southern Carmine Bee Eaters are Intra African Migrants that Nest in Sandbanks along the Zambezi River



Source: Internet / Date: Unkown/ Coordinates: Unknown

Rock Pratincole (*Glareola nuchalis*)

These are small, fast flying birds that inhabit and nest on the exposed rocks in the middle of fast flowing rivers where there is protection from predators. Rock Pratincoles feed predominantly on emerging aquatic insect larvae, such as caddisflies, that they forage from rocks midstream and on the margins of rivers. They are found along the Zambezi River, and are known to breed in Kariba Gorge and Mupata Gorge. The impoundments of Lake Kariba and Cahora Bassa have greatly reduced the birds' habitat and the diurnal fluctuations in water levels in Kariba Gorge caused by changes in electricity generation from Kariba create a tidal effect of more than one metre which may affect the birds. The effects of human predation have not been evaluated but may be significant (Hockey et al, 2005). The species is a localised, uncommon intra-African migrant that arrives late July-August and departs in December-January to non-breeding grounds in East Africa. Although it occurs elsewhere in Africa, the population in the sub region is considered to be of high conservation concern.

African Skimmer (*Rhynchops flavirostris*)

This bird is has a modified bill and flight pattern that enables it to fly just above the water, literally skimming the surface for small fish. It a localised species found on large river systems with exposed un-vegetated sandbars and islands, particularly on the Zambezi. It is partial intra-African migrant, arriving in May and departing in December. It has very specific requirements for nesting and lays its eggs on bare sand, often close to the water's edge.

Although categorised as Near Threatened (IUCN) the southern African population is now considered to be Endangered as it is decreasing rapidly due to habitat loss, exploitation and disturbance. Construction of Lake Kariba resulted in loss of breeding sites both up- and downstream of the dam wall. During breeding (dry) season, boats create wakes that wash eggs and chicks into the water. The breeding birds are also disturbed by canoeing safaris camping on islands in the Zambezi River. Eggs are collected for food by local villagers and the chicks used as fishing bait.

Population surveys along the 256 km of Zambezi River between Kariba Gorge and Kanyemba show a decline in numbers: (1981) 100; (1986/1987) 137; (1989) 56; (1991) 36 and no evidence of breeding at the last count. In January 1990, the pre-migratory gathering at Rukomeche, Zimbabwe, contained only 12 birds (Hockey, et.al. 2005).

7.3.4 Levels of Habitat Modification

This Section evaluates the level of disturbance to the main habitats and the natural functioning of the ecosystems.

7.3.4.1 World Bank-IFC Definitions

The IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources classifies habitats under the following three main categories.

Modified Habitat
Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. Examples of this habitat are the urban areas around Siavonga, Kariba and Chirundu towns, as well as the cultivated fields along the Zambian bank.

Natural Habitat

Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. Excluding the immediate environs of the various safari camps, the protected areas on the Zimbabwean side of the river are good examples of natural habitats.

Critical Habitat

Critical habitats are areas with high biodiversity value, including:

- Habitat of significant importance to Critically Endangered and/or Endangered species;
- Habitat of significant importance to endemic and/or restricted-range species;
- Habitat supporting globally significant concentrations of migratory species and/or congregatory species; and
- Highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

Table 7.8 Habitat Type and Levels of Modification

Habitat Type	IFC Classification	Level of Modification	Biodiversity Value
Escarpment Habitats a) Miombo Woodland (Julbernardia-Brachystegia) b) Kirkia-Sterculia-Commiphora woodland	Natural Natural	Low – medium modification is around towns. Trees are cut for poles (housing) and firewood. Elephant damage in Zimbabwe national parks and safari areas; annual late dry season hot fires in Zambia and Zimbabwe reducing woodland to open shrubland in places	Low – medium. Type is widespread through project area and region
Valley Floor Habitats a) Colophospermum mopane woodland on heavy soils b)Dry forest / thicket "jesse" on sandy soils	Natural – some Modified Natural	Low-medium. Localised modification where elephant densities are high. Low-medium. Localised modification where elephant densities are high	Medium. Although the type is very widespread, there are some particularly good examples of cathedral mopane woodland in the Parks Estate. Medium-High. Dry forest is a restricted type with high species diversity
Alluvial Habitats a) Zambezi river sandbanks b) Zambezi river riparian woodland	Natural. Modification due to absence of natural flood patterns caused by damming of Zambezi river (Lake Kariba).	This type meets the criteria (i), (iii), (iv) listed for Critical Habitat	Very High Biodiversity Value Especially Mana Pools floodplain
Cultivation	Modified	High. Where the cultivation has been intense and long term, the level of modification is high, although some ecological processes still continue, albeit at a reduced rate: e.g. nutrient re-cycling. Invasive or Weedy species are common	Low. Wildlife species absent or in low numbers; habitats highly modified.
Urban	Highly modified	High. Many ecological processes have been compromised, except in	Low although there may be more species than in cultivated areas due to the

Habitat Type	IFC Classification	Level of Modification	Biodiversity Value
		suburban gardens. Weedy species common.	introduction of ornamental plants into gardens.

7.3.4.2 Key Findings – Terrestrial Ecology:

The area of direct influence around Kariba and Siavonga towns is already highly disturbed through urbanization. The impact of the project to the local ecology is therefore not as significant as to the Kariba Gorge itself which is an undisturbed and largely natural habitat and the location of several plant and fauna endangered, vulnerable species.

Downstream, the area of indirect influence has two contrasting land use types and therefore different levels of habitat modification. On the Zambian bank from Nyamuomba to Chiawa, the area is disturbed through cultivation but further downstream in the Lower Zambezi National Park, the habitats are natural. The same applies to the Zimbabwe bank which has vast expanses of undisturbed natural habitats. The Zambezi River riparian habitat including the riparian woodlands within the Gorge, the sandbanks and floodplains are important habitats for several bird species, as well a refuge for large populations of hippopotamus and crocodile.

7.3.5 Aquatic Ecology

This section presents a summary of the aquatic ecology baseline. Full details of the baseline are presented in Appendix B – Aquatic Ecology and Part II Annex E of the ESIA.
The baseline presented in this Section is based on data collection during the dry season only. Wet season sampling was undertaken during the time of finalizing the ESIA, and is included in Annex E in Part II of the ESIA. The results from the wet season sampling do show some variation to those of the dry season; however, this did not influence the outcomes of the aquatic impact assessment presented in Section 7.3.5.

7.3.5.1 Methodology and Sampling Sites

A detailed literature review of information on the aquatic ecology of the area was undertaken.

Three sites on the downstream Zambezi River were sampled for the ESIA: site ZR1, immediately downstream of the dam wall; site ZR2, 10 km downstream of ZR1 but still within the Kariba Gorge; and site ZR3, located approximately 23 km downstream of the dam wall at the end of the Kariba Gorge. The three sites are representative of the available habitat in the downstream reach, and forms a hydrological unit, as the volume contribution of tributaries in this reach is not significant.

Four further sites were also sampled: site D1, i.e. the preferred option for spoil disposal, the disused Sinhydro quarry; D2, the site of an alternative waste rock dump site approximately 100 m to the east on a drainage line; DT3, selected for monitoring purposes on an ephemeral stream located approximately 200 m west of the disused quarry site; and KD1 at the site of the existing slipway on the Kariba Reservoir, which is being upgraded and dredged to launch the floating coffer dam.

Information gathered at these sites was used to determine the Present Ecological State (PES) and Ecological Importance and Significance (EIS) of the aquatic environments, and to quantify:

- Response Metrics:
  - Aquatic macroinvertebrates (MIRAI - Dickens & Graham, 2002)
  - Fish (FRAI - Kleynhans, 2007);
  - Diatom assessment (Taylor et al., 2005); and
- Drivers Metrics:

- Habitat Indicators (IHAS and IHI - McMillan, 1998; Kleynhans, 1999); and
- In situ water quality measurements [pH, electrical conductivity (EC), Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and Turbidity].

7.3.5.2 Water Quality

In situ Results

In situ water quality for sites located on the Zambezi River (ZR1-3) showed slightly alkaline conditions, with low electrical conductivity (ECs). Site KD1 on the Kariba Dam reservoir showed a more alkaline condition and marginally higher salt load than sites ZR1-3 on the Zambezi River, downstream of the spillway. This most likely relates to the lentic and lotic differences between the sites assessed. Site D1, representing the preferred waste rock dump site, the disused Sinohydro quarry site, reflected hyper alkaline and saline conditions. The water in the existing quarry is contaminated, probably through geological exposure and leachate.

Table 7.9 In situ Water Quality Values Measured during the September 2014 Survey

Variable	Abb.	Unit	ZR1	ZR2	ZR3	KD1	D1
pH	-	[H^{1+} ions]	7.8	7.8	7.6	8.3	9.3
Electrical Conductivity	EC	$\mu S\text{-}cm^{-1}$	87.0	87.6	86.9	91.6	6.5*
Total Dissolved Solids	TDS	ppm	62.1	62.8	63.2	65.7	4.6#
Temperature	Temp	°C	23.5	24.9	24	25.1	25.8
* = $mS\text{-}cm^{-1}$; # = ppt							

	Ideal (Kotze, 2002)
	Tolerable (Kotze, 2002)
	Intolerable (Kotze, 2002)

Source: Ecotone, 2014
Please Note: tolerability describes the threshold for sustaining ecological integrity. A loss in ecosystem functioning will occur or can be expected if this threshold is exceeded.

Water quality fell within threshold values for sustaining aquatic ecosystems, with the exception of D1. Results from the September 2014 field assessment were consistent with historical water quality data provided by the Zambezi River Authority. Water from downstream of the Kariba Dam was characterized by circumneutral pH values and relatively low electrical conductivities. Conversely, water sampled within the proposed rock disposal area (D1) reflected a high alkalinity and salt loads with trace elements potentially posing an ecotoxicological threat. These include Aluminium, Arsenic, Copper, Fluoride, Mercury and Selenium. Due to the possible ecotoxicological threat, any water removed from the quarry should be considered as contaminated and should not be released into the surrounding watercourses. **The analysis of sediment taken at Site KD1 indicated elevated levels of Aluminium, Calcium, Magnesium, Manganese, Sodium and Diesel Rage Hydro-carbons.** Detailed monitoring of these parameters will be performed by the project in this and other related areas.

Habitat Integrity

Instream habitat integrity (IHI) assessment (Kleynhans, 1996) was applied in order to ascertain the change of instream and riparian habitat from natural conditions on a site basis. Sites assessed along the Zambezi River reflected a Moderate to Largely modified state (IHI 50 - 69 %), with site ZR1 indicating the largest modification to habitat integrity. This is due to the flow, bed and channel modification resulting from the construction of Kariba Dam and the associated power generation.

The sites associated with the waste rock dump site were less impacted and classed in C categories, inferring a Moderately modified state, where a loss and change of natural habitat

have occurred but the basic ecosystem functions are still predominantly unchanged. Overall IHI scores ranged from 73 – 78 % for these sites.

Table 7.10 Results for the Index of Habitat Integrity for Study Sites (September 2014)

Habitat Type	ZR1	ZR2	ZR3	D2	DT3
Instream habitat integrity %	43	64	51	78	72
Instream habitat integrity Class	D	C	D	C	C
Riparian habitat integrity %	59	74	62	78	76
Riparian habitat integrity Class	D	C	C	C	C
Over all IHI %	50.8	69.0	56.8	78.1	73.8
Over all IHI category	D	C	D	C	C
C	A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged				
D	Large loss of natural habitat, biota and basic ecosystem functions has occurred				

Catchment Condition

The degree of catchment transformation, which will influence aquatic ecology, was assessed using DEM and Enhanced Vegetation Index based on satellite imagery. Land-use on the Zimbabwean side of the Zambezi River is national parks and nature reserves along most of the length of the middle Zambezi. While on the Zambian side, up to the downstream confluence of the Chongwe River, land-use is dominated mostly by subsistence farming, rural developments and pastoral activities. This elevated landuse puts pressure on the left bank and results in increased surface denudation and subsequent soil erosion and runoff. It could be concluded that any large volumes of sediment input into the Zambezi River downstream of the dam wall would originate predominantly from the catchment region associated with the left bank. Although generally more sparsely vegetated, most of the southward facing slopes indicated higher vegetation indices on the Zimbabwean side than on the Zambian side, suggesting a higher overall catchment transformation on the left Zambian bank.

Macroinvertebrate Habitat Availability

Sites assessed showed an Adequate to Poor macroinvertebrate habitat availability in the September 2014 survey. Site ZR1 reflected the lowest habitat availability for macroinvertebrate colonization, lacking both aquatic and marginal vegetation and riffle/rapids section. Marginal and aquatic vegetation was more readily available in the lower reaches. Site ZR2 obtained the highest habitat availability score and was classed as Adequate.

Fish Habitat Availability

In general, available fish habitat was dominated by fast-deep and slow-deep flowing water, with substrate and water column being the most dominant cover unit at all sites assessed. Site ZR2 and 3 also showed some overhanging vegetation and aquatic macrophytes present as cover units. The daily and weekly fluctuation in water level does expose shallower riffle rapid section, but these remain largely uncolonised. The rapid fluctuation in water level prohibits invertebrate colonisation and excludes these areas as feeding grounds for fish.

Key Findings – Habitat Assessment

Sites on non-perennial systems (Sites D1, 2 and DT3) fell in C ecological categories and reflected Moderately modified conditions. Roads and stream crossings causing secondary impacts related to bed modification were the biggest reasons for the loss in habitat integrity on

these non-perennial systems. Sites located on the main stem Zambezi River (ZR1-3) fell into D, C and D categories respectively, and were affected by flow, channel and bed modification induced by the Kariba Dam and the Power station operations.

Sites on the Kariba Dam and the Zambezi River downstream of the Dam were in a Good and Moderate ecological state according to the diatom community. The community at these sites reflected slightly alkaline, fresh-brackish, oxygenated waters with Moderate pollution. Site (ZR1), downstream of the Dam wall, showed species with a preference for Sulphate, Calcium and Carbonates, where sites further downstream showed an increase in nutrient tolerant diatoms.

7.3.5.3 Macroinvertebrates

The macroinvertebrate communities in the study area had a low to moderate diversity comprising of mostly tolerant taxa. A total of 23 families were identified in the reach sampled. Of these families only the Heptageniidae and the Baetidae are considered sensitive to water quality. Many expected flow and water quality sensitive taxa were conspicuously missing from the present assemblage, such as various Trichopterans (Caddisflies), Psephenidae (Water Pennies), Perlidae (Stone Flies), Polymitarcyidae (Pale Burrowers) and Tricorythidae (Stout Crawlers).

The macroinvertebrate assemblage is considered Largely modified due to a knock-on effect from flow regulation from the dam on habitat, connectivity, and water quality. The major driver of change in the system is hydrology, which has a subsequent impact on habitat, connectivity and water quality.

Table 7.11 Aquatic Macroinvertebrates Sampled during the September 2014 Survey with Relevant Abundance and Sensitivity Scores according to Dickens & Graham (2001)

Taxon	Sensitivity Score	ZR1	ZR2	ZR3
Oligochaeta	**1**	A	A	A
Potamonautidae*	**3**		A	
Atyidae	**8**		A	B
Baetidae 2 sp.	**6**		B	
Baetidae > 2 sp.	**12**			B
Caenidae	**6**		A	
Heptageniidae	**13**		A	
Leptophlebiidae	**9**		A	
Coenagrionidae	**4**		A	B
Corixidae*	**3**		B	
Gerridae*	**5**		B	
Veliidae*	**5**		B	
Hydropsychidae 1 sp.	**3**	C		
Hydropsychidae 2 sp.	**6**		A	
Hydroptilidae	**6**			A
Gyrinidae*	**5**		B	A
Chironomidae	**2**	A	B	A
Simuliidae	**5**			A
Lymnaeidae*	**3**	A	1	B
Physidae*	**3**		**A**	
Planorbinae*	**3**		A	B
Thiaridae	**3**	A	B	B

Taxon		Sensitivity Score	ZR1	ZR2	ZR3
Corbiculidae		5	A	B	B
Score			**18**	**93**	**51**
No. of Taxa			**6**	**19**	**12**
ASPT			**3.00**	**4.89**	**4.25**
	Sensitive taxa				
	Moderately tolerant to pollution				
*	Air breathing				
1	1 individual				
A	2-10 individuals				
B	11-100 individuals				
C	101-1000 individuals				

7.3.5.4 Fish

Fish Community – Expected and Sampled

Based on previous surveys (WCD 2000, Bills and Marshall 2004, IUCN Bio Browser), a total of 51 indigenous fish species is expected, from 28 genera and 13 families. Surveys for this ESIA found 22 species, from 15 genera and 9 families.

The majority of expected species carry an IUCN conservation status of Least Concern (LC). Two potentially occurring species (*Oreochromis mortimeri* and *O.macrochir*) are Critically Endangered (CR) and Vulnerable (V), respectively. The conservation status of both species is attributed to the introduction of the exotic *Oreochromis niloticus*. *Oreochromis mortimeri* is more affected by *O.niloticus* due to hybridisation, while *O.macrochir* is affected by competition and displacement by *O.niloticus*. It should be noted that *O.macrochir* itself has been introduced to Kariba Dam and the middle Zambezi from the upper reaches. The presence of *O.mortimeri* remains to be confirmed following the September 2014 assessment, although the proposed activities are unlikely to aggravate the existing conservation status of this fish. The IBAT Proximity Report on IUCN-listed species potentially presented within 50 km of the project site identified these 2 *Oreochromis* species, as well as *Oreochromis andersonii* (Threespot tilapia; VU; Actinopterygii).

Chiloglanis neumanni have been sampled downstream of the Dam during the September 2014 assessment, albeit in low numbers and at a single location. This species is listed as Data Deficient (DD) by the IUCN.

The development of the Kariba Dam and reservoir has changed the composition of the fish populations (Timberlake, 1997; Davies, et al., 1986). The post-Kariba Dam fish community reflects a dominance of Cichlids, Mochokids and Alestids, and rheophilic fishes (preferring fast-moving water, and riffle habitats) such as *Amphilius uranoscopus*, *Zaireichthys rotundiceps*, *Opsaridium zambezense* and *Labeobarbus marequensis* have disappeared from the reach affected by Kariba Dam. Some, more tolerant rheophilic species such as *Chiloglanis neumanni* are still present, but in lower numbers. Fish with specific migration requirements (most of the *Labeo, Barbus* and *Anguilla* species) have also been negatively affected by the dam. It is likely that the absence of the smaller Barbus species may be attributed to changes in the flow regime and the alteration of instream habitat.

Table 7.12 Expected and Sampled Fish Showing IUCN Conservation Status

Family	*Genus Species*	*Common Name*	Local Name	IUCN	Site
Anguilliformes					
Anguillidae	*Anguilla bengalensis ssp. Labiata*	Indian Mottled Eel	Solomon Fish	NT	
Anguillidae	*Anguilla marmorata*	Marbled Eel	Solomon Fish	LC	

Family	*Genus Species*	*Common Name*	Local Name	IUCN	Site
Anguillidae	*Anguilla mossambicus*	Longfin Eel	Solomon Fish	LC	
Characiformes					
Alestidae	*Brycinus lateralis*	Stripped Robber	Chenga	LC	ZR3
Alestidae	*Bycinus imberi*	Imberi	Chenga	LC	ZR1,2, 3
Alestidae	*Hydrocynus vittatus*	Tigerfish	Tiger Fish	LC	ZR2,3
Alestidae	*Micralestes acutidens*	Sharptooth tetra	Chenga	LC	ZR2,3
Distichodontidae	*Distichodus mossambicus*	Nkupe	Nkupe	LC	
Distichodontidae	*Distichodus schenga*	Chessa	Chesa	LC	ZR1,2, 3
Cypriniformes					
Cyprinidae	*Barbus annectance*	Broadstripe Barb	- Mimbulwe	LC	
Cyprinidae	*Barbus afrovernayi*	Spottail Barb	- Mimbulwe	LC	
Cyprinidae	*Barbus fasciolatus*	African banded barb	- Mimbulwe	LC	
Cyprinidae	*Barbus paludinosis*	Straightfin barb	Mimbulwe	LC	
Cyprinidae	*Barbus poechii*	Dashtail barb	- Mimbulwe	LC	
Cyprinidae	*Barbus radiatus*	Redeye Barb	- Mimbulwe	LC	
Cyprinidae	*Barbus trimaculatus*	Threespot barb	- Mimbulwe	LC	
Cyprinidae	*Barbus unitaeniatus*	Slender barb	- Mimbulwe	LC	ZR3
Cyprinidae	*Cyprinus carpio*	Wild Common Carp	-	Exotic	
Cyprinidae	*Labeo altivelis*	Sailfin mudsucker	- Mpumbu	LC	
Cyprinidae	*Labeo congoro*	Purple Labeo	Mpumbu	LC	ZR2
Cyprinidae	*Labeo cylindricus*	Redeyed labeo	Ningu	LC	ZR1,2
Cyprinidae	*Labeo molybdinus*	Leaden Labeo	- Ningu	LC	
Cyprinidae	*Labeobarbus marequensis*	Lowveld Largescale Yellowfish	Chitumbwa	LC	
Cyprinidae	*Opsaridium zambezense*	Dwarf Sanjika	N-angazambia	LC	
Cyprinodontiformes					
Poeciliidae	*Aplocheilichthys johnstoni*	Johnston's Topminnow	Mimburwe	LC	ZR2
Poeciliidae	*Gambusia affinis*	Western Mosquitofish	-	Exotic	
Lepidosireniformes					
Protopteridae	*Protopterus annectens*	African Lungfish	Inkomo	LC	
Protopteridae	*Protopterus annectens ssp. brieni*	African Lungfish	Inkomo	LC	
Osteoglossiformes					
Mormyridae	*Cyphomyrus discorhynchus*	Zambezi Parrotfish	Nyanzi	LC	ZR1,2, 3
Mormyridae	*Marcusenius altisambesi*	Bulldog	Chise	LC	
Mormyridae	*Marcusenius macrolepidotus*	Bulldog	Chise	LC	
Mormyridae	*Mormyrops anguilloides*	Cornish jack	Lombo-lombo	LC	ZR2,3
Mormyridae	*Mormyrus longirostris*	Eastern Bottlenose	Botoro Fish	LC	
Perciformes					
Cichlidae	*Oreochromis macrochir*	Greenhead Tilapia	White Bream	VU	
Cichlidae	*Oreochromis mortimeri*	Kariba Tilapia	White Bream	CR	
Cichlidae	*Oreochromis niloticus*	Nile Tilapia	White Bream	Exotic	ZR3

Family	*Genus Species*	*Common Name*	Local Name	IUCN	Site
Cichlidae	*Pharyngochromis acuticeps*	Zambezi River Bream	Lufindu	LC	ZR1,2, 3
Cichlidae	*Pseudocrenilabrus philander ssp. Philander*	Southern Mouthbrooder	Lufindu	LC	ZR1
Cichlidae	*Sargochromis carlottae*	Rainbow Bream	-	LC	
Cichlidae	*Sargochromis codringtonii*	Green Bream	-	LC	
Cichlidae	*Sargochromis giardi*	Pink Bream	-	LC	
Cichlidae	*Serranochromis macrocephalus*	Purpleface largemouth	Mbiriya	LC	
Cichlidae	*Serranochromis Robustus*	Yellow-belly Bream	Makovo	LC	
Cichlidae	*Tilapia rendalli*	Northern Redbreast Tilapia	Red Bream	LC	ZR1,2, 3
Cichlidae	*Tilapia sparrmanii*	Sparrman's Bream	-	LC	ZR2,3
Siluriformes					
Amphiliidae	*Zaireichthys rotundiceps*	Spotted Sand Catlet	-	LC	
Clariidae	*Clarias gariepinus*	Sharptooth Catfish	Mulamba	LC	
Clariidae	*Heterobranchus longifilis*	Vundu	Vunda	LC	
Malapteruridae	*Malapterurus shirensis*	Electric Catfish	Ntetenezi	LC	ZR1
Mochokidae	*Chiloglanis emarginatus*	Phongolo Suckermouth	Mbowa	LC	
Mochokidae	*Chiloglanis neumanni*	Neumann's suckermouth	Mbowa	DD	ZR2
Mochokidae	*Synodontis zambezensis*	Brown Squeaker	Choko-choko	LC	ZR1,2, 3
Mochokidae	*Synodontis nebulosus*	Cloudy Squeaker	Choko-choko	LC	ZR1
Schilbeidae	*Schilbe intermedius*	Silver Butter Catfish	Silver Fish/ Shlitungu	LC	ZR3
	Sampled				
	Exotic				
	Introduced				

Fish Community Assemblage Integrity

A community integrity assessment was conducted for the whole reach, represented by the three ZR sites. The present fish community shows a Moderate to Largely altered state in comparison to reference fish assemblages and fell into a C/D ecological category. A comparison between the habitat preferences and environmental tolerances of the expected and the sampled community highlighted that flow modification contributed the most towards digression from reference condition, and secondary factors that are related to flow alteration, such as a loss in preferred velocity and depth classes, also contributed notably towards the altered state of the present fish community.

Spatial Variation in Fish Communities

Site ZR1 yielded the lowest fish abundances, number of species and overall diversity score, while site ZR2 reflected the highest number of species followed by site ZR3, the latter showed a better evenness distribution and subsequently measured a higher diversity. Less than 20 percent of the total fish abundance for site ZR3 can be allocated to a single species. Conversely, nearly 50 percent of the fish abundances for site ZR1 are represented by a single species.

7.3.6 Protected Areas

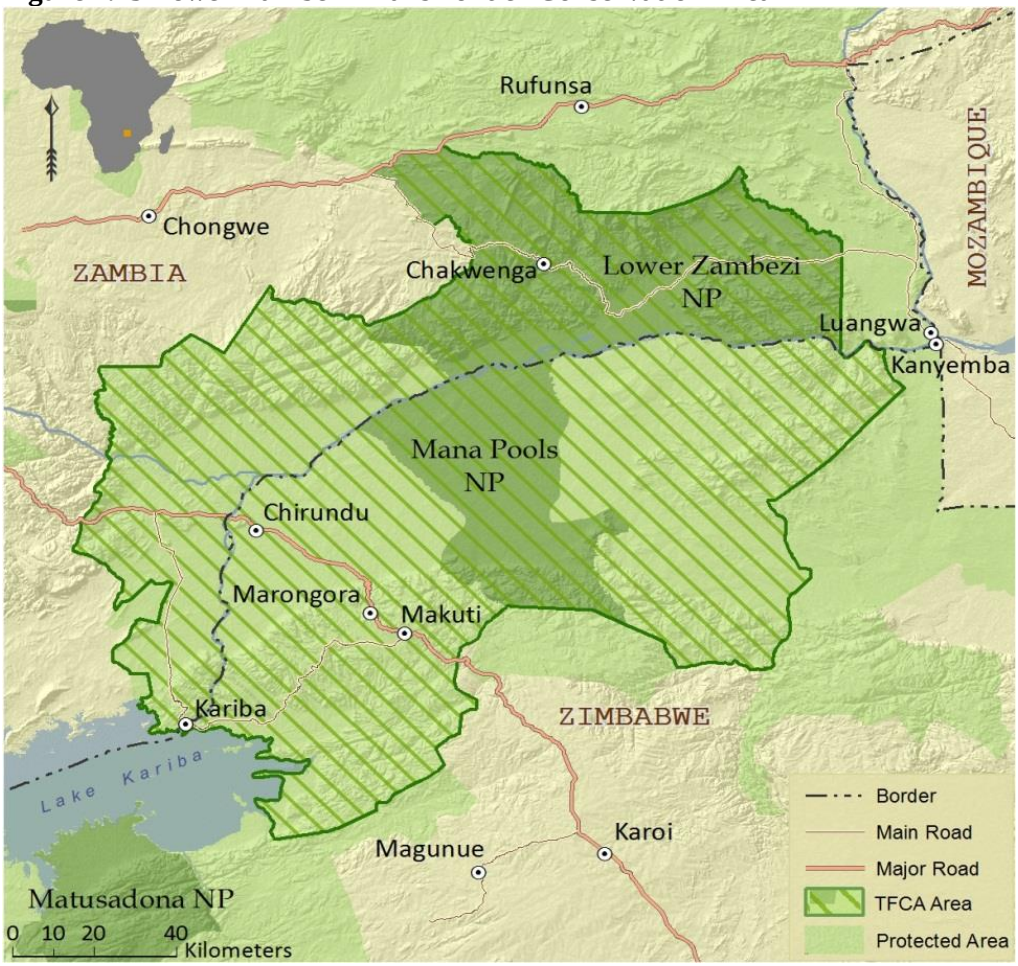
The IBAT Proximity Report generated in July 2020, found four protected areas overlapping with the 5 km buffer around the project site:

- Charara (1692 km^2) and Hurungwe (2894 km^2) Safari Areas (IUCN Protected Area category VI) in Zimbabwe;
- Lake Kariba National Park; and
- Lukwechele Forest Reserve, a 24.5 km^2 reserve on the Zambian shoreline east of Siavonga.

The Project is located within the Lower Zambezi Transfrontier Conservation Area (LZTFCA) (see Figure 7.1). In Zambia this Transfrontier Conservation Area (TFCA) includes the Open Area around Siavonga down to Chirundu, Chiawa Game Management Area and Lower Zambezi National Park. In Zimbabwe, the TFCA includes the Charara, Hurungwe and Rifa Safari Areas between Kariba and Chirundu, Mana Pools National Park, Sapi and Chewore Safari Areas down to Kanyemba.

While the Project is in the LZTFCA, the Project's Direct Area of Influence only extends 5 km from the Kariba Dam wall into the LZTFCA, and the Indirect Area of Influence extends 10 km into the LZTFCA.

Figure 7.15 Lower Zambezi Transfrontier Conservation Area



Source: Peace Parks Foundation, 2014. (http://www.peaceparks.org/tfca.php?pid=19&mid=1019. Accessed 11 November 2014)

Mana Pools National Park, Sapi and Chewore are a designated United Nations Organization for Education, Science and Culture (UNESCO) World Heritage Sites based on the area's wildlife populations and outstanding beauty

(http://whc.unesco.org/pg.cfm?cid=31&id_site=302). The Zimbabwean side of the LZTFCA is also a regionally Important Bird Area (IBA) (Childes & Mundy, 2001).

The Open Area from Siavonga to Chirundu and further down to Chiawa is largely under agriculture. The Zambian Wildlife Authority (ZAWA) manages the wildlife in Chiawa and Lower Zambezi, whilst on the Zimbabwean side all the land is protected under the Parks and Wildlife Management Authority. The wildlife areas on both sides of the river are popular tourist destinations.

7.4 Social Characteristics

This Section of the report provides a description of the social environment (which includes economic, health, and cultural heritage aspects) in the Project Affected Areas (PAA). It provides a comprehensive description of the characteristics of the Social Study Area (SSA) and draws on primary data specifically collected for this purpose as well as secondary data sources.

7.4.1 Methodology

The social baseline study was compiled from publicly available secondary data. The secondary data was supplemented by primary data that was collected by way of various social data gathering methods.

Due to the limited Project footprint and limited expected social impacts, primary data collection was limited to a small sample size: a limited livelihoods survey was conducted with 40 participants in Mahombekombe and Kariba Heights in Zimbabwe, and Siavonga Town and Micho in Zambia. The results of this survey should not be extrapolated to the wider population of Kariba and Siavona Districts. In addition four focus group discussions (FGDs) were also undertaken with representatives of traders, fishermen and two local women's groups (one each in Zimbabwe and Zambia). Ad hoc one-to-one meetings were also held with key informants including health and education officials as well as the district planner in Zambia and the town clerk in Zimbabwe.

Secondary data sources included:

- The most recent Population and Household Census information of both countries;
- Demographic and Health Survey information;
- Research reports from various international NGOs and organisations; and
- Other sources of information identified via the Internet.

In certain cases outdated data (information older than five years) was used due to a lack of current data.

In addition to the above, for the updated ESIA, ZRA assembled further information on the social conditions in the primary Project site(s) and related facilities (disposal area, transport route to the disposal area, and the area influenced by blasting). This is summarized in Section 7.4.2.

7.4.2 Social Conditions in the Primary Project Site

7.4.2.1 Plunge Pool Site and Spoil Disposal Site

The plunge pool and the spoil disposal site are both within the security area between the border posts of Zambia and Zimbabwe. The area is not populated – no persons use the land for any purpose, and there are no residences except for 7 immigration authority houses (on the Zambian

side of the Zambezi river but within the security area between the two border posts), which house some of the Zambian immigration personnel that are employed at the border post.

7.4.2.2 Area of Influence of Blasting

KDRP blasting activities are confined to the plunge pool area. There are therefore no dwellings or community infrastructure within the area of influence of blasting. However, the road that passes along the crest of Kariba Dam is a public road that is used by civilians (pedestrians and motorists). The 7 houses for Zambia Immigration staff mentioned above are outside of the the area of influence of blasting and further from the blasting area than the KDRP offices.

7.4.3 Demographic Profile

The closest towns are Kariba in Zimbabwe and Siavonga in Zambia. Both are located along the reservoir shore. In Zambia, Kariba Dam is located in Siavonga District, Southern Province. In Zimbabwe, Kariba Dam is located in Kariba District, Mashonaland West Province. Kariba District is highly urbanized, whilst Siavonga remains largely (65%) rural. The wards in which the project is located are: Kariba Ward in Siavonga District, with a population of 16,415 (https://www.zamstats.gov.zm/); and Ward 4, including Mahombekombe, in Kariba District, with a population of 29,928 in 2017 (https://ucaz.org.zw/).

Table 7.13 Demographic Indicators at National, Provincial and District Levels

Demographic Indicators	Zimbabwe	Mashonaland West Province	Kariba District	Zambia	Southern Province	Siavonga District
Population size	14,862,924	1,552, 520	67,820	18,383,955	1.6	89, 787
Population Growth	3.63	2.3	-	3.2	2.8	4.4
Population Density	38	-	-	25	18.6	26.3
Average Household Size	5.6	4.3	-	5.2	4.5	-
Female and Male Headed Households in %						
Male Headed Households	59	68	-	50.1	82.7	81.8
Female Headed Households	41	32	-	499	17.3	18.2
Gender Distribution in %						
Females	50.7	50.8	49	50.49	52.2	49.3
Males	49.3	49.2	50	49.51	47.8	50.7
Age Distribution in %						
Under 15 years	41.41	43	-	46.7	21.2	-
15–64 years	55.47	53	90	50.8	71.3	-
65+ years	3.13	4	10	2.5	2.5	-
Rural/ Urban Split in %						
Urban	67.79	6.2	98.7		25	35
Rural	32.21	93.8	1.3	45.3	75	65

7.4.4 Ethnicity and Migration

7.4.4.1 Zambia

At Provincial and District levels (Southern Province), the Tonga people are 70% of the population, whilst the other ethno-linguistic groups are smaller percentages including the Nyanja (5.5%), Lozi (5%), Ila (3.8%), Bemba (2.8%), and English (0.8%).

Of the population surveyed during the ESIA in Siavonga Town and Micho, 42% were of Tonga ethno-linguistic groups, followed by Bemba (25%) and a number of other ethno-linguistic making up the remaining 33 percent.

Based on stakeholder consultation, a majority of people currently residing in Siavonga Town are migrants from other parts of Zambia. This portion of the population either works in government, own businesses or trade in the district. Of the people surveyed for the ESIA social assessment, in Micho and Siavonga Town (Zambia), the majority reported that they were migrants from elsewhere in Southern province (54%).

7.4.4.2 Zimbabwe

Mahombekombe and Kariba Heights are located within the Mashonaland region which is dominated by the Shona people and language. The surveyed population in the Mahombekombe and Kariba Heights found a population that is 63% Zimbabwean, as well as significant numbers of Zambians and Malawians.

Mashonaland West Province has the fourth largest level of migration in Zimbabwe, with 29.9% in-migration and 23.9% out-migration from 2002 to 2012, and a net migration of 8.5%. Of the people surveyed for the ESIA social assessment, in Mahombekombe and Kariba Heights (Zimbabwe), the majority reported that they were migrants from elsewhere in the country (56%).

7.4.5 Economy and Livelihoods

The economies of the Siavonga and Kariba Districts are based on trading, fishing (including agro-fisheries, subsistence and commercial), and tourism. The majority of the businesses are informal, except in the tourism sector.

7.4.5.1 Trading

Local informal markets sell a wide range of goods and services which includes clothing, perishables, and arts and crafts targeted at tourists visiting Lake Kariba. Informal trading serves as the main source of livelihoods for a large portion of the population in both Siavonga and Kariba Districts. Informal trading occurs daily in formal and informal market places in both districts. The markets often consist of a mixture of types of trading structures, such as formally constructed shops or stalls comprising of tables and crates to display sale goods.

The income generated from informal trading activities varies greatly, depending on the type of trading activity. For example, in Siavonga Town fruit and vegetable trader can earn up to eight dollars a month. Fishermen sometimes earn nothing in certain months as they are catching and processing fish around the small islands across Lake Kariba. People who sell and fix fishing equipment can earn up to USD 4,000 per month in peak-season. Those that sell arts and crafts can earn as little as USD 40 per month during the off-season; but as much as USD 150 to USD 400 during the peak tourist season.

7.4.5.2 Commercial Fishing

Fishing occurs on various scales across Lake Kariba, i.e. at an industrial or commercial scale or at an artisanal and small scale. The types of fishing that occurs on Lake Kariba include *kapenta* (offshore), gillnet fish (inshore) and limited numbers of crayfish.

There is a number of large commercial enterprises, serving markets in Lusaka and Harare. Some fish at night using lights to attract kapenta (small fish) into large "dip nets" suspended just below the water surface[7]. Some breed fish, predominantly tilapia, in floating cages close to islands on Lake Kariba. These enterprises employ people from the Siavonga and Kariba Districts, and are focused on Lake Kariba, not the downstream river.

7.4.5.3 Artisanal Fishers

The artisanal fishers comprise of local men and incoming participants who moved into the area for this purpose. The main fish is kapenta, which is dried on the reservoir shore and sold. However Fishers interviewed in Siavonga Town reported that they only undertake gillnet fishing and they fish bream, bottle fish, tiger fish, and babel fish. Generally, women are not engaged in fishing and the male fishers also process their fish (clean and dry /or smoke it), but women are actively engaged in the sale of fish. Kapenta fishers report earning $700 to $800 per month, while gillnet fishers earn between $25 and $630.

7.4.5.4 Tourism

An unintended consequence of the construction of the Kariba Dam has been the emergence of a thriving tourism industry, especially at the dam wall. Visitors are attracted to the water body and the surrounding rural/natural environment. A variety of activities such as safaris, boating, fishing, sunset cruises, canoeing, water sports, bird watching, cultural village tours and visiting look-out points are sought after. The tourism industry also supports a large informal trade sector whose customers are mainly tourists.

The majority of the mentioned activities happen upstream from the dam and adjacent to the lake on both sides of the river/lake. The wall itself was constructed in a narrow gorge and thus blends in well with the landscape. Downstream of the wall, there are two look-out points facing the wall which are popular tourist stops (i.e. at the Zimbabwean Tourism Authority Offices (ZTA) and at the wall itself).

Tourism in both Kariba and Siavonga Districts is an important part of the economy, and similarly to the fisheries industry, tourism driven by the presence of Lake Kariba. Other tourism attractions are the protected areas found in close proximity to the lake, especially on the Zimbabwean side of the border.

Long weekends, such as the Easter and school holidays as well as the festive season bring the most tourists in the area. The majority of which are domestic returners (who reside in other countries). There are limited numbers of foreign tourists in the area, and majority of which are from Europe and South Africa, especially around the tiger fish tournament (held annually in October), and a half marathon (August).

Siavonga District has a well-developed tourism industry, comprised of hotels, lodges, conference centres, boating, fishing, sunset cruises, canoeing, water sports, bird watching, cultural village tours, visits to the dam wall and power station. Most of the larger hotels/ or lodges focus mainly on hosting conferences in addition to general tourism, while the smaller hotels/ or lodges and resorts focus specifically on tourism and provide a wide variety of tours and other activities.

According to the Zimbabwean Tourism Agency (ZTA), there are currently more than 60 tourism operators registered on their database. These include hotels, lodges, tour operators and

[7] Kapenta (*Limnothrissa miodon*) was introduced into Lake Kariba in the 1970's as a potential source of protein and since then their numbers have grown significantly. It is one of the region's major sources of refrigeration-free protein foods.

safaris, as well as speed boats and houseboats. According to the ZTA, the majority of tourists who visit the area are domestic including government officials (mainly for conferences).

7.4.5.5 Subsistence Farming

Both Districts (Kariba and Siavonga) are situated in provinces known for intensive agricultural activities (commercial and subsistence). However, the residents of these districts do not undertake any extensive agricultural activities in the area. A limited number of households within the five kilometre area of influence keep livestock. Even those who sell fruits and vegetables in both Kariba and Siavonga travel to Harare and Lusaka, respectively, to procure these. This may reflect the steppe climate in this location, which consists of an average annual temperature above 25 °C, annual average rainfall of 727 mm, and a distinct wet season centred on January.

7.4.6 Employment Levels

Formal employment opportunities in the AoI are very limited. The sectors providing formal employment are Government, the energy parastatals ZESA and ZESCO, and the formal tourism and fisheries sectors. However, the informal trading and fishing sectors are the biggest employer.

7.4.6.1 Zambia

The Zambian 2012 Labour-force Survey (May 2013) reported labour force participation in Southern Province of 88.4%, with male participation 81.1%, and female 78.1%. The agriculture sector was the main employer (58% of the labour force). Unemployment is now (2020) 14.70%.

Siavonga District's IDP report states that formal employment is provided by the fishing industry, tourism (lodges), central government, and the Kariba Dam and power station. In turn the informal sector employs the most people especially, fisheries and informal trading.

7.4.6.2 Zimbabwe

The Zimbabwe Labour Force Survey 2011 reported labour force participation in Mashonaland West Province of 88.4%, with male participation 90.8%, and female 86.2%. The agriculture sector was the main employer (54.8% of the labour force) and unemployment approximately 11%.

Unemployment in Kariba District is higher, at 22% (Mashonaland West Province Report). Kariba District is more urban than the province, with only 17.9% engaged in agriculture and the 28.7% engaged in the services sector.

7.4.7 Education

In 2020, the national literacy rate in Zambia stands at 86.5%. Amongst the adults interviewed in Kariba (Zimbabwe), 20% reported that they had no schooling, 67% had attended primary school only, and 13% had also attended secondary school. The Siavonga respondents (Zambia) had greater access to schooling, with only 14% not receiving any schooling, 43% primary, and 36% secondary.

In 2012, a total of 7,538 pupils attend Kariba District's 41 schools. In 2009, a total of 19,467 pupils attended Siavonga District's 64 schools.

7.4.8 Health

7.4.8.1 Zambia

In 2007, Southern Province of Zambia had an HIV prevalence rate of 14.5 percent among men and women aged 15-49 years (Central Statistical Office, 2009). Siavonga has a higher HIV prevalence rate of 15.7. Of those with HIV, 17.4% receive antiretroviral treatment, and the province has a total of 53 health facilities that are able to provide antiretroviral medication to adults and children.
The Siavonga District has a health facility for each of its catchment areas, including two District hospitals and 12 health posts and centres. In 2010, malaria, malnutrition, respiratory infection (pneumonia), anaemia, diarrhoea (non-blood), severe diarrhoea with dehydration, and poisoning were the main causes of deaths. It is estimated that the HIV prevalence rate in the Siavonga District is 15.70%, and of those who are HIV positive it is estimated that 42.33% are women (Zambian National HIV/Aids/STI/TB Council, 2010). Incidence of Malaria is also prevalent in the adjacent Siavonga area on the Zambia side.

7.4.8.2 Zimbabwe

In Mashonaland Province, Acute Respiratory Infections (ARI), malaria, skin diseases and injuries are the five major reasons to visit a health facility. Tuberculosis (TB), ARI, HIV/AIDS, malaria and other viral diseases are reported to be the top five causes of mortality, and the infant mortality rate is estimated at 65 deaths per 1,000 births, with infant mortality higher in rural areas (Population Census: Mashonaland West Province Report, 2012). HIV prevalence in Mashonaland West Province was 15% (Kerina et al. 2013), with an estimated 58,754 new cases of AIDs cases reported in the Province in 2011 (The Zimbabwe National Health Profile, 2011).

There are 12 health centres in Kariba District and these consist of one district hospital and five clinics. All the health centres have access roads, access to electricity and sewerage systems. The Kariba Urban Primary Health Level comprises of Nyamhunga and Mahombekombe clinics that provide the first point of contact between the communities, Home Based Care Givers (HBCG) and the formal health delivery system. This level provides comprehensive, promotive, preventative, curative and rehabilitative health services. The crude death rate in Kariba is 10 per 1,000 people. Common illnesses include cholera, malaria, upper respiratory tract infections, HIV/Aids and others. No HIV/Aids statistical data could be obtained for the Kariba District. Incidence of Malaria is also prevalent in the adjacent Kariba area on the Zimbabwe side.

7.4.9 COVID-19

As of 15th July 2020, there have been over 13.1 million confirmed cases of COVID-19, including 573,752 deaths known to be caused by COVID-19, reported to the World Health Organization (https://covid19.who.int/).

Also, by 15th July 2020, Zambia has confirmed 2283 cases and 82 deaths, and Zimbabwe has confirmed 1034 cases and 19 deaths (https://covid19.who.int/).

Despite declining rates of transmission, numbers of new cases and deaths in many parts of the world, globally, the pandemic continues to accelerate. Zambia reported its second highest weekly number of new cases (388) and highest-yet weekly deaths (40) for the week ending 13th July to WHO. Zimbabwe reported its highest-yet weekly number of new cases (284) and deaths (10) for the week ending 30th June. In both countries, however, the number of reported cases and deaths remains relatively low per capita.

7.4.10 Water

The availability of potable water in Siavonga and Kariba Districts depends on the household's location: urban households have access to piped water inside the dwelling; households located

in the peri-urban areas have access to communal taps located within 500m of their households; households in rural areas, have access to boreholes, springs, or communal taps which may be two or more kilometres from the household. The water in communal sources may not be clean, for example people in the settlement of Micho complain of contamination of water supplies with sewage.

Similarly, access to improved sanitation is dependent on the location of the household. The urban population has access to improved sanitation facilities while the peri-urban communities have a mixture of improved and unimproved sanitation. The rural population uses pit latrines.

7.4.11 Energy

In Mashonaland West, 43% of households have access to electricity. The remaining households rely on charcoal, fuelwood, candles, solar and other alternative sources of energy. There is a large disparity between urban and rural households' access to electricity in Kariba District: 88% of households have access to electricity while the remaining 12% relies on gas, paraffin and solar power.

The majority of the population in Southern Province has no access to electricity. Forests provide an important source of energy with 69.3% relying on firewood and 17.8% on charcoal for cooking. In Siavonga District, only 18% of households are connected to the national grid. The remaining 82% use other sources, such as charcoal (the main source of energy for cooking) and solar and battery-fuelled camping-lights for lighting.

7.4.12 Roads

The A1 highway is paved and traverses through Mashonaland West Province, from Harare to the Zimbabwe-Zambia border. Further there are two secondary unpaved roads which run in an east-west direction across the Province. The A1 highway crosses the border into Zambia where it becomes the T2 highway and then traverses the Southern Province. In addition, the T1 highway also traverses the Southern Province, and connects Livingston to Lusaka. The T1 further traverses through the Kariba and Siavonga districts. The secondary roads in the districts are mostly paved though some have potholes.

7.4.13 Cultural Heritage

There are no sites of physical cultural heritage or archaeological monuments or remains, or grave sites in the direct area of influence of the project.

Nyami Nyami is important intangible cultural heritage associated with the Zambezi River. Also known as Shingai Musasiwa (Shingai River God) or Zambezi Snake spirit, Nyami Nyami is one of the most important gods of the Tonga people. Nyami Nyami is believed to protect the Tonga people, while also giving sustenance in difficult times, and is seen as the god of the Zambezi Valley and the river before the creation of the Kariba Dam. The Nyami Nyami is variously described as having the body of a snake and the head of a fish, a whirlpool or a river dragon, and often depicted as a snake-like being or dragon-like creature with a head of a fish. Carvings of the Nyami Nyami can be found as pendants on jewelry, usually carved out of wood, stone or bone, occasionally ivory, silver or gold both as a fashion accessory and as a good luck charm.

7.4.14 Vulnerable Groups

An estimated 47.3 percent of the population of Southern Province is affected by extreme poverty (Millennium Development Goals: Provincial Profile of Southern Province, 2013), but this is a decline from 73% in 2006. The incidence of poverty is generally higher in rural areas

than urban areas. Female headed households are generally most vulnerable to the incidence of poverty due to limited access to economic assets.

7.4.14.1 Women

Women in the project-affected area may be more vulnerable as they are often expected to fulfil traditional care roles which limit their socio-economic activities to the home, rather than seeking formal employment. In many cases women also lack education, mostly having attained only primary school level education. Local women may be unlikely to seek employment with the Project because of the burden of care and restrictive gender norms. Low status in society make women vulnerable to GBV and SEA.

Zimbabwe's population has a relatively high number of female-headed households (32 percent) as compared to Zambia which has 17.3 percent female headed households in the project affected Provinces and Districts.

7.4.14.2 The Elderly

The elderly are considered vulnerable due to their inability to participate in income generation activities such as employment or trading. They are highly unlikely to directly benefit from the project in terms of employment and business opportunities because of advanced age.

7.4.14.3 Youth

For the purposes of the ESIA prepared by ERM, youth were defined as persons aged approximately 15 to 24 or, recognising variations by cultural context, qualitatively defined by their degree of independence with respect to their ability to secure a livelihood, their relationship status (i.e., marriage, children), and living arrangements.

There are high levels of unemployment and illiteracy rate among youths (49.1%) in Siavonga. The inability by youth to read and write entails further relegates them to seek low paying jobs such as general workers. This perpetuates poverty from one generation to the next, merely surviving with limited opportunities to improve their lives.

7.4.14.4 HIV infected, Persons with Disabilities or Chronically ill Persons

People living with HIV may experience workplace stigma and discrimination which may impede them from disclosing their status and accessing HIV-related services leading to failure to remain healthy and maintain their employment and/or livelihoods.

People living with disabilities would be vulnerable and not able to take up employment if physical access to the project site is not guaranteed.

8 Impact Assessment and Mitigation

This Chapter presents the identified impacts of the KDRP and proposed mitigation measures. It predicts the physical, biophysical and social impacts of each project activity systematically, details potential mitigation measures that can be applied to avoid, minimise, mitigate or compensate potential negative impacts, and enhance potential benefits, and predicts the resulting residual impacts. Potential mitigation measures are then developed into detailed plans, as set out in the Environmental and Social Management Plan (ESMP; Section 9).

The Chapter prioritises the most potentially significant impacts of KDRP. As part of the Scoping Phase of the ESIA process, a number of impacts were screened out, and are therefore not analysed further in this Chapter: noise impacts; impacts due to dust (air quality impacts); loss of archaeological, palaeontological and cultural heritage; visual and landscape impacts; and impacts of waste generation. However, the ESMP includes measures to address any impacts in these areas.

8.1 Impact Assessment Methodology

Terminology used in characterizing the type, extent, duration, scale and frequency of each impact assessment is summarised in Table 8.1. The terminology and designations are provided to ensure consistency when these characteristics are described in an impact assessment deliverable.

Table 8.1 Impact Characteristic Terminology

Characteristic	Definition	Options and Definitions	
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
		Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
		Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.).	Local Regional International	Defined on a resource/receptor-specific basis.
Duration	The time period over which a resource / receptor is affected.	Temporary Short-term Long-term Permanent	Defined on a resource/receptor-specific basis (e.g., the definition of what constitutes a "short term" duration for a noise-related impact may differ from that of a "short term" duration for a habitat-related impact)
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	No fixed options; intended to be a numerical value.	
Frequency	A measure of the constancy or periodicity of the impact.	No fixed options; intended to be a numerical value.	

8.1.1 Assigning Magnitude

Once the impact characteristics are understood, these characteristics are used, in a manner specific to the resource/receptor in question, to assign each impact a magnitude. Magnitude describes the degree of change that the impact is likely to impart upon the resource/ receptor, and for adverse impacts is either: Negligible; Small; Medium; or Large. Positive or beneficial effects are simply described as Positive.

8.1.2 Assigning Sensitivity

The second principal step necessary to assign significance for a given impact is to define the sensitivity/vulnerability/importance of the impacted resource/receptor as either: Low; Medium; or High.

There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor. Where the resource is physical (for example, a water body) its quality, sensitivity to change and importance (on a local, national and international scale) are considered. Where the resource/receptor is biological or cultural (for example, the marine environment or a coral reef), its importance (for example, its local, regional, national or international importance) and its sensitivity to the specific type of impact are considered. Where the receptor is human, the vulnerability of the individual, community or wider societal group is considered. Legal protection, government policy, stakeholder views and economic value may also be considered when characterising sensitivity/vulnerability/ importance.

8.1.3 Determining Significance

Based on the magnitude of impact and sensitivity/vulnerability/importance of resource/receptor, the significance of each impact is determined using the matrix shown in Table 8.2.

Table 8.2 Impact Significance Matrix

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Negligible. An impact of negligible significance is one where a resource/receptor (including people) will not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

Minor. An impact of minor significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low sensitivity/ vulnerability/ importance.

Moderate. An impact of moderate significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from just above a minor impacts to a level that may be just short of breaching a legal limit.

Major. An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors.

8.1.4 Assigning Likelihood

An additional characteristic that pertains only to unplanned events (e.g., traffic accident, operational release of toxic gas, community riot, etc.) is likelihood. The likelihood of an unplanned event occurring is designated using a qualitative (or semi-quantitative, where appropriate data are available) scale, as described in Table 8.3, and is estimated on the basis of experience and/or evidence of the impact previously occurring for similar activities.

Table 8.3 Definitions for Likelihood Designations

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Likelihood is a measure of the degree to which the unplanned event is expected to occur, not the degree to which an impact or effect is expected to occur as a result of the unplanned event.

In the case of impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilised, but likelihood is considered when assigning a magnitude designation. The "likelihood-factored" magnitude is considered with the resource/receptor sensitivity/vulnerability/importance in order to assign impact significance, based on professional judgment, possibly assisted by quantitative data (e.g., modelling, frequency charts) where available.

8.1.5 The Mitigation Hierarchy

Once the significance of a given impact has been characterised, the next step is to evaluate what mitigation measures are warranted. In keeping with the Mitigation Hierarchy, the priority in mitigation is to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

It is important to have a solid basis for recommending mitigation measures. The role of any given ESIA is to develop a consentable project, and to help develop the project in a responsible manner. Impact assessment is about identifying the aspects of a project that need to be managed, and demonstrating how these have been appropriately dealt with. As key influencers in the decision making process, the role of the impact assessment is not to stop development or propose every possible mitigation or compensatory measure imaginable, but rather to make balanced judgements as to what is warranted, informed by a high quality evidence base.

8.1.6 Residual Impact Assessment

The aim of impact assessment and the planning of mitigation measures is to get to a position where the Project does not have any residual impacts of Major significance, certainly not ones that would endure into the long term or extend over a large area. As mitigation measures are identified, the next step in the impact assessment process is to determine the significance of the residual impact, and if this is not Minor or Negligible, to consider additional mitigation measures.

The intention is to reduce all residual impacts to a level that is as low as reasonably practicable (ALARP). Some residual impacts may be of Major significance even after all practicable mitigation options have been exhausted, e.g. the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project. In other cases, a Moderate residual impact may be only just avoiding breaking a law or causing a major impact, and therefore the emphasis is on demonstrating that the impact has been reduced to a level that is ALARP.

8.1.7 Dealing with Uncertainty

Uncertainties in impact assessment may arise from uncertainties in the final design (e.g. layout) of the project, or uncertainty in whether an activity or feature of the project, or an unplanned event, may result in an impact (e.g. will the project attract camp followers?). Where such uncertainties are material to ESIA findings, they have been clearly stated and conservatively approached, applying the precautionary principle.

8.2 Impacts on the Physical Environment

Potential KDRP impacts on the physical environment are:

- Altered Flows in the Zambezi River;
- Altered Flows in Tributaries to the Zambezi River;
- Risk of Weakening Rock Foundations;
- Reduced water quality and increased sediment mobilisation in the Zambezi River and tributaries;
- Physical presence of disused project infrastructure;
- Deposition of debris from project sites in the Zambezi River; and
- Loss of land due to the unmanaged disposal of waste spoil and solid waste.

8.2.1 Altered Flows in the Zambezi River

While the development of Kariba Dam and its operations have significantly altered the pattern of flows in the downstream Zambezi River from the pre-Kariba natural regime, *KDRP will not alter flows in the Zambezi River any further than this, either during rehabilitation works or during ongoing operations*.

The selected KDRP approach of allowing spilling as before and ceasing plunge pool works in advance of spilling until spilling ceases, does not require any alteration of current operating rules of the reservoir. If either of the two alternative scenarios had been selected, as discussed in Chapter 5 Assessment of Alternatives, there would have been a possibility of a sustained non-spillage of 16 or 11 months.

Downstream communities may be concerned that KDRP will alter flows, which could affect shoreline agriculture, or change the levels of the water table locally. However, flows will not be significantly altered.

The pumping of water from the plunge pool once each year during rehabilitation will marginally increase flow volumes downstream, but this is negligible compared to the volume of flow in the river, and therefore **Not Significant (Negligible),** and does not require mitigation.

Table 8.4 Increased flow volumes downstream due to dewatering of plunge pool

Impact	**Increased flow volumes downstream due to dewatering of plunge pool annually during rehabilitation**	
Type	Direct negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**

Extent	Local	Volume of dewatered water is negligible compared to Zambezi flows
Duration	Temporary	Occurs once each season during rehabilitation
Scale	Negligible	Volume of dewatered water is negligible compared to Zambezi flows
Frequency	Low	Occurs once each season during rehabilitation
Likelihood	Likely	Will occur each season.
Magnitude	Negligible	
Sensitivity	Medium	
Significance	Negligible	

8.2.2 Altered Flows in Tributaries to the Zambezi River

The crossing of smaller intermittent or perennial tributaries by new or upgraded access roads will require permanent culverts to prevent flow from being interrupted.

The following mitigation measures will be taken for both temporary and permanent crossing structures:

- Watercourse crossing design should aim to maintain natural channel processes, requiring a complete span of the watercourse;
- Spanning structures are preferred over in-channel support structures;
- Tributaries will be crossed perpendicular to banks and where feasible at the narrowest section of the watercourse;
- In-channel support structures will be perpendicular to stream flow; and
- Temporary and permanent crossing structures will allow sufficient space to accommodate flood events.

Table 8.5 Interrupted flow in tributaries crossed by new of upgraded access roads

Impact	**Interrupted flow in tributaries crossed by new of upgraded access roads**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	These tributaries are highly local	-	Impact will be avoided by use of culverts
Duration	Permanent	Access road are permanent	Permanent	Access road are permanent
Scale	Small		-	Impact will be avoided by use of culverts
Frequency		N/A		
Likelihood	Likely	Will occur	Likely	Will occur
Magnitude	Medium		Negligible	
Sensitivity	Low		Low	
Significance	Minor		Negligible	

8.2.3 Risk of Weakening Rock Foundations

The lowering of the water level in the plunge pool during excavation works could weaken the rock foundation due to de-confinement and loss of balance of water pore pressure. Tractebel Engineering (2014) carried out geotechnical investigations to establish the stability of both river banks, the dam toe and rock wedges. The geotechnical study of the banks stability established that, due to the good quality of the rock, both banks are stable.

Along the south bank, two different geological movements were identified from the first reservoir impounding, namely shallow and deep slides. The shallow slide is located 150 m downstream of the plunge pool and 20 m above water table, therefore the plunge pool dewatering will not influence this “shallow” slide. The deep slide is located downstream of the south abutment, with the slip surface exit approximately at 450 m elevation while slip surface

enter is around 500 m elevation. Even though this deep slide is closer to the plunge pool than the shallow slide, it is still above the water table, in a dry area, and according to the study will not be influenced by the plunge pool dewatering.

On the north bank, different polyline slip surfaces have been considered, following the observed sub-vertical and sub-horizontal discontinuities on site. For each case minimal safety conditions were considered; and in all cases rapid drawdown creates unstable conditions.

The impact of the weakening of rock foundations, especially on the north bank, is considered **Significant (Major)**.

Table 8.6 Risk of Weakening Rock Foundations

Impact	**Risk of Weakening Rock Foundations**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Impact of geological movements would be local.		
Duration	Long term	Impacts would be long term		
Scale	Large	Unstable conditions, potentially affecting dam foundations.		
Frequency	One-off	Risk of one-off event		
Likelihood	Possible		Not likely	Measures will avoid the risk of weakening foundations
Magnitude	Medium		Negligible	
Sensitivity	High		High	
Significance	Major		Negligible	

8.2.3.1 Mitigation

On the north bank, the water level will be lowered in a measured manner in order to maintain balance of pore pressure between the plunge pool and the foundation. Given the good quality of rock, failure could only occur according to the study along existing discontinuities. Therefore, groundwater level should be cautiously monitored, and discontinuities should be visually checked during the emptying of the plunge pool. The residual impact is **Not Significant (Negligible)**.

8.2.4 Reduced Water Quality and Increased Sediment Mobilisation in the Zambezi River and Tributaries

Reduced water quality is one of the most likely of the potential impacts identified. It may result from:

Plunge Pool:

- Underwater excavations and concreting to establish the coffer dam;
- Spillage and leakage of contaminants from boats or other floating platforms;
- Pumping/dewatering of the plunge pool;
- Annual spilling of water into the plunge pool and its flow downstream;
- Rock crushing and concrete batching plants; and
- Deposition of excavated rock material in the disused quarry;

Spillway Rehabilitation:

- Dredging of the slipway;

- Spillage and leakage of contaminants from the barge.

Other:
- Construction and use of associated access roads;
- Release of contaminated wastewater from worker accommodation.

Reduced water quality will most likely be caused by increased sediment loads (e.g. earth and rock moving activities), construction material (e.g. cement), hydrocarbons (e.g. oil and diesel), solvents and other hazardous substances via accidental spillage/leakage from construction machinery and equipment. The construction and installation of the downstream cofferdam (required for the rehabilitation of plunge pool) is anticipated to have a higher probability of water quality related impacts. The installation of the upstream floating cofferdam (required for rehabilitation of the spillway) and the associated work area is perceived to have a negligible impact on water quality due to the small quantities of water that is anticipated to come into contact with the work area. The following briefly discusses each of the potential impacts on water quality:

- Underwater excavations and concreting to establish the piers and foundation of the coffer dam may release sediment and soluble cements during works;

- The plunge pool area may become sediment laden and contaminated by sediments, solvents and other hazardous substances during rehabilitation. The degree of contamination within the plunge pool may intensify over time as the water level drops. It is likely that sediment and silt will accumulate at the bottom of the pool. Dewatering will release this water in the downstream river;

- Activities in the plunge pool area, including blasting and excavations, use of hazardous substances, movement of equipment and machinery, rock crushing and concrete batching, will produce contaminants that will be washed out during annual spilling to the downstream river; blasting activities during plunge pool rehabilitation may alter water chemistry (e.g. alter pH and increase in salts) and result in elevated nitrate levels and heavy metals, which are highly toxic to fish;

- Deposition of spoil rock in the quarry may result in run-off of contaminated water into tributaries and the Zambezi;

- The barge to be used to transport and store spillway rehabilitation equipment and parts may leak or be a source of spilled contaminants;

- The sediment that will be removed during the dredging process may be contaminated with diesel range organic pollutants and may pose a risk to downstream water quality during the dredging process;

- Due to the steep nature of the associated banks of the Zambezi River, sediment laden surface runoff has a high probability of entering the river around access roads and site lay-down and workshop areas; this runoff may also transport pollutants into the receiving watercourse.

To-date in the plunge pool works, unforeseen geological conditions in the riverbed has required additional works that including intensive underwater excavation of sand and boulders and extensive underwater concreting works. This may have a further impact on water quality. The Plunge Pool Contractor has adopted measures to minimise these impacts in its Work Method Statements for underwater works.

As noted in the TS&S Consultant's review of the ESIA and ESMP in 2016, while a one off spill may be managed, the daily spills and leaks by heavy machinery excavating and removing rock from the excavation will build up. At the end of the dry season when then plunge pool is inundated with water, these hydrocarbons will be flushed downstream, together with all the dusty sediments that have built up over the 7 month construction period. With low flows downstream during the dry stream, the low lying areas on the rivers' edge will be polluted by the build-up of hydrocarbons.

These impacts are expected to be **Significant (Moderate)**.

Table 8.7 Reduced Water Quality and Increased Sediment Mobilisation in the Zambezi River and Tributaries

Impact	**Reduced Water Quality and Increased Sediment Mobilisation in the Zambezi River and Tributaries**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Regional	Rivers are longitudinal systems and contamination pathways.		
Duration	Short term	Although the proposed construction activities are relatively short lived, some forms of possible pollution remains persistent once they have occurred.		
Scale	Moderate	The scale of contamination, compared volumes of river flow may not be significant	Minor	Sources of contamination will be avoided and reduced.
Frequency	Continuous	There is a continuous risk of impacts during most works		
Likelihood	Likely	Likely to occur owing to the nature of the proposed activities		
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Minor	

8.2.4.1 Mitigation Measures

The following mitigation measures will be taken, and will reduce the residual impact to **Not Significant (Minor)**:

Measures related to specific sites and activities:

- Procedures to prevent the routine or accidental release of materials into the water during underwater excavations and concreting;
- Plunge pool dewatering systems to include a mechanism for sediment trapping as far as possible, so that total suspended solid (TSS) levels downstream of the dewatering point should not be more than 15% that of background levels;
- Depending on the silt load suspension within the plunge pool, it may be necessary to delay dewatering until sediment has settled or until turbidity levels downstream of the discharge point do not increase more than 10% to that of background values (see water quality monitoring plan below);

- Clearance and clean up of the plunge pool area, at the close of each excavation season, prior to spilling;
- Water at rock crushing and concrete batching plants will be recycled on-site;
- Surface water run-off from the existing quarry to be used for deposition will be managed;
- Disposal of any building rubble, soil, litter, organic matter or chemical substances only in designated areas, with temporary storage of these only at predetermined locations located outside of the riparian zone;
- Spoil piles will be placed above the high water mark in distinct piles and adequate erosion measures will be implemented in order to minimise and reduce erosion and siltation into the watercourse from spoil piles;
- Drainage design and rehabilitation of the spoil disposal area in the former quarry;
- Dredging activities associated with the construction of the slipway will be minimised spatially and temporally, and if dredged material will be removed and disposed of at an area outside of the riparian zone, river, dam or any other drainage line and associated vegetation;
- The floating machinery including the barge will be maintained to avoid and contain all leakages of fuels, oils, materials, equipment etc., and inspected regularly;
- All roads will be improved or constructed to meet required drainage specifications;
- Wastewater from worker accommodation and from work sites will be collected and disposed of in a wastewater treatment plant.

General measures:

- Surface flows through all work sites, including seepage from the Dam running through the plunge pool, will be avoided;
- Silt barriers will be placed along all affected drainage lines to curb any sediment and silt run-off;
- Non-erodible materials will be used for the construction of any berms, cofferdams or other isolation structures;
- The area of land that will be disturbed will be kept to an absolute minimum;
- Strictly no dumping of any building rubble, soil, litter, organic matter or chemical substances in watercourses;
- Construction equipment will not be serviced or refueled near the river or dam; in cases where there is no option but to refuel near water, suitable bunding and trapping measures will be used, and spill response measures applied;
- Spill response measures for accidental spills or surface water contamination to be provided for all sites where such contaminates are stored/used (including detailed measures to control risks related to suspended sediment and turbidity, damage to riparian vegetation and spillage of fuels and oils, cement and other foreign materials).
- All active work sites will be located, designed and built with adequate drainage and to control stormwater runoff, and bunding, and separation of clean and contaminated runoff, where contaminated runoff is isolated and treated;
- No infrastructure will be built on unstable slopes.

Alternatives to the direct spilling of water pumped from the plunge pool into the river below were also recommended by the Dam Safety Panel of Experts (DSPOE) for the project in 2016 (4th DSPOE report).

8.2.4.2 Monitoring

Water quality monitoring during rehabilitation works will monitor pH, EC, TDS, temperature, turbidity (turbidity will be used as an indicator for monitoring increased sediment loads) and dissolved oxygen on a weekly basis. For the rehabilitation of the plunge pool, these measurements can be taken from the river bank at 200m, 500m and 1km intervals downstream from the instream activities. Measurements at the 1km monitoring point should remain below

threshold values as provided in the water quality monitoring plan (refer to Part III of the ESIA). Hydrocarbons, major ions (Sulphates, Chlorides, Calcium, Magnesium, Sodium, Carbonates/ Bicarbonates) and nutrients (total Nitrogen and total Phosphates) will be monitored in line with a water quality monitoring plan.

Erosion control measures will be inspected regularly (at least weekly during the wet season) during the course of rehabilitation works and necessary repairs need to be carried out if any damage has occurred.

8.2.5 Disused Project Infrastructure

Following the plunge pool rehabilitation works, the coffer dam stop logs will be removed, and will be disposed of, and the piers will be demolished through controlled blasting. The spillway rehabilitation will also remove a range of mechanical equipment. All of these items have the potential to create a permanent visual and physical impact in the area, and will require careful disposal.

The receiving environment is considered to have a Medium sensitivity, due to the potential effect on visual amenity. With a Medium magnitude, this impact is therefore considered **Significant (Moderate)**.

Table 8.8 Visual and physical impact of disused project infrastructure

Impact	**Visual and physical impact of disused project infrastructure**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	The infrastructure is local		
Duration	Permanent	It is permanent		
Scale	Small	It is small in scale compared to the receiving environment	Negligible	Mitigation will reduce the visibility of the disused project infrastructure
Frequency	-		-	
Likelihood	Likely		Likely	
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Negligible	

8.2.5.1 Mitigation

Mitigation will focus on the removal of disused KDRP infrastructure as far as is reasonably practical. All removable items will be removed, and either (i) disposed of in a designated area, (ii) removed entirely from the site for safe disposal elsewhere, or (iii) re-purposed for a new function, including functions that may benefit the community. Stop-logs will be re-used. Examples of re-purposing might be, for example: disused mechanical equipment may be cleaned, painted, and put on display by ZRA for visitors' appreciation as part of contributing to the tourism industry within Siavonga district, and the barge or other water vessels may be re-purposed for ZRA or community purposes. With these measures, this impact will be reduced in visibility, and reduced to **Not Significant (Minor)**.

8.2.6 Accidental Deposition of Debris from Project Sites in the Zambezi River

There is a risk that debris from project sites may be washed into the river or reservoir in the following circumstances:

- Coffer dam failure;
- Failure of the piers during spilling;

- Washing away of any other items during spilling;
- Sinking of KDRP barge or other vessels;
- Floating coffer dam failure, resulting in the washing of materials through the spillway;
- Accidental loss of equipment in the reservoir during spillway rehabilitation.

The preparation of the cofferdam for the spilling may mean, depending on its design (to be defined by the Contractor), either its complete or partial removal, with either an opening of the gates, or no specific measures being taken if its destruction by the flood is accepted. When the cofferdam is put back in operation after spilling, it could consist in either its complete or partial reconstruction, a closing of the gates, or its complete reconstruction with the cleaning of the riverbed if it was destroyed and washed away by the flood.

This impact would be **Significant (Moderate)**.

Table 8.9 Accidental Deposition of Debris from Project Sites in the Zambezi River

Impact	**Accidental Deposition of Debris from Project Sites in the Zambezi River**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Impacts would only be felt in the immediate area		
Duration	Permanent	But it would be left permanently if not removed	Temporary or will not occur	Measures will avoid the accidental loss of items from project sites
Scale	Limited	The equipment is limited in scale		
Frequency	One-off	-	Will not occur	
Likelihood	Not likely			
Magnitude	Medium		Negligible	
Sensitivity	Medium		Medium	
Significance	Moderate		Negligible	

8.2.6.1 Mitigation

Coffer dam failure, failure of the piers during spilling, and floating coffer dam failure will be avoided by: design of these structures to withstand the loads expected during normal and extreme circumstances; regular inspections of the structures to identify any stresses or weaknesses, and re-inforcement / fixing if necessary. These will be part of Emergency Response Plans, implemented by the Punge Pool Contractor and the Spillway Rehabilitation Contractor.

The washing away of any items from the plunge pool area will be avoided by the implementation of a site clearance plan and inspection prior to each spilling season.

The sinking of KDRP barge or other vessels will be avoided by (i) operation of all on-water vehicles only by authorised and trained personnel, and (ii) regular inspections and maintenance of all on-water craft or vessels.

The accidental loss of equipment in the reservoir during spillway rehabilitation will be avoided by its storage in secure areas when not in use, and the careful logging of all equipment taken out to and returned from the spillway rehabilitation site.

8.2.7 Loss of Land Due to Wastes Disposal

The unmanaged storage and disposal of waste rock, spoil and other excavations, and of solid wastes, will result in the loss of land to any other usable purpose, and visual impact. Two main types of waste will be generated:

- Waste rock and in-situ material of approximately 300,000 tonnes;
- General waste from the construction base camp and from the work site will be generated, including hazardous (hydrocarbons etc) and non-hazardous, eg organic waste, food waste etc.

In the opening stages of KDRP, waste rock has been stored on the north bank, and its removal will be required.

This has the potential to create a **Significant (Moderate)** impact.

Table 8.10 Loss of Land Due to Wastes Disposal

Impact	**Loss of Land Due to Wastes Disposal**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	The volumes required for waste disposal are low enough for local disposal		
Duration	Permanent	Wastes are permanent		
Scale	Medium	Wastes from plunge pool excavation amount to XX m^3.	Negligible	Wastes will be disposed of responsibly, reducing the scale of disposal in the environment to negligible.
Frequency	One-off			
Likelihood	Likely			
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Minor	

This will require mitigation through:

- Disposal of excavated rock, spoil and other excavated materials in the designated spoil disposal area, a disused quarry;
- Regular and safe transport of spoils to the spoil disposal area;
- Collection, separation, and recycling of solid wastes produced on-site, and at worker accommodation;
- Removal of hazardous wastes (including metals, oils, used explosives, etc) and treatment by a licenced provider of hazardous waste disposal services; and
- Removal of recyclable wastes (water bottles, paper, etc), and recycling by a provider of recycling services.

Rehabilitation of the rock waste dump area in the old Sino-Hydro quarry will be planned in consultation with the local community, district authorities and nearby stakeholders, based on their requirements for the future use of the area overlying the deposited rock. Options may include, subject to technical and safety constraints, creating a recreational area, maintaining it as a source of construction materials, or re-afforestation.

With these measures, the impact of the loss of land due to unmanaged wastes disposal will be reduced to **Not Significant (Minor)**.

8.3 Impacts on the Biological Environment

The following potential KDRP impacts on the biological environment are considered:

Aquatic:

- Direct fish kills due to dredging, blasting and dewatering
- Changes in aquatic biota due to hazardous substances, water quality and sediment;
- Fisheries decline or loss in species of conservation importance due to increased fishing;

Terrestrial:

- Loss of natural habitat in the direct project footprint;
- Reduction in the Abundance of Terrestrial Species of Conservation Concern; and
- Impacts on Protected Areas.

8.3.1 Direct fish kills due to dredging, blasting and dewatering

Rehabilitation activities relating to dredging, underwater blasting and dewatering are likely to result in direct fish mortalities due to the proximity of these activities to the instream environment. Fish may become isolated and trapped within the plunge pool area during dewatering activities. It is anticipated that the impact of blasting, dewatering and other instream activities on the instream aquatic community of the receiving environment will be a **Significant (Moderate)** Negative impact pre-mitigation.

Table 8.11 Direct fish kills due to dredging, blasting and dewatering

Impact	**Direct fish kills due to dredging, blasting and dewatering**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Mortalities of instream biota induced by blasting and dewatering activities will be localised.	Local	Ensuring that the over pressure and peak particle velocity remains below the thresholds provided and implementing catch and release of fish within the dewatered area, the extent of the impact on the instream community can be decreased.
Duration	Short Term	The temporal extent and frequency of blasting and dewatering is short lived.	Temporary	Rapid construction and deconstruction of cofferdam and isolation of instream activities as quickly as possible from river processes will decrease temporal extent of impacts owing to instream activities.
Scale	Small	Instream impacts to biota will be localised.	Small	Current conditions are already altered; mitigated impacts will further reduce the scale.
Frequency	Intermittent during rehabilitation works	Blasting and dewatering activity will last for the duration of rehabilitation works.	Intermittent during rehabilitation works	Remains bound during rehabilitation activities, mostly related to dewatering and blasting.
Likelihood	Llikely	Blasting and direct mortalities due to instream activities are likely to occur due to the proximity of the activities to the instream community.	Possible	Some mortality remains likely to occur under normal operating conditions.
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Minor	

8.3.1.1 Mitigation

International literature suggests that blasting induced over pressure should not exceed a 100 kPa and peak particle velocity should not exceed 13mm/s (Sean et al., 2008; Kolden & Aimone-Martin 2013). Fish killed as a result of blasting (assuming that TNT will be used) will die due to the shock wave, which causes their swim bladders to rupture. Some fish will float to the surface, but it is likely that most will sink to the bottom.

Fish trapped within the dewatered area can be removed via gill and seine netting (as is the preferred method locally), and released downstream area.

Ensuring that the over pressure and peak particle velocity remains below the thresholds provided and implementing catch and release of fish within the dewatered area will reduce this impact to Not Significant (Minor).

8.3.2 Changes in aquatic biota due to hazardous substances and sediment

The leakage of hazardous substances (i.e. hydrocarbons, solvents and chemicals) or intense sediment plumes may also result in instream responses. There may be changes in community structure due to changes in water quality, flow and sediment. This is not likely to have a significant impact, except in a very localised area, due to the very large volumes of flow in the Zambezi compared to effluents.

Table 8.12 Loss of aquatic biota due to hazardous substances, reduced water quality and sediment

Impact	**Loss of aquatic biota due to hazardous substances, reduced water quality and sediment**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Effluents and spills will be quickly diluted by very large Zambezi flows	Local	The scale of contaminated effluents will be reduced to negligible by mitigation measures.
Duration	Temporary		Temporary	
Scale	Small		Negligible	
Frequency	Frequent	Ongoing risk of spillage	Frequent	Ongoing risk of spillage
Likelihood	Likely			
Magnitude	Small		Negligible	
Sensitivity	Medium		Medium	
Significance	Minor		Negligible	

8.3.2.1 Mitigation

Implementing mitigation measures described in Section 8.2.4 above for impacts related to water quality, hydrology, erosion and sedimentation, will also mitigate most expected impacts on aquatic biota.

8.3.2.2 Monitoring

A biomonitoring regime will be put in place. The methodologies and metrics included in the baseline aquatic ecology report should be repeated at the same biomonitoring points on a regular basis during rehabilitation works and reduced to biannual basis for a period of two years following the end of rehabilitation works. The main criteria for instream biomonitoring are presented in the ESMP (Section 9).

8.3.3 Fisheries decline or loss in species of conservation importance due to increased fishing

Members of the workforce may engage in fishing, and food supplies for the workforce may increase pressure on fisheries resources in Kariba Lake and downstream Zambezi River. An influx of people seeking employment and camp followers may place further pressure on fishing resources. However, the scale of this impact is negligible due to a relatively small workforce, and the existence of large fishing industry supplying Lusaka and Harare with fish. The main species of conservation importance, *Oreochromis mortimeri* (CR) and *O.macrochir* (VU) (potentially presented, not recorded) are threatened by the introduction of the exotic *Oreochromis niloticus* (Nile tilapia) not by over-fishing. This impact is therefore considered **Not Significant (Negligible)**.

8.3.4 Loss of natural habitat in the direct project footprint

The area of direct terrestrial ecological influence is the general construction site on the Zambian side of the river, the temporary access road into the plunge pool area, the access road to the waste rock dumpsite, the dumpsite itself, access to the slipway on the Zimbabwean side of the river and the slipway area itself. As described in Section, this area is
already highly disturbed through urbanisation, and most habitats are modified. Any impacts on terrestrial habitats would be limited to Kariba Gorge itself, which is undisturbed and a largely natural habitat, and the location of red listed plant species, but it will not be directly affected. Impacts are **Not Significant (Negligible)**.

Table 8.13 Loss of natural habitat in the direct project footprint

Impact	**Loss of natural habitat in the direct project footprint**	
Type	Direct negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Local	Loss of terrestrial habitats will be restricted to the direct terrestrial ecological area of influence
Duration	Permanent	Areas may recover but will take a long time if left to natural processes
Scale	Small	The extent of the site and quarry footprints are small
Frequency	One-off	Through rehabilitation activities
Likelihood	Likely	Rehabilitation works are expected to proceed as planned
Magnitude	Small	
Sensitivity	Low	
Significance	Negligible	

8.3.4.1 Mitigation

However, measures will be taken to determine the minimum required area for all rehabilitation works, equipment laydown sites, construction vehicle parking, erection of staff toilet facilities, construction viewing sites and other activities. These areas will be clearly marked on the ground prior to the onset of activities and edge markers pointed out to staff and contractors to ensure that activities remain within their minimum required area.

8.3.5 Reduction in the Abundance of Terrestrial Species of Conservation Concern

The baseline assessment found that *Cyclantheropsis parviflora* (a Vulnerable plant species) occurs in Kariba Gorge. Various threatened mammal species may occur in the greater area such as Endangered Wild Dogs and other predators (though these species are mobile and typically avoid active work zones). A large elephant population occurs within the Zimbabwean side of the Ecological AoI but are not expected within Kariba Gorge, the slipway or quarry sites. Bird species of concern include Southern Carmine Bee-eater (*Merops nubicoides*), African Skimmer (*Rhynchops flavirostris*) and Rock Pratincole (*Glareola nuchalis*). These birds may be

displaced by rehabilitation activities within the plunge pool, but the area of displacement represents a small area of their available habitat. It is anticipated that the significance of any impact on species of conservation concern will be a **Not Significant (Minor)**.

Table 8.14 Reduction in the Abundance of Terrestrial Species of Conservation Concern

Impact	**Reduction in the Abundance of Terrestrial Species of Conservation Concern**	
Type	Direct negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Local	Any impacts to species are expected to be restricted to the direct terrestrial AoI.
Duration	Short term	Impacts to species are expected to be to individuals and no whole populations would be impacted. Populations could recover during the short term.
Scale	Small	Species losses would be to individuals and not to populations and the scale of an impact to any one species is expected to be small.
Frequency	During rehabilitation works	
Likelihood	Possible	Loss of individuals may occur in the form of accidents or loss of habitats. Species of conservation concern generally occur in low abundance and likelihood of impacts are reduced as a result of the small Project footprint.
Magnitude	Small	
Sensitivity	Low	
Significance	Negligible	

8.3.5.1 Mitigation

The following mitigation measures will be taken:

- **Animal rescue**. There is a high likelihood that animals may become trapped (e.g. in trenches) or unexpectedly cornered, and many can be dangerous when trapped or cornered (including snakes, carnivores, horned antelope, porcupines and others). Training will be provided to workers on handling wildlife interactions (such as with snakes from rocky outcrops to be cleared), including the safe removal of animals from the site. Wildlife authorities or private veterinarians will be used if necessary., and their contact details available to on-site teams;
- **Recognise threatened species and translocate**. The environmental staff of ZRA and Contractors will be trained to be able to recognise these species; they will survey areas to be used as project sits prior to clearance to determine if they are present or potentially present (in the case of animals), and take appropriate steps based on the species found. Areas with an occurrence of threatened plants will be avoided where possible (such as parking or equipment laydown that can be shifted), and plants of threatened species that would be lost due to activities will be translocated to a similar habitat nearby;
- **Incorporate ecological awareness in induction programmes** for staff, contractors and site visitors, pointing out that the site is within a transfrontier conservation area (TFCA) and Important Bird Area, and including the importance of minimising disturbance to the environment, and on what to do when encountering wildlife;
- Worker Code of Conduct to prevent illegal hunting. The following activities will be prohibited by all personnel associated with KDRP within and surrounding the Project Area, both during and outside work hours:
  - Any forms of hunting of wildlife or fishing by staff and contractors;
  - Purchase or transport of fuel wood from/for surrounding communities;
  - Purchase, sale or transport of any bush meat products from local communities or passing traders;
  - Collection of any animals or animal products for consumption, medicinal or other use.
  - Camp residents keeping pets, either introduced species such as cats or dogs, or native wildlife;

- Camp residents purchasing local wildlife for any reason.

8.3.6 Impacts on Protected Areas

The area downstream of the dam up to the Mozambique border consists of National Parks and extensive transfrontier conservation areas, including the Lower Zambezi TFCA. The Mana Pools National Park and adjacent conservation areas are recognized as a UNESCO World Heritage Site and the Zimbabwean side of the lower Zambezi River is also recognised as an Important Bird Area. The wildlife areas on both sides of the river are popular tourist destinations. These conservation areas are important tourist destinations with international recognition.

While these sites are highly sensitive, any impacts of KDRP on the area is not expected, and any impacts would be indirect. The impact is **Not Significant (Negligible)** and Indirect. Impacts of far greater significance would arise from failure of Kariba Dam, which KDRP directly addresses.

Table 8.15 Impacts on Protected Areas

Impact	**Impacts on Protected Areas**	
Type	Indirect negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Regional	Large protected areas occur downstream of the project site and have extensive coverage along the Zambezi River.
Duration	Medium	Possible impacts may occur for the duration of the rehabilitation period and shortly thereafter.
Scale	Negligible	There are no direct impacts on the projected areas.
Frequency	Throughout KDRP	
Likelihood	Not Likely	The protected areas cover a large area and the likelihood of impacts associated with this project being detected within the greater area are considered to be unlikely.
Magnitude	Negligible	
Sensitivity	High	
Significance	Negligible	

8.3.6.1 Mitigation

ZRA will maintain dialogue and collaboration with protected area authorities to ensure that they are familiar with future plans, activities taking place and are provided with the opportunity to advise on day-to-day measures to minimise possible impacts. Their advice and support should be considered regarding an animal rescue plan and translocation of species.

8.4 Impacts on the Social Environment

This section considers a range of potential social impacts and benefits of KDRP. They can be grouped in three categories, and are assessed in the following order:

Labour and Working Conditions
- Unfair Working Conditions
- Unsafe Working Conditions
- Transmission of COVID-19 in the Workforce
- Creation of Employment Opportunities
- Creation of Opportunities for Local Enterprises
- Loss of Income Upon Demobilisation

Community Health and Safety

- Injury to the Public on Work Sites and at the Quarry
- Community Transmission of Covid-19 and Other Communicable Diseases
- Increased Incidence of Sexually Transmitted Infections (STIs) including HIV/AIDS
- Increased Risk of Road Traffic Accidents
- Influx of Opportunistic Job-seekers and Camp-followers
- Employee Harassment and Abuse of the Local Community, including SEA and GBV
- Lower Access to Health Services Due to Demand from Project Employees
- Conflicts on Demobilisation and Settlement of Former Employees

Physical and Economic Displacement

- Physical and Economic Displacement Due to Land Acquisition
- Reduction in Tourism-based Livelihoods
- Decline in Fisheries-based Livelihoods, including downstream
- Wear and Tear of Road Transport Infrastructure.

8.4.1 Please note that there will be no social impacts related to altered flows downstream, such as impacts on livelihoods or safety, because KDRP will not alter the current flow regime of the Kariba Hydroelectric Scheme, as described in Section 8.2.1.Unfair Working Conditions

The possible impacts that employees will be exposed to if illegal, unfair and unsafe labour conditions are practised by employers were identified during stakeholder engagement sessions in the AoI. Unemployed jobseekers who are desperate for employment may be most vulnerable to unfair working conditions. This includes the unskilled, women and the disabled specifically who may be willing to work for below market wages, in unsafe conditions or too long hours. Without mitigation, this impact is considered to be **Significant (Moderate)**.

Table 8.16 Unfair Working Conditions

Impact	**Unfair Working Conditions**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local and Regional	Workers from the local area and within Zambia and Zimbabwe will be exposed to this risk.	Local and Regional	
Duration	Long term	It would continue for the duration of the Project.	Long term	
Scale	Small	A relatively small number of employees would be affected.	Small	
Frequency	Ongoing		Infrequent	Mitigation will focus on avoiding the occurrence of unfair working conditions and practices.
Likelihood	Likely	Will occur intermittently	Not likely	
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Minor	

8.4.1.1 Mitigation

KDRP and its Contractors, and their sub-contractors will meet the requirements of labour legislation of both countries, international standards (viz. World Bank, ILO and IFC), whichever is most stringent.

All employers – including ZRA, the TS&S Consultant, Plunge Pool Contractor, and Spillway Rehabilitation Contractor – will meet international standards and in-country legislation for working conditions, living conditions and occupational health and safety.

All employers will pass on these requirements to their sub-contractors, and pay particular attention to the conditions of employees, including 'non-employees' (i.e. hidden and casual employees) of sub-contractors.

KDRP will put in place a robust Grievance Policy and Procedure available to all employees so that unfair and unsafe practices are reported and investigated.

Contractors will include monthly and cumulative data on non-compliances and grievances, and review these with ZRA, who will compile them into ZRA Monthly Reports.

An annual audit of grievance and safety statistics will be conducted.

Based on the implementation of the proposed mitigation measures, the significance of the impacts of unfair working conditions will be **Not Significant (Minor)**.

8.4.2 Unsafe Working Conditions

KDRP presents a range of occupational health and safety (OHS) risks for workers, with high risk of injury and fatality, including but not limited to:

- Working on water, including drowning;
- Risks of underwater working, including drowning and decompression sickness (the bends);
- Wildlife attacks, especially from crocodile (which occur in Lake Kariba and are found downstream of the dam wall);
- Vector-borne diseases, including malaria;
- Water-borne diseases, including schistosomiasis;
- Working at height (especially on the spillway) including risks from falling and dropping tools and equipment;
- Sexual harassment and GBV at work;
- Traffic accidents from the movement of heavy equipment around the sites;
- Traffic accidents moving to and from the workplace, and while at leisure; and
- Collapse of the plunge pool coffer dam or spillway floating coffer dam.

OHS risks are one of the most significant risks for the project, and without mitigation, impacts are considered to be **Significant (Major)**.

Table 8.17 Unsafe Working Conditions

Impact	**Unsafe Working Conditions**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local, Regional, and Global	All workers will be exposed to these risks.	Local, Regional, and Global	
Duration	Long term or Permanent	Injuries and fatalities would have long term and permanent consequences.	Long term	
Scale	Medium	All employees are exposed to these risks.	Medium	
Frequency	Ongoing		Infrequent	Mitigation will focus on minimising OHS risks.
Likelihood	Likely	Will occur intermittently	Not likely	
Magnitude	Large		Small	

Sensitivity	High	High
Significance	Major	Moderate

8.4.2.1 Mitigation

ZRA has a Health and Safety Policy which stipulates the Safety, Health and Environmental (SHE) Management System that will have to apply and which calls for:

- Safe and healthy working conditions;
- Arrangements for the operation, design and maintenance of safe systems for work;
- Proper maintenance of machinery;
- Information, instruction, training and supervision appropriate to the project proponent's activities; and
- Arrangement for consultation with employees and their representation on health and safety matters.

All Contractors will be required to meet this policy, apply systems for the avoidance and minimisation of OHS risks effectively, and pass on all OHS requirements effectively to its sub-contractors. Contractors will be required to adopt a Sexual Harassment Policy and complaints form.

Risks of failure of either coffer dam will be addressed in Emergency Response Plans during the period of the works to ensure protection of the work population as well as possible environmental and social impacts with a failure of the cofferdam. A failure of the cofferdam would be catastrophic to those working on the Project.

With effective implementation of OHS management measures, these risks can be minimised, and impacts are expected to be **Significant (Moderate)**.

8.4.3 Transmission of COVID-19 in the Workforce

The number of COVID-19 cases is accelerating rapidly in Zambia and Zimbabwe (Table 8.18). As of 31st July 2020, no case was recorded at KDRP. To date, there has been one reported case of COVID-19 in Kariba town as at June 2020. The virus continues to present a highly significant risk of morbidity and death to those who contract it, and the bringing together of the workforce on-site from 2019 onwards will increase the risk of exposure of all employees to COVID-19. This impact is **Significant (Major)**.

Table 8.18 COVID 19 Statistics

S/N	Context	Cases	Deaths	Recovered
1.	Zambia	8,275	241	7,004
2.	Zimbabwe	4,748	104	1,524
3.	Global	20,322,897	740,473	13,245,532

Source: https://www.worldometers.info/coronavirus:accessed on 11/08/2020 .

Table 8.19 Transmission of COVID-19 in the Workforce

Impact	**Transmission of COVID-19 in the Workforce**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local, Regional, and Global	All workers will be exposed to these risks.	Local, Regional, and Global	

Duration	Long term and permanent	Risk of fatality for some, and long term cardiovascular and neurological damage for survivors.	Long term and permanent	
Scale	Medium	All employees are exposed to these risks.	Medium	
Frequency	Ongoing		Infrequent	Mitigation will focus on minimising OHS risks.
Likelihood	Possible	COVID-19 has occurred in the project area	Not likely	
Magnitude	Large		Small	
Sensitivity	High		High	
Significance	Major		Moderate	

8.4.3.1 Mitigation

ZRA will apply strict measures for prevent COVID-19 from entering the project site. These will include:

- Carefully following and complying with Government of Zambia and Government of Zimbabwe restrictions on movement, quarantine, hand-washing and wearing of protective PPE;

- Basic infection prevention measures, adapted from the World Health Organization (WHO), including:
  - Promote and enforce frequent handwashing and respiratory hygiene among the workforce;
  - Discourage touching eyes, nose and mouth;
  - Hand washing and sanitization facilities available at frequent locations throughout the sites and at worker accommodation;
  - Ensure the workplace is clean and hygienic, and regularly disinfect surfaces and objects;
  - Advise employees to self-isolate when sick and provide medical advice if they have a fever, a cough and difficulty breathing;
  - Implement social distancing in all workplaces, and provide advice to employees on doing so when off duty;
  - Avoid large gatherings of personnel;

- Polymerase Chain Reaction (PCR) Testing for new employees as soon as testing capability becomes available;

- Measures for international travel, including PCR testing prior to travel, advice on measures that must be followed during travel (masks, distancing etc), and quarantine on arrival if it is suspected the employee has had any exposure immediately preceding or during travel (i.e. since the date of when the PCR test result is applicable for;

- A specific procedure for preventing, identifying, mitigating, and responding to instances of COVID-19; and

- Stay informed and follow advice from international health organisations such as the WHO and your national health organisation and government.

With effective implementation of COVID-19 measures, risks can be minimised, and impacts are expected to be **Significant (Moderate)**.

8.4.4 Creation of Employment Opportunities

KDRP will employ a total of over 300 personnel for plunge pool and spillway rehabilitation, the majority of which are expected to Zambian or Zimbabwean nationals, and 20% of which may be from the local area. This employment began in 2017, will peak in 2021, and continue until 2024. The ability to access employment opportunities was the biggest single issue raised by people in local consultations. A large number of the opportunities will be for highly skilled and skilled persons e.g. engineers, shutter hands, drillers and blasters, steel fixers, machine operators, concrete hands and drivers while a relatively small number of opportunities will be available for unskilled labour such as security, housekeeping and catering staff.

The structuring of sub-contractors and employees by each of the Plunge Pool Contractor and Spillway Contractor will influence local people's ability to access employment. The skills held by local people and Zambian and Zimbabwean nationals will also influence their ability to take up and remain in employment.

Unskilled employment seekers will be more vulnerable to missing out on employment opportunities because most of the available opportunities will be skilled and highly skilled people. Within these, females and people with disabilities, unskilled job seekers will be the most vulnerable.

Employment opportunities will provide a cash income to employees for the duration of the employment opportunity and contribute to households having more disposable income to contribute to improved livelihoods. The impact on those seeking employment will be **Significant (Positive)**.

8.4.4.1 Enhancement Measures

The following measures are proposed to enhance this positive impact, and increase the probabilities that local employment seeker can successfully obtain employment:

- KDRP-specific Recruitment Policies, by ZRA, the TS&S Consultant, Plunge Pool Contractor and Spillway Rehabilitation Contractor;
- Monitoring of and the setting of targets to maximise the number of Zambian and Zimbabwean nationals, male and female applicants and employees, and consideration of targets for disabled, unskilled, skilled and highly skilled employees from the AoI;
- Targets included in Conditions of Contract with TS&S Consultant and Contractors;
- Preparation of monthly and cumulative employment statistics reports for submission to ZRA;
- An annual audit of employment statistics based on which an incentive for achieving employment targets can be considered;
- Public advertising of employment opportunities in all newspapers, public libraries, the District Office and in all relevant languages;
- The establishment of a Recruitment Office by the Contractor with the purpose of keeping a record of available prospective employees, their skills levels and contact details. Registration of job seekers with the Recruitment Office will be free of charge.

8.4.5 Contractors will be required to consider a training program for unskilled employees to enable them take up new jobs following the end of KDRP. - In discussions with local communities, emphasis will be given to job opportunities for locals, versus non-locals, and non-nationals, as this was a source of local concern during ESIA consultation and since. Creation of Opportunities for Local Enterprises

KDRP will have a significant requirement for the procurement of construction equipment, goods and services. Although some of the equipment is highly specialised, such as the new

spillway gates, and will have to be designed and manufactured for the project overseas and imported, there will also be procurement opportunities for local, regional, and national businesses. Zambia and Zimbabwe will primarily benefit through procurement from the civil engineering and construction industry and the hospitality and service industry through the provision of accommodation, catering, transport, vehicle servicing and security services.

The most sensitive receptors for this aspect are the entry level and small and medium contractors and service providers who have the technical skill and know-how to support the Project, but who are not used to delivering goods and services at the required quantities and rate as needed for the Project. Furthermore, it is unlikely that these parties have the business support structures in place to respond to sourcing and delivery challenges as well as the administrative challenges that come with invoicing and payment.

It is expected that the impact of KDRP on opportunities for enterprises will be a **Significant (Positive)** impact. The extent of the impact will possibly be curtailed mainly due to administrative challenges and the inability by in-country businesses to respond at the required speed and quantities required by the project authorities.

8.4.5.1 Enhancement Measures

ZRA, the TS&S Consultant, and Contractors will be bound to achieving a certain target percentage of their envisaged procurement locally, regionally and nationally to ensure that these benefits find their way into the national economies.

They will develop Procurement Strategies to stimulate and incentivise in-country business opportunities at local, regional and national levels. The Procurement Strategies should provide for:

- The establishment of a service provider database by the Contractors (also for use by ZRA and the TS&S Consultant), with the name, type, location, contact details and capacity of the businesses as a minimum;
- Unbundling of contracts into smaller and more manageable packages so that in-country and possibly less experienced local and regional suppliers have a better chance of being selected;
- Procurement targets for different business categories e.g. per sector or in terms in-country or women ownership and or management of the business;
- Tracking of performance against procurement targets and issuing of quarterly performance reports to the Project Proponent;
- Basic capacity building support to in-country businesses to assist them with responding to tender opportunities and meeting administrative requirements of written communication, invoicing and reporting; and
- Advertising of procurement opportunities according to a specific, agreed and well–communicated method and medium.

8.4.6 Loss of Income Upon Demobilisation

Rehabilitation activities of the plunge pool is planned for during dry seasons (7 months per year) over an estimated four-year period and the spillway for a period of approximately 8 years. Employees will experience a loss of income during the off work periods, and following their permanent demobilisation. This impact will be felt particularly by employees from the local area, and those employed by sub-contractors, who are least likely to have alternative employment or livelihoods to rely on during the down-time, and will find it most difficult to obtain new employment. This impact is considered **Significant (Moderate)** for these employees.

Table 8.20 Loss of Income Upon Demobilization

Impact	Loss of Income Upon Demobilisation			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Local employees will experience this impact	Local	
Duration	Temporary and Short Term	Temporary de-mobilisation of plunge pool employees each year, and short term following complete demobilisation	Temporary	Mitigation will focus on providing alternative employment for the demobilised employees during down-time, and on training and promotion for demobilisation.
Scale	Small	A limited number of employees	Small	
Frequency	Occasional		Occasional	
Likelihood	Likely	Employees will be demobilised	Likely	
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Minor	

8.4.6.1 Mitigation

Mitigation will focus on providing alternative employment or maintaining salaries for the demobilized employees during down-time, and on training in preparation for demobilization, and promotion of the employees with agencies and future employers:

- Maintenance of a list of all employees, including those employed by sub-contractors, and non-employed (informal or hidden employees);
- Identification of which of these employees has no alternative income for the 5 month annual down-time period, and consideration of placement of these with other employers on site;
- Certificated-training of local employees in skills that enable them to take up new employment readily, and on how to obtain employment;
- Identification of employers / infrastructure projects requiring employees, or agencies that provide them with employees, and the active promotion of demobilized employees with these potential new employers.

With these mitigation measures, the impact can be reduced to Not Significant (Minor).

8.4.7 Injury to the Public on Work Sites and at the Quarry

The public including children are at high risk of injury or fatality if allowed to enter work sites, the quarry, or any other set-down or workshop area. This would be a **Significant (Major)** impact.

Table 8.21 Injury to the Public on Work Sites and at the Quarry

Impact	Injury to the Public on Work Sites and at the Quarry			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	The local community members	Local	
Duration	Long term and permanent	Long term injury or fatality	Long term and permanent	
Scale	Small	The number of person who may enter work sites it relatively small, as they are in isolated rural locations	Medium	

Frequency	Ongoing		Infrequent	Mitigation will focus on minimising the possibility that community members can enter worksites.
Likelihood	Possible		Not likely	
Magnitude	Medium		Negligible	
Sensitivity	High		High	
Significance	Major		Negligible	

8.4.7.1 Mitigation

Mitigation will focus on ensuring that all sites are secure and are manned to prevent access from members of the public:

- Fencing of all work sites on land;
- Security staff manning the most major sites, recording the entry and exit of all personnel, and preventing entry of un-authorized personnel;
- Securing of all machinery or hazardous areas if at any time the site is left unattended.

With these measures, the residual impact is expected to be reduced to **Not Significant (Negligible)**.

8.4.8 Community Transmission of Covid-19 and Other Communicable Diseases

COVID-19 remains in low numbers but is accelerating rapidly in Zambia and Zimbabwe. The virus continues to present a highly significant risk of morbidity and death to those who contract it, and the interaction between the workforce and local communities will increase exposure of communities and employees. The risk of COVID-19 is most significant due to the limited capacity of local health centres, which would be further reduced if KDRP employees had to seek treatment. This impact is **Significant (Major)**.

Table 8.22 Community Transmission of Covid-19 and Other Communicable Diseases

Impact	**Community Transmission of Covid-19 and Other Communicable Diseases**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	The local community will be exposed.	Local	
Duration	Long term and permanent	Risk of fatality for some, and long term cardiovascular and neurological damage for survivors.	Long term and permanent	
Scale	Medium	As yet there is no vaccine, and COVID-19 brought in to the local area by employees could spread widely.	Medium	
Frequency	Ongoing		Infrequent	Mitigation will focus on minimising workforce-community interactions.
Likelihood	Possible		Not likely	
Magnitude	Large		Small	
Sensitivity	High		High	
Significance	Major		Moderate	

8.4.8.1 Mitigation

A range of measures to protect the workforce from COVID-19 are set out under Section 8.4.3 above. These will reduce the risk of community exposure, but specific measures will also be necessary to prevent communities' exposure to the virus from workers. These concern:

Transmission from employees who are from and reside in the local community:

- Strict application of handwashing and arrival and departure and at regular intervals, and wearing of masks while at work;
- Provision of facilities for the storage of work uniforms, footwear, hard hats etc, so that the employee is not required to carry any items that may have been exposed home;
- Facilities for isolating employees from their families if they develop COVID-19 symptoms;

Transmission from employees who have migrated from elsewhere in the regional or internationally:

- Provision of worker accommodation that minimises interaction with the local community;
- Discouragement of interactions, and the prevention of anti-social behavious such as drunkenness, prostitution, and drug-taking etc.

There is also a need for effective collaboration between the project and local health centres to prevent these health centres being overwhelmed by KDRP employees and becoming centres of transmission of COVID-19.

These measures must be applied equally for the employees of contractors and sub-contractors, and will be included in specific procedure for preventing, identifying, mitigating, and responding to instances of COVID-19.

With effective implementation of COVID-19 measures, this impact can be expected to be **Significant (Moderate)**.

8.4.9 Increased Incidence of Sexually Transmitted Infections (STIs) including HIV/AIDS

The proposed Project has the potential to increase the transmission of HIV and other STIs in the social AOI due to the following:

- Transport drivers, who may typically have higher rates of HIV or STIs than the general population, may engage in casual sexual activity at their end destination, acting as a vector for the disease;
- A mainly male workforce, drawn from across the region and the world, with a comparatively larger disposable income, may engage in GBV and SEA in local communities, acting as a vector for the disease;
- Existing stigma and taboos around STIs and HIV could make it challenging to practice safe sexual practices such as the use of condoms (including the use of female condoms) and stop people accessing testing and treatment in a timely manner;
- Limited access to treatment for STIs in the social AOI, affecting the long-term health of those who suffer infections.

The transmission of HIV and STIs is a business risk for KDRP, ZRA and its Contractors, as they may affect the health of their workforce, and therefore the ability of affected employees to do their jobs.

The population between 15 and 24 years remains at a higher risk than other age groups to be infected with HIV/AIDs. Those infected by HIV or STIs are likely to endure long term stigmatization by their peers. Women may be vulnerable to being infected by their partners and passing on HIV to their children via childbirth. In turn, the elderly may end up having to care for the young children in case of the parents' severe illnesses and deaths.

Based on the analysis provided above, this impact is assessed as a **Significant (Major)** impact.

Table 8.23 Increased Incidence of Sexually Transmitted Infections (STIs) including HIV/AIDS

Impact	**Increased Incidence of Sexually Transmitted Infections (STIs) including HIV/AIDS**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Regional	The transmission STIs and HIV/AIDs has a potential to extend beyond the Project Area given the presence of migrant workers.	Local	Mitigation will prevent the spread of STIs and HIV beyond the existing carriers
Duration	Permanent	STIs and HIV/AIDs can take a long time to treat and sometimes require a complete change in lifestyle by those affected and respective carers. These also result in deaths if not treated or managed accordingly.	Permanent	STIs and HIV/AIDs can take a long time to treat and sometimes require a complete change in lifestyle by those affected and respective carers. These also result in deaths if not treated or managed accordingly.
Scale	Large	A significant degree of change in the affected person will be required; some may not be able to provide for their households while other people will require additional care.	Limited	Mitigation will limit the transmission of STIs and HIV.
Frequency	Intermittent	The frequency of the impact will depend on multiple factors.	Infrequent	
Likelihood	Likely		Possible	
Magnitude	Large		Small	
Sensitivity	High		High	
Significance	Major		Minor	

8.4.9.1 Mitigation

As a means to mitigate impacts related to the increased incidences of HIV/AIDS and other STIs:

- GBV Management Plan, including the identification of service providers to address GBV and SEA risks;
- In partnership with local health officials and relevant NGOs, Contractors will be required to undertake information, education and communication campaigns around safe sexual practices and transmission of STIs and HIV/AIDS;
- Contractors should engage with an independent entity such as an NGO to develop and implement an HIV/AIDS Prevention Programmes for its workforce. The NGO's mandate shall cover the workers and communities in the Project Area.
- ZRA will develop and implement a Workforce Code of Conduct for appointed Contractors. The key health and safety elements of the code should include:
  - Zero tolerance of illegal activities by all personnel (e.g. drug peddling, theft);
  - Forbidding buying and selling sex (commercial sex) ;
  - Forbidding the illegal sale or purchase of alcohol;
  - Forbidding the sale, purchase or consumption of drugs; and
  - Forbidding gambling and fighting.
- The Workforce Code of Conduct will be adhered to by all Contractors. Any Contractor found in violation of the Code should face disciplinary hearing which should potentially result in dismissal.

- Contractors will ensure that they have sufficient capacity and capability to care and treat any HIV-positive employees.
- Contractors will ensure there is access to free condoms (including female condoms) at the worker camp to promote safe sexual practices.
- In partnership with local authorities and relevant NGOs Contractors will support women's empowerment and education programmes to promote women's rights and safe sexual practices (including the use of condoms and female condoms) and support.

The key elements of the workforce and community HIV/AIDS prevention programme are presented in Box 8.1 below.

With the implementation of these measures, the significance of the impact is expected to be **Not Significant (Minor)**, as transmission of STIs and HIV will be minimized.

Box 8.1 Key Elements of a Workforce HIV/AIDS Prevention Programme

Prevention:

- Raise awareness (address the facts and fiction of HIV transmission);
- Get the message out (make use of local languages or non-written forms of communication);
- Go beyond the workplace;
- De-stigmatize the disease;
- Peer education (train and support peer educators);
- Review occupational health and safety procedures;
- Condom distribution;
- Circumcision promotion;
- Voluntary HIV testing and counselling;
- Post exposure prophylaxis programme for all employees with potential exposure to blood or body fluids;
- Prevention of Mother-to-Child Transmission; and
- Training of managers and supervisors - to improve programme success.

Treatment and Care:

- Anti-Retroviral Treatment (ARV);
- ARV programme for family members infected;
- Adherence promotion;
- Preparation for treatment;
- Controlled dispensing of medication;
- On-going adherence monitoring promotion;
- Provision of nutritional programme; and
- Terminal and home-based care.

8.4.10 Increased Risk of Road Traffic Accidents

The plunge pool site will be accessed from the existing M15 national road, situated on the north bank of the river as well as via an existing paved road from the M15 to the turbine outlets on the north bank. To facilitate rehabilitation works, a new road (100m long and 10m wide) will be constructed from the turbine outlets to the north bank powerhouse.

Rehabilitation works will result in increased traffic, particularly heavy traffic. Material excavated (waste rock) from the plunge pool will have to be hauled to the disused Sinohydro Quarry Site where it will be disposed of permanently. The quarry is located on the north bank, approximately 3.5 km from the plunge pool in a downstream direction and will be accessed via a 1km adjoining road strip and then directly onto the M15.

Construction equipment and materials will also have to be transport to the Project site. Although the number and size of construction material loads are unknown, it is expected that heavy traffic will increase for the duration of rehabilitation works.

All road users in the AoI are considered to be sensitive receptors to expected increases in construction traffic. This includes livestock, pedestrians, cyclists, motorcyclists and motorists. Receptor sensitivity is considered to be medium as there is a general awareness regarding personal safety on the road; however, there is a lack of adequate health care facilities that will be able to deal with traffic trauma cases.

Based on this analysis, it is anticipated that the impact of increased risk of road traffic accidents will be a Moderate to Major Negative Impact pre-mitigation (refer to Table 9.25).

Table 8.24 Increased Risk of Road Traffic Accidents

Impact	**Increased Risk of Road Traffic Accidents**			
Type	Direct and indirect negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	The transportation of workers, goods, materials and equipment to and from site is considered local. As is the transport of spoil material to the quarry.	Local	
Duration	Permanent	Injuries and fatalities arising will be permanent.	Long term	The duration of injuries may be shortened with fewer and less injurious accidents.
Scale	Medium	Residents near or along transport routes will be primarily at risk, while residents in the greater area may experience potential impacts on their safety.	-	
Frequency	Intermittent	The impact will be experienced during specific times of high high traffic flow (i.e. at the beginning of the project when materials are transported through to site and during plunge pool rehabilitation).	Occasional	Frequency is lower with the mitigation measures set out below.
Likelihood	Possible	The risk of traffic accidents is possible.	Infrequent	Likelihood is lower with mitigation measures set out below.
Magnitude	Medium		Small	
Sensitivity	High		High	
Significance	Major		Moderate	

8.4.10.1 Mitigation

ZRA will require that vehicle and traffic management procedures be adhered to. Procedures will become compulsory for all Contractors and service providers to adhere to. These procedures will include the following mitigation measures:

- Fitting all Project vehicles with tracking devices capable of checking vehicle speeds and routes followed. Should drivers not adhere to agreed speed limits and approved routes, disciplinary measures will be implemented according to an agreed system.

- Project vehicles to be subjected to regular maintenance checks and maintained in a safe operating condition.
- Definition of safe operating speeds for loaded and empty haulage vehicles, particularly on public roads.
- Prohibition of unauthorized passenger transport. No members of the public will be transported in any Project vehicles.
- Alcohol and drug use will be strictly prohibited before and during the use of Project vehicles.
- ZRA to check on competence and assess any person intended to drive at KDRP before the person is permitted to drive.
- The use of cellular telephones whilst driving Project vehicles will be strictly prohibited.
- Where necessary public roads used as part of the Project will be upgraded and maintained as necessary in the interest of safety.
- Clear signage and signals will be installed on-site and along main haul roads.
- The transport of oversized loads will be restricted to non-peak periods where possible.
- Necessary approvals for the transport of oversize loads willobtained from the relevant authorities prior to the transporting of loads.
- ZRA can instigate and recommend disciplinary measures related to Vehicles and driving breaches

In addition to vehicle and traffic management procedures, the following mitigation measures will also be undertaken:

- The development and implementation of a Grievance Mechanism whereby members of the public can raise traffic related incidences and grievances for management by the Project Authorities.

- The development and implementation of Damage Compensation Policy and Procedure in the event that traffic accidents lead to injury and death as a result of negligence on the part of the Project.
- Permitting approval of abnormal loads to be agreed in advance with the relevant authorities.

Based on the implementation of the proposed mitigation measures, the post-mitigation significance of the impact related to increased road traffic accidents will be Significant (Moderate) due to the sensitivity of the receptor.

8.4.11 Influx of Opportunistic Job-seekers and Camp-followers

As indicated in the baseline, the availability of formal employment is limited in the KDRP area. KDRP will provide an opportunity for employment, which may attract job-seekers or those seeking trading and business opportunities. This may result in: informal settlements and housing around the area, and associated anti-social behaviour, alcohol consumption and GBV, SEA and commercial sex work. . However the scale of this impact is expected to be limited, and is it considered **Not Significant (Minor)**.

Table 8.25 Influx of Opportunistic -seekers and Camp-followers

Impact	**Influx of Opportunistic Job-seekers and Camp-followers**	
Type	Indirect negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Local	Limited to the local area
Duration	Long term	Potentially for the length of the project
Scale	Small	Job opportunities are relatively limited (‘00s)
Frequency	Continuous	

Likelihood	Possible	
Magnitude	Small	
Sensitivity	Medium	
Significance	Minor	

8.4.11.1 Mitigation

Measures can reduce the impact further, by: prohibiting any contractors or their sub-contractors from hiring 'at the gate'; actively planning recruitment from local communities, in advance and in consultation with community leaders; planning and implementing the procurement of sub-contractors, and only using those with a track record of providing fair employment; and awareness raising among employees on the Worker Code of Conduct.

8.4.12 Employee Harassment and Abuse of the Local Community

Where major Projects introduce a significant workforce, there is the potential for worker-community conflict, arising from the interactions and relationships formed between the workforce and the local community. Local persons who are newly employed may alter their behaviour with their new incomes from employment. These issues can have a material effect on how the Project is supported and accepted by local stakeholders. There are risks of:

- Verbal and physical abuse of local people by workers;
- Increased sexual exploitation; and
- Conflict around employment opportunities.

Women and girls are especially at risk, due to gender-based violence (GBV) and sexual exploitation and abuse (SEA), with exposure to STIs including HIV, prostitution, and the soliciting of sexual favours.

This may occur at the individual level (persons engaging in sex trade, bar fights, drinking and accidents) or at the community level (general unhappiness of employment benefits, division between those with money and without, conflict between locals and non-local workers).

Conflicts may be especially probably at the time of temporary demobilisation of plunge pool employees during the annual 5 month spilling period, or on permanent demobilisation.

Table 8.26 Employee Harassment and Abuse of the Local Community

Impact	**Employee Harassment and Abuse of the Local Community**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Local community members are affected	Local	
Duration	Long term	For the duration of the project	Long term	
Scale	Small	There is a relatively small workforce	Small	
Frequency	Occasional		Very occasional	Mitigation will focus on minimising the risk of these incidents
Likelihood	Likely		Not likely	
Magnitude	Medium		Negligible	
Sensitivity	Medium		Medium	
Significance	Moderate		Negligible	

8.4.12.1 Mitigation

Measures will include the continuation of ZRA's community relations, worker rules of employment and Code of Conduct etc. These measures should reduce potential conflict, but

also where feasible permit employees to engage with local communities and where possible promote local economic development. Measures will include:

- Worker Code of Conduct, applied by ZRA and all Contractors, and included in individual employee's Terms of Employment; this will establish clear rules and regulations to be adopted by employees in visiting local communities for work or recreation both during and after working hours, and identify acceptable and unacceptable behaviour;
- Rules on alcohol consumption, and a zero-tolerance approach for drunken behaviour and drug use;
-
- Transport for all employees from their homes camp to the working sites;
- Travel provision to enable workers from outside project area and the region to periodically return home to visit their wives and girlfriends;
- Engagement with local communities only via ZRA's Stakeholder Relations Officer; and
- A grievance mechanism that local people can use to lodge complaints where conflict with workers has occurred.

ZRA and Contractors will adopt a GBV Management Plan. Contractors will develop an Employees Welfare Plan for the non-local workforce not housed at Kariba Inn in Siavonga. The Kariba Inn Camp site will provide the needed services (including food, water, power, fuel, sanitation) to reduce pressure on local natural resources and community facilities.

Conflict during demobilisation during the 5-month spilling or on permanent demobilisation will be mitigated through the measures set out in Section 8.4.6.

The residual impact will be **Not Significant (Negligible)** with the effective implementation of these measures.

8.4.13 Lower Access to Health Services Due to Demand from Project Employees

Health facilities serving the people living in and around the Project area are often inadequate in terms of the level of services being offered with insufficient health professionals and drug supplies. The influx of a construction workforce may place greater pressure on these existing health facilities, due to accidents on-site or demand for health care services). An influx of job-seeking migrants would add to this pressure.

Table 8.27 Lower Access to Health Care Services Due to Demand from Project Employees

Impact	**Lower Access to Health Care Services Due to Demand from Project Employees**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Local facilities will be affected		
Duration	Long term	For the project duration		
Scale	Small	The workforce is relatively limited in size	Negligible	The measures taken aim to reduce demand for local health services.
Frequency	Continuous	Through project duration	Continuous	
Likelihood	Likely		Likely	
Magnitude	Medium		Small	
Sensitivity	Medium		Medium	
Significance	Moderate		Minor	

8.4.13.1 Mitigation

Control and prevention measures that will be put in place are:

- Contractors will be required to provide adequate health facilities to the workforce (such as an onsite health clinic catering for all KDRP parties and employees);
- Contractors will develop and implement OHS management systems to minimise OHS risks for the workforce;
- Contractors will provide worker accommodation that is safe and employees will be provided with meals cooked in hygienic and safe facilities;
- Worker Code of Conduct to minimize demand for the treatment of communicable diseases;
- COVID-19 procedures described in Section 8.4.3;
- Support to local clinics with equipment, medical supplies and supervisory support; and
- Provide Health Schemes or Health Insurance which enables employees access to specialized health care services from private health care providers as well as public health facilities that offer Out-of Pocket services.

The residual impact will be **Not Significant (Minor)** with the effective implementation of these control and prevention measures.

8.4.14 Health Impacts of Consumption of Explosive-contaminated Fish

There is a risk that fish, if exposed to large amounts of TNT over long periods of time, will become harmful to human health if consumed (ATSDR, 1995). This is not likely to be a significant issue, but the Plunge Pool Contractor will be required to prevent fish collected during dewatering of the plunge pool, whether due to fish kills from the explosion or otherwise, to be distributed or sold for human consumption.

8.4.15 Physical and Economic Displacement Due to Land Acquisition

KDRP does not require the acquisition of additional land outside of that which is already under the ownership or control of ZRA. However, ZRA has prepared a Resettlement Policy Framework for KDRP, which sets out the steps that will be taken in the case that land acquisition is required, in order to meet the requirements of the World Bank safeguard on Involuntary Resettlement, avoid physical or economic displacement where necessary, and avoid the risk of the impoverishment of the owners of such land.

Table 8.28 Physical and Economic Displacement Due to Land Acquisition

Impact	**Physical and Economic Displacement Due to Land Acquisition**	
Type	Direct negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**
Extent	-	No land acquisition is required
Duration	-	
Scale	Negligible	If any land acquisition is required, it is highly likely to be small, and will avoid physical and economic displacement.
Frequency	-	
Likelihood	Not likely	
Magnitude	Negligible	
Sensitivity	High	
Significance	Negligible	

8.4.16 Reduction in Tourism-based Livelihoods

KDRP activities with the most likely impact on tourism probably are blasting for rehabilitation of the plunge pool. It is anticipated that blasting activities will take place over a six month period, for each year of excavation. There will be temporary access restrictions to the wall when blasting occurs, and therefore blasting may result in a slight disturbance to tourism activities in the area.

Although tourists visiting the dam may be disappointed by the undertaking of rehabilitation works they are not considered sensitive receptors, as there are numerous other (upstream) tourist activities that will not be affected by rehabilitation works. In fact it is anticipated that rehabilitation works may attract tourism to the area, as many tourists may be interested in Kariba Dam rehabilitation works. Based on this analysis, it is anticipated that the pre-mitigation impact on tourism will be **Not Significant (Negligible)** and negative.

Table 8.29 Reduction in Tourism-based Livelihoods

Impact	**Reduction in Tourism-based Livelihoods**	
Type	Direct negative	
	Pre-mitigation	
Characteristic	**Designation**	**Summary of Reasoning**
Extent	Local	The impact will be restricted mainly to those that visit the two look-out points on either side of the Kariba Dam.
Duration	Short term	The impact associated with rehabilitation of the plunge pool will occur for 7 months during the dry season for the first four years of rehabilitation works.
Scale	Small	The impact will affect a very small number of people.
Frequency	Frequent	For 7 months annually
Likelihood	Likely	Rehabilitation works will take place
Magnitude	Small	
Sensitivity	Low	
Significance	Negligible	

8.4.16.1 Mitigation

The following mitigation measures will be taken:

- Installation of project information boards, which provide a brief description of rehabilitation works, KDRP timeframes, and the blasting schedule;
- Sharing of Project description and rehabilitation schedule with tourism operators;
- Implementation of noise and dust abatement measures as required.

Blasting will be highly controlled and with expected minimal vibration and noise. Those making their living from tourism are located a long distance from the blasting zone, and visits can continue even during a blasting day, with controls during the typical one-hour evacuation. To date, during blasting activities, tourism has continued in the area with no significant negative effects.

The negative impact on tourism will remain Negligible, and there may be a possibility of enhancing a positive benefit, if tourists value seeing the rehabilitation works in progress and receiving information on them.

8.4.17 Decline in Fisheries-based Livelihoods, including downstream

As described in Section 8.2.1 there will be no impact on flows downstream, and therefore no impact on livelihoods of altered flows. However, a decline in fisheries due to impacts on water quality and sediments in the downstream river would affect the fishing industry and those who base their livelihoods on fisheries. As is described in Section 8.2.4, an impact on water quality and sediments during rehabilitation works is considered likely, but the resulting impact on fisheries is not certain.

Some of the receptors of this may be more sensitive than others: those with fragile livelihood strategies, income instability, food insecurity and those who live in poverty are more sensitive; and most sensitive receptors are downstream fishers who may lose an important source of nutrition and income if activities associated with the rehabilitation works change the water

quality to such an extent that it negatively affects the fish population, or their customers' willingness to eat the fish. It is unlikely that the fishers will be able to find an alternative source of nutrition and income easily.

Based on this analysis, it is anticipated that the pre-mitigation impact on fisheries-based livelihoods would be a **Significant (Moderate)** negative impact.

Table 8.30 Decline in Fisheries-based Livelihoods

Impact	**Decline in Fisheries-based Livelihoods**			
Type	Direct negative			
	Pre-mitigation		**Post-mitigation / Residual**	
Characteristic	**Designation**	**Summary of Reasoning**	**Designation**	**Summary of Reasoning**
Extent	Local	Fish mortalities by blasting and dewatering activities will be downstream of the Kariba Dam and highly localised.	Local	Although the intensity of contamination can be mitigated the extent will remain approximately the same.
Duration	Short term	The temporal extent and frequency of blasting and dewatering is short lived. Moreover, issues associated with direct sediment through instream activities will be of short duration.	Temporary	Mitigation will decrease the duration of exposure if contamination does occur. The duration of sediment plumes will be reduced by limiting the period of disturbance.
Scale	Small	The resultant impact on fish downstream of the dam will be highly localised, and it is unlikely that this will result in a reduction in fish catches downstream.	Small	
Frequency	Medium	Blasting, decant and spill event dependant.	Medium	
Likelihood	Likely	Some form of water contamination is likely to occur owing to the nature of the proposed activities. The main impacts relate to sediment pluming, during instream and dewatering activities, and nutrient releases during blasting.	Possible	
Magnitude	Small		Negligible	
Sensitivity	High		High	
Significance	Moderate		Negligible	

8.4.17.1 Mitigation

The mitigation measures to limit impacts on water quality will be implemented, as described in Section 8.2.4.1. Post-mitigation, impacts are expected to be Not Significant (Negligible).

8.4.17.2 Monitoring

An aquatic monitoring program will be implemented that will enable early identification of a decline in fish numbers and associated fish catches downstream. If declines are observed that can be attributed to the works, ZRA will work with NGOs and Government to develop a mitigation and compensation plan.

8.5 Summary of Impacts and Residual Impacts

A summary of pre- and post-(residual) mitigation impacts is provided in Table 8.31.

Table 8.31 Summary of Impacts

Impact	Significance (Pre-mitigation)	Residual Impact Significant (i.e. post-mitigation)
IMPACTS ON THE PHYSICAL ENVIRONMENT		
Increased flow volumes downstream due to dewatering of plunge pool	Negligible	Negligible
Interrupted flow in tributaries crossed by new of upgraded access roads	Minor	Negligible
Risk of Weakening Rock Foundations	Major	Negligible
Reduced Water Quality and Increased Sediment Mobilisation in the Zambezi River and Tributaries	Moderate	Minor
Visual and physical impact of disused project infrastructure	Moderate	Minor
Accidental Deposition of Debris from Project Sites in the Zambezi River	Moderate	Negligible
Loss of Land Due to Wastes Disposal	Moderate	Minor
IMPACTS ON THE BIOPHYSICAL ENVIRONMENT		
Direct fish kills due to dredging, blasting and dewatering	Moderate	Minor
Loss of aquatic biota due to hazardous substances, reduced water quality and sediment	Minor	Negligible
Fisheries decline or loss in species of conservation importance due to increased fishing	Negligible	Negligible
Loss of natural habitat in the direct project footprint	Negligible	Negligible
Reduction in the Abundance of Terrestrial Species of Conservation Concern	Negligible	Negligible
Impacts on Protected Areas (no considering impacts from potential dam failure)	Negligible	Negligible
IMPACTS ON THE SOCIAL ENVIRONMENT		
Unfair Working Conditions	Moderate	Minor
Unsafe Working Conditions	Major	Moderate
Transmission of COVID-19 in the Workforce	Major	Moderate
Creation of Employment Opportunities	Positive	
Creation of Opportunities for Local Enterprises	Positive	
Loss of Income Upon Demobilisation	Moderate	Minor
Injury to the Public on Work Sites and at the Quarry	Major	Negligible
Community Transmission of Covid-19 and Other Communicable Diseases	Major	Moderate
Increased Incidence of Sexually Transmitted Infections (STIs) including HIV/AIDS	Major	Minor
Increased Risk of Road Traffic Accidents	Major	Moderate
Influx of Opportunistic Job-seekers and Camp-followers	Minor	Negligible
Employee Harassment and Abuse of the Local Community including GBV and SEA	Moderate	Negligible
Lower Access to Health Services Due to Demand from Project Employees	Moderate	Minor
Health Impacts of Consumption of Explosive-contaminated Fish	Negligible	Negligible
Physical and Economic Displacement Due to Land Acquisition	Negligible	Negligible
Reduction in Tourism-based Livelihoods	Negligible	Negligible
Decline in Fisheries-based Livelihoods	Moderate	Negligible

8.6 Impacts of Associated Facilities

The associated facility of KDRP is the Kariba Dam and the North and South Bank Power Stations and associated transmission lines. These are far larger infrastructural projects in their own right, and were developed in the 1950's, as described in Section 2.1. Assessment of the impacts of operating were not considered as part of the scope of this ESIA. However, ZRA and the operators of the power stations ZESCO and ZPC, are implementing the following activities, either on an ongoing basis or as part of KDRP:

- ZRA's Environmental and Social Management System;
- Dam Break Analysis;
- Emergency Preparedness Plan;
- ZESCO Environmental, Health and Safety Management System;
- ZPC Environmental, Health and Safety Management System; and
- Assessment of Kariba's operation using the internationally-recognized methodology, the HESG (Hydropower Environmental, Social and Governance) Tool.
- Communication plans

8.6.1 ZRA's Environmental and Social Management System

Zambezi River Authority is dedicated to the protection of the environment, worker health and safety and the social values of the communities along the Zambezi river. This is demonstrated by the ZRA Environmental monitoring programme (EMP) which consists of monthly, quarterly and biannual sampling of Zambezi river water and its tributaries. The focus of the programme was to monitor water quality and weeds. An EMP work group was established to ensure the achievement of the objectives of the EMP in respect of the Zambezi River Authority Environmental monitoring policy and strategies.

The physical-chemical water quality monitoring programme, the biological monitoring programme and water hyacinth control and management plan of Lake Kariba. Through continuous engagement with surrounding communities ZRA ensures the preservation of social values and assist in the sustainable development of the community through its cooperate social responsibility activities and capacity building activities

Worker health and safety is one of the values of ZRA and a policy signed by the CEO is in place to demonstrate commitment to worker health and safety.

With the coming in of the Kariba Rehabilitation Project ZRA established a team of Safety health environment and social professionals headed by the EHS manager. This is to ensure effective facilitation in the implementation of the KDRP ESIA and ESMP monitoring and mitigatory requirements.

8.6.2 Dam Break Analysis

ZRA contracted a third party to conduct a comprehensive assessment of the potential consequences of a partial or full dam breach (Dam Break Analysis - DBA) in compliance with the OP 4.37 WB Safeguard Policy, within the Zambezi River Basin. The specific objectives of the DBA were to:

- Analyze potential flood hydrographs from plausible dam breach scenarios for the existing dams in Zambezi and Kafue rivers;
- Route such floods through the downstream river stretches to assess impacts and potential sub-sequent damage or breach of downstream dams;
- Identify the need for, and carry out, additional detailed topographical surveys for selected river stretches and floodprone areas; and

- Produce flood inundation maps and characteristics for floods generated through malfunctioned dam operations or dam failures.

The DBA will be used to update the Kariba Dam Emergency Preparedness Plan.

8.6.2.1 Climate Change Resilience

The dam break analysis will further include a review of the computed historical design flood for Kariba in the scenario of potential climate change. The analysis will cover the downstream flooding simulation with return periods of 100, 200, 500, and 1,000 years in order to prepare required emergency action plans for large spillway discharges without involving dam break. The review will be informed by updated historical hydrological data and the latest Intergovernmental Panel on Climate Change (IPCC) climate change predictions for southern Africa. The results will inform the need for updating the future operation of the Kariba Dam. The 2001 flood, with its peak discharge of 8,000 cubic meters per second, caused displacement of around 500,000 people and an estimated 150 fatalities with around 100,000 ha flooded in Mozambique alone.

8.6.3 Emergency Preparedness Plan (EPP)

ZRA is developing a new EPP based on topographic survey, the DBA and downstream inundation simulation and mapping, to ensure that emergency preparedness and response planning is tested and improved. A consultant to prepare the new EPP was appointed in 2020, and will deliver the EPP in 2022. The EPP will be distinct from the Emergency Response Plans (ERP) of the Plunge Pool and Spillway Contractors for KDRP, and the consultant will clarify the interface of between the plans during inception. The scope of the work includes:

- Definition of roles and responsibilities;
- Potential Failure Mode and Effects Analysis (PFMA) and flood mapping;
- Development of an Early Warning System (EWS);
- Communication strategy;
- Definition of the EPP Response Process, responses to emergencies, and an Emergency Response Matrix;
- Identification of preparedness activities;
- Defining access / permissions to sites;
- Communication and Warning Systems; and
- Management of tenders for the installation of equipment.

It will deliver review and update of PFMA, integration of the DBA report to the EPP, identification of all downstream flood-prone communities, analysis of the existing EPP, an emergency capacity assessment (equipment and material) with local and national disaster management agencies among other key stakeholders, GIS layout on assessed secondary accesses and evacuation routes, an updated roles and responsibility matrix, installed Early Warning System downstream covering all exposed communities, training on the EPP to exposed communities, training of Dam EPP and EWS to ZRA employees, a dam emergency mock drill, and hand over including all certificates for all EPP installations.

Copies of the final amended Kariba Dam Emergency Preparedness Plan will be made available to, in both countries:

- The Offices of the President;
- Disaster Management and Mitigation Unit;
- Civil Protection Unit.

ZRA will continue to:

- Periodically undertake Kariba Dam emergency preparedness drills to test the emergency plan;
- Assess the dam safety implications of any transition to peaking (currently Kariba Dam is a base load facility, but may transition to a modified peaking plant in future);

8.6.4 ZESCO Environmental, Health and Safety Management System

The ZESCO Kariba North Bank Power Station has a SHEQ Management System, resources and operational standards, policies and procedures in place. Further, all environmental and social activities associated with the operation of the Station and KDRP are managed by the an Environmental and Social Affairs Team. The Power utility has a certified integrated management system which is modelled according to the requirements and guidelines of ISO 9001 Quality Management System, ISO 14001 Environmental Management System and ISO 45001 Occupational Health and Safety Management System.

ZESCO monitors the release of water and is compliant with all relevant statutory requirements. In conjunction with the contractor, the utility measures the appropriate physical, chemical and biological water sampling parameters at regular intervals both upstream and downstream of the dam.

ZESCO, ZRA and the KDRP PIU have formal communication channels in place to ensure sound environmental management and safety of the Project. ZESCO has an approved Emergency Preparedness Plan that has been communicated to the Project. The KDRP has authority to use some of the Power Utility infrastructure such as access gates, emergency assembly points, roads and quarry site to prevent environmental impacts that would arise from the establishment of new sites.

8.6.5 ZPC Environmental, Health and Safety Management System

Zimbabwe Power Company Kariba South Power Station is the hydro power plant generating unit of Zimbabwe Power Company with a generating capacity of 1050 MW. The power plant is committed to zero harm to humans, property, community and the environment. ZPC has a certified integrated management system IMS which is modelled according to the requirements and guidelines of ISO 9001 Quality Management System, ISO 14001 Environmental Management System and OHSAS 18001 Occupational Health and Safety Management System.

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8.6.6 HESG (Hydropower Environmental, Social and Governance) Tool

A number of Hydropower Sustainability Tools are available internationally, defining and measuring sustainability in the hydropower sector, developed by the International Hydropower Association (IHA) in partnership with a range of hydropower industry stakeholders. The tools provide a framework to assess the performance of hydropower projects – including operating projects – using a defined set of globally applicable sustainability criteria, and a common language to allow governments, civil society, financial institutions and the hydropower sector to discuss and evaluate sustainability issues.
There are three complementary tools: The Hydropower Sustainability Guidelines on Good International Industry Practice (HGIIP), the Hydropower Sustainability Assessment Protocol (HSAP) and the Hydropower Sustainability ESG Gap Analysis Tool (HESG).

The use of HSAP was the focus of a World Bank-supported technical assistance program on the "Application of the Hydropower Sustainability Assessment Protocol in the Zambezi River Basin" from 2015 to 2018, as part of which ZRA, ZESCO, and Hidroeléctrica Cahora Bassa performed informal assessments of their own projects using the tool. The results were published in the World Bank Water Global Practice Paper "Application of the Hydropower Sustainability Assessment Protocol in the Zambezi River Basin" in 2018. ZRA informally applied the tool to the Preparation stage Batoka Gorge project. Hidroeléctrica Cahora Bassa applied the HSAP and HESG tools formally, using an independent team, to the operating Cahora Bassa project.

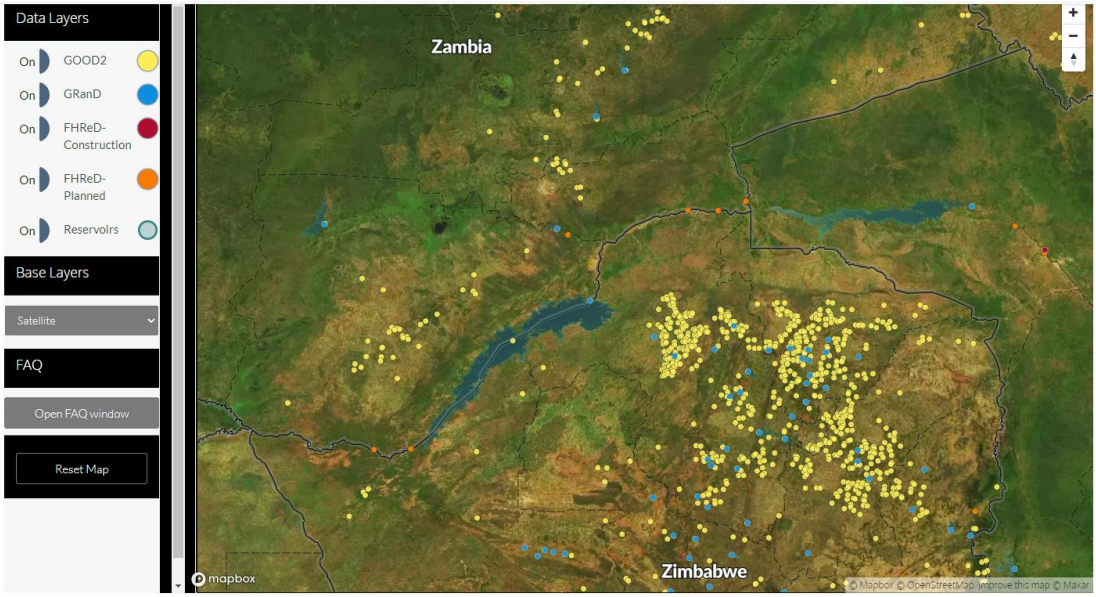
As part of this update, it is recommended for to apply the HESG to Kariba to provide an opportunity to assess:

- Conformance of the management of the operating scheme with Good International Industry Practice;
- The effectiveness of ZRA programs to address the social legacy issues of the development of Kariba dam;
- Whether Kariba's downstream flow regime, including with the recent expansion in the power stations, should be adjusted for biodiversity objectives;
- Actions to take to meet Good International Industry Practice.

8.7 Cumulative Impacts

The original ESIA-ESMP of the project did not performed a separate CIA (Cumulative Impact Assessment) since the works of the Kariba dam rehabilitation project where concentrated in the footprint of the already existing dam which has lead already caused significant direct, indirect and cumulative impacts to the river ecosystems and to the people; in addition the Kariba dam is upstream of another large dam (Cahora Bassa, 2025 MW from Mozambique). The main cumulative impacts are related to the existing operations of the Kariba and Cahora Bassa dams and residual impacts caused in the lower floodplain of the river. There are also several other dams planned in the river water system (main steam and a tributary) which if build will add additional cumulative impacts.

Dams in Zambia and Zimbabwe (Global dam watch. Consulted in October 10, 2020; http://globaldamwatch.org/map/). Orange: planned; blue and yellow: operation; red: construction;



This Section considers the cumulative impacts that would result from the combination of the Kariba Dam Rehabilitation Project and other actual or proposed future developments in the broader area.

The IFC Performance Standard 1 (Paragraph 5) defines the broader Project area to include "… areas potentially impacted by cumulative impacts from further planned development of the Project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken."

In addition, the IFC Performance Standard 1 (Paragraph 6) states that the "… assessment will also consider potential trans-boundary effects, such as pollution of air, or use or pollution of international waterways, as well as global impacts, such as the emission of greenhouse gases."

Cumulative impacts and effects are those that arise as a result of an impact and effect from the Project interacting with those from another activity, including those from concurrent or planned future third party activities, to create an additional impact and effect. Cumulative impacts may arise from 'the sum that is greater than the parts' or a sum of impacts that is greater in magnitude and therefore more significant.

8.7.1 Other Activities in the Area

In addition to the proposed KDRP the broader area may experience cumulative impacts as a result of the following developments:

- The upgrading (extension) of the Kariba North Bank Power Station, which was completed in 2013;
- Upgrading of the Kariba South Bank Power Station, which was completed in 2018;
- Ongoing operation of Kariba Dam and associated reservoir management requirements.
- Other dams planned for downstream areas in the main river or tributaries

The assessment that follows is necessarily of a qualitative nature and focuses on key issues and sensitivities, and how these might be influenced by cumulative impacts with other developments in the area.

8.7.2 Identified Cumulative Impacts

The cumulative impacts that would result from a combination of KDRP and other developments in the broader Project Area, in general will include cumulative impacts such as:

- Impacts on the flow regime
- Impact on natural and critical habitat and distribution of migratory, endemic, endangered species especially aquatic
- Impacts on Surface Water Hydrology and Aquatic Environment;
- Employment;
- Increased Risk of Health and safety and Road Accidents among local families in the AoI
- General Construction Impacts (dust and noise emissions).

8.7.2.1 Impacts on the terrestrial ecosystems

Clearing of vegetation has been performed and will be performed in the project and some area permanently changed. The creation of the reservoir and Kariba dam already affected a very unique river and riparian ecosystems; potential future dams planned downstream between

Kariba and Cahora Bassa will include opening of roads and more impacts to the terrestrial and riparian habitats. The biodiversity of the Zambesi is very rich in endemic species.

8.7.2.2 Impacts on Surface Water Hydrology and Aquatic Environment

Cumulative impacts affecting the aquatic integrity of the Kariba gorge include the historic construction of the Kariba dam and the associated hydroelectric power stations, both current and proposed, all of which have irreversibly altered the hydrological regime operational within the gorge. Current downstream activities involving the deposition of large volumes of coarse aggregate, resulting in steep unstable slopes which are vulnerable to erosion and threaten the current water qualities through increased turbidity, are likely to further add to the cumulative impacts affecting the receiving aquatic environment. Subsequently, proposed activities directly downstream of the dam involving localized decanting, blasting and potential short-term alteration of existing flow regime, are unlikely to add significantly to the overall cumulative impact already affecting the aquatic system downstream of the Kariba dam and between the two dams (Cahora Bassa). However, the richness of the aquatic ecosystem of the Zambesi river is enormous and important local likelihoods and yet there is a lot of missing information how the river has recover from the Kariba dam and if the original species has still present and their current populations. ZRA will implement different measures with the collaboration of the Kariba team, consultants and local communities to support better knowledge on these ecosystems and restore riparian areas to generate positive actions for the river ecosystems.

8.7.2.3 Employment

Although development in the AoI provides employment opportunities and contributes to households having more disposable income to contribute to improved livelihoods, it also has the potential to result in unfair and unsafe working conditions. During in-field engagement with local stakeholders, concerns related to labour and conditions of employment for existing/previous projects (viz. the North and South Bank Kariba Power Station extensions) were raised. It was reported that contractors associated with such projects do not adhere to basic conditions of employment as set out in the countries' legislation. Such conditions include low remuneration packages, poor treatment, long working hours, poor workforce accommodation and poor health and safety standards. However, with the mitigation measures included in Sections 8.4.1 and 8.4.2of this Chapter be implemented, it is unlikely that the KDRP will add to negative impacts around inadequate labour and poor employment conditions.

8.7.2.4 Increased Risk of Health and safety, Road Accidents, blasting or other type accidents

Baseline vehicle traffic volumes are low in the Project AoI. Existing upgrade works at the Kariba South Bank Power Station and KDRP will increase light and heavy vehicles using the local roads throughout the duration of works. The combined volumes of road traffic will place both human and livestock in danger of being injured or killed throughout the life of these projects. Close communication and coordination between both project teams and effective signage and traffic management will be required to avoid significant cumulative impacts.

8.7.2.5 General Construction Impacts (Dust and Noise)

Rehabilitation activities associated with the proposed Kariba Dam Rehabilitation Project together with construction activities from other developments have the potential to create negative cumulative impacts associated with the generation of total dust, PM10 and PM2.5. The magnitude of these potential impacts may be minor, moderate or major, depending upon how the impacts from other projects will combine with impacts arising from KDRP and the respective timing of each project. There will not be any overlap of works between KDRP and the upgrading of the Kariba South Bank Power Station which was completed in 2018.

9 Environmental and Social Management Plan

This Chapter describes the Environmental and Social Management Plan (ESMP) for the Kariba Dam Rehabilitation Project (KDRP, or 'the Project'), which is rehabilitating the plunge pool and the spillway of the Kariba Dam, located on the border of Zambia and Zimbabwe.

The ESMP is applicable to all work activities during the site establishment and the rehabilitation works. It is a dynamic document implying that information gained during site establishment and the rehabilitation works and monitoring on the site could lead to changes in the ESMP.

9.1 Scope and Objectives of the ESMP

This ESMP provides for environmental and social management, monitoring and reporting for the pre-rehabilitation, rehabilitation and post rehabilitation phases of the KDRP, and beyond.

Environmental and social management and monitoring for the ongoing operation of Kariba Dam is not included in this ESMP, because this is included in the Zambezi River Authority (ZRA)'s existing Standing Operations Procedures for managing the dam and reservoir.

The ESMP outlines appropriate management strategies and actions to meet acceptable levels of environmental and social, including occupational health and safety, performance. It provides a basis for an on-site environmental and social manual for staff, maintenance personnel, contractors and consultants with responsibilities for the Project.

The objectives of the ESMP are to:

- Identify environmental and social management procedures and mitigation measures for the control of impacts of the Project, to ensure that environmental and social requirements are specified and complied with;

- Identify environmental and social performance indicators, monitoring requirements and review procedures for the Project activities;

- Provide government authorities, stakeholders and proponents with a common focus for approvals and compliance with relevant policies, approvals, licences, agreements, legislation and other requirements; and

- Provide the community with evidence that the environmental and social management of the Project is acceptable.

9.2 ESMP Organizational Structure

9.2.1 Overview

Overall accountability for ESMP implementation lies with ZRA who is the ESIA/ESMP licence while the immediate responsibility lies with Contractors who are the holders of licences for the specific ESMP plans. A further three main organizations are responsible for the implementation and delivery of the ESMP –the Technical Services and Supervision (TS&S) Consultant, Plunge Pool Contractor, and the Spillway Rehabilitation Contractor. In addition, ZEMA and EMA, in their roles as the national regulators, will monitor the performance of the Project. An overview of each entity's roles and responsibilities is outlined below whilst Figure 9.1 presents the organization chart for the Project showing the linkages between each organization.

9.2.2 Roles and Responsibilities

9.2.2.1 Zambezi River Authority (ZRA)

ZRA has overall responsibility for KDRP's compliance with the ESMP and the conditions of the environmental licences issued by ZEMA and EMA.

ZRA has an Environmental Policy, and Occupational Health and Safety Policy and Procedures governing the environmental management and safety of the dam. The Environmental Monitoring Program entails The Zambezi River Authority Environmental Policy and Strategy, The physical-chemical Water Quality Monitoring Programme, The Biological Monitoring Programme and The Water Hyacinth Control and Management Plan for Lake Kariba.

ZRA has an Environmental monitoring programme, which ensures achievements are made on the objectives of the EMP in respect of the Zambezi River Authority Environmental Policy and strategy, The physical -chemical water quality monitoring programme, Biological monitoring programme and the water hyacinth control and management plan for Kariba. In terms of worker health and safety ZRA has one of its values as health and safety and it has a signed health and safety policy as proof of commitment to employee health and safety. ZRA continuously engages with the communities along the Zambezi river through its stakeholder relations department. This present opportunity to receive grievances, carry out social responsibility activities and capacity building to ensure sustainability

ZRA has recruited EHS professionals headed by an Environmental Manager (hereafter referred to as the EHS Unit), under the Projects and Dam Safety Management Department. The unit is capacitated to carry out the activities allocated to the unit and ZRA under this ESMP.

The key responsibilities of ZRA are outlined below.

ESMP, Permitting, and Stakeholder Relations:

- Ensure that the ESMP has been approved by ZEMA and EMA prior to the start of rehabilitation activities on the site (completed);
- Ensure that ZEMA and EMA have been notified of the date on which rehabilitation activities will be starting, prior to commencement of the activity (completed);
- Ensure that all conditions of approval are complied with;
- Undertake regular internal review of the ESMP and update it, and require corresponding updates from the TS&S Consultant and Contractors; and
- Liaise with ZEMA, EMA, communities, and other Project stakeholders;

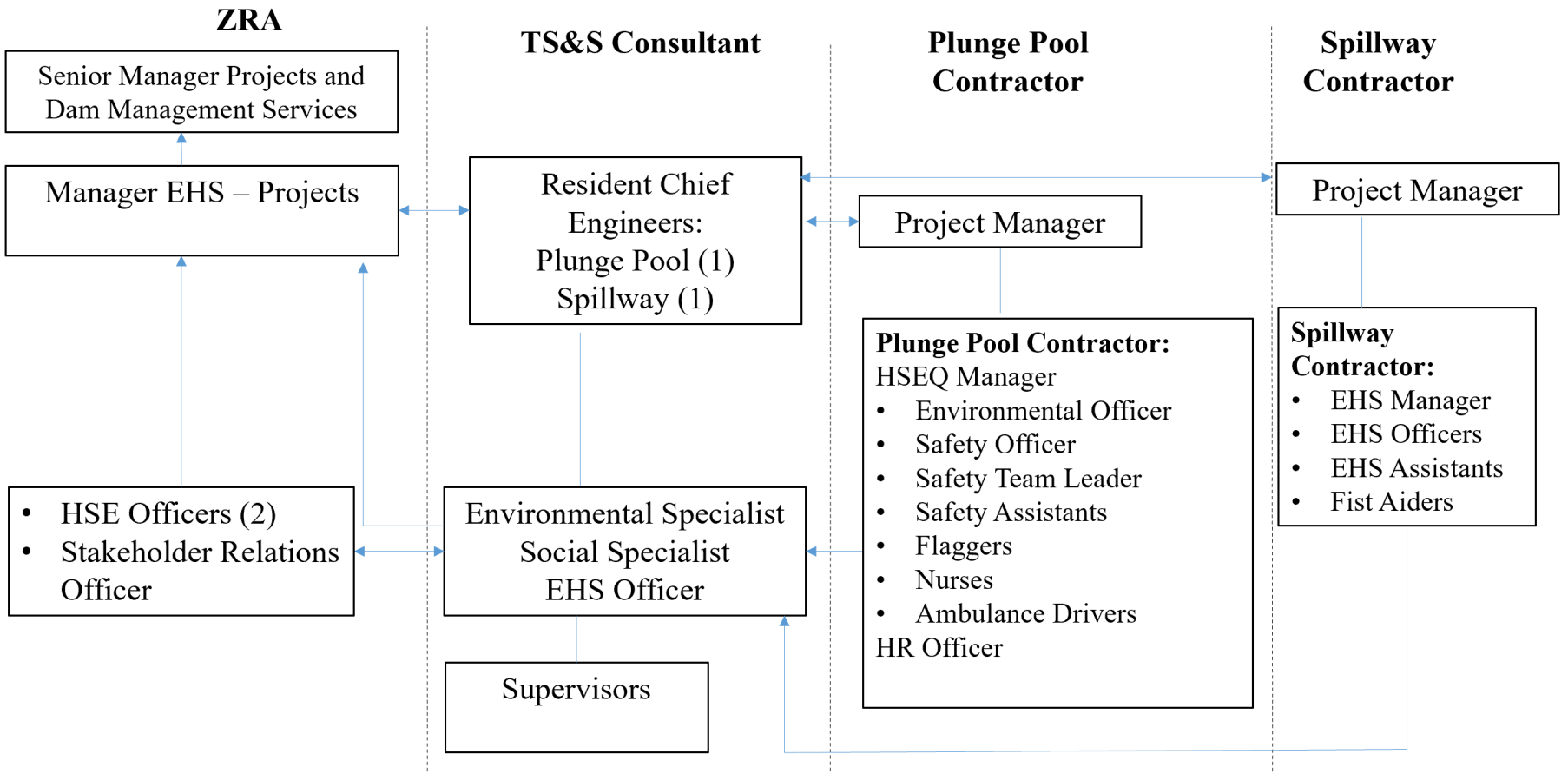
Personnel:

- Recruit qualified personnel to fill the positions of the EHS Unit and carry out any necessary training to build capacity of these resources (completed);

Procurement:

- Select the TS&S Consultant to provide primary oversight of the Contractors' performance (completed);
- Ensure that the measures assigned to the Plunge Pool Contractor and Spillway Contractor are included in procurement processes and contract (completed);
- Ensure that Contractors have provided appropriately qualified staff and realistic costs for the implementation of the ESMP;

Figure 9.1 Organizational Structure for EHS Management



Advising on Requirements:

- Conduct training with the Contractors and all staff on the key requirements of the ESMP, environmental and social World Bank safeguards Policies, National environmental regulations, good housekeeping practices, and any other aspect of ESHS management.
- Ensure that the Contractors have a copy of the ESMP and all agreed method statements;

Approval of Plans in coordination with lenders and national authorities:

- With the TS&S Consultant, review and approve Contractor's plans including Construction ESMPs, environmental and occupational health and safety management systems, management plans, environmental and social monitoring plans, and work method statements (WMS) to confirm that they comply with the requirements of this ESMP;
- Review and approve the detailed design drawings and any environmental and social assessments carried out on these in coordination with the TS&S Consultant;

Inspections:

- Undertake regular site inspections to audit compliance of all parties with the requirements of the ESMP;
- Coordinate inspections with the TS&S Consultant;
- Participate in meetings between the TS&S Consultant and the Contractors' Health and Safety, Environment and Social Managers;
- Identify actions or issues affecting the environment with the TS&S Consultant, who shall issue any required instructions to the Contractors, including the removal of person(s) and/or equipment not complying with the ESMP;
- Assist Contractors in finding responsible solutions to environmental and social problems that may arise;
- Take immediate action on the site to stop works where significant and irreparable damage is being inflicted on the environment, and to inform the TS&S Consultant immediately of the occurrence and action taken.

Monitoring:

- Review monitoring reports and any incident reports and approve any corrective actions;
- Undertake photographic monitoring of the rehabilitation works at the site.
- Ensure any specialist monitoring is being undertaken and reported at the correct intervals; and
- Keep records of all activities/ incidents concerning the environmental and social issues on the site in a site diary / logbook;

Site Closure:

- Complete temporary and permanent site closure checklists.

ZRA will resource an EHS Unit reporting to the Senior Manager that will have overall responsibility for ensuring the above steps are implemented. Table 9.1 outlines the specialisms that need to be filled.

Table 9.1 ZRA Key Personnel for Delivery of the ESMP

Role	Responsibilities	Location	Number of Personnel Required
Manager EHS – Projects	Delivery of ESMP requirements, reporting to regulators and lenders	Kariba	1
HSE Officers	Focus on environmental and	Kariba	2

	safety aspects of the ESMP		
Stakeholder Relations Officer	Stakeholder relations and communications	Kariba	1

The EHS Manager will have the authority to recommend to the TS&S Consultant that works be stopped if in his/her opinion serious harm to personnel, or impact on the environment is likely to occur or has occurred and such actual or potential harm or impact is in contravention of the ESMP and EHS legal requirements, and which is or may be caused by construction or related works.

In the event of failure by the Contractors or Contractors' employee(s) to show adequate consideration to the environmental, Safety and social aspects of this contract, the EHS Manager may recommend to the TS&S Consultant and the Contractor management team to have those employee(s) removed from the site or to suspend work until the matter is remedied.

9.2.2.2 Technical Services and Supervision (TS&S) Consultant

The Technical Services and Supervision (TS&S) Consultant is the engineer (Owner's Engineer) for the Project, responsible for detailed design and supervision of the technical and contractual implementation of the works to be undertaken. The TS&S Consultant was appointed pre-construction and is responsible for the day-to-day supervision of the Contractors and for reporting their performance on a regular basis to ZRA's EHS Unit. The TS&S Consultant will review and approve all method statements, construction, drawings, etc. proposed by the Contractors for permanent and temporary works to ensure conformity with construction contracts and that the work can be carried out safely and in accordance with recognized and accepted practices.

The responsibilities of the TS&S Consultant, pertaining to the ESMP, are to:

Designs and Planning:
- Review detailed design drawings and advise on environmental and social measures to be included in the designs;
- Review of ESIA and ESMP, and prepare a final Construction Environmental and Social Management Plan (CESMP) or Health and Safety Plan and Environmental and Social Management Plan, incorporating the relevant provisions in the tender documentation for Contractors;
- Emergency Preparedness Plan, review the existing plan, and identify any issues and proposed revisions / remedies as may be required;

Technical Assistance for Prequalification, Tendering and Award of Contracts:
- Assist in the Contractor selection process and review their environment and social and OHS management systems, plans, and procedures for compliance with this ESMP;

Review and approve Contractor plans:
- Review and approve all submittals, including method statements, construction / shop drawings, etc.;
- Review and approve work method statements with input from ZRA;

Supervision:
- Ensure that the requirements as set out in this ESMP and any other conditions stipulated by the relevant Authorities are implemented;
- Monitor contractors' compliance with the specific provisions of the ESMP, Construction Environmental and Social Management Plan, Occupational Health and Safety provisions, relevant national legal obligations and specific contractual provisions.;

- Supervise all operations on behalf of ZRA;
- Monitor any emergency and unsafe conditions and report to ZRA for speedy response / remedial actions;
- Daily inspection of construction sites and worker accommodation;
- Reporting of all detected cases of non-conformity and follow up their correction by the Contractors and informing ZRA's EHS Unit;
- Order the removal of person(s) and/or equipment not complying with the specifications (as required by ZRA or otherwise);
- Assist Contractors in finding solutions to environmental and social problems that may arise during the works.

Issue of Instructions to the Contractor(s):
- Promptly issue instructions requested by ZRA to the Contractors;
- All instructions relating to environmental and social matters issued by the TS&S at the site to the Contractors are to be copied in writing to ZRA.

Advise ZRA on Progress of the Works:
- Assist ZRA in decision-making and approving solutions to environmental and social problems that may arise during the rehabilitation works;
- Weekly meetings with the Contractor's EHS managers;
- Regular monitoring reports (monthly) to ZRA's EHS Unit; and
- Contribute to ZRA's on-going internal review and update of the ESMP.

Table 9.2 TS&S Consultant Key Personnel for the Delivery of the ESMP

Role	Responsibilities	Location	Number of Personnel Required
Resident Engineer – Plunge Pool	Supervision of all requirements including HSE	Kariba	1
Resident Engineer – Spillway	Supervision of all requirements including HSE	Kariba	1
Environmental Specialist, Social Specialist, and EHS Officer	Review of WMS for HSE measures Daily inspections Weekly and monthly HSE reports Non-conformity reporting	Kariba	3
Supervisors	Supervisors of all tasks are responsible for HSE measures	Kariba	Numerous

9.2.2.3 Contractors

For the purposes of this document, "Contractors" refers to the Plunge Pool Contractor and Spillway Contractor, and any other company or individual appointed by ZRA to implement any aspect of the works.

Contractors are required to have management systems for environmental and social, and health and safety management that are equivalent to the standards set out in ISO 14001:2015 and ISO 45001:2018.

Contractors are required to implement the measures set out in this ESMP, including the management plans and work method statements therein, during all works on the site, including all additional requirements as may be contained in approved method statements.

Contractors are responsible for all sub-contractor(s) performance, including sub-contractor(s) adherence to the Project Code of Conduct, requirements of the ESMP and specialist management plans as relevant to their activities.

Prior to on-site activities, Contractors are responsible for:

- Detailed designs of the infrastructure and temporary works layout that meet ESHS requirements, including any restrictions and mitigation measures outlined in this ESMP;
- Obtaining required construction permits identified in the permit register;
- Appointment of the personnel outlined in Table 9.3 and Table 9.4 to manage the ESMP requirements;
- Hiring and training of the workforce and sub-contractors including site inductions and requirements to implement the ESMP;
- Development of a contract- specific ESMP or management system, and elaboration of specialist management plans as detailed in this ESMP; and
- Production of detailed method statements relating to key activities that include specific reference to the relevant management plan.

During on-site activities, Contractors are responsible for:

- Implementing this ESMP and the management plans outlined in it;
- Monitoring performance (including sub-contractors) and implementing corrective actions as necessary;
- Ensuring that all sub-contractors', employees, suppliers, agents etc. are fully aware of the environmental and social requirements detailed in the ESMP.
- Liaising closely with the TS&S Consultant and ZRA to ensure that the works on the site are conducted in an safe, environmentally and socially controlled manner. It is recommended that site inspections are carried out and meetings held with all the stated parties regularly;
- Informing the TS&S Consultant and ZRA should environmental and social conditions on the site deteriorate, e.g. dumping, pollution, littering and damage to vegetation, community grievance and devise control measures to rectify.
- Carrying out instructions issued by the TS&S Consultant and ZRA, required to comply with the ESMP.
- Working closely with the TS&S Consultant and ZRA's EHS Unit to resolve any issues arising;
- Implementing regular environmental awareness sessions for support personnel and sub-contractors.

Contractors shall designate a permanent onsite employee as the Environmental and Social Manager who shall be responsible for undertaking a daily site inspection to monitor compliance with this ESMP. Table 9.3 and Table 9.4 set out the key personnel appointed or to be appointed by Contractors.

Table 9.3 Plunge Pool Contractor Key Personnel for the Delivery of the ESMP

Role	Responsibilities	Location	Number of Personnel Required
Project Manager	Overall responsibility Regards Implementation of ESMP	Kariba	1
HSEQ Manager	Responsible for overall Contractors ESMP Implementation	Kariba	1
Safety Officer	Coordinating and Implementing the Safety Management Plan	Kariba	1
Environmental Officer	Coordinating and Implementing the ESMP	Kariba	1

Safety Team Leader	Supervision of Safety at Site	Kariba	1
Safety Assistants	Assist Supervision of Safety at site	Kariba	3
Flaggers	Traffic Control	Kariba	3
Nurses	Administer the site infirmary and administer treatment and counselling procedures	Kariba	2
Ambulance Drivers	Oversight on Casualty transported by the ambulance and driving safely	Kariba	2
Human Resources Officer	HR issues administration	Kariba	1

Table 9.4 Spillway Contractor Key Personnel for the Delivery of the ESMP

Role	Number of Personnel Required
Project Manager	2
EHS Manager	1
EHS Officers	2
EHS Assistants	2

9.2.2.4 Independent Dam Safety and Environmental and Social Panel of Experts (DSPOE)

Because of the magnitude and complexity of such a Project and the potential for significant adverse impacts in the event of a failure of the structure, ZRA has appointed an independent dam safety panel of experts (DSPOE) whose primary purpose is to review the overall project, procedures, progress, operations, and monitoring efforts, throughout the entire period of the work schedule. DSPOE consists of a Chair and Hydrology, Hydraulics and Scour Expert, Socio-Economic Expert, Concrete Technology Expert, Environmental Expert, Dam Engineering, Scour and Hydraulics Expert, Engineering Geology/Geotechnical Expert, and Hydro-Mechanical/Electrical Expert.

9.2.3 Supervision and Reporting

ZRA will monitor the performance of Contractors directly and through the use of its agents such as the TS&S Consultant, through all phases of the contract including mobilization, the main construction phase, and demobilization.

The objectives of supervision and reporting are to:

- Ensure regulatory requirements are met;
- Check that impacts do not exceed Project standards and other environmental standards described in Section 3;
- Verify predictions made in the ESIA for the construction period by obtaining real time measurements;
- Verify that mitigation measures are effective and implemented in the manner described in this ESMP, so that impacts are not occurring on any receptors;
- Identify corrective actions if performance criteria are not met;
- Provide early warning of emerging environmental, social and health and safety issues;
- Contribute to the continuous improvement of the Contractor's Management Systems; and

- Provide formal assurance to ZRA and other KDRP stakeholders that the project is compliant with regulations and agreed limits and that mitigation measures are being implemented and are effective.

9.2.3.1 Contractors

ZRA with TS&S Consultant will define Key Performance Indicators (KPIs) in selected aspects, such as water quality, and measurable acceptance criteria and targets for each. They will agree these with ZRA, and measure and compile KPI data to confirm that activities on-site are not resulting in impacts, for example including water quality of effluents and river water quality below discharge points, safety indicators, indicators of the frequency of poaching by employees, or indicators of the number of community grievances. The frequency of measurement and reporting of these KPIs will depend on each KPI.

Contractors will conduct the following types of inspections and monitoring:

- Inspections planned and conducted on an at least weekly basis to ensure that mitigation measures and commitments are properly maintained and implemented, and that specific management procedures are being following (e.g. practices on waste storage and disposal).
- Receptor monitoring undertaken to verify predictions made in the ESIA and to confirm that the activities at the site are not resulting in an unacceptable deterioration in the quality of habitats or infrastructure (e.g. monitoring disturbance to affected residents through a grievance mechanism).
- Compliance monitoring involving periodic sampling or continuous recording of specific environmental quality indicators.
- Internal audits on a quarterly basis to assess compliance of on-site activities with environmental and OHS management systems and regulatory requirements; and
- An annual external audit, as part of its certification to international standards.

The outputs will be used in the following ways:

- To provide early warning and adjust mitigation measures on a day to day basis to suit evolving conditions.
- To demonstrate that mitigation measures and procedures laid down in mitigation plans are being followed and operations are being conducted within compliance limits;
- To provide formal assurance to ZRA and Project stakeholders that the project is compliant with regulations and agreed limits and that relevant mitigation / enhancement measures are being adhered to.

The monitoring plan and parameters will be reviewed periodically and, if necessary, will be modified to include any additional parameters necessary to ensure good environmental and social performance. Similarly, the monitoring methods and frequencies will be subject to periodic review.

Contractors' monitoring of ESHS performance will include performance by all sub-contractors, and contractor's workers including non-employed employees.

9.2.3.2 ZRA and TS&S Consultant

TS&S Consultant, on behalf of ZRA, will conduct supervision monitoring of the performance of the Contractors in conforming with ESHS policies and commitments, and contractual, permitting and ESMP requirements. This will require daily inspection of construction sites and activities in order to verify compliance.

The TS&S Consultant will not measure all the same aspects and parameters as the Contractors, but will verify monitoring information, and will be required to conduct spot checks and independent measurements from time to time. The TS&S Consultant will report on all detected

cases of non-conformity and follow up their correction by the Contractor and inform ZRA's EHS Unit.

This may require regular (as much as daily) inspection of construction sites and other sites such as worker accommodation, and inspection of the measures undertaken, sites of incidents, corrective actions etc. The TS&S Consultant, separately from the Contractor, will conduct measurement of KPIs, and spot checks and independent measurements as frequently as it considers necessary.

ZRA's EHS Manager shall keep a site Diary or Logbook in which events and concerns of environmental and social significance will be recorded.

ZRA's EHS Manager will be responsible for the compilation of a final completion checklist for the Project, completed when all rehabilitation works related to the Project have terminated and the site has been cleared of all construction related debris, materials or equipment not forming part of the permanent works. The completion checklist will audit the Contractors' compliance with the rehabilitation works requirements of the ESMP throughout the duration of the works and, together with a final written report, will be submitted to ZEMA and EMA and where appropriate to the relevant lenders in order to achieve "environmental and social closure" for the Project.

9.2.3.3 Reporting

The Contractor will follow the reporting requirements outlined in Table 9.5. All reports will be submitted to ZRA and TS&S Consultants.

Table 9.5 Reporting Requirements

Report Type	**Requirements**
Accident and Incident Investigation Procedure	An accident and incident investigation Procedure/Plan shall be developed and implemented to manage all incidents.
Accident / incident and Non-Compliance Report (NCR)	Site Engineers, EHS Officers, or other employees will report breaches of accepted standards to the Contractors' Site Managers and ZRA EHS Manager immediately for action and investigation; a reporting format will be developed including accidents, incidents and environmental and health and safety near misses.
Root Cause Analysis	In the case of severe incidents, Contractors will prepare a root cause analysis of the incident, in order to understanding of the underlying causes that require further attention.
Internal Weekly Site Reports	Checklist format, completed on a weekly basis for each working site, based on daily site walk-overs, to be discussed at weekly on-site meetings at an operational level with TS&S Consultant and ZRA EHS personnel.
Monthly Internal EHS Reports	Contractors will deliver Monthly Reports using a form (structure) agreed with ZRA, including at least the following information: • Progress in implementing the ESMP and EHS Management Systems, and any major changes to EHS management; • Compliance with permits and consents, and any relevant changes or anticipated changes in legislation, regulations and international standards; • Numbers of local, national, and foreign personnel; male and female personnel; and skill levels (unskilled, skilled, supervisory, professional, management); • EHS staffing – new hires and departures, and listing of current staff and titles; • EHS training including dates, number of trainees, and topics; • Results of KPI monitoring; • Safety statistics – hours worked, recordable incidents (lost time incidents, medical treatment cases), high potential near misses, and corresponding Root Cause Analysis, and remedial and preventive actions required; • Environmental incidents and near misses – environmental incidents and high potential near misses and how they have been addressed, what is outstanding, and remedial and preventive actions required;

	• Non-compliance incidents with permits and national law, project commitments, or other ESHS requirements – raised, corrected and outstanding, with details and summary of numbers; • Details of any work occurring outside of the site boundaries or major off-site impacts caused by ongoing construction—to include date, location, impacts, and actions taken; • Summary of ESHS inspections and audits, by the Contractor, TS&S Consultant, or others including authorities, including date, inspector or auditor name, sites visited and records reviewed, major findings, and actions taken; • Summary of external stakeholder engagement activities, including formal and informal meetings, and information disclosure and dissemination; • Security risks, i.e. updated analysis of threats from third parties including security personnel or public security forces; • Grievances raised by community members, including occurrence date, the grievance, date submitted, whether resolved or outstanding, and actions taken and dates, with summary table of numbers raised, resolved and outstanding to-date and during the reporting period; disaggregated by gender; • Grievances raised by workers, including occurrence date, the grievance, date submitted, whether resolved or outstanding, and actions taken and dates, with summary table of numbers raised, resolved and outstanding to-date and during the reporting period; disaggregated by gender; • Complaints raised by any external body, raised, resolved and outstanding; • Deficiency and performance management: actions taken in response to previous notices of deficiency and/or plans for actions to be taken; • Priority actions in the following month; • Any other information on activities relating to EHS. The TS&S Consultant will prepare a monthly report on Contractors' conformance with the ESMP, summarising the above points for the whole project. These monthly reports may be combined with wider monthly reports concerning all technical and financial matters.
Quarterly and Annual ESHS Reports	Contractors and TS&S Consultant will prepare quarterly and Annual versions of the above monthly reports, compiling data from across the preceding quarter or year.
Annual KDRP EHS Report	ZRA will annually compile a review of ESMP implementation, based on the Contractors' and TS&S Consultant annual report, and its own quartly reports to ZEMA/EMA. This will re-examine the continued appropriateness of the ESMP and identify up-dates required. Attention will be given to lessons learnt in the light of experience. In particular, consideration will be given to the monitoring programmes in place to determine whether their purpose has been served and they can therefore be terminated or reduced in frequency.
Reporting to and audits by ZEMA and EMA	ZRA will prepare a report on compliance with licence conditions, for submission to ZEMA and EMA on a quarterly basis. At least annual audits by ZEMA and EMA (2 per year were planned, but COVID-19 has prevented these). ZRA will include compliance with labour standards in these reports. The Zambian and Zimbabwean Labour Agencies will be invited to visit annually to check on compliance of workers contracts with labour laws.
Complaints Register	Contractors will prepare a quarterly summary of any complaints by external bodies and actions taken/to be taken to be agreed between ZRA and the Contractors.
Internal Audits	Contractors will undertake quarterly internal audits of conformance of procedures and practices on-site with the requirements stated in this ESMP.
Annual Independent Audits (External)	At a minimum, annually for the duration of the construction period, Contractors will be independently audited, auditing existing practices against the requirements of the ESMP, in accordance with ISO-14001 / OHSAS 18001.
Closure report	ZEMA requires a closure report outlining implementation of the commitments in the Environmental Impact Statement on which KDRP was licensed, and an environmental audit not less than 12 months and no more than 36 months after KDRP completion, and submission to ZEMA and EMA for review.

9.2.3.4 Communications

ZRA, TS&S Consultant and Contractors will hold weekly meetings on-site at each site to observe and discuss ESHS Performance. They will hold additional meetings on an at least monthly basis to discuss all aspects of ESHS performance, including those that may not be evident on-site (for example Local Employment), and the TS&S EHS Officer will record minutes. At least annually, ZRA and Contractors will conduct a performance review of each Contractor's ESHS management systems, in accordance with international standards.

The results of inspection and monitoring activities will be reported to ZRA on a weekly/monthly basis, or as required. In addition to routine reporting, an annual monitoring report, aggregating much of the data produced by the other reporting processes, will be submitted to ZEMA and appropriate external stakeholders (e.g. lenders). ZRA may use 'Site Memos', stipulating recommended actions required to improve compliance with the ESMP by the Contractor, and deliver these to the Contractor via the TS&S Consultant.

ZRA, TS&S Consultant and the Contractor shall arrange for presentations to site staff as necessary to introduce them with ESHS requirements. General site staff would commonly receive a basic environmental and social awareness presentation or talk highlighting general environmental and social "do's and don'ts", including good housekeeping practices. This information would be provided throughout works in the form of regular toolbox talks. Management level staff on the site, e.g. site agents and foremen, will require more detailed knowledge about the environmental and social sensitivities on site and the requirements of the ESMP.

9.2.3.4.1 Communication of Major Incidents

In the case of major environmental, safety, or social incidents, the Contractor responsible will inform ZRA immediately. The definition of such major incidents will be jointly developed and agreed by the Contractors and ZRA, and understood by all Contractor, TS&S and ZRA EHS personnel.

9.2.3.4.2 Stop Work

At any stage of construction or other work, if a Contractor has not taken appropriate action to achieve compliance with ESHS requirements after ZRA/TS&S Consultant's notices of violation and warnings of non-compliance, and significant impacts are occurring or imminent, ZRA may order the contractor to stop work until performance is brought under control and up to acceptable standards. Any costs associated with such will be borne by the Contractor

9.2.3.4.3 Dispute Resolution

Any disputes or disagreements regarding environmental and social performance will firstly be referred to the TS&S Consultant during rehabilitation. If no resolution on the matter is reached, ZRA will be consulted and reference made to the Contractor's contract and legal requirements.

9.2.4 Remote Supervision

The development of the COVID-19 pandemic and restrictions on travel may limit on-site observations, regulators' audits, and international visits by lenders of the DSPOE to conduct supervision missions. To enable supervision remotely, a combination of measures will be taken:

- Installation of cameras at the main work sites (plunge pool and other project sites), providing real-time footage of activities on site, accessible via a secure website; and
- Recorded drone surveys at least every 2 weeks.
- Other activities to be agreed with the lenders.

9.2.5 Adaptive Management

Material changes to the design or activities of KDRP may require a social and environmental assessment process. Changes to ESMP measures may be required in response to experience of their effectiveness, accidents, environmental or social conditions. The organizational structure and roles and responsibilities included in the ESMP may also change as KDRP progresses.

ESMP and the plans included in will be adaptively managed and adjusted in response. Substantive design / technology changes that might potentially alter the ESIA findings (i.e. those that result in changes to the predicted significance of environmental and social impacts) will be subject to re-assessment, further stakeholder consultation, supplementary reporting and revision of the ESMP as needed and future reviews will concentrate in the ESMP which dictates the mandatory topics and actions that the contractors/subcontractors must reflect in its ESMPs.

9.3 Contractors' ESMPs

9.3.1 Overview

This Section describes the plans that the Plunge Pool Contractor and the Spillway Rehabilitation Contractor must implement and adhere to in order to fulfil the obligations of the KDRP ESMP. The plans and responsibilities listed herein are a contractual responsibility of the selected Contractors, who were required to demonstrate that they will meet these obligations as part of the procurement process.

A range of General Requirements, for site preparation, mitigation measures during rehabilitation works, and site closure, are set out in Appendix D. Similar requirements were reflected in the technical specifications concerning Health, Safety, Environmental and Social Requirements, that were included in ZRA contractors with the Plunge Pool Contractor and Spillway Contractor. These technical specifications refer to corresponding parts of the ZEMA- and EMA-approved ESMP, and are included here as Appendix E (PDF).

The responsibilities of the Contractors are organized under three sub-sections:

- Section 9.3.1.1: Actions to be completed prior to works commencing including:
  - a fully functioning ESMS in place and resourced;
  - locations of construction areas confirmed (spoil areas etc), including supporting infrastructure identified and all required permits secured;
  - completion of detailed design including any environmental and social assessment of proposed changes to previous designs;
  - implementation of the recruitment and training programmes for construction personnel; and
  - drafting of the Environmental Protection Plan, thematic sub-plans, and Work Method Statements (outlined in Section 5.3).

- Section 9.3.3: Contractor Plans and Work Method Statements – the measures identified in the ESIA translated into framework management plans that the Contractors will develop for approval by ZRA prior to the start of construction, and implement. The required management plans and systems are detailed further in Sections 9.3.2 and 9.3.3. The lead person responsible for each plan is listed whilst overall responsibility for the delivery of the plans sits with the Project Manager as outlined in Section 9.2.2.3.

- Section 10: Monitoring and Reporting – the monitoring programmes that the Contractors will implement including the key performance indicators (KPIs) they will report against.

9.3.1.1 Sub-contractors

The Contractors will apply the requirements of the ESMP and the policies and commitments therein equally to sub-contractors, and in turn to parties contracted by these sub-contractors, including all employed and non-employed staff.

The Contractors will: a) manage contracting tiers to be fully aware, and ensure ZRA is fully aware, of all companies contracted and on-site; b) ensure all EHS and labour rights requirements are passed to all sub-contractors; c) allow the use of the ZRA Grievance Redress Mechanism for workers by the workers of sub-contractors; d) prevent any hiring at the gate; and e) ensure disclosure of the workers' code of conduct to sub-contractors.

9.3.2 Actions to be Completed Prior to Works

9.3.2.1 Contractors' Management System(s)

Both the Plunge Pool Contractor and the Spillway Rehabilitation Contractor will have a Environmental Management System certified to ISO 14001 and an Occupational Health and Safety (OHS) system certified to ISO 45001 or equivalent. Above, all these plans have to comply with this updated ESMP and the WB safeguards policies. These may be combined in one management system. The Contractors will implement the measures outlined in this ESMP via this management system. As part of the system, each Contractor will commit to implementing ZRA's Policies and will establish an environmental data management system (EDMS) for effective record keeping and reporting.

The Management Systems will be a systematic approach to the identification of impacts and risks, measures to address them, systems to ensure their implementation, and procedures for review and improvement. It will incorporate (i) policies; (ii) management plans (as described below); (iii) organizational capacity and competency; (iv) performance indicators and targets; and (v) monitoring, supervision, reporting and review. The Contractor will take into account international guidance on Environmental and Social Management Systems, including IFC (2014) Environmental and Social Management System Implementation Handbook: Construction, rev 2.2.

To-date, the Plunge Pool Contractor has adopted:

- A specific policy and commitments for its Zambia operations to ensure the sustainability of its activities. This includes a series of quantitative commitments and targets, including, for example, incident frequency rates, operator training, near miss frequency, actual/foreseen QSE site visits, and numbers of complaints;
- A Quality Management Plan, which describes quality control organization, responsibilities, and provisions to ensure complete quality, and a Quality Management System, in line with ISO 9001, ISO 14001 and ISO 18001;
- The Environmental Protection Plan and Health and safety Management Plan described below; and
- Similar Quality Management Plans of its blasting sub-contractor and underwater works sub-contractor.

The Contractors will adapt and continuously improve the management system, plans, procedures and practices, in response to changes included in this revised ESMP, new circumstances, unforeseen events like Covid 19, the results of monitoring and review, and upon instruction from ZRA, national government agencies and lending institutions.

9.3.2.2 Commitment to Applicable Standards and Policies

The Contractors must do their contracted works according to the World Bank and the African Development Bank Safeguards policies which are requirements under the legal agreement of this project, the applicable national and international regulations of Zambia and Zimbabwe and

the standards, policies and ZRA Mission, Vision, Values and Policies set out in Section 4.3 within their environmental and social management systems and plans. As with the ESMP, adherence to these policies is a contractual requirement. Contractors may also define their own environmental, social and health and safety policies.

9.3.2.3 Permitting Register

Authorizations may be required for certain construction works. The Contractors will obtain all of the consents (permits and authorizations, etc) that are necessary for the execution of the works from the Zambian Government.

It is the responsibility of the Contractors to identify all necessary consents (outside of those noted as the ZRA's responsibility to obtain) and obtain these prior to mobilizing the relevant construction activity.

The Contractors will establish a permits register as part of their Management System listing all authorizations required (national and district level), date obtained, period of validity, and responsibility for obtaining or renewing the permit/authorization. The Contractors will prepare a schedule for obtaining these permits/authorizations. The Contractor will make this register and copies of all consents available to ZRA through a continuously available electronic portal.

In the first quarter of 2020, KDRP had the following permits in place and valid:

- Waste Transportation License;
- Hazardous Waste Management License;
- License for incinerator;
- License for diesel tanks;
- ZICTA – Land Mobile Radio Station License;
- Authorization for a motor vehicle for the transportation of explosives;
- Explosive Magazine License;
- Open permit to purchase, acquire and possess explosives and accessories for 2019; and
- EPB for emission license for incinerator.

9.3.2.4 Supply Chain Management

As part of the management systems, the Contractors will implement a supply chain management system or procedure to effectively screen and manage environmental and social risks in their supply chain. The objective of the supply chain management system is for third parties to adhere to ZRA's policies and reference environmental and social standards. For the avoidance of doubt, this system relates to suppliers, not sub-contractors that the Contractor exerts a significant level of control over and who are required to meet the measures set out in the ESMP.

The level of supply chain management will be informed by the level of leverage that can be exerted on the supplier and the level of environmental and social risks presented by the sector in which the supplier operates. Typically, direct suppliers such as quarries and cement manufacturers that have significant environmental and social risks and that the Contractor has significant control over will be managed and monitored closely. Contractors are required to demonstrate they have a procurement process in place that assesses supply chain risks and a management system that adequately monitors these risks at regular intervals.

9.3.3 Contractor Plans and Work Method Statements

Section 9.3.3 concerns the specific management plans and Work Method Statements (WMS) that Contractors are required to develop prior to the start of works, and implement throughout the works.

Each Contractor will implement an Environmental Protection Plan (EPP) and Health and Safety Management Plan through their management systems.

Table 9.6 and Table 9.7 below present the range of plans and WMS to be implemented by Contractors, indicating whether they were included in the ESMP prepared in 2016 (the original ESMP) or whether they are additional or updated.

The relation between these management systems, various management plans and WMS is depicted in Figure 9.2.

Figure 9.2 Contractors' Management Systems and Plans

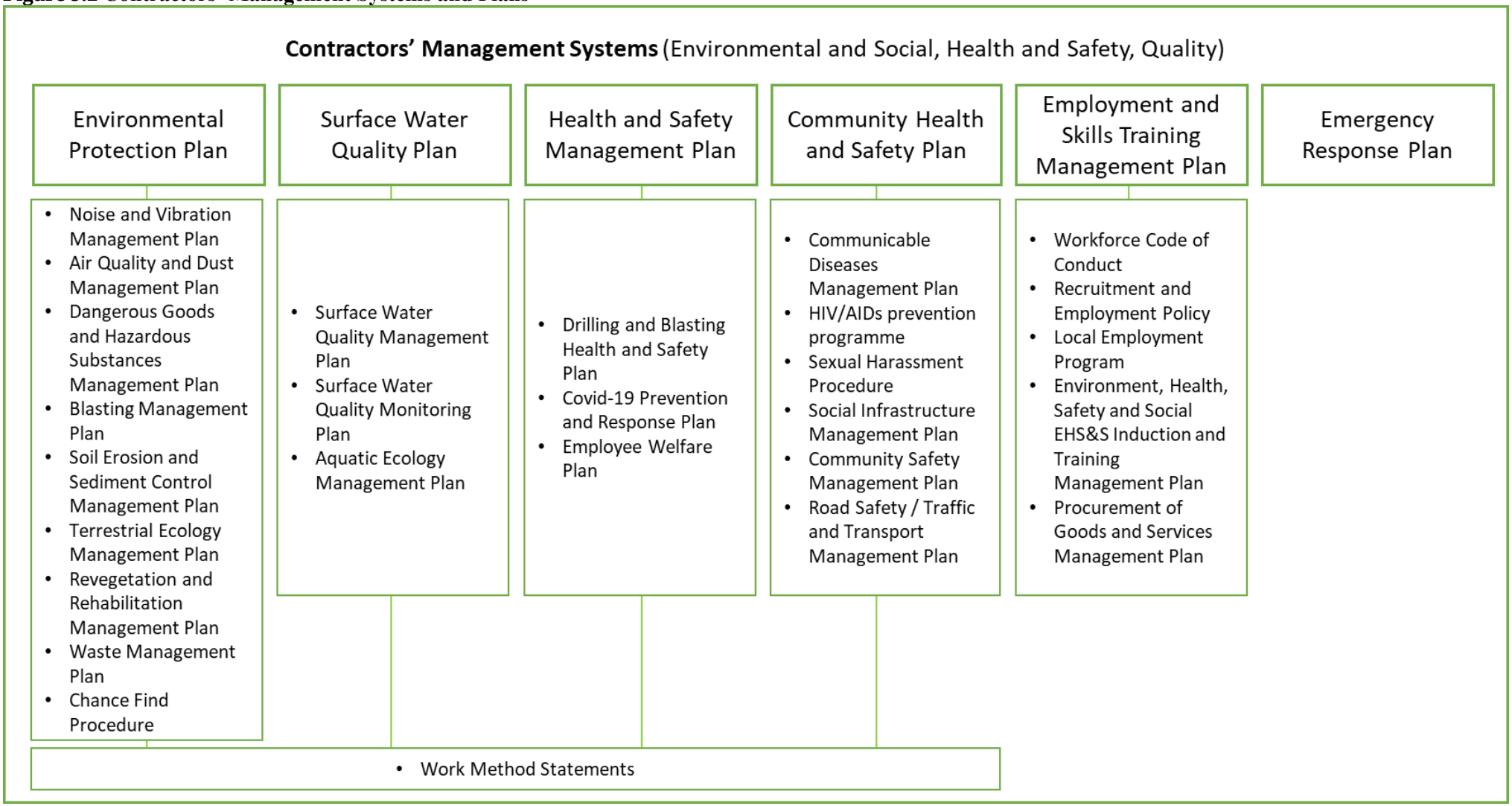


Table 9.6 Environmental and Social Management Plans for Contractor Implementation

Reference	Plan	Included in original ESMP (2016)	Update (October 2020)	Further Actions / Comments
9.3.3.3	Environmental Protection Plan (EPP)	No	The Plunge Pool Contractor has developed an EPP, through which several of the plans below are being implemented for the Plunge Pool Works. The Spillway Contractor may develop a similar EPP.	
9.3.3.4	Worker Health and Safety Management Plan, including Workforce Code of Conduct.	Yes	The Plunge Pool Contractor is implementing this through its Health and Safety Management Plan (KDRP H00 QSE GEN 0600 03). The Spillway Contractor may develop a similar EPP.	The Plunge Pool Contractor is applying the Workforce Code of Conduct through its Disciplinary Policy. This will be checked and developed to ensure it covers all requirements for the Code of Conduct. Linked to the ZRA GBV Plan also.
9.3.3.4	Drilling and Blasting Health and Safety Plan	No	The Plunge Pool Contractor's Drilling and Blasting sub-contractor is implementing a Health and Safety Management Plan (KDRP I05 QSE DAB 7003 01).	
9.3.3.5	Covid-19 Prevention and Response Plan	No	ZRA, Supervision contractors, contractors and other subcontractor will prepare a Covid-19 Plan to reduce exposure to the virus and manage any sick people according to national and international protocols.	New
9.3.3.6	Employee Welfare Plan	No	Workers working the project must be protected from accidents, and even those living outside the project area. ZRA and its contractors will implement a protocol to check the living conditions of those workers, to access to water, sleeping area, food, safe transportation, among others	New
9.3.3.7	Employment and Skills Training Management Plan including Recruitment and Employment Policy and Local Employment Program	Yes	The Plunge Pool Contractor is implementing these requirements through a policy (KDRP I00 QSE INT 0502 01) on Local Staff Recruitment and its Quality Management Plan (KDRP I00 QSE GEN 0500 05). It is reporting employment and training statistics in monthly reports.	Plunge Pool Contractor will make the policy available to ZRA.
9.3.3.7	Environment, Health, Safety and Social EHS&S Induction and Training Management Plan	Yes	The Plunge Pool Contractor is implementing this plan through KDRP H00 QSE GEN 0600 03 - Health and Safety Management Plan, and KDRP I00 QSE GEN 0500 05 - Quality Management Plan. It reports Training Statistics in Monthly Reports.	

Reference	Plan	Included in original ESMP (2016)	Update (October 2020)	Further Actions / Comments
9.3.3.8	Procurement of Goods and Services Management Plan	Yes		Plunge Pool Contractor to clarify how this is being addressed through the EPP.
9.3.3.9	Emergency Response Plan	Yes	The Plunge Pool Contractor is implementing this through its Emergency Response Plan (KDRP H00 QSE GEN 0601 05 - 18 01 19). The ERP must comply with the WB OP 4.37 Policy.	
9.3.3.10	Noise and Vibration Management Plan	Yes	The Plunge Pool Contractor is implementing this through the EPP (Section 7.3), Environmental Monitoring Plan (KDRP QSE GEN 07700 01), and Blasting Work Method Statement. This plan must comply with the WB Health and Safety Guidelines and national regulations.	
9.3.3.11	Air Quality and Dust Management Plan	Yes	The Plunge Pool Contractor is implementing this through the EPP (Section 7.2), and Environmental Monitoring Plan (KDRP QSE GEN 07700 01). This plan must comply with the WB Health and Safety Guidelines and national regulations.	
9.3.3.12	Dangerous Goods and Hazardous Substances Management Plan (Including Storage of Explosives)	Yes	The Plunge Pool Contractor is implementing this through its procedure on handling of chemical substances, and Environmental Monitoring Plan (KDRP QSE GEN 07700 01). This plan must comply with the WB Health and Safety Guidelines and national regulations.	
9.3.3.13	Blasting Management Plan	Yes	The Plunge Pool Contractor's sub-contractor for drilling and blasting is implementing these requirements through its Quality Management Plan (KDRP I05 QSE DAB 7002 01) and Health and Safety Management Plan (KDRP I05 QSE DAB 7003 01). This plan must comply with the WB Health and Safety Guidelines and national regulations.	
9.3.3.14	Surface Water Quality Management Plan	Yes	The Plunge Pool Contractor is implementing this through the EPP (Section 7.4), and Environmental Monitoring Plan (KDRP QSE GEN 07700 01). Monthly tests conducted. This plan must comply with the WB Health and Safety Guidelines and national regulations.	
9.3.3.15	Soil Erosion and Sediment Control Management Plan	Yes	The Plunge Pool Contractor is implementing this through the EPP (Section 7.6), and Environmental Monitoring Plan (KDRP QSE GEN 07700 01). This plan must comply with the WB Safeguard Policies OP 4.01 and national regulations.	

Reference	Plan	Included in original ESMP (2016)	Update (October 2020)	Further Actions / Comments
9.3.3.16	Aquatic Ecology Management Plan	Yes	The Plunge Pool Contractor is implementing this through the EPP (Section 7.5), and Environmental Monitoring Plan (KDRP QSE GEN 07700 01). Weak implementation. Water quality tests are conducted on a monthly basis.	Water quality monitoring will be done per week as indicated in the original ESMP Biological monitoring will be added and start soon. Collaboration with national experts will be needed.
9.3.3.17	Terrestrial Ecology Management Plan	Yes	Not implemented to date.	Implementation must iniaite inmediately through -Landscape restoration efforts -Biodiversity monitoring -Worker Code of Conduct (to prevent hunting / fishing) and site preparation (checking to avoid nesting sites etc).
9.3.3.18	Revegetation and Rehabilitation Management Plan	Yes	Not implemented to date.	Not included in EPP to-date; requires updating.
9.3.3.19	Road Safety Management Plan, including Vehicle and Traffic Programme, and Traffic and Transport Management Plan	Yes	Addressed in the Plunge Pool Contractor's KDRP H00 QSE GEN 0600 03 - Health and Safety Management Plan.	
9.3.3.20	Waste Management Plan	Yes	The Plunge Pool Contractor is implementing this through the EPP (Section 7.7), and Environmental Monitoring Plan (KDRP QSE GEN 07700 01), as well as a Waste Disposal Register.	
9.3.3.21	Community Safety Management Plan	Yes (now adapted)	Yet to be fully Implemented. This must be a priority for all contractors.	Detail plan to be developed and approved by the WB team
9.3.3.21	Communicable Diseases (STDs, HIV/AIDS and Malaria) Management Plan including HIV/AIDs prevention programme, and Sexual Harassment Procedure	Adapted from Community Health Plan, with new procedures	Sexual Harassment Procedure is an addition.	Linked to the ZRA GBV Management Plan. Detail plan to be developed and approved by the WB.
9.3.3.22	Social Infrastructure Management Plan	Yes	The objectives of the Plunge Pool Contractor's Social Responsibility Policy address this plan	Results to be monitored and informed to the WB .

Reference	Plan	Included in original ESMP (2016)	Update (October 2020)	Further Actions / Comments
0	Grievance Management and Incident Reporting Plan	Yes	ZRA has put in place a Grievance Redress Mechanism (KDRP-GRM-00) which Contractors will also use.	Claims to be registered, resolved, monitored and informed to the WB .
9.3.3.24	Cultural Heritage Management Plan including Chance Find Procedure	Yes	Not yet in place.	In case of findings, to be registered, protected and informed to the WB .

Table 9.7 Work Method Statements for Contractor Implementation

Work Method Statement	Included in original ESMP (2016)	Update (July 2020)	Further Actions / Comments
Temporary Construction Camp and Site Division	Yes	The Plunge Pool Contractor's equivalent is: KDRP I00 WMS BAC 4001 02 - Site installation.	
Vegetation Clearing	Yes	Not required in the areas of work of the Plunge Pool Contractor (all sites and access routes were pre-established during the North Bank power station expansion).	
Topsoil	Yes		
Access/Haul Routes	Yes	Yet to be developed	Not clear how these would
Fuel Storage and Use	Yes	Yet to be developed	
Solid Waste Management	Yes	The Plunge Pool Contractor has included waste management requirements in the EPP (Section 7.7), but this does not provide details of how risks will be managed in a WMS.	
Contaminated Water	Yes	Not yet developed.	An Effluent Management Procedure is proposed.
Hazardous Substances	Yes	The Plunge Pool Contractor has adopted a procedure on handling of chemical substances.	
Cement and Concrete Batching	Yes	The Plunge Pool Contractor is implementing this through a Concrete Production and Transportation WMS (KDRP-I00-WMS-GEN-4038-01)	
Emergency Procedures	Yes	See above: Emergency Response Plan (KDRP H00 QSE GEN 0601 05 - 18 01 19).	
Erosion and Sedimentation Control	Yes	A WMS is required for Plunge Pool water extraction avoiding the discharge of sediment-laden waters downstream.	
Pontoons Management	No	Plunge Pool Contractor WMS, including safety and environmental risk assessment.	

Work Method Statement	Included in original ESMP (2016)	Update (July 2020)	Further Actions / Comments
Underwater Inspection and Survey	No	Plunge Pool Contractor WMS, including safety and environmental risk assessment	
Underwater Blasting of Boulders on the Cofferdam	No	Plunge Pool Contractor WMS, including environmental analysis for underwater blasting, and a detailed tabular safety risks analysis and environmental impact assessment.	
Underwater Drilling and Blasting for the Lift	No	Plunge Pool Contractor WMS, including environmental analysis of underwater blasting, for before, during and after firing, and separate safety and environmental risks analyses.	
Underwater Purging and Mucking	No	Plunge Pool Contractor WMS, including environmental analysis for underwater blasting, and a detailed tabular safety risks analysis and environmental impact assessment.	
Drilling and Blasting in the quarry of the Dumping Site	No	A WMS of the Plunge Pool Contractor's Blasting Sub-contractor.	Drilling and blasting operations at the spoil site are not expected.

9.3.3.1 Management Plan Structure

Management Plans are presented in Sections to below, using a consistent structure as far as possible. This consistent structure is outlined in Table 9.8.

Table 9.8 Management Plan Structure

Objective	The management objective that applies to each aspect or impact.
Timeframe	The period through which the plan will be implemented
Aspect/Impact	The aspect or impact that needs to be managed in order to minimize the impact on the biophysical and socioeconomic environment.
Responsibility	The party responsible for implementing the management plan.
Performance Criteria	Measurable performance criteria (outcomes) for each element.
Mitigation Measure	The strategies, tasks or action program (to nominated operational design standards) that will be implemented to achieve the performance criteria.
Monitoring	The monitoring requirements to measure actual performance (i.e. specified limits to pre-selected indicators of change).
Auditing	The auditing requirements to demonstrate implementation of agreed environmental mitigation measures and compliance with agreed performance criteria.
Reporting	Format, timing and responsibility for reporting and auditing of monitoring results.
Corrective Action	The action (options) to be implemented in case a performance requirement is not reached and the person responsible for that action (including staff authority, responsibility and management structure).

9.3.3.2 Work Method Statements

Contractors will use Work Method Statements to set out the detailed steps to be undertaken to avoid and minimise environmental and social and OHS risks. Contractors will provide these WMS to ZRA's EHS Manager and the TS&S Consultant for approval prior to works commencing. Approved WMS shall be readily available on the site and shall be communicated to all relevant personnel, and Contractors will carry out the works in accordance with the approved WMS. Contractors will not commence the activity until the WMS has been approved and will, except in the case of emergency activities, allow a period of two weeks for approval by the TS&S Consultant.

WMS are required for all activities, especially those that are deemed or identified to pose a risk to the environment and/or health and safety which require site-specific detail beyond that contained in the ESMP or detail requested by the TS&S Consultant or ZRA. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the Contract.

ZRA or the TS&S Consultant may request a WMS for any activity they believe may impact on the environment, and may require changes to a WMS if it does not comply with the Contract specifications, this ESMP, or if the works may result in, or carry a greater than reasonable risk of, damage to the environment.

A Work Method Statement is a "live document" in that modifications are made, including on feedback from the TS&S Consultant and ZRA, as circumstances unfold. Changes to, and adaptations of, WMS can be implemented with the prior consent of all parties.

Each WMS is a starting point for understanding the nature of the intended actions to be carried out and allows for all parties to review and understand the procedures to be followed in order to minimise environmental and safety risk. It describes the scope of the intended work in a step-by-step description, in order for sub-contractors, supervisors, and employees to understand the

requirements, and TS&S Consultant or ZRA to assist in devising any additional mitigation measures, which would minimize risks during these tasks.

Each WMS will clearly indicate:

- Objectives of the WMS;
- Reference Documents, including technical specifications, emissions guidelines, relevant ESMP plans;
- Responsibilities, i.e. who is responsible for WMS implementation and communication;
- Human Resources, Equipment, and Materials;
- Preliminary Works;
- Method Statement, i.e. a step-by-step description of the works;
- Safety Risks Analysis, including for each operation, risks and risk mitigation measures;
- Environmental Risks Analysis, including for each operation, risks and risk mitigation measures; and
- Regulations related from Zambia and Zimbabwe and WB policies compliance
- ESMP related plan
- Appendices, including photos, maps, control sheets and forms.

The following WMS were proposed in 2016:

- **Temporary Construction Camp and Site Division.** The location, layout and method of establishment of the temporary construction camp (including all buildings, offices, lay down yards, vehicle washing areas, fuel storage areas, batching areas and other infrastructure required for the construction of the project).
- **Vegetation Clearing.** Method of vegetation clearing during site establishment and disposal procedure for cleared material.
- **Topsoil.** Method of clearing topsoil and location of topsoil stockpiles including erosion protection.
- **Access/Haul Routes**. Details, including a drawing, showing where and how the access points and routes will be located and managed, including traffic safety measures.
- **Fuel Storage and Use.** The design, location and construction of the fuel storage area, for the filling and dispensing from storage tanks and management of drip trays.
- **Solid Waste Management.** Expected solid waste types, quantities, methods of recycling to be employed, monitoring and record keeping procedures, staff responsible for the oversight of waste management and recycling and frequency of collection and disposal of the non-recycled component, as well as location of disposal sites.
- **Contaminated Water.** Methods of minimizing, controlling, collecting and disposing of contaminated water.
- **Hazardous Substances.** Details of any hazardous substances / materials (e.g., diesel, blasting material, gas, paints, batteries, transformers, etc. to be used, together with the transport, storage, handling and disposal procedures for the substances.
- **Cement and Concrete Batching.** Location, layout and preparation of cement/ concrete mixing areas including the methods employed for the mixing of concrete, and particularly the containment of runoff water from such areas, as well as the method of transportation of concrete and spoil material. All truck carrying cement, rocks, spoils, of any kind must have their cargo cover and tied with ropes to avoid flying rocks and potential accidents.
- **Emergency Procedures.** Emergency procedures for fire and accidental leaks and spillages of hazardous substances (including fuel and oil). Include details of risk reduction measures to be implemented, such as fire fighting equipment, fire prevention procedures and spill kits (materials and compounds used to reduce the extent of spills and to breakdown or encapsulate hydrocarbons).
- **Erosion and Sedimentation Control.** The proposed methods of Sedimentation and Erosion Control for bulk earthworks in particular and the remainder of the construction

period, in order to ensure the prevention of sedimentation of water courses and storm-water infrastructure.

9.3.3.3 Environmental Protection Plan (EPP)

Contractors may integrate the requirements set out in this ESMP, including organizational responsibilities and the individual plans below, into an Environmental Protection Plan (EPP). The Plunge Pool Contractor has prepared an Environmental Protection Plan, which is ZRA-approved. It consists of:

- Reference documents, including the ESMP, environmental requirements in the contract Technical Specifications, ZRA Emergency Preparedness Plan, Zambia and Zimbabwean legal requirements, and international standards
- A statement of their commitment, and that of their suppliers, service providers and subcontractors, to the EPP
- A description of organizational arrangements, including responsibilities of the supervisor and contractors
- Potential impacts and protection measures
- Environmental protection measures, under headings of:
  - Minimisation of disruption to local residents
  - Prevention of air pollution and hazards
  - Prevention of noise pollution and hazards
  - Prevention of water and soil pollution
  - Protection of wildlife and fish
  - Erosion control and storm water management
  - Waste management;
- Communication of information and instructions;
- Management of non-compliance; and
- Environmental monitoring (i.e. the monitoring table presented in Section XX below).

9.3.3.4 Worker Health and Safety Management Plan

Table 9.9 presents the KDRP Worker Health and Safety Management Plan. At the time of the 2016 ESMP, this included an HIV/AIDs prevention programme and Workforce Code of Conduct. All Contractors are required to take full responsibility for the prevention of unhealthy or unsafe conditions and practices and for the promotion of healthy and safe working practices, and to implement management of health and safety aligned with the requirements of ISO 45001 or its equivalent. All worker health and safety plans and practices will be in conformance with the requirements of insurers that may be required to cover compensation payments for injuries and fatalities.

Contractors are required to apply the OHS Policy and OHS Plan equally to sub-contractors and their employees, and to proactively manage the OHS performance of all activities both on and off site, using dedicated, qualified and experienced health and safety staff. ZRA will have the authority to instruct Contractors to replace or modify any permanent or temporary works, equipment and/or safety provisions, if they are deemed unsafe or insufficient to complete the works.

The Plunge Pool Contractor will meet its obligations under this plan through its Health and Safety Management Plan (KDRP H00 QSE GEN 0600 03). In addition, the Plunge Pool Contractor's Drilling and Blasting sub-contractor is implementing a Health and Safety Management Plan (KDRP I05 QSE DAB 7003 01). The Spillway Contractor may develop a similar Health and Safety Management Plan.

The Plunge Pool Contractor Health and Safety Plan consists of:

- Reference documents, including the health and safety requirements of the contract Technical Specifications, International standards (ISO 14001, ISO 9001, OHSAS 18001), Work code, their Task Implementation Program (KDRP I01 PRO GEN 0001), Quality Management Plan (KDRP I00 QSE GEN 0500), and Emergency Preparedness Plan (KDRP H00 QSE GEN 0601);
- Mandatory safety inductions and training at the workstation;
- A requirement for all sub-contractors to produce their own HSMP, aligned to this one;
- Appointment of a safety officer, and health, safety and environment committee;
- Risks analysis, related to the activity, and to the project;
- Measures for
  - hygiene on installations
  - fire fighting
  - emergencies (fire, ambulance etc)
  - access and circulation
  - awareness training
  - equipment and vehicles
  - excavations and trenches
  - material handling
  - electricity
  - storage
  - work at a height (scaffolding, shoring)
  - compressed air
  - loading and unloading
  - using portable electrical equipment;
  - formwork, concreting, and removal of forms; and
  - chemical risk.

All WMS developed by the Plunge Pool Contractor to-date include safety risk analysis. For example, the WMS for Underwater Blasting of Boulders on the Cofferdam includes a detailed tabular safety risks analysis, showing equipment to be used, PPE to be used, safety risks, and preventive measures, for each of: all works, machines and worker placement, explosive transport, drilling, explosive loading underwater, firing, diving activities in currents, entry/exit of divers in the water, and cable management. The WMS for Underwater Purging and Mucking includes similarly detailed analysis, with particular emphasis on the risks of diving activities. The WMS for Underwater Inspection and Survey includes general risks related to diving activities, risks related to entry/exit of divers in/out of the water, risks related to inspection in unknown area, risks related to diving work in current, and risks related to sudden increase in flow rate. The WMS for Underwater Drilling and Blasting for the Lift includes identification of risks for a range of tasks. The WMS for Concrete Transportation and Production includes identification of risks and preventative measures for Transportation of aggregates, concrete production, loading concrete, concrete transportation, and lab tests.

The Plunge Pool Contractor is applying the Workforce Code of Conduct through its Disciplinary Policy, referred to in the KDRP Worker Health and Safety Management Plan through its Disciplinary Policy. It has also developed a Sexual Harassment Procedure, which involves making a Sexual Harassment Complaints Form available to employees, training for all employees on what sexual harassment is, that employees have a right for a workplace free of sexual harassment, and the complaint procedure.

Table 9.9 Worker Health and Safety Management Plan

Objectives	• Creating a fair and safe working environment to contribute to the health and welfare of the Project labour force.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).

Aspect (Project Activity)	• Exposure of workforce to health and safety standards incidents. • Exposure of workforce to insufficient labour and working standards.
Responsibility	• All contractors
Performance Criteria	• No recorded unfair and unsafe working condition incident. • No worker health and safety incidents. • Correct use and maintenance of Personal Protective Equipment (PPE) • Maximum number of hours worked without the reporting of unfair or unsafe employment conditions. • Zero accidents • Recording of all accidents • presence of permanent life guard and life vest for all workers working in the river and above water • presence of emergency leader for works above and underwater
Mitigation Measures	• All foreign employees will have the correct travel permits/documents associated with entry into Zambia/Zimbabwe. • Evidence and on time insurance coverage for liability for injury and deaths to employees, including sub-contractors' employees, and members of the public, arising from incidents on or off site. • Ensure all dangerous work areas, quarries and borrow pits are fenced off. • Develop and implement a site access plan to regulate transport routes to and from the dam site to defined areas with clear reporting conditions. • Strictly enforce and monitor road safety standards. • Provide the Facilities and procedures for Emergency Response. • Appropriate Personal Protective Equipment (PPE) must be worn by all construction personnel. This shall include the bare minimum PPE: use of ear protection in areas where the 8-hour ambient noise levels exceed 75dBA, foot protection, a reflective vest and helmet (where deemed necessary. Further, all personnel operating on water should wear a life jacket and should know how to swim. Personnel working at heights shall be required to use a full body harness. Safety gloves shall be used accordingly. • During the COVID 19 pandemic personnel shall be required to wear a mask when working within a meter of other personnel. COVID 19 prevention guidelines will be adhered to as in Section 9.3.3.5 • A PPE programme will be developed. The program will address the hazards present; the selection, maintenance, and use of PPE; the training of employees; and monitoring the program to ensure its ongoing effectiveness. • To ensure that the Contractor will follow legally regulated employment practices and health and safety practices, the ZRA will assess the robustness of proposed human resource and health and safety policies and plans as part of the tender evaluation process. This will include aspects such as workers' working conditions, living conditions and health and safety. Non-compliance with legislative requirements will result in penalties, the form of which must be determined by the ZRA. • Contractors must register as provider of the countries compensation fund as required by national regulations to confront payments to families in case of fatal accidents from citizens of Zambia and Zimbawee • ZRA will required Contractors to explain the benefits to workers in case of death, permanent disability or accident. Workers will not be fired in case of medical recovery after an accident • A Workforce Code of Conduct will be developed and implemented and will include: – Zero tolerance of illegal activities by all personnel. – Forbidding the use of prostitution. – Forbidding the illegal sale or purchase of alcohol. – Forbidding the sale, purchase or consumption of drugs. – Forbidding gambling and fighting. • The Contractor will have a robust Grievance Policy and Procedure available to employees so that unfair and possible unsafe practices are reported and investigated.

	• Conduct an annual audit of grievance and safety statistics. • Establish a protocol for medical evacuation arrangements.
Monitoring and Auditing	• Monthly monitoring of achievement against stated performance criteria of maximum number of hours worked without reporting of an unfair or unsafe employment condition. • Preparation of monthly and cumulative performance statistics reports on this matter for submission to the ZRA. • Conduct an semi-annual audit of performance statistics based on which an incentive for registering health and safety conditions of the workforce working in the project, the near misses and accidents, and any records/complains of unfair or unsafe conditions can be considered by the ZRA. • The Contractor will host weekly engagement sessions with their employees to assess whether there are grievances or safety issues to address pro-actively. This can be done as part of the regular weekly Toolbox Talk practise. • Upon approval of the revised ESIA-ESMP, ZRA will contract and Health and Safety audit to check overall project health and safety issues inside the project area, and where the workers are been hosted in the local communities, to check also transportation, Covid19 plans and other potential risks. Terms of reference will be prepared and agreed with the World Bank.
Reporting and Corrective Action	• The contractor will implement a system whereby workers can report any observed unsafe and/or remarkably safe practices and conditions. Such a system can be setup through site logs- available 24 hours for all workers, which will be reviewed daily by the Project Management team. • Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented and reported to the World Bank. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • All incidents including near-misses and deaths need to be reported through the incident reporting system within 24-hours of the incident occurring. • Any worker found in violation of the Workforce Code of Conduct will face disciplinary hearing which will potentially result in dismissal. • All incidents to be reviewed by the EHS Manager and Developer. • Review Emergency Preparedness Plan, annually.

9.3.3.5 Covid-19 Prevention and Response Plan

ZRA will apply strict measures for prevent COVID-19 from entering the project site. These will include:

- Carefully following and complying with Government of Zambia and Government of Zimbabwe restrictions on movement, quarantine, hand-washing and wearing of protective PPE;

- Basic infection prevention measures, adapted from the World Health Organization (WHO), including:
  - Promote and enforce frequent handwashing and respiratory hygiene among the workforce;
  - Discourage touching eyes, nose and mouth;
  - Hand washing and installation of sanitization facilities available at frequent locations throughout the sites and at worker accommodations,
  - Ensure the workplace is clean and hygienic, and regularly disinfect surfaces and objects;

- Advise employees to self-isolate when sick and provide medical advice if they have a fever, a cough and difficulty breathing;
- Implement social distancing in all workplaces, and provide advice to employees on doing so when off duty;
- Avoid large gatherings of personnel;

- Polymerase Chain Reaction (PCR) -Covid19 Testing for new employees as soon as testing capability becomes available;

- Measures for international travel, including PCR testing prior to travel, advice on measures that must be followed during travel (masks, distancing etc), and quarantine on arrival if it is suspected the employee has had any exposure immediately preceding or during travel (i.e. since the date of when the PCR test result is applicable for;

- A specific procedure for preventing, identifying, mitigating, and responding to instances of COVID-19; and

- Stay informed and follow advice from international health organizations such as the WHO and your national health organization and government.

The Plunge Pool Contractor has adopted the following measures, to-date:

- A procedure for informing the HSEQ Manager and Company Representative of the case, and referring suspected COVID-19 cases to Siavonga hospital for a decision on whether to move the patient to the hospital or place them in quarantine;
- All personnel entering the company's premises will have their temperature checked, and any person with a temperature of more than 38 degrees will not be permitted to enter;
- Social distancing of 1.5 m at all times, or when this is not possible 'strongly recommended' wearing of face masks;
- Face masks will be made continuously available;
- Hand-washing facilities with soap and water or hand sanitiser at regular locations;
- Vehicles sanitised daily, and all occupants to wear face masks;
- Email, text, phone, video conferencing preferred over face-to-face discussions;
- Discouragement of hand shakes;
- Sanitizing of all offices daily, and keyboards and phones twice daily;
- Sanitizing of goods arriving from outside the site.

KDRP is undertaking daily reporting, through a 'Site Health and Safety Report (Covid-19)', on the numbers of personnel on-site, number of any feeling unwell, and of those, the number with potential COVID-19 symptoms.

ZRA and its Contractors will share information with nearby communities (through local authorities/leaders) on COVID prevention messaging, awareness, and prevention methods.

ZRA, the TS&S Consultant, and all Contractors will continue to develop detailed plans, making reference to emerging guidelines, for example:

- World Bank guidance on COVID-19 (Attached Annex G)
- WHO: Considerations for public health and social measures in the workplace in the context of COVID-19
  https://www.who.int/publications/i/item/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19

- EBRD Covid-19 briefing note: Workplace risk assessment checklist
- EBRD Covid-19 briefing note: Labour requirements.

- Interim advice for IFC clients on preventing and managing health risks of Covid-19 in the workplace; and
- CDC Covid-19 guidance for employers.

The sharing of offices at KDRP can present a higher risk of COVID-19 transmission than employees working at site. ZRA, TS&S Consultant and Contractors shall eliminate office sharing and target to have an individual with their partitioned office with independent entrance at KDRP. For employees working at site, social/physical distancing and PPE controls need to be maintained.

Proposed Actions

Social distance must increase to 1.8 meters (6 feet) which is the recommended WHO
All parties need to prepare their Covid19 plan – following guidance included in Appendix xx including Supervision consultant, contractors, subcontractors, ZRA supervision team
Covid19 plans will be sent to the World Bank
A monitoring Covid19 datasheet will be fill up by each contractor and sent to the ZRA and this one to the World Bank to keep track of any worker falling sick and preventing and outbreak at the project site.
Coordinate a clear command coordination with the local hospitals and clinics

9.3.3.6 Employee Welfare Plan

Contractors will be required to manage worker accommodation in order to minimise worker-community conflicts, the spread of communicable diseases, and environmental impacts of accommodation (e.g. from effluents and waste), and ensure that worker accommodation is of an acceptable standard.

Worker accommodation for all KDRP employees is off-site. In addition, the Plunge Pool Contractor has housed its workers in Lake Kariba Inn Siavonga. However, this exposes workers and community members to significant risk, as they are not able to control this accommodation directly, especially with the additional risk of COVID-19.

In order to minimize worker-community conflicts, the spread of communicable diseases, and environmental impacts of off-site accommodation (e.g. from effluents and waste) and ensure employee welfare, Contractors will be required to a develop an Employee Welfare Plan which stipulates necessary measures to prevent the above impacts. Worker accommodation at Lake Kariba Inns or other off-site accommodation will be acceptable only where Contractors can demonstrate that the hotel and alternative accommodation meets acceptable standards, good environmental practices, and ensures safe conditions.

Upon approval of the revised ESIA-ESMP, ZRA will contract and Health and Safety audit to check overall project health and safety issues inside the project area, and where the workers are been hosted in the local communities, to check also transportation, Covid19 plans and other potential risks. Terms of reference will be prepared and agreed with the World Bank.

9.3.3.7 Employment and Skills Training Management Plan

Table 9.10 presents the KDRP Employment and Training Management Plan including Recruitment and Employment Policy and Local Employment Program. Table 9.11 presents the KDRP Environmental Induction and Training Management Plan.

Under its Quality Management Plan, The Plunge Pool Contractor requires all workers to participate in a Health, Safety, Environment and Quality induction, and its HSEQ

department to regularly organise Quality toolbox talks in order to raise the team's awareness on Quality matters related to their tasks (control plan, tracking sheets, etc.).

Table 9.10 Employment and Training Management Plan

Objectives	• To develop a Recruitment and Employment Policy with the aim of maximising employment and training opportunities for local job seekers. • To optimise employment opportunities, firstly for job seekers from the Project Area and secondly for job seekers from Zambia and Zimbabwe.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	Employment opportunities associated with the Project are estimated to be – • Plunge Pool – 100 unskilled, 40, skilled and 20 highly skilled. • Spillway - 160 unskilled, 75, skilled and 30 highly skilled.
Responsibility	• All contractors and ZRA
Performance Criteria	• The number, type and duration of employment opportunities for people from the Project Area and from Zimbabwe and Zambia. • The total monthly wage and salary bill of employees originating from the Project Area and from Zimbabwe and Zambia. • The number of employment opportunities for marginalised/vulnerable groups such as the disabled and women.
Mitigation Measures	• Develop a Local Employment Program including: – Skills audits, including local people, young people and woman. – A program of up-skilling, training and development to increase local availability of those trades with a local shortage. – Job readiness training program. – Women's training and employment program. – Participate in events where potential employees can meet Project staff, learn about the Project, and register their interest for training and employment. – Provide a program of up-skilling, training and development to increase local availability of those trades with a local shortage. – Recruitment and retention programs and strategies to attract skilled trades and supervision personnel from the local area. – Local content strategy focusing on the Project Area, based on an accurate understanding of current and potential future business capacity. • Project specific Recruitment Policies will be developed by the ZRA as well as the Contractor. • Targets will be set to maximise the number of Zambian and Zimbabwean nationals, local, female, disabled, unskilled, skilled and highly skilled employees from the Project Area. • Local Employment targets will form part of the Conditions of Contract with the Contractor. • In discussions with local communities, emphasis will be given to job opportunities for locals, versus non-locals, and non-nationals, as this was a source of local concern during ESIA consultation and since. • Target skills development and recruitment programs to unemployed, young people and woman, to enhance capacity and resilience of disadvantaged people. • Employment opportunities will be publicly advertised in appropriate newspapers, public libraries, the District Offices and in all relevant languages. • The Contractor will establish a recruitment office for the purpose of keeping a record of available prospective employees, their skills levels and contact details. Registration of job seekers with the Recruitment Office will be free of charge. • No employment will take place at the entrance to the site. Only formal channels for employment will be used.
Monitoring and Auditing	• Monthly monitoring of achievement against contractual employment targets. • Preparation of monthly and cumulative employment statistics reports for submission to the ZRA. • Conduct an annual audit of employment statistics based on which an incentive for achieving employment targets can be considered.

Reporting and Corrective Action	• Monthly reporting by the Contractor to the ZRA on achievement of contractual employment targets and suggested corrective actions if needed. • The ZAR will comply with Zambian and Zimbabwean regulations pertaining to reporting requirements related to recruitment. • The ZRA will report to the World Band and African Development Bank as per their agreed reporting schedule. • Twice annually progress reporting to interested and affected parties from the Project Area regarding achievement of employment targets and corrective actions if so required.

Table 9.11 Environmental Induction and Training Management Plan

Objective	To ensure that all Project personnel, including contractors, comply with the environmental requirements of all tasks.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project will require a workforce that will have direct interaction with the physical, biological and social environments.
Responsibility	All contractors
Performance Criteria	• All personnel undergo site inductions and, where necessary, additional training, that address environmental and social requirements of Project activities. • Full compliance with induction and training procedures.
Mitigation Measures	• Develop an induction training plan that explains environmental and social obligations, the purpose of the ESMP and any issues new starters, whether permanent or contractors, must be aware of. • All personnel will receive site inductions which will include environmental and social responsibilities. • Training programs will be conducted as required. • All site staff will be made aware of the ESMP, Project detailed management plans, Environmental Licence conditions, environmentally and socially sensitive areas and responsibilities. • As a minimum, everyone will have basic environmental and social training and be familiar with the ESMP, irrespective of their respective roles and responsibilities. • Identify and describe how, when and with whom specific skills training will occur. • Ensure a document exists that clearly lists who will require training, the frequency of training and the procedure to document training activities. Identify to what basic level or standard training will be targeted. • Environmental Awareness Training: – Environmental awareness training sessions shall be run for all personnel on the site. Two types of course shall be run, one for the Contractor's and Subcontractor's management and one for all site staff and labourers. Courses shall be run during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the Engineer. – All staff are to attend an initial presentation of approximately 45 minutes, and approximately half an hour a month thereafter for the duration of the contract shall be allowed for employees to attend any follow-up lectures, should such follow-up lectures be deemed necessary by the EHS Manager. In addition, all new staff and sub-contractors as well as employees that spend more than one day a week or four days in a month, to attend the environmental education session within one week of commencement of work on site. The Contractor shall supply the EHS Manager with a monthly report indicating the number of employees that will be present on site during the following month and any changes in this number that may occur during the month. – No more than 30 people shall attend each course and the cost, venue and logistics for this/ these course/s shall be for the Contractors responsibility. The EHS Manager shall keep a register of all personnel attending the Environmental awareness training sessions.

	– Notwithstanding the specific provisions of this clause, it is incumbent upon the Contractor to convey the sentiments of the ESMP to all personnel involved with the works. – Training for management and foremen: o The environmental awareness training session for management shall include all management and foremen. The session, which will be presented by the EHS Manager, will be of approximately one-hour duration. The initial session shall be undertaken not less than seven days prior to commencement of work on the site. Subsequent sessions shall be held as and when required. – Training course for site staff and labour: o The environmental awareness training session for the site staff and labour shall be presented by the EHS Manager. The course will be approximately 45 minutes long. The course shall be run not more than seven days after commencement of work on site with sufficient sessions to accommodate all available personnel. Subsequent sessions shall be held as and when required.
Monitoring and Auditing	• The success of the training programs will be assessed and documented. • Non-compliance with training will be recorded. • All training records will be reviewed.
Reporting and Corrective Action	• In the event of a staff member not being adequately trained or inducted, training activities will be undertaken as necessary. • The training or induction programme will be revised accordingly.

9.3.3.8 Procurement of Goods and Services Management Plan

Table 9.12 presents the KDRP Procurement Management Plan. To-date, the Plunge Pool Contractor has adopted purchasing procedures (KDRP-I00-QSE-INT-0503-01) which prioritises purchasing locally and from South Africa, prior to purchasing from France of other countries.

Table 9.12 Procurement of Goods and Services Management Plan

Objectives	• Promote procurement of goods and services by the Project in the Project Area as well as in Zimbabwe and Zambia. • Maximise opportunities for local suppliers to participate in the Project's supply chain. • Provide training courses and support to service providers (in the Project Area and in-countries) who are seeking to supply goods and services to the Project. Specific training needs will be identified with in consultation with service providers.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project will require the purchase of equipment and other goods and services. The majority of these will be for highly specialised and technical goods and will be provided by specialist providers; however, it is anticipated that some potential exists for local /and regional businesses to meet at least some of the procurement needs of the Project.
Responsibility	All Contractors
Performance Criteria	• Number of businesses from the Project Area and from Zambia and Zimbabwe that benefit from Project procurement. • Value of sales against total value of procured goods and services on the Project.
Mitigation Measures	This ESMP will form part of the tender documents for potential contractors during the bidding process. This will allow bidders to adequately factor in the costs associated with compliance to this plan into the overall costing. Contractors will develop and implement Procurement Strategies to comply with all measures included in this ESIA-ESMP which are mandatory to all contractors, subcontractors and consultant financed under this project. To the extent possible, the Procurement Strategies will provide for: • The establishment of a service provider database by the Contractor. The database will reflect the name, type, location, contact details and capacity of the businesses as a minimum.

	• The unbundling of contracts into smaller and more manageable packages so that in-country and possibly less experienced local and regional suppliers have a better chance of being selected. • Setting procurement targets for different business categories e.g. per sector or in terms in-country or women ownership and or management of the business. • Basic capacity building support to in-country businesses to assist them with responding to tender opportunities and meeting administrative requirements of written communication, invoicing and reporting. • Advertising of procurement opportunities according to a specific, agreed and well–communicated method and medium.
Monitoring and Auditing	• Contractors compliance with the ESIA- ESMP measures described in this document and pertinent national regulations • Monthly monitoring of achievement against contractual procurement targets. • Monthly monitoring of the value of procurement in the Project Area and in Zimbabwe and Zambia against Project's total procurement value. • Preparation and submission of monthly and cumulative procurement figure reports for submission to the ZRA. • Conduct an annual audit of procurement figures based on which an incentive for achieving procurement targets can be considered. Monthly monitoring achievement against procurement targets. • Monthly monitoring of procurement training courses in terms of type of training, number of participants, duration of training and value of training.
Reporting and Corrective Action	• Monthly reporting by the Contractor to the ZRA on the achievement of contractual procurement targets and suggested corrective actions to reach targets if needed. • Monthly reporting by the Contractor to the ZRA regarding training courses presented and attended. • Monthly reporting on value of procurement in Project Area as well as in Zimbabwe and Zambia. • Regular progress reporting to Government and other interested and affected parties regarding procurement matters.

9.3.3.9 Emergency Response Plans

Table 9.13 presents the requirements of Contractor's Emergency Response Plans, which concern response to immediate environmental, health and safety incidents during works. These are not to be confused with the ZRA Emergency Preparedness Plan that concerns the infrastructure safety of the whole Kariba scheme (see Section 9.4.3.2).

The Plunge Pool Contractor has adopted an Emergency Response Plan which includes:

- Reference documents and definition of terms;
- Responsibilities for emergencies;
- A flow chart for communications during emergency
- Reaction procedures and measures to be taken;
- Clear steps to take and flow chart for each of the following emergency scenarios:
  - failure or impending failure of the dam, flooding, overtopping, cracking of the dam and/or abutments
  - unprecedented seepage of water after dewatering the plunge pool
  - landslides during cofferdam works
  - landslides during plunge pool works
  - severe storms
  - fire
  - COVid19 outbreak
  - work accident
  - oil and hazardous substance spills on land
  - oil and hazardous substances spills in water
  - drowning
  - Explosions due to blasting material storage area, spoil area, etc.

    - demonstrations, sabotage, criminal action
- Resources available on site;
- External agreements for emergencies; and
- Simulation activities.

It also describes immediate actions to be taken in cases of suspected COVID-19. COVID-19 measures are described in further detail in Section 9.3.3.5.

Table 9.13 Emergency Response Plans

Objective	To ensure that Project personnel can respond effectively and efficiently in the event of an environmental incident to ensure no long-term adverse impacts on health, safety or the environment.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and/or Spillway).
Aspect (Project Activity)	The Project may result in process upset, accidental, and emergency situations for operations and activities during rehabilitation of the Plunge Pool and Spillway.
Responsibility	All Contractors
Performance Criteria	• Emergency Response Plan. • Zero incidents.
Mitigation Measures	A detailed Emergency Preparedness Plan will be prepared, kept up to date and will include but not be limited to the following: • Response procedures in the event of a fire, chemical release, spill, leak, explosion, equipment failure, natural disaster (including severe storm and flood events) or any other likely emergency. • Communication arrangements and contact details. • Roles and responsibilities of relevant personnel. • Emergency controls and alarms. • Evacuation procedures. • Emergency response equipment. • Leak detection and control points. • Training requirements. • Site access and security. • Notification and reporting to ZEMA and EMA. • Spill-containment procedure. • The safe recovery of spillage. • Clean-up and rehabilitation. • Incident investigation. • Emergency response training. • Monitoring and detection systems. • Callout contact lists. • Measures to halt spills. • Requirements for remediation or disposal of contaminated soil. • Personnel responsibilities. • Equipment requirements. • Location, storage, maintenance and transport of equipment to site. Communications and logistics.
Monitoring and Auditing	• The effectiveness of the Emergency Preparedness Plan will be tested at least annually and audited.
Reporting and Corrective Action	• The Contractor will be responsible for compiling the results of testing and auditing programs. These results will be reported to the ZRA. • The following constitute incidents or failure to comply: – Emergency Preparedness Plan is not prepared or implemented. – Emergency response equipment is not provided. – Emergency response training is not undertaken. – Emergency response procedures not followed in the event of an incident. • In the event of an incident or failure to comply, a selection of the following actions will be undertaken, as appropriate:

	– Prepare or implement the Emergency Preparedness Plan. – Provide the necessary equipment or training. – Investigate why the emergency response procedures were not followed and implement mitigating measures.

9.3.3.10 Noise and Vibration Management Plan

Table 9.14 presents KDRP's Noise and Vibration Management Plan. The Plunge Pool contractor has implemented this to-date through its EPP, and its sub-contractors' Blasting Management Plan.

ZEMA made an explicit request for a vibration monitoring programme, with instantaneous measurements, and records made available to ZEMA and EMA, in its approval letter for KDRP.

Table 9.14 Noise and Vibration Management Plan

Objective	To construct in a manner that minimises the impact of noise and vibrations on surrounding residences.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool only).
Aspect (Project Activity)	• Noise from refurbishment activities (site preparation and general construction activities associated with refurbishment of the plunge pool and spillway). • Vibration and noise associated with blasting.
Responsibility	All Contractors
Performance Criteria	• For the reason that there are currently no standards for noise emissions in Zambia and Zimbabwe (refer to *Sections 4.2.1 and 4.2.2*respectively) the Project will adopt the IFC/World Bank noise level guidelines. These guidelines state that the maximum allowable ambient noise levels at the nearest noise sensitive receptor, LAeq,1hr, dB(A) Free field, are 55 dB(A) during the daytime (07:00 – 22:00) and 45 dB(A) during the night time (22:00 – 07:00). • No undue concerns expressed by surrounding stakeholders in terms of vibration. • Respond to all noise and vibration related complaints received from surrounding stakeholders and implement mitigation measures.
Mitigation Measures	• Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be periodically checked. • Use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85dB (A) during excavations and other work. • Implement noise monitoring if noise complaints are received. • Careful monitoring of vibration during blasting will form a key component of dam safety. • To manage perceptions of possible dam wall collapse, blasting schedule and methods to be effectively communicated to relevant stakeholders and community members.
Monitoring and Auditing	• Complaints relating to noise and vibrations will be recorded and closed out by the Environmental Manager or delegate. • Noise monitoring only to be undertaken if complaints received. • The method of measurement and reporting will be conducted in accordance with relevant international standards. • Vibration monitoring as per dam safety aspects.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident.

	• Complaints relating to noise and will be addressed promptly, with further investigations and reporting to ZEMA and EMA if required. • Non-compliance and incident reports will be reviewed and closed out by senior management. • Regular reviews, recommendations and corrective actions will be implemented.

9.3.3.11 Air Quality and Dust Management Plan

Table 9.15 presents the KDRP Air Quality and Dust Management Plan. The Plunge Pool Contractor is implementing this to-date through its EPP.

Table 9.15 Air Quality and Dust Management Plan

Objectives	To undertake the rehabilitation works in a manner that minimises impacts on ambient air quality.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool only).
Aspect (Project Activity)	• Emissions to atmosphere from refurbishment activities (site preparation and general construction activities associated with refurbishment of the plunge pool and spillway). • Vehicle movement over paved and unpaved surfaces. • Vehicle exhaust emissions.
Responsibility	All Contractors
Performance Criteria	• The Zimbabwean ambient air quality standards are still in draft and have not yet been promulgated, as such these will not be considered in this ESMP. The Zambian ambient air quality standards have similar limits for Sulphur Dioxide and PM_{10} when compared to the IFC/World Bank guidelines. In addition, the Zambian standards have limits for Total Suspended Particulates (TSP), carbon monoxide and ambient lead. The only parameter where the IFC/World Bank guidelines are more conservative is for Oxides of Nitrogen (NO_x). As such, the proposed Kariba Dam Rehabilitation Project will adopt the Zambian guideline limits for ambient air pollutants for all parameters except for NO_x where 1-year mean values should not exceed 40µg/m^3 and 1 hour maximum should not exceed 200µg/m^3. • Minimise nuisance dust on unsurfaced roads. • Minimise emissions from construction equipment and vehicles. • Respond to all complaints on air quality.
Mitigation Measures	• Reduce dust through management and control (e.g. watering, mulching cleared vegetation to provide a stable surface and covering stockpile with shade cloth). • Watering frequency will be increased during periods of high risk (e.g. high winds). • Stockpiles of dusty materials must be enclosed or covered by suitable shade cloth or netting to prevent escape of dust during loading and transfer from site. • Vehicles and equipment will be maintained to keep exhaust emissions within manufacturers specifications. • The extent and period of exposure of bare surfaces will be minimised. • A "no burning" policy will be implemented. • Vehicles travelling on unpaved or gravel roads must not exceed a speed of 30 km/hr.
Monitoring and Auditing	• Visual inspection during windy conditions or during time of high traffic on unsurfaced roads. • Record all dust related complaints from surrounding stakeholders. • Visual checks of defective exhausts. • Regular inspections during rehabilitation works to review air and dust issues and watering frequency altered as required.

	• Maintenance records for all equipment and machinery needs to be filed and made available to the EHS Manager. Maintenance compliance will be assessed on a quarterly basis.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • Complaints relating to air and dust emissions will be addressed promptly, with further investigations carried out and reporting to ZEMA and EMA, if required. • Non-compliance and incident reports will be reviewed and closed out by ZRA.

9.3.3.12 Dangerous Goods and Hazardous Substances Management Plan

The Dangerous Goods and Hazardous Substances Management Plan in Table 9.16 will be implemented by Contractors. The Plunge Pool Contractor is implementing this through its procedure on handling of chemical substances.

Table 9.16 Dangerous Goods and Hazardous Substances Management Plan

Objectives	To protect Project personnel, the public and the environment from harm due to the transport, storage or use of dangerous goods or hazardous substances.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	Dangerous goods and hazardous substances used during the life cycle of the rehabilitation project.
Responsibility	All Contractors
Performance Criteria	• No unplanned release of dangerous goods or hazardous substances. • All transport, storage and handling of dangerous goods or hazardous and dangerous substances is performed in accordance with applicable – including – – The Zambian Explosives Act (No 10 of 1974) Regulations. – The Zimbabwean Explosives Act (Chapter 10:08). – The Zimbabwean Regulation 12 of 2007 Environmental Management Act (Hazardous Substances, Pesticides and other Toxic Substances). – The IFC PS 3 - Resource Efficiency and Pollution Prevention Performance Standard. – The African Development Bank Operational Safeguard (OS) 4 – Pollution Prevention and Control, Hazardous Materials and Resource Efficiency.
Mitigation Measures	• Training of personnel in the storage and handling of corrosive substances and hazardous materials. • Hazchem signage used where hazardous goods are being stored and hazardous materials to be clearly labelled. • Storage areas of hazardous materials should have impermeable floors • No burning of hazardous materials will be allowed • Segregation of corrosive substances that are kept in bulk from incompatible goods and goods with which they may react dangerously. • Hazardous chemical substances used during rehabilitation works will be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) will be available on the site. Procedures detailed in the MSDS will be followed in the event of an emergency situation. • Implementation of clean-up procedures for spills. • Spill management materials will be provided at any fuel or chemical storage location. • Suitable compound drainage implemented.

	• Provision of compounds (bunded areas) for all above-ground bulk containers of corrosive substances. Bunds to be 110% volume of the largest storage vessel in the bund. • Ensuring there are no ignition sources in the vicinity of the bunded area. • Maintenance of spill kits including pumps and hoses for transferring spilt liquids. • Fueling area to have containment for spills, and spill kits. • If potentially hazardous substances are to be stored on the site, the Contractor will provide a Method Statement detailing the substances/ materials to be used, together with the storage, handling and disposal procedures of the materials.
Monitoring and Auditing	• Dangerous goods locations inspected on a regular basis. • Record of all incidents involving dangerous goods. • Inspection of MSDS for all dangerous goods. • Inspection of training records for those handling dangerous goods.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • Instances of release of dangerous goods followed up and corrective actions taken to minimise probability of reoccurrence. • Release of potential contaminants reported to relevant authorities as appropriate.

9.3.3.13 Blasting Management Plan

The Plunge Pool Contractor's sub-contractor for drilling and blasting is implementing these requirements through its Quality Management Plan (KDRP I05 QSE DAB 7002 01) and Health and Safety Management Plan (KDRP I05 QSE DAB 7003 01), as well as a specific WMS for drilling and blasting operations at the spoil site (an open pit remaining at the quarry site used for ZESCO's North Bank expansion; excavation material from the plunge pool will be used to rehabilitate this area.

These plans will be developed to include at least the requirements in Table 9.17 and. following requirements.

Table 9.17 Blasting Management Plan – indicative requirements

Objectives of the plan	Undertake blasting activities with no health and safety incidents. Undertake blasting activities in an environmentally and socially sensitive manner.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool only).
Aspect (Project Activity)	Rehabilitation of the Plunge Pool will require the removal of rock through the use of blasting.
Responsibility	Plunge Pool Contractor and sub-contractors Identify the expert teams in charge of blasting operations, with name, years of experience in blasting operations and role of each person.
Blasting Protocols	Describe the Blasting Proposed Technical Revised Protocol (procedures): calculation of MIC, indicating the type of explosive to be used, proposed blasting pattern, expected PPV, dB vs distance and number of houses or infrastructure identified, proposed Schedule, timing and frequency. Add and refer to technical Annexes.
Regulations and Limits	Indicate the relevant legislation and compliance limit to be followed (PPV, Hz, overpressure dBL, distance). Attach permits obtained from the governments.
Performance Criteria	• PPV will not exceed 5. • Noise- should not exceed 120 dB • No health and safety incidents. • No complaints from residents, landholders, users of the Kariba Dam.

Diagnostic Field Survey	Describe the location of sensitive ecosystems, houses and public infrastructure that could be damaged (water systems, springs, public and private structures, electricity lines, bridges, houses) within at least 300 meters of the blasting location.
Environmental and Social Impacts	Describe the impacts blasting might cause to people, environment (aquifer, groundwater, soil), private and public infrastructure -roads – power lines, others. Blasting is causing direct, indirect and cumulative impacts. Describe impacts before and after safety, prevention and mitigation measures.
Mitigation Measures	• Plunge Pool blasting will be highly controlled to remain within the threshold limit value in terms of a Peak Particle Velocity (PPV) of 9 mm/s to ensure the sustainable integrity of the dam structure, and to ensure noise and fly rock remain localized and minimal. • Ammonium-nitrate based explosives will not be used due to the production of toxic by-products. • Fume management if Nitrate Ammonia used (NOx can generate toxic fumes) • The explosives storage area will be designed and constructed by an accredited and approved professional engineer. • Measures for storage, transport and custody of explosives and detonators. • Chain of custody for the explosives- location, hazardous management plan, maps. • Explosives will be stored in such a way so as to avoid uncontrolled reactions or conditions resulting in fire or explosion. This will be achieved through: – Storing explosives in separate areas, away from main work areas. In addition, storage will be designed so as to prevent explosion situations form affecting main work areas. – Searching all employees entering the explosives storage area. Persons entering the explosives storage area will not possess tobacco, matches, cigarettes, lighters, or other devices capable of generating heat or spark sources. Moreover, no radio transmitters or cellular telephones will be permitted in the explosives storage area. – The storage area will be fenced and will contain a guarded entrance. • The handling of explosives will be undertaken as follows: – All explosives handled will be free of foreign material. – All reasonable precautions will be taken to prevent the spillage of explosives during their handling. – Explosives will be conveyed as soon and as carefully as possible and precautions will be taken that will effectively guard against any accidental ignition or explosion. – Only containers provided for the conveyance of explosives will be used for transporting explosives. These containers will at all times be kept clean, free from grit and in a good state of repair. – Vehicles containing explosives will only be left unattended in designated areas. – No explosives used or not used will be discarded in trash containers that will end in the spoil area or community land – Except for drying purposes, the use of planned explosive activity or testing, explosives will not be exposed to direct rays of the sun or to rain. – The transport of explosives from the storage area to the site of planned detonation must be undertake. – Vehicles carrying the explosives will be washed in a designated area as the water could contain elevated ammonia concentrations from residual ammonium nitrate and is unsuitable for the direct discharge into a receiving water body. This water will be collected (e.g. in a sump) and treated in the appropriate manner. The target water quality range for acceptable nitrate levels 0 to 6 mg/N. • No person will use any explosive material for blasting purposes unless that person is trained and authorized to use blasting material. • In case any explosive material is stolen, the police will be informed, and an investigation will be carried out as an emergency. This situation will be informed to the local authorities and the World Bank. • An emergency preparedness plan will be developed and will include provisions associated with the storage and handling of explosives.

	• Rock blasting material management, identifying where material will be deposited, and testing for acidity of deposited materials, with washing of spoil before depositing in designated sites, and stabilisation and rehabilitation upon closure • No person will bury, dump, hide or abandon any explosive • Traffic control plan the public road across the crest of the dam will be cordoned off during blasting, and access restricted in coordination with border authorities and state security who prevent civilians accessing the road from both sides of the dam during scheduled blasting; KDRP Project employees will be evacuated and the dam road access blocked for at least 1 hour to allow for the pre-blast and post-blast procedures. • Safety Measures, PPE • Fire prevention at all sites.
Reporting and Notification procedures	• Local residents and communities will be advised of the planned blasting schedule ahead of time • Pre- blast • Emergency • Reporting procedures (blasting event, weekly, monthly)/progress), progress and environmental and social management, claims • Please inform the ppv, noise and all measures agreed in this ESMP.
Monitoring and Auditing	• Identify blasting monitoring procedures including location of seismographs • Monitor the effects of blasting activities up- and downstream of the blast zone, including impact of blasting in birds and wildlife, include report in the blasting report • All complaints from residents or landholders will be audited every week and every month • Adherence to the blasting schedule will be monitored.
Consultation	• Minimum consultation, and consultation agreements • Grievance Mechanism for any claim must be informed to communities or local inhabitants
Reporting and Corrective Action	• Records of blasting monitoring will be kept, with results reported to ZRA at agreed intervals. • Incident reporting, including instruments to be used, corrective actions to be taken depending of the nature of the incident, indicators to be collected (number of injured workers, number of houses affected, etc). • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • Complaints resolution through the Grievance Management Procedure • All complaints regarding blasting activities will be reported on and all complaints addressed by the Contractor.
Annexes	• Technical Annexes • Incidents and Resolution to-date

9.3.3.14 Surface Water Quality Management Plan

Table 9.18 presents the KDRP plans for managing impacts on surface waters. A key part of this is the management of water that is pumped from the plunge pool behind the cofferdam to downstream, annually, as the plunge pool is dewatered. Additionally, there are significant surface water pollution risks from underwater concreting, as the coffer dam is being constructed. More detailed plans (than the generic measures set out in the Plunge Pool Contractor EPP) for these will be prepared and implemented.

The Plunge Pool Contractor has developed several WMS of direct relevance to surface water quality management:

- Pontoons Management (i.e. the pontoons from which the foundations for the coffer dam piers, piers, and coffer dam will be constructed), which includes measures to address a

number of safety risks, and some measures to prevent surface water contamination, including spill kits available on site for accidental spillage and leaks, and refuelling only at the construction camp in a designated area;

- Underwater Blasting of Boulders on the Cofferdam, which includes measures to minimize pollution from explosive loading and firing, drilling, use of machines, and waste disposal;
- Underwater Drilling and Blasting for the Lift, including environmental analysis of underwater blasting, for drilling, before, during and after firing, and separate safety and environmental risks analyses;
- Underwater Purging and Mucking, including measures to prevent spills and dropping machinery into the water, and to manage refueling, and wastes; and
- Concrete Transportation and Production, including identification of environmental risks of spillage of concrete, and concrete equipment washing.

A Work Method Statement for the pumping of water from the plunge pool will be required. This will establish the most appropriate pumping arrangements to minimise the water quality impacts downstream, including diversion into sedimentation/stilling ponds for the most polluted water, and specifics on the frequency and duration of pumping. The frequency and duration of pumping will be determined on the basis of acceptable limits of water quality parameters in the downstream river, based on water quality assessment of the plunge pool water to be discharged, volumes of discharge, and flows (i.e. volume of the receiving water). Water treatment is at least likely to be required towards the end of pool dewatering when the concentration of contaminants from the explosives, oil and grease and sediments is likely to exceed allowable limits.

Table 9.18 Surface Water Quality Management Plan

Objective	To minimize the potential impacts associated with blasting, erosion and spills and to prevent the release of contaminants and increase in turbidity downstream of the cofferdam during blasting and dewatering.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool only).
Aspect (Project Activity)	• Construction of access roads across drainage lines. • Pumping of water from the cofferdam into the downstream environment. • Potential spillage events of dangerous/hazardous goods and substances. • Blasting. • Erosion and sediment runoff from active work areas.
Responsibility	All Contractors
Performance Criteria	• No significant changes to the ambient water quality of the water downstream of the cofferdam. • Maintain water quality parameters below thresholds as provided in the surface water quality monitoring plan (refer to *Section 10.1.1*). • No release of contaminants to surface waters. • No failures of sediment and erosion control techniques leading to unacceptable sediment release.
Mitigation Measures	• Procedures to prevent the routine or accidental release of materials into the water during underwater excavations and concreting; • Measures to prevent the movement downstream of materials released from underwater excavations and concreting (e.g. floating boom, with geotextiles curtain below); • Disposal of any building rubble, soil, litter, organic matter or chemical substances only in designated areas, with temporary storage of these only at predetermined locations located outside of the riparian zone; • Spoil piles will be placed above the high water mark in distinct piles and adequate erosion measures will be implemented in order to minimise and reduce erosion and siltation into the watercourse from spoil piles; • Drainage design and rehabilitation of the spoil disposal area in the former quarry; • Dredging activities associated with the construction of the slipway will be minimised spatially and temporally, and if dredged material will be removed and disposed of at an area outside of the riparian zone, river, dam or any other drainage line and associated vegetation;

	• The floating machinery including the barge will be maintained to avoid and contain all leakages of fuels, oils, materials, equipment etc, and inspected regularly; • All roads will be improved or constructed to meet required drainage specifications; • Wastewater from worker accommodation and from work sites will be collected and disposed of in a wastewater treatment plant. • No waste or blasted rock should be deposited in the river banks since no land was agreed to be taken or land change by the project and Zimbabwe river bank is protected area. **<u>Pumping Water from Cofferdam Downstream</u>** • Plunge pool dewatering systems to include a mechanism for sediment trapping as far as possible, so that total suspended solid (TSS) levels downstream of the dewatering point should not be more than 15% that of background levels; • Depending on the silt load suspension within the plunge pool, it may be necessary to delay dewatering until sediment has settled or until turbidity levels downstream of the discharge point do not increase more than 10% to that of background values (see water quality monitoring plan below); • Clearance and clean up of the plunge pool area, at the close of each excavation season, prior to spilling; • Water pumped out of the cofferdam will not be released directly downstream if water is suspected to be contaminated or turbidity levels are high. If high turbidity levels then techniques to reduce turbidity will be investigated. • Water quality will be monitored on a weekly and monthly basis. The main variables to be measured and reported area : turbidity, pH, electrical conductivity, suspended solids, Dissolved oxygen, DBO, total coliforms, major ions, nitrate, phosphorus, asbestos, and trace metals. There are a number of other management plans that will help achieve the above objective. These include: • Soil Erosion and Sediment Control Management Plan; • Dangerous Goods and Hazardous Substances Management Plan; • Waste Management Plan; • Blasting Management Plan.
Monitoring and Auditing	• Weekly/monthly water quality monitoring downstream of the cofferdam, inmediate of the cement and rock crunching plants, dormitories and kitchen outflows, among others. Refer to surface water quality monitoring plan (in *Section 10.1.1*) for parameters and other locations. • Regular monitoring of activities involving rehabilitation works in or near watercourses. • Semi-Annual audit of controls to minimise impacts on surface water at all facilities and infrastructure.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • The following will be reported regularly: – Contractor compliance with approved erosion and sediment control plan. – Incidents of erosion or surface water contamination. – Results of routine inspections. • The following are classified as incidents relating to surface-water management: – Erosion and sediment control plan not prepared and/or implemented. – Breach in integrity of bunds. – Any temporary sediment basins demonstrating significant reduced available volume.

	– Insufficient housekeeping to prevent general rubbish and contaminants entering stormwater and runoff from the site. – Turbidity levels and water quality parameters exceeding desired parameters. • Should an incident/failure to comply occur, the following corrective actions could be considered: – Repair soil erosion and sediment controls. – Repair stormwater controls. – Contain and remedy or dispose of contaminated material/s. – Clean out temporary sediment basins. – Improve level of housekeeping. – Review the relevant plans. – Adjust pumping mechanisms and water discharge so as to reach appropriate turbidity levels.

9.3.3.15 Soil Erosion and Sediment Control Management Plan

Table 9.19 presents the KDRP Soil Erosion and Sediment Control Management Plan.

Table 9.19 Soil Erosion and Sediment Control Management Plan

Objective	To minimise environmental impacts caused by soil loss and erosion.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool only).
Aspect (Project Activity)	• Clearing of vegetation. • Sediment laden run-off from active worksites. • Soil stockpiles.
Responsibility	All Contractors
Performance Criteria	• Erosion and sediment control techniques implemented onsite where necessary. • No failures of sediment and erosion control techniques leading to unacceptable sediment release.
Mitigation Measures	• Keep the work area to a minimum so that the smallest possible ground area is disturbed. • Where appropriate, installation of temporary sediment basins to capture sediment laden runoff from site. • Stabilising cleared areas not used for infrastructure with vegetation or appropriate surface treatments such as mulching or jute matting as soon as practicable following earthworks, to minimise erosion. • Diversion channels and silt fences will be constructed around the topsoil stockpiles to prevent erosion and loss of topsoil. • Place erosion control structures such as diversion drains, rock-check dams and silt fences or traps at key locations (swales, stormwater pit inlets, around stockpiles) to capture the suspended sediment. • Divert stormwater away from exposed soil to reduce overland flow or channel flow on vulnerable soils. • Provide bunding around stockpiles to prevent the material from being washed away. The height of the bund depends on the site location, the volume and type of material being stockpiled, as well as the topography. • Reinstate all drainage pits and clean out accumulated sediment or leaf litter in pits after storm/heavy rain events. • Reinstate all existing erosion-control structures after storm/heavy rain events. • Divert stormwater away from disturbed channels or swales to minimise the flow of water and risk of erosion. • On completion of works, reseed the ground with the appropriate indigenous species. • Remove temporary erosion-control structures when no longer required. • Stockpile topsoil close to rehabilitation areas and away from drainage lines.

	• Temporary stockpiles of soil will be protected from erosion by using a reduced slope angle, where practical, and by incorporating sediment traps in drainage ditches. • Keep stockpiles <2 m in height and aim to reuse within 12 months. • Stockpiles should be vegetated or covered, depending on size. • Stockpile topsoil and subsoil separately to allow better site restoration.
Monitoring and Auditing	• Routine maintenance inspections will be conducted of all erosion and sediment control structures to identify areas where erosion is occurring and where action is required. • All erosion control measures will be monitored for the duration of the Project. • Erosion and sedimentation controls will be inspected following any significant rainfall event.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • In the event of a control measure failing, the EHS Manager will record it, as well as the reasons for failure and appropriate actions undertaken. • Remedial measures will be put in place should any controls fail. • Any defects revealed by maintenance and inspection of erosion and sediment control structures will be rectified immediately, and these works are to be cleaned, repaired and augmented as required to ensure effective erosion and sedimentation control thereafter. • The Contractor is responsible for ensuring all necessary erosion and sediment control structures are installed and operating effectively.

9.3.3.16 Aquatic Ecology Management Plan

The KRDP Aquatic Ecology Management Plan is presented in Table 9.20. The measures therein are largely for the Plunge Pool Contractor, concerning fish capture and release prior to dewatering or blasting.

Table 9.20 Aquatic Ecology Management Plan

Objective	• To protect aquatic habitats and receiving aquatic communities from the adverse effects of Project activities. • Avoid the contamination or sedimentation of aquatic habitats.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway)
Aspect (Project Activity)	• Construction of access roads across drainage lines. • Pumping of water from the cofferdam into the downstream environment. • Potential spillage events of dangerous/hazardous goods and substances. • Blasting. • Erosion and sediment runoff from active work areas.
Responsibility	Plunge Pool Contractor
Performance Criteria	• Minimise impacts to aquatic habitats. • Maintain water quality parameters below thresholds as provided in the surface water quality monitoring plan (refer to *Section10.1.1*).
Mitigation Measures	Implementing mitigation measures for impacts related to water quality, hydrology, erosion and sedimentation, will also mitigate most expected impacts on aquatic biota. However, it is envisaged that there will be fish kills associated with rehabilitation works and blasting activities once the cofferdam has been constructed. The following are additional commitments: • Where practical fish will be captured and released downstream prior to dewatering the cofferdam area or blasting. • Fishermen, Universities or research institutions will be engaged to assist with the fish capture and monitoring.

	• The practicality and safety of allowing community member's access to any fish kills will be considered. • An aquatic biodiversity monitoring report will be implemented. The Terms of reference will be prepared and agreed with the World Bank. The monitoring reports will be shared with the World Bank. The aquatic biodiversity monitoring plan will monitor not only richness, diversity of taxa but also presence of vectors water borne diseases like mollusks (Planorbidae family) related to schistosomiasis, diptera (malaria, and others diseases). • A representation of the fish community captured or killed are to be made available for scientific study in order to further taxonomic resolution and coordinated with research and NGOs working in biodiversity conservation of the Zambesi river. • Peak particle velocity, caused by blasting should not exceed 9 mm/s.
Monitoring and Auditing	• Water quality and turbidity monitoring in accordance with the surface water quality monitoring plan (refer to *Section 10.1.1*. • Records will be maintained of fish casualties and if these were used for scientific study.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • Fish mortality records. • Quarterly biomonitoring reports during the duration of rehabilitation works. • Biannual biomonitoring reports over a period of two years following the completion of rehabilitation works.

9.3.3.17 Terrestrial Ecology Management Plan

Table 9.21 Terrestrial Ecology Management Plan

Objective	To protect natural habitats and minimise impacts on the loss or disturbance of terrestrial and aquatic flora and fauna as a result of Project activities.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project Area extends over terrestrial habitats. These habitats and associated flora and fauna will be impacted on either directly or indirectly by the Project.
Responsibility	All contractors
Performance Criteria	• Minimise impacts to natural vegetation and on habitat fragmentation. • According to WB Policies, the project cannot affect, impact critical habitats of endangered, critically endangered vulnerable, migratory and rare (EVR) flora and fauna species • No unauthorised clearing of natural vegetation occurs. • Permits and approvals are in place prior to any unavoidable disturbance of EVR flora and fauna species. • No introduction of declared pests occurs as a result of Project activities. • No burning of natural and critical habitats. • Implement actions to improve biodiversity habitat
Mitigation Measures	**<u>Terrestrial Flora Protection Measures</u>** • Prepare a formal application to remove natural vegetation on sites in accordance with any requirements in the Zambian Forest Act (Cap 199) and the Zimbabwean Forest Act, 1948 (Chapter 19:05). • The total area to be cleared will be restricted to the minimal area required, leave mature trees where possible and avoid soil compacting in order to promote regrowth. Prepare record log to know the areas and locations of the cleared areas and localized in a GIS or Google earth file

	• Outer limits of the area to be cleared will be marked prior to any works commencing, and any mature trees that are not to be disturbed will be appropriately marked. • Cleared vegetation will be either stick raked or chipped and stored for use as mulch during site rehabilitation works and/or in surrounding vegetated areas susceptible to erosion. • No burning of wood materials will be allowed • Access of construction personnel to areas outside the disturbed areas will only be allowed with the prior approval of the EHS Manager. • An invasive plant control program will be implemented, which will include: – Effective management methods to control the spread of declared invasive plant species. – Routine monitoring to identify any new incidents of invasive plant infestation. – Provision of information for personnel on the identification of declared weeds. – Wash-down protocols for vehicles. – Appropriate procedures for invasive plant eradication and disposal. • Stockpile areas and haul roads will be clearly defined, so that invasive plant establishment and the potential spread of plant diseases may be contained. Stockpiles will be developed in previously cleared areas, with adequate open-spaces buffers, where possible. • Individual site pre-clearance surveys will be undertaken for each proposed clearing, to enable detection and avoidance of flora whenever possible, but should be expanded to include: – Recording of the presence or absence of listed communities and species. – Confirmation of the results of EVR flora field clearance searches and fauna microhabitat features. – Identification of permitting requirements. – Noting the presence or absence of declared invasive plant species in order to develop site-specific weed management options (control, vehicle and machinery washdowns). **<u>Terrestrial Fauna Protection Measures</u>** • Contact will be established with locally available persons (such as a veterinarian) capable of handling venomous snakes and dangerous fauna. Their contact details will be retained by the EHS Manager and provided to onsite engineers, foremen or persons in authority onsite. • In the event of a dangerous animal being present that is threatened by, or presents a risk to activities, activities will be stopped and a qualified and equipped biodiversity specialist will be called to relocate the animal to a safe location in an appropriate manner. • The EHS Manager shall keep a record of any animal been captured and properly released in a nearby natural habitats • The EHS manager will ensure that any animals needing to be moved are released, and are not eaten, or kept in captivity or as pets. • Rescue Plan, contractors under the supervision of ZRA will implement a fauna and flora (for instance orchids, shrubs, palms, etc) rescue plan. Prior to clearing of any natural vegetation, any microhabitats within the site (such as under rocks, logs, up trees, under dry bark) will be inspected by the EHS Manager's staff to check for the presence of small fauna that can be safely captured and translocated to nearby and safe areas of similar habitat. • Records will be kept, including photographs, of any animals that are relocated through any of the above procedures. Where the identity or potential threat posed by an animal is uncertain, advice will be sought from competent specialists. • A Terrestrial Biodiversity monitoring plan will be implemented in coordination with the teams of ZRA might be doing the riverbasin

	(upstream and downstream of the dam) Terms of reference will be prepared by ZRA and shred with the World Bank. University and NGOs working in biodiversity in the area should be invited to participate and collaborate.
Monitoring and Auditing	• Routine inspections of undisturbed areas by the EHS Manager to identify any evidence of vegetation disturbance and invasive plant infestation. • Inspections of planned disturbances to ensure that they comply with Flora Management Plan requirements. • Records will be maintained of fauna relocations or casualties. • The EHS Manager will monitor site clearing to ensure that: – The minimum required areas for vegetation clearing are clearly defined in advance of any disturbance. – There is no unauthorized disturbance of the surrounding habitat area. – Compensatory shelter is established where necessary. – An animal relocation program is implemented where necessary. -Biodiversity Monitoring report to be released every 6 months.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals and shared in the project website. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • The EHS Manager will report any incidents of disturbance, weed infestation or occurrence of feral animals to the Engineer as necessary. • The following constitute an incident or failure to comply: – Unauthorised disturbance of vegetation outside defined areas. – Evidence of weed infestation. – Fire of vegetation – Evidence of feral pests. – Animal retrieval program not implemented during site clearing activities. – Failure to release an animal located on site. – Failure to obtain a necessary permit. – Hunting or killing of protected species and any other species

9.3.3.18 Revegetation and Rehabilitation Management Plan

Table 9.22 presents the KDRP Revegetation and Rehabilitation Plan. Please note that this plan is not relevant for the rock waste dump area in the old Sino-Hydro quarry. The approach in this area will be developed in consultation with international and national experts the local community, district authorities and nearby stakeholders, based on their requirements for the future use of the area overlying the deposited rock. Options may include, subject to technical and safety constraints, (once the explosives found in the area are removed and considered safe), maintaining it as a source of construction materials, or re-afforestation -which is the preferred option for the World Bank. Since this project is using this area, this area is considered an associated facility, therefore, ZRA will need to comply with the WB safeguards policies in the restoration and remediation of this site.

Table 9.22 Revegetation and Rehabilitation Management Plan

Policy	To restore, as far as reasonably practicable, land to its pre-existing condition.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project Area extends over terrestrial habitats. These habitats and associated flora and fauna will be impacted on either directly or indirectly by the Project.
Responsibility	All contractors
Performance Criteria	• Rehabilitation area is stabilised with no significant erosion events.

	• Rehabilitation efforts are implemented until natural succession processes take over and restore the species composition to a natural state similar to surrounding vegetation. • No invasive/exotic plant species are introduced or pose a threat to adjacent areas. • Monitoring of rehabilitation effort occurs at a frequency necessary to maximise rehabilitation success.
Implementation Strategy	• Rehabilitation of disturbed areas will be undertaken progressively. • Prior to the re-spreading of topsoil, the ground surface will be ripped to assist with binding of the soil layers, water penetration and revegetation. • Topsoil application will only take place after spreading of subsoil's. Topsoil's will be evenly spread and left with a slightly rough surface. • Seeding of long-term topsoil stockpiles will be carried out with an appropriately designed seed mix. • Topsoil will be respread prior to revegetation of areas to be rehabilitated at completion of site activities. • Where sufficient topsoil is available, topsoil will be re-spread to a minimum depth of 75 mm. • Activities will be timed with the expected rainfall and/or availability of irrigation so that prompt vegetation can occur. • Subsoils displaced and not utilised may be stockpiled in locations approved by ZRA for later use during use. • Indigenous vegetation will be respread over the area to assist in the distribution of seed stock and provide shelter for fauna. Distribution of vegetation will be controlled to ensure that any erosion or subsidence that may occur will not be concealed during subsequent monitoring inspections. • Native groundcover and shrubs will be encouraged to revegetate wherever appropriate to minimise habitat barrier effects in significant habitat areas. • Seeding will be utilised where rapid restoration is required (e.g. watercourse crossings and potential high erosion areas). • Where disturbed areas are to be re-planted or reseeded, preference will be given to locally indigenous species. • Locally indigenous trees and shrubs will be allowed to regenerate naturally on cleared areas not required to be kept tree free for the purpose of operation. • Fertilisers and soil supplements will be used only as necessary and with the agreement the EHS Manager, and at concentrations that will not lead to contamination of aquatic environments. • Temporary access roads will be closed and rehabilitated to a condition compatible with the surrounding land use. • Specific vehicle access tracks will be defined, and driving vehicles off these tracks over freshly top-soiled areas will be prohibited. • Heavy grazing of recently revegetated areas will be controlled. • Fences or other barriers will be installed where appropriate to minimise unauthorised access. • Any Weed Control Program must avoid synthetic pesticide use when possible in favour of biological or environmental control methods. According to the World Bank OP 4.09, the following criteria apply to the selection and use of pesticides in Bank-financed projects: – The project cannot purchase any pesticide classify as toxic under the list 1a, b and II by the World health Organizaton" Recommended Classification of Pesticides by Hazard" – https://www.who.int/ipcs/publications/pesticides_hazard/en/ – They must have negligible adverse human health effects. – They must be shown to be effective against the target species. – They must have minimal effect on target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs must be demonstrated to

	be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying them. – Their use must consider the need to prevent the development of resistance in pests.
	• In order to compensate direct, indirect, cumulative and residual impacts caused by the project, ZRA will implement a landscape restoration project which will be described in terms of reference to be prepare and shared with the World Bank. The landscapes restoration plan will support the planting of native species that been cut in the area an affecting natural and critical habitat of species and the connectivity loss with the dam. Terms of reference will describe areas to be restored, species to be used to create microcorridors, nurseries to be prepared in collaboration with local communities, monitoring of restoration plots, etc. This is not intender to achieve a net gain per WBG PS6 but to provide some positive gain to the disturbed biodiversity of this very important river basin.
Monitoring and Auditing	• Regular inspections will be undertaken during the revegetation period for subsidence, presence of weeds, revegetation success and stability. • Photo-monitoring points will be established within representative examples of the rehabilitated areas, with photographs of these sites taken on a monthly basis. • Until regrowth is established, significant (e.g. riparian zones) areas and any seeded areas will be monitored regularly to ensure growth and, if necessary, appropriate reapplication of seed will be carried out. • The success of restoration will be assessed by comparing the percentage cover and species diversity in the revegetated area with that of adjoining land. • Monitoring will also include an assessment of the effectiveness of invasive plant-control measures. • The process of monitoring and rehabilitation will conclude only once the site becomes stable. • The rehabilitation plan will include monitoring requirements post rehabilitation works.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • Any sites not displaying stability (after 12 months) will undergo additional rehabilitation using a method approved by the relevant authority. • Non-compliant disturbance of rehabilitated sites (such as unauthorised driving, livestock grazing, burning, tree cutting or settlement) will be reported to the EHS Manager and appropriate authorities. • Complaints will be recorded and appropriate actions implemented and closed out by ZRA.

9.3.3.19 Road Safety and Traffic Management Plans

Two KDRP plans address road safety, transport and traffic. The first (Table 9.23) concerns the risk of traffic accidents, whilst the second (Table 9.24) concerns impacts associated with traffic generated by the Project and transport of abnormal loads to the Project Area.

Table 9.23 Road Safety Management Plan

Objectives	• Design and implementation of measures to curb the increased risk of traffic accidents due to increased road traffic numbers and road users. • Increased awareness through training of safe road traffic and pedestrian behaviour on site and in the Project Area.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).

Aspect (Project Activity)	Vehicles and traffic associated with the Project and the interaction of these with surrounding communities.
Responsibility	All contractors
Performance Criteria	• Maximum number of accident free hours driven by Project vehicles and Project related traffic. • Number of staff to successfully conclude road traffic safety awareness training.
Mitigation Measures	Implement a Vehicle and Traffic Programme that includes: • Fitting all construction vehicles with tracking devices capable of checking speed driven at and routes followed. Should drivers not adhere to agreed speed limits and approved routes, disciplinary. measures will be implemented according to an agreed system. • Construction vehicles will be subjected to regular maintenance checks and maintained in good operating condition. • All drivers will hold a valid licence issued to him in respect of motor vehicles of the class concerned. • All motor vehicles will have adequate motor vehicle insurance against third party. • Where necessary, drivers driving outside of the borders of their origin will have the appropriate international driving permit. • Safe operating speeds for loaded and empty haulage vehicles will be defined, particularly on public roads. • Unauthorized passenger transport is prohibited. No members of the public may be transported in construction vehicles. • Alcohol and drug use immediately before and during operations of construction vehicles is prohibited. • Cellular telephone use during driving of construction vehicles is prohibited. • A Grievance Procedure will be developed and implemented whereby members of the public can raise road traffic related incidences and grievances for management by the Project authorities. • A Damage Compensation Policy and Procedure will be developed and implemented in the event that traffic accidents lead to injury and death as a result of negligence on the part of the Project. • Permitting approval of abnormal loads will be agreed in advance with the relevant authorities. • The Plunge Pool Contractor and Spillway Contractor will coordinate traffic restrictions on the road along the dam crest, working with Zambian and Zimbabwean border control personnel to prevent pedestrian and vehicular access at times of risk, e.g. during blasting in the plunge pool area.
Monitoring and Auditing	• The number of incidents or complaints received in relation to community health and safety will be monitored and reported. • Regular audits and reviews will be undertaken and recommendations and corrective actions will be implemented. • Community Liaison personnel will work alongside the rehabilitation work activities and will ensure the social mitigation measures outlined are implemented.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • All incidents including near-misses and deaths need to be reported through the incident reporting system within 24-hours of the incident occurring. • All incidents to be reviewed by the EHS Manager and the ZRA. • Community complaints will be recorded and closed out by the ZRA. • Review Emergency Preparedness Plan, annually. • Regular liaison with community representatives to monitor the effectiveness of the management plan and review as required.

Table 9.24 Traffic and Transport Management Plan

Objective	To minimise impacts associated with traffic generated by the Project and transport of abnormal loads to the Project Area.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	Vehicles and traffic associated with the Project and the interaction of these with surrounding communities.
Responsibility	All contractors
Performance Criteria	• No traffic-related incidents and minimal complaints. • Minimise impacts on road pavements.
Mitigation Measures	• Development and implementation of a traffic management strategy for transport of rehabilitation work materials and equipment to the site, including abnormal loads. • Clear signs and signals will be installed on-site and along access and haul roads to guide traffic movement and increase traffic safety. • Vehicles will observe site traffic regulations (i.e. speed limits). Vehicles must to adhere to speed limits on site, and not exceed 30km/hr on site. • The transport of oversize loads will be restricted to non-peak periods where possible and deliveries will be restricted to periods of least risk to other road users where possible. • Necessary approvals for the transport of oversize loads will be obtained from the relevant authorities prior to transporting the loads. • All vehicles transporting goods to the Project Area (both local and foreign vehicles) will need to obtain the appropriate licenses and have certificate of fitness. • Rail will be used, where feasible to transport Project components from the port to the site. • All truck carrying cargos of materials, rocks, disposal waste, must cover the cargos with a cover (plastic, other material) and tied rope around. Failure to do this will represent fines to contractors. • All trucks must carry a safety kit: fire extinguisher, first aid kit, radio, others • Contractors will prepare a checklist to monitor daily All truck and checked in and out of the project area for fuel used, tires issues, checking driver no alcoholic influence, accidental impacts, others
Monitoring and Auditing	• The number of incidents or complaints received in relation to project traffic will be monitored. • Potential transport network shortcomings will be reported to the relevant authorities and appropriate action taken in agreement with those authorities. • Road conditions will be monitored on a regular basis. • Transport companies/subcontractors will be audited to ensure compliance with Traffic Management Plan, insurance, safety measure and others. • Drivers must be valid driving license for the country and cannot drive under alcoholic influence
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to the ZRA at agreed intervals. • Recommendations and corrective actions arising from audits will be recorded. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • The occurrence of any traffic incidents or complaints will be notified to y the EHS Manager and reported to ZRA. • All traffic incidents involving Project personnel will be thoroughly investigated. • All incidents including near-misses and deaths need to be reported through the incident reporting system within 24-hours of the incident occurring. • In the event of a complaint/incident or failure to comply with requirements, relevant corrective action will be taken.

9.3.3.20 Waste Management Plan

The KDRP Waste Management Plan is presented in Table 9.25. To date, the Plunge Pool Contractor has implemented this plan, through the measures set out in its EPP. A number of the WMS developed by the Plunge Pool Contractor to-date include measures for the management of wastes associated with specific tasks, e.g. concrete production. The Plunge Pool Contractor is disposing of excavated material from the plunge pool in an open pit remaining from the North Bank extension project, as part of a rehabilitation strategy.

By October 2020, undetonated explosives had been found during routine site inspections at the spoil disposal area. The Mines Safety Department of Zambia was immediately engaged for a joint inspection at site, and following the joint site inspection, the Authority recommended that the unsafe zone is barricaded off, while spoils disposal continues in the safe zone. The Mines Safety Department is now requiring the ZESCO and Sinohydro (the contractor that established the quarry) to implement a long-term solution to remove the explosives. ZRA will engaged in the proper use supervision of the spoil area which needs to be restored and clean up per WB safeguard policies and remediation guidelines. If necessary ZRA will hire special consultants to be able to ensure safety to the area and remediate the area.

Table 9.25 Waste Management Plan

Objective	• To minimise waste generation and maximise reuse and recycling of waste products. • To dispose of waste in a manner that does not cause contamination of soils, water or air or harm to human health.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	Wastes (general and hazardous) produced during the life cycle of the rehabilitation project.
Responsibility	All contractors
Performance Criteria	• No contamination of soil, air or water as a result of inappropriate waste management. • No loss of health to personnel or third parties as a result on inappropriate waste management practices. • All waste disposal to be carried out by a licensed waste contractor.

Mitigation Measures	• A waste inventory of waste streams (including hazardous wastes) will be developed and be reviewed for optimal, efficient and effective management. • Management strategies for specific waste streams will be developed before rehabilitation works commence. • All waste material will be removed from the workplace by an appropriately licensed waste contractor. No wastes will be buried or disposed of on-site. • Local authorities will be consulted about their capacity to receive waste. • Wherever possible wastes will be reused or recycled and segregated and bins or storage areas labelled to ensure the correct items are disposed of appropriately. • Recycling protocols will sort materials into the following categories: – Paper / cardboard; – Any packaging materials suitable for re-use; – Plastics; – Aluminium; – Metals (other than aluminium); – Wood; – Organic waste; – Glass; and – Clean Building Rubble. • Perishable solid waste will be stored in covered, standard general waste containers to prevent odours and public health hazards, and disposed of by a licensed waste contractor. • General rubbish, food wastes and non-recycled glass, paper, plastics and related materials will be disposed of in an appropriate waste disposal facility. • Refuse containers will be located at each worksite. • All personnel will be instructed in waste management practices and procedures as a component of the environmental induction process. • A high emphasis will be placed on housekeeping and all work areas will be maintained in a neat and orderly manner. • All equipment and facilities will be maintained in a clean and safe condition. • Chemical wastes will be collected and appropriately labelled for safe transport to an approved chemical waste depot or collection by a liquid waste treatment service. • Grease traps from each site or worker accommodation kitchens will be pumped out approximately once every month. Grease trap waste will be removed by a licensed waste transport company for disposal at appropriate waste disposal facilities. • Containment bunds and/or sumps will be drained periodically to prevent overflow and subsequent pollution of the surrounding land and/or water body. • All hazardous wastes will be appropriately stored in bunded areas away from watercourses. • Hydrocarbon wastes, including lube oil, oil filters, oily rags will be collected for safe transport off-site for reuse, recycling, treatment or disposal at appropriate waste disposal facilities. • Waste tracking applies to all regulated, controlled and hazardous wastes such as oil, spent oil filters, oily rags and spent oil absorbent. Correct waste-tracking forms will be obtained and used. • Copies of the licenses of waste transporters, disposers and recyclers will be kept on site and up to date. • Unknown substances must be identified prior to disposal. This may require off-site laboratory testing. • When a new waste stream is identified, investigations will be conducted to determine the options to reuse, recycle, reclaim or reprocess the waste materials. Littering includes the loss of waste onto roads from a trailer or back of a vehicle and disposal of cigarette butts or other items thrown from cars, including cigarette butts thrown onto the ground outside offices or

	camp rooms. It will be obligatory for all waste items to be placed in the correct waste disposal receptacles. • Temporary waste storage area to be weather proof to prevent dispersion of waste through e.g. wind or rain. • A Method Statement shall be required for all wash areas where hydrocarbon and hazardous materials or other pollutants are expected to be used. This includes, but is not limited to, vehicle washing, workshop wash bays and paint equipment cleaning. Wash areas for domestic use shall ensure that the disposal of contaminated "grey" water is sanctioned by the Engineer. • For the spillway contractor: a detailed waste management plant for electro-mechanical parts will be prepared, indicated estimated volumen of residue, hazardous characteristics of the waste, presence of asbestos or other pollutant related to the wastes, potential use for materials in recycling, proposed areas for temporary storage, final disposal plan, staff to be in chare, permits required, coordination with local authorities, companies to recover or used the non-toxic and recycle material, etc.
Monitoring and Auditing	• Housekeeping checks will be conducted to ensure waste is being transferred and stored correctly and that no littering is occurring. • Regular inspections of waste disposal areas for compliance with waste management plans, Environmental Licence conditions and relevant legislation. • A complaints register will be maintained detailing complaints about waste management including litter, odour, soil or water contamination and visual amenity. • A record will be maintained of all impacts to health that are potentially attributable to waste management.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • All complaints due to waste management practices will be investigated.

9.3.3.21 Community Health and Safety Management Plans

Table 9.26 presents the KDRP Community Safety Management Plan for Contractors and presents the KDRP Communicable Diseases Management Plan. Both ZRA and Plunge Pool Contractor have HIV and AIDS policies, programs and training on HIV prevention and management. The Plunge Pool Contractor is working with the Zambian National AIDS Council to ensure that the HIV/AIDS program is suitably implemented. ZRA and contractors will coordinate closely with the local health authorities.

Table 9.26 Community Safety Management Plan

Objectives	• Reduce and offset demand on health and social services from workers.

	• Ensure worker behaviour and the Project avoids impacts on community health and protects and enhances community safety. • Avoid worker and Project traffic impact on local businesses and sensitive receptors.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	Interactions between the workforce and local communities.
Responsibility	All contractors
Performance Criteria	• Onsite health services meet all workers' primary health care needs and demand for general practitioners. • No offences against the person attributable to Project employees or contractors for the duration of the Project. • No traffic accidents attributable to Project employees or contractors.
Mitigation Measures	• Develop and implement an Emergency Response Plan (*Section 9.3.3.9*. • Provide safety induction to all personnel and contractors working on the Project, including traffic safety and community safety, with failure to adhere to these procedures leading to disciplinary measures. • Ensure all personnel understand that they are responsible for ensuring the safety of themselves and any other people who may be affected by their actions. • The Contractor will partner up with an NGO that is working for HIV/AIDs initiative in the Kariba and Siavonga Districts. This partnership will ensure that the Project assists in HIV/AIDs awareness initiatives in the Project Area of Influence. • Clearly communicate information on safety standards and respond quickly to community questions as they arise. • Provide onsite health professionals at site and ensure access to a medical practitioner for workers. • Ensure workers are aware of Project-provided, community-provided and government-provided support services in the region. • Support pedestrian and traffic safety education initiatives through knowledge-sharing (refer to *Section 9.3.3.19* ***Error! Reference source not found.***).
Monitoring and Auditing	• The number of incidents or complaints received in relation to community health and safety will be monitored and compiled. • Regular audits and reviews will be undertaken, and recommendations and corrective actions will be implemented. • Community Liaison personnel will work alongside the rehabilitation work activities and will ensure the social mitigation measures outlined are implemented.
Reporting and Corrective Action	• Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • All incidents including near-misses and deaths need to be reported through the incident reporting system within 24-hours of the incident occurring. • Community complaints will be recorded and closed out by ZRA. • Review Emergency Preparedness Plan, annually.

Table 9.27 Communicable Diseases (STDs, HIV/AIDS and water borne or other zoonotic diseases such as Malaria, dengue, bilharzia) Management Plan

Objectives	• Creating a safe working environment to contribute to the health and welfare of the Project labour force • Prevention and control of communicable diseases in the Project and the Community

	• Ensure worker behaviour and the Project avoids impacts on community health
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	• Interactions between the workforce and local communities.
Responsibility	• All contractors
Performance Criteria	• Established partnership with an independent entity such as an NGO (whose mandate covers both the workers and communities in the Project Area) for implementation of HIV/AIDS prevention and control. • Maintained baseline statistics of communicable diseases, specially related to zoonotic spillovers from land use change and water borne such as malaria, schistosomiasis, • Policies developed regarding access to health care and confidentiality of information • Zero zoonotic diseases outbreaks and cases in the project area, communities and workforce
Mitigation Measures	HIV/AIDS • Vaccination of workers against common and locally prevalent diseases, where possible • A HIV/AIDs prevention programme for the workforce will be developed and implemented through an entity such as an NGO, whose mandate shall cover workers and communities around the Project Area. • In association with the Zambia National AIDS Council, an HIV Service Provider shall be engaged to provide for onsite as well as external services such as Voluntary Counselling and Testing, as well as a referral system for those who test positive. The service shall cover workers and communities around the Project Area. • Provision of a scheme to provide free or subsidized HIV/AIDS and Malaria medicine for personnel on the Project Site, Provide opportunities VCT • Implementation of HIV/AIDs education program • Implement training of trainer (TOT) and peer educators program in order to ensure sustainability of awareness and prevention activities • Information campaigns on STDs among the workers and local community • Provision of condoms to promote safe sexual practices will be ensured • Provision of mosquito nets for personnel or at the bare minimum, pregnant women on site • Policies in place regarding confidentiality of information and nondiscrimination of positive employees, and providing access to health care • Provide care and support program for the infected and affected and their families. Incorporate into Corporate Social Responsibilities Activities • Monitoring of local health data • Access to free condoms (including female condoms) at worker accommodation to promote safe sexual practices will be ensured. • Information, education and communication campaigns around safe sexual practices and transmission of STIs and HIV/AIDS will be undertaken. • Women's empowerment and education programmes to promote women's rights and safe sexual practices (including the use of condoms and female condoms) and support will be supported in partnership with local government. • The Contractor will have a robust Grievance Policy and Procedure available to employees. • Conduct an annual audit of grievance and health statistics. • Establish a protocol for medical evacuation arrangements.
	Water related and zoonotic diseases • Maintained baseline statistics of communicable diseases, specially related to zoonotic spillovers from land use change and water borne such as malaria, schistosomiasis, bilharzia

	• Coordination with health care and • Zero zoonotic diseases outbreaks and cases in the project area, communities and workforce
Monitoring and Auditing	• Monitoring of knowledge uptake • Monitoring of local population health data, in particular for transmissible diseases. • Preparation of monthly and cumulative performance statistics reports on this matter for submission to the ZRA. • Coordination with the Aquatic Monitoring team on the presence of vectors in the river and associated habitats and water quality monitoring from the river and reservoir
Reporting and Corrective Action	• Report any occurrence of any communicable diseases amongst the workforce (STD, HIV/AIDS, Hepatitis B and C) and set up disease prevention programme if needed. • Records of all monitoring and auditing activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • Report on zoonotic and water borne diseases such as TB, malaria, bilharzia, etc.

9.3.3.22 Social Infrastructure Management Plan

This plans concerns support and investment to local social infrastructure and services (e.g. health services), if the additional pressure from the presence of workers places additional burden on them. However, this impact should be avoided by (i) recruiting as much as feasible from the local community, and (ii) providing all necessary health services to employees throughout.

The Plunge Pool Contractor has adopted a social responsibility policy addressing the objectives of this plan.

Table 9.28 Social Infrastructure Management Plan

Objective	• Avoid net increase in demand on community services from Project workers. • Mitigate impacts on community resources. • Support the capacity of health and community service providers to maintain quality service provision and strong community networks.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project may result in additional pressure to social infrastructure in the Project Area and surrounds.
Responsibility	Contractors
Performance Criteria	• Community services capacity not exceeded as a result of the Project.
Mitigation Measures	• Develop consultative relationships between ZRA and key social infrastructure providers (Health, Education & Training, Police, Dept Communities, and Regional Councils). • Identify appropriate Corporate Social Investment Initiatives that support social infrastructure and services.
Monitoring and Auditing	• Direct and cumulative impacts on social and health infrastructure will be closely monitored, with corrective action such as re-allocations of community investment as required.
Reporting and Corrective Action	• Community relations report including relevant metrics quarterly during the duration of rehabilitation works. • Corrective action as required including reviewing workforce behaviour management strategies.

9.3.3.23 Grievance Management and Incident Reporting Plan

ZRA has established a KDRP Grievance Redress Mechanism (KDRP-GRM-00–) which will also be used by Contractors and further revised and updated as needed by ZRA and World Bank. From a community member's point of view, they may not be aware of or concerned about which contractor or sub-contractor is the cause of their grievance; therefore, a unified mechanism is required. The Plunge Pool Contractor logs complaints in a Complaints Register, including description, date received, site decision on the complaint, director's decision, date of response, and whether resolved.

9.3.3.24 Cultural Heritage Chance Finds Procedures

KDRP has adopted a chance finds procedure, which all Contractors will be required to apply, as described in Table 9.29.

Table 9.29 Cultural Heritage Chance Finds Procedure

Objectives	Avoid or mitigate impacts on indigenous cultural values Avoid or mitigate impacts on indigenous culture and sites of cultural heritage significance.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	It is not anticipated that there are any cultural heritage sites located in the Project Area; however, there may be sub-surface archaeological resources that could fall within the footprints of proposed ground disturbing activities.
Responsibility	All contractors
Performance Criteria	• Compliance with the Chance Find Procedures. • Compliance with community expectations regarding protection and management of cultural heritage.
Mitigation Measures	• Should any archaeological materials be uncovered or exposed during earthworks or excavations, the following Chance Find Procedure will be followed: – Inform site supervisor/foreman. – Install temporary site protection measures (warning tape and stakes, avoidance signs). – Inform all personnel of the Chance Find if access to any part of the work area is restricted. – Establish a localized no-go area needed to protect the Chance Find. – The local qualified cultural heritage/archaeological specialist will confer and perform a preliminary evaluation to determine whether the Chance Find is cultural heritage and if so, whether it is an isolate or part of a larger site or feature. – Artefacts will be left in place when possible; if materials are collected they will be placed in bags and labelled by the specialist and transported to the Zambian National Heritage Conservation Commission headquarters, or the Zimbabwean National Museums and Monuments headquarters. No Project personnel are permitted to take or keep artefacts as personal possessions. – Document find through photography, notes, GPS coordinates, and maps (collect spatial data) as appropriate. – If the Chance Find proves to be an isolated find or not cultural heritage, the local specialist will authorize the removal of site protection measures and activity in the vicinity of the site can resume. – If the specialists confirm the Chance Find is a cultural heritage site they will inform the Zambian National Heritage Conservation Commission or Zimbabwean National Museums and Monuments and initiate discussions with the latter about treatment. – Prepare and retain archaeological monitoring records including all initial reports whether they are later confirmed or not. The record

	will include coordinates of all observations to be retained within the project's GIS system (*viz*. ArcGIS). – Develop and implement treatment plans for confirmed finds using the services of the specialist. – If a Chance Find is a verified cultural heritage site, prepare a final Chance Finds report once treatment has been completed. • While investigation is ongoing, co-ordinate with on-site personnel keeping them informed as to status and schedule of investigations, and informing them when the rehabilitation works may resume.
Monitoring and Auditing	• Ensure detailed design and rehabilitation work planning avoids or mitigates impacts on sites of cultural heritage significance. • Record of all artefacts or cultural heritage aspects identified during the duration of rehabilitation works.
Reporting and Corrective Action	• New indigenous heritage sites identified during rehabilitation works will be reported to the relevant heritage authorities. Notify the Police if human remains are discovered to determine whether the remains are ancient and/or indigenous. If determined to be indigenous, the former procedure on the discovery, handling and management of human remains under the provisions of the heritage authorities will apply.

9.4 ZRA Plans

9.4.1 Overview

This Section describes ZRA responsibilities to fulfil the obligations of the ESMP. These responsibilities are organized under two sub-sections:

- Section 6.2: Plans to be developed and implemented during KDRP – these will be put in place prior to the rehabilitation works, and will continue through the rehabilitation works of the programme; and
- Section 6.3: Plans to be implemented through the continuing operation of Kariba Dam – these will be developed during KDRP.

The range of required plans is presented in Table 9.30.

Table 9.30 Summary of ZRA Management Plans

#Ref	ZRA Plans and Commitments	Responsibility	Timing
9.4.2.1 and Appendix F	Resettlement Policy Framework	ZRA	KDRP
9.4.2.2	Gender-based Violence Management Plan	ZRA	KDRP
9.4.2.3	Social Values Management Plan including Community Engagement Management Plan	ZRA	KDRP
9.4.2.4	Grievance Management and Incident Reporting Plan	ZRA	KDRP
9.4.2.5	Tourism Management Plan	ZRA	KDRP
9.4.3.2	Emergency Preparedness Plan	ZRA	Kariba Operations

9.4.2 Plans to be Developed and Implemented During KDRP

9.4.2.1 Resettlement Policy Framework

The KDRP Resettlement Policy Framework (RPF) is attached as Appendix F. No land acquisition or displacement is expected for KDRP, as all land requirements are within the existing footprint of ZRA-owned land.

However, an RPF was required to set out the steps that should be taken, in the event that ancillary works may be re-positioned outside of ZRA land. This RPF outlines the principles, procedures, and organizational requirements that should be considered by the ZRA should the implementation of the Project result in any physical or economic displacement.

The RPF was prepared by Environmental Resources Management (ERM) for ZRA as part of the preparation of the Environmental and Social Impact Assessment and ESMP for KDRP.

9.4.2.2 Gender-based Violence (GBV) Management Plan

Table 9.31 presents the KDRP Gender-based Violence (GBV) Management Plan. This is the result of a GBV risk assessment. ZRA will implement the plan, but it will require actions and reporting by Contractors, as described in the table.

Table 9.31 Gender-based Violence (GBV) Management Plan

Objective	• To establish an approach for further identification and assessment of risks of GBV, Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). • To develop a strategy on how to address GBV, SEA and SH incidents that may arise. • To foster a framework for gender equality, that adequately protects girls' and women's rights, tackles the barriers they face and meets their particular needs. • To build on KDRP's experience and contribute to best international and national social practices.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect/Impact	The aspect or impact that needs to be managed in order to minimise GBV, SEA and SH risks are as follows: • Limited information on how and where to report project induced grievances • Lack of project specific framework that addresses GBV • Influx of large male-dominated workforce may increase the demand for transactional sex • Increase in income for local workers changes power dynamics leading to increase of GBV risks that may be perpetrated by project workers or partners of local women and girls. • Increased risk of violence experienced by women at the workplace. • Discrimination may occur in skills training and development, where selection may be based on criteria that are discriminatory. It can relate to termination of employment, where a specific age group or gender may be disproportionately affected.
Responsibility	ZRA and all contractors
Performance Criteria	• Measurable performance criteria (outcomes) for each element. • Number of awareness raising sessions on Grievance mechanism conducted • Number of GBV risks and incidences reported • Successful implementation of GBV Action Plan • Number of training sessions related to GBV delivered • Number of ZRA management, contractor and project staff trained on GBV, SEA and SH • Percentage of project workers that have signed the Code of Conduct • Percentage of workers that have attended Sexual harassment training/ sensitization. • Develop and implement Employee Welfare Plan with specific safety measures for protecting and addressing vulnerabilities of project workers such as women and people with disabilities • Contractors to develop and implement recruitment policy which prohibits discriminatory recruitment criteria for project workers.

Mitigation Measure	The strategies, tasks or action program that will be implemented to achieve the performance criteria: • Develop a project specific Stakeholder Engagement Plan (SEP) to keep the local communities and other stakeholders informed about proceedings of GBV allegation and to enable continuous engagement with and provide feedback to affected communities/workers. • GBV Action Plan to address specific arrangements for the project by which GBV risks will be addressed. This includes considerations such as: • Awareness raising strategy which describes how workers and local communities will be sensitized to GBV risks, and the worker's responsibilities under the Code of Conduct; • Engage external Gender Specialists to facilitate GBV trainings for ZRA management, Contractors and KDRP project staff members; • Conduct Gender mapping exercise to identify GBV service providers and assess local stakeholders capacity to prevent and respond to GBV, including the services which will be available Develop GBV Response Framework which provides: • mechanisms to hold accountable alleged perpetrators associated to the project; • access and strong link to GRM for capturing disclosure of GBV • a referral pathway to refer survivors to appropriate support services. • a clear defined GBV requirements and expectations for stakeholders involved in GBV response • mechanisms for regular monitoring and feedback to track effectiveness and to build internal knowledge of what works to prevent, mitigate and respond to GBV. • a survivor-centered approach which ensures the safety and protection of survivors from further re-traumatisation and violence. • mechanism for anonymous complaints and protect confidentiality of complainants. • Consultation of men and women separately as well as jointly where appropriate.
Monitoring	The monitoring requirements to measure actual performance include: • Conduct spot checks to project sites • Obtain reports from identified GBV service providers • Collect data from grievance mechanism about GBV issues of concern and how they were handled • Collection data which is disaggregated to track differentiated impacts by sex, age, and other characteristics: • Number of GBV cases referred by the GRM, disaggregated by adult/children and by sex; • The number of cases open, and the average time they have been open; • The number of cases closed, and the average time they were open.
Auditing	The effectiveness of the GBV Action will be tested at least annually and audited.
Reporting	• Monthly reporting by ZRA on GBV cases and actions undertaken to address them • Monthly reporting by the Contractor to the ZRA regarding GBV training sessions held and number of workers trained. • Regular progress reporting to ZRA management and other stakeholders and affected parties regarding GBV matters.
Corrective Action	• Records of all monitoring activities will be kept, with results reported to ZRA at agreed intervals. • Recommendations and corrective actions arising from audits, monitoring and reviews will be implemented.

	• All activities that deviate from normal operating conditions will be reported and corrective action initiated to prevent a recurrence of the incident. • All GBV incidences including allegations will be investigated promptly and disclosure and feedback done by GRM • Non-compliance and incident reports will be reviewed and closed out by senior management.

9.4.2.3 Social Values Management Plan

Table 9.32 presents the Social Values Management Plan. The plan largely concerns Community Engagement. ZRA has an established relationship with community stakeholders on both north and south banks, and will continue to engage with stakeholders throughout KDRP. Communication with local communities and other local stakeholders will be a key part of this engagement process, and ZRA and the Contractor will need to work closely on engagement during rehabilitation works. ZRA has a Corporate Communication Strategy which includes community and stakeholder engagement protocols, which will be used for this engagement.

The objectives of communication and liaison with local communities are the following:

- To provide residents in the vicinity of the Project and other interested stakeholders with regular information on the progress of work and its implications;
- To monitor implementation of mitigation measures and the impact of the Project on communities via direct monitoring and feedback from those affected, in order to ensure the mitigation objectives are achieved; and
- To manage any disputes between the ZRA, the Contractors and local communities.

Table 9.32 Social Values Management Plan

Objectives	• Ensure the Project does not constrain community lifestyles or access to amenities, and avoids damage to social values including local networks. • Ensure workers respect local social values and enact mitigation strategies. • Establish and maintain regular engagement with all key stakeholders throughout the Project Area.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project will result in non-locals / local interaction. This interaction may result in: • Changes to cultural and social values. • Changes to formal and informal support structures.
Responsibility	• ZRA
Performance Criteria	• Community satisfaction with management of impacts on amenity and local values throughout the Project Area, during rehabilitation works, measured through successful resolution of queries and complaints, and survey for corporate reporting. • Positive, productive relationships with community members and organisations throughout the duration of rehabilitation works, as evidenced in satisfaction surveys and local media.
Mitigation Measures	• Develop a comprehensive Community Engagement Management Plan, to include: – Community engagement plans for the Project Area. – Community participation in monitoring. – Community enquiries and complaints resolution process. • Consult with local leaders to ensure the Project is fulfilling commitments to local participation including in training, employment, community benefits package, and monitoring activities and outcomes. • Ensure community relations plans detail responsibilities falling on the Contractor to the same standard as for ZRA's performance. • Develop a detailed community grievance procedure to ensure that individuals are able to easily contact the company and have their concern promptly addressed. • Ensure a high standard of environmental management and monitoring, including participative monitoring with community groups, where practical.

	• The Project will clearly communicate information on safety standards and practices, and respond quickly to community questions as they arise. • Maintain a focus on protection of recreational, community and, tourism in Project execution planning and contracts. • Train all workers in Camp and Town Rules and Code of Conduct, and standardise disciplinary and safety procedures for all Contractors and subcontractors.
Monitoring and Auditing	• Community and environmental group participation in monitoring projects and review of results. • Successful resolution of community complaints and grievances. • Minutes of all community meetings.
Reporting and Corrective Action	• Community relations report, including minutes of all meetings held with community leaders and other stakeholders. • Corrective action as required including reviewing social investment and labour force behaviour management strategies. • Non-compliance and Incident Reporting will be closed out by ZRA to ensure prompt rectification and change management as required. • The Contractor will maintain records of all monitoring and auditing activities and report results to the EHS Manager and Developer at agreed intervals. • Recommendations and corrective actions arising from audits and reviews will be implemented. • Regular liaison with government officials to monitor the effectiveness of the management plan and review as required.

9.4.2.4 Grievance Management and Incident Reporting Plan

ZRA has established a Grievance Redress Mechanism (GRM). Operationalization of the GRM began with the appointment by ZRA Executive Representative of GRM Committee members from the community. Individual and community-level complaints will be handled through the same mechanism. ZRA will manage the mechanism, and will mediate between Contractors and the complainant if necessary, to resolve the grievance. Contractors are required to promote and use the GRM, and required to participate in resolving grievances as necessary.

Some grievances have been received, related to employment, wages, and infrastructure expectations, and feedback was given to the complainants. To-date, three formal meetings have been convened by the GRM Committee.

Table 9.33 Grievance Management and Incident Reporting Plan

Objectives	To have a process whereby all incidents and complaints can be lodged and responded to in an appropriate manner.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Aspect (Project Activity)	The Project may result in local community complaints.
Responsibility	ZRA with Contractors involvement
Performance Criteria	• Record all complaints and responses in an incidents and complaints register. • Respond appropriately to all incidents and complaints.
Mitigation Measures	• The contractor will develop a robust IEC (Information, Education and Communication) strategy whereby communities will be educated and kept informed of the Project, associated positive and negative impacts and management/mitigation commitments. The strategy will be implemented throughout the Project and can involve communication and education through the development of posters, flyers, brochures and focused engagement sessions. The strategy will– – Have a clear set of objective – Be structured in a way that ensures understanding for a target a specific audience

	– Address specific problems / misunderstandings regarding the Project (for example employment expectations, retrenchment issues, fears regarding plunge pool works and the possibility of dam failure, water quality issues to downstream water flows, etc.) • Contact names and numbers and mechanisms for lodging grievances will be clearly communicated to affected communities. • All incidents and grievances will be recorded in a database, with corrective actions assigned and followed up by the responsible person for a particular incident or grievance. • The complaints form will document at least the following information: – Time, date and nature of complaint. – Type of communication (telephone, letter, email, visit). – Name, contact address and contact number (if provided). – Response and investigation undertaken as a result of the complaint. – Action taken and signature of person investigating complaint. • Each complaint will be investigated as soon as practicable and, where appropriate, action taken to remedy the cause of the complaint. If ZEMA or EMA advises alleged nuisance, it will be investigated and ZEMA or EMA will be advised of any action proposed or undertaken, and records will be kept of all complaints.
Monitoring and Auditing	• The Contractor will maintain the complaints register and ensure all complaints are resolved. The complaint form will be checked by the EHS Manager within two weeks of complaint receipt to ensure follow-up action has been taken to resolve the issue. • If complaints cannot be resolved the Contractor will inform the EHS Manager and Engineer who in turn will inform ZRA. • Where required, the relevant authorities will be informed of complaints.
Reporting and Corrective Action	• All complaints and incidents are to be reported to the EHS Manager. • Should further incidents occur or complaints be received in relation to previous occurrences, an appropriate selection of the following corrective actions will be undertaken. • Additional environmental awareness training of the labour force with respect to the procedures to be followed for environmental incidents or complaints. • Investigation into why the incident/complaint was not addressed within the specified timeframe. • Incident/complaint follow-up according to the results of the investigation. • Where required, work place practices will be reviewed. • Regular liaison with community representatives to monitor the effectiveness of the management plan and review as required.

9.4.2.5 Tourism Management Plan

KDRP may affect the tourism industry and those who make a living from tourism. In addition to the contractors' responsibilities to manage their noise and air quality impacts, impacts on the tourism industry will be mitigated by: providing information to tourism operators on the works, and their timing, for example the daily blasting schedule; providing information on the works that may enhance the experience of interested tourists, for example project information boards, public viewing places, and information provided to tourism operators.

Table 9.34 Tourism Management Plan

Objective	To minimise the negative Project inceptions on the tourism industry and maximise possible positive impacts on the tourism industry in the Project Area.
Timeframe	Construction (i.e. rehabilitation activities associated with the Plunge Pool and Spillway).
Responsibility	ZRA

Aspect (Project Activity)	The rehabilitation of the plunge pool and visual obtrusiveness of general construction activities may result curiosity and/or aggravation with tourists visiting the Kariba Dam.
Performance Criteria	No recorded complaints against any aspect of the rehabilitation process by tourists and tourism operators. Recorded positive comments regarding the management of the rehabilitation activities so that it does not negatively affect the tourism industry.
Mitigation Measure	• A Grievance Procedure and Mechanism where complaints and positive comments can be recorded by tourists and tourist operators will be established. • Project information boards will be erected, which provide a brief description of the rehabilitation works, the Project Programme and the daily blasting schedule. These boards are to be placed in public viewing places at the Kariba Dam. • Project information will be pro-actively shared with tourism operators to include in their presentation to tourists. • Noise and dust abatement measures will be implemented as required (refer to *Sections9.3.3.10 and 9.3.3.11*). • Appropriate access restrictions and safety procedures will be put in place for tourist visiting and/or moving through the Project Area.
Monitoring and Auditing	• Monthly monitoring of possible reported grievances or positive comments as captured in the Grievance Mechanism. • Biannual auditing of grievance and positive comments records. • Suggest corrective actions if required.
Reporting and Corrective Action	• An active grievance procedure and mechanism. • Monthly reporting by Contractor to the ZRA of monitoring information. • Biannual audit reports by the Contractor to the ZRA with presentation of audit outcome. • Regular presentations and interaction by the ZRA with tourist operators and other community representatives to report on the rehabilitation works process and share monitoring and audit findings with them.

9.4.3 Plans for the Continuing Operation of Kariba Dam

9.4.3.1 ZRA's Environmental and Social Management System

ZRA has an Environmental Policy, and Occupational Health and Safety Policy and Procedures governing the environmental management and safety of the dam. ZRA shall continue to implement its Environmental Monitoring Program.

9.4.3.2 Emergency Preparedness Plan (EPP)

ZRA is developing a new EPP based on topographic survey, the DBA and downstream inundation simulation and mapping, to ensure that emergency preparedness and response planning is tested and improved. A consultant to prepare the new EPP was appointed in 2020, and will deliver the EPP in 2022. The EPP will be distinct from the Emergency Response Plans (ERP) of the Plunge Pool and Spillway Contractors for KDRP, and the consultant will clarify the interface of between the plans during inception. The scope of the work includes:

- Definition of roles and responsibilities;
- Potential Failure Mode and Effects Analysis (PFMA) and flood mapping;
- Development of an Early Warning System (EWS);
- Communication strategy;
- Definition of the EPP Response Process, responses to emergencies, and an Emergency Response Matrix;
- Identification of preparedness activities;

- Defining access / permissions to sites;
- Communication and Warning Systems; and
- Management of tenders for the installation of equipment.

It will deliver review and update of PFMA, integration of the DBA report to the EPP, identification of all downstream flood-prone communities, analysis of the existing EPP, an emergency capacity assessment (equipment and material) with local and national disaster management agencies among other key stakeholders, GIS layout on assessed secondary accesses and evacuation routes, an updated roles and responsibility matrix, installed Early Warning System downstream covering all exposed communities, training on the EPP to exposed communities, training of Dam EPP and EWS to ZRA employees, a dam emergency mock drill, and hand over including all certificates for all EPP installations.

Copies of the final amended Kariba Dam Emergency Preparedness Plan will be made available to, in both countries:
- The Offices of the President;
- Disaster Management and Mitigation Unit;
- Civil Protection Unit.

ZRA will continue to:
- Periodically undertake Kariba Dam emergency preparedness drills to test the emergency plan;
- Assess the dam safety implications of any transition to peaking (currently Kariba Dam is a base load facility, but may transition to a modified peaking plant in future);

9.4.3.3 ZESCO Environmental, Health and Safety Management System

To ensure compliance to international and national standards, ZESCO shall continue to implement its SHEQ Management System. The institution shall continue water sampling and compliance reports to the relevant Environmental and Water Resources regulatory bodies.

9.4.3.4 ZPC Environmental, Health and Safety Management System

Zimbabwe Power Company Kariba South Power Station is the hydropower plant generating unit of Zimbabwe Power Company with a generating capacity of 1050 MW. The power plant is committed to zero harm to humans, property, community and the environment. ZPC has a certified integrated management system (IMS) which is modelled according to the requirements and guidelines of ISO 9001 Quality Management System, ISO 14001 Environmental Management System and OHSAS 18001 Occupational Health and Safety Management System.

10 Monitoring

This Chapter outlines the key monitoring requirements identified through the ESIA process that are the responsibility of Contractors and ZRA through the implementation of KDRP, and ongoing into the continued operation of Kariba Dam. Table 10.1 presents the KDRP Monitoring Plan, including responsibilities.

10.1 Contractors' Monitoring

Contractors will, as part of their ESHS management systems, develop detailed monitoring plans, and obtain ZRA's agreement to them, prior to the start of the construction. The Contractor's monitoring of ESHS performance will include performance by all sub-contractors, and contractor workers.

Contractors may modify ESHS monitoring plans and update them in response to unforeseen incidents, the results of monitoring activities, and as a result of discussions with stakeholders as new issues arise.

Section 9.2.3 above details the inspections, supervision and reporting that will be conducted. This section, and the plan set out in Table 10.1 outlines the key monitoring requirements identified through the ESIA process in relation to certain ESHS aspects. Contractors may develop this into more detailed monitoring plans.

It is the responsibility of the Contractors' EHS Managers and their team to undertake the monitoring programme and ensure all reporting is completed at the intervals specified and on time. Where capacity does not exist internally to undertake certain reporting, specialist consultants may be brought in as required to complete the monitoring at the specified intervals.

10.1.1 Surface Water and Aquatic Monitoring Plan

The KDRP Surface Water and Aquatic Monitoring Plan, which was originally developed in the original ESMP (2016) is presented in Table 10.2. This has been implemented since 2018 by the Plunge Pool Contractor and verified by ZRA and the TS&S Consultant, as expected in the original ESMP and Technical Specifications of the Plunge Pool Contractor's Contract, and results are presented in the TS&S Consultant's monthly reports. Further steps will be taken to improve the frequency and timing of water quality monitoring, especially in relation to specific underwater works.

10.1.1.1 Monitoring Parameters

The parameters selected for surface water quality monitoring include:

- On Site Measurements - PH, Electrical Conductivity, Turbidity, Dissolved oxygen saturation, Temperature.
- Major Ions - Calcium, Chloride, Magnesium, Potassium, Sodium, Sulphate and Alkalinity.
- Nutrients - Inorganic nitrogen and Phosphorus.
- Common Trace Elements - Aluminium, Arsenic, cadmium, Chromium, Copper, Cyanide, Fluoride, Iron, Lead, Manganese, Mercury, Selenium and Zinc.

Instream biomonitoring (aquatic) including variation in:

- Diatoms - Specific Pollution Index (SPI), Biological Diatom Index (BDI) and % Pollution Tolerant Valves (% PTV);
- Aquatic Macroinvertebrates - Cumulative sensitivity scores and Average Score Per Taxa (ASPT); and
- Fish - Shannon-wiener diversity scores.

10.1.1.2 Monitoring Frequency

The following monitoring frequencies are stipulated for:

- On Site Measurements - weekly during rehabilitation works, with the exception of dissolved oxygen saturation which should be monitored daily during construction;
- Chemical Analyses of Water Quality - monthly during construction;
- Biomonitoring - quarterly during construction.

10.1.1.3 Monitoring Locations

The following locations are stipulated:

For all Water Quality Monitoring, surface samples at the power station intakes or immediately above the dam for control purposes, and at three sites 200 m, 500 m and 1,000 m from the discharge point from the power stations.

Biomonitoring points encompass the gorge and represents a total hydrological unit and all habitat types associated with the gorge – site ZR1 (approximately 500 m from the dam wall), ZR2 (located in the middle of the gorge) and ZR3 (located and the end of the gorge). Baseline conditions at these points are presented in the aquatic ecology baseline of the ESIA.

10.1.1.4 Data Quality

The monitoring program will apply internationally approved methods for sample collection, preservation and analysis. Sampling will be conducted by or under the supervision of trained individuals. Analysis will be conducted by entities permitted or certified for this purpose (Samples are sent to the Food and Drugs Control Laboratory (FDCL) – Ministry of Health Zambia). Sampling and Analysis Quality Assurance/Quality Control (QA/QC) plans will be prepared and implemented. QA/QC documentation will be included in monitoring reports.

10.1.1.5 References

DWAF. (1996) South African Water Quality Guidelines (second edition). Volume 7: *Aquatic Ecosystems*, Pretoria, South Africa.

EPA. (1986). *Quality Criteria for Water*. *Office of Water Regulation and Standards*, Washington DC, 26460.

IFC & World Bank (2007) *Environmental Health and Safety Guidelines: 1.3 - Waste Water and Ambient Water Quality*.

10.2 ZRA Monitoring

During KDRP, ZRA will monitor aspects of the environment that are outside of the Contractors' responsibilities and generally concern the wider aspects of the environment and social context.

Table 10.1 Kariba Dam Rehabilitation Monitoring Plan

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
Noise and Vibration Management Plan	• Inspection of vehicle maintenance record. • Noise monitoring only if significant complaints received.	At the nearest sensitive receptor.	If significant complaints are received.	Contractors	IFC General EHS Guidelines 1.7 – Noise.	• Complaints register. • Equipment/machinery maintenance reports.	-
Air Quality and Dust Management Plan	• Inspection of vehicle maintenance record. • Visual inspection.	• Areas of high construction traffic where roads are not surfaced. • Active work areas.	On ad *hoc* basis during dry conditions of no rain.	Contractors	IFC General EHS Guidelines 1.1 - Air Emissions and Ambient Air Quality. Section 37, 46 and 96 – The Air Pollution Control (Licensing and Emission Standards) Regulations, S.I. 141 of 1996 Environmental Management (Atmospheric Pollution Control) Regulations, of the Laws of Zimbabwe. S.I 72 of 2009	• Record of high dust incidents and corrective actions taken. • Complaints register. • Equipment/machinery maintenance reports.	-
Soil Erosion and Sediment Control Management Plan	Visual inspections of all erosion and sediment control structures.	At specific areas susceptible to erosion and sediment control structures.	Weekly and after major rain events.	Contractors	None	Records of ineffective control measures and corrective actions taken.	-
Waste Management Plan	• Visual inspection of waste storage facilities. • Review of waste manifestos.	Waste disposal sites.	On *ad hoc* weekly basis.	Contractors	IFC General EHS Guidelines 1.6 – Waste Management.	Records of ineffective control measures and corrective actions taken.	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
	• Review of contractor licenses. • Review of waste inventory.				Zimbabwean Effluent and Solid Waste Disposal Regulations SI 6, 2007. Zimbabwean Hazardous Waste Management Regulations SI 10, 2007. Zimbabwean Environmental Management (Hazardous Waste Management) Regulation 10 of 2007.		
Dangerous Goods and Hazardous Substances Management Plan	• Dangerous goods locations inspected on a regular basis for compliance with relevant management plans. • Inspection of MSDS for all dangerous goods. • Inspection of training records for those handling dangerous goods.	Dangerous goods store.	Monthly	Contractors	IFC General EHS Guidelines 1.5 – Hazardous Materials Management. African Development Bank Operational Safeguard (OS) 4 – Pollution Prevention and Control, Hazardous Materials and Resource Efficiency. Zimbabwean Regulation 12 of 2007 Environmental Management Act (Hazardous	Records of ineffective control measures and corrective actions taken.	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
					Substances, Pesticides and other Toxic Substances).		
Surface Water Quality Management Plan	• Water quality monitoring downstream of the cofferdam. • Monitoring of watercourses near activities involving rehabilitation works. • Audit of control measures to minimise impacts on surface water.	• Downstream of the cofferdam. • Water courses near to active working areas.	• Weekly/monthly water quality monitoring downstream of the cofferdam. • Regular monitoring of activities involving rehabilitation works in or near watercourses. • Annual audit of controls to minimise impacts on surface water at all facilities and infrastructure.	Contractors	IFC General EHS Guidelines 1.3 –Waste Water and Ambient Water Quality. Zambian Water Resources Management Act, No 21 of 2011. Zambian Water Supply and Sanitation Act, No 28 of 1997. Zimbabwean Water Act, 2003 (Chapter 20:24).	• Records of all monitoring and auditing activities. • Records of recommendations and corrective actions arising from audits.	Refer to detailed monitoring plan included in *Annex C*.
Aquatic Ecology Management Plan	• Water quality and turbidity monitoring downstream of the cofferdam. • Biomonitoring. • Recording fish casualties.	• Downstream of the cofferdam. • Plunge pool.	• Weekly/monthly water quality monitoring downstream of the cofferdam. • *Ad hoc* inspection of fish kills.	Contractors	DWAF. (1996) South African Water Quality Guidelines (second edition). Volume 7: Aquatic Ecosystems, Pretoria, South Africa. Zambian Fisheries Act, No 22 of 2011. Zambian National Policy on Wetlands Conservation, September 2001.	• Records of all monitoring and auditing activities. • Records of recommendations and corrective actions arising from audits. • Quarterly biomonitoring reports during the duration of rehabilitation works. • Biannual biomonitoring reports over a period of two years following the completion of rehabilitation works. • Fish mortality records.	Refer to detailed monitoring plan included in *Annex C*.

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
					Zimbabwean GN 380 of 2013 (Protection of Wetlands) per Section 113 of the Environmental Management Act.		
Revegetation and Rehabilitation Management Plan	• Regular inspections will be undertaken during the revegetation period for subsidence, presence of weeds, revegetation success and stability. • Regular inspection of any seeded areas until regrowth is established or once the site becomes stable. • Regular inspection of weed control measures.	Areas where revegetation has taken place.	On *ad hoc* monthly basis.	Contractors	Zambian Forests Act, Cap 199. Zimbabwean Forest Act, 1948 (Chapter 19:05). Environmental Management Act, [Chapter 20:27]. Statutory instrument 6 of 2007.	Reporting on success of revegetation and weed control programme.	-
Social Values Management Plan	• Attendance of community meetings. • Maintenance of complaints registers.	Across the site and surrounding communities.	Regular community meetings and ongoing monitoring of complaints.	ZRA	None.	• Minutes of meetings. • Record of complaints and corrective actions.	
Procurement of Goods and Services Management Plan	• Monitoring of achievement against contractual procurement targets. • Monitoring of the value of procurement in the Project Area and in Zimbabwe and Zambia against Project's total procurement value. • Monitoring of procurement training courses in terms of type	-	• Monitoring to be conducted on a monthly basis. • Conduct an annual audit of procurement figures based on which an incentive for achieving procurement targets can be considered.	Contractors	None.	• Monthly reporting to the ZRA on – – The achievement of contractual procurement targets and suggested corrective actions. – Training courses presented and attended. – Value of procurement in Project Area as well	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
	of training, number of participants, and duration of training and value of training.					as in Zimbabwe and Zambia. • Regular progress reporting to Government and other interested and affected parties regarding procurement matters. • Preparation and submission of monthly and cumulative procurement figure reports for submission to the ZRA.	
Road Safety Management Plan	The number of incidents or complaints received in relation to road safety.	Across the site and surrounding communities.	• Ongoing monitoring of complaints. • Regular audits and reviews will be undertaken regarding road safety.	Contractors	IFC General EHS Guidelines 3.4 – Traffic Safety.	• Record of complaints and corrective actions. • Regular audits and reviews will be undertaken and recommendations and corrective actions will be implemented.	-
Social Infrastructure Management Plan	Monitoring of complaints associated with cumulative impacts on social and health infrastructure.	Across the site and surrounding communities.	• Ongoing monitoring of complaints. • Direct and cumulative impacts on social and health infrastructure will be closely monitored on an ongoing basis, with corrective action such as re-allocations of community investment as required.	Contractors	None	• Record of complaints and corrective actions. • Community relations report including relevant metrics quarterly during the duration of rehabilitation works, with corrective action such as re-allocations of community investment as required.	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
Community Health and Safety Management Plan	Monitoring of the number of incidents or complaints received from community.	Across the site and surrounding communities.	• Ongoing monitoring of complaints received. • Regular audits and reviews will be undertaken and recommendations and corrective actions will be implemented.	Contractors	IFC General EHS Guidelines 3 – Community Health and Safety.	• Record of complaints, monitoring and audits and corrective actions taken. • All incidents including near-misses reported through the incident reporting system.	-
Traffic and Transport Management Plan	• Monitoring of number of community complaints received relating to Project traffic and transport systems. • Monitoring of road connection. • Monitoring of contracted transport companies.	Across the site and surrounding communities	• Ongoing monitoring of complaints received and number of incidents in relation to traffic. • Ongoing monitoring of road conditions and transport network shortcomings. • *Ad hoc* quarterly monitoring of transport companies.	Contractors	IFC General EHS Guidelines 3.4 – Traffic Safety.	• Records of all monitoring and auditing activities will be kept, with results reported to the ZRA at agreed intervals. • Recommendations and corrective actions arising from audits will be recorded.	-
Worker Health and Safety Management Plan	Monitoring of worker health and safety against national requirements and international standards.	The Kariba Dam Rehabilitation Project.	• Regular engagement sessions with employees to assess grievances or safety issues. This can be done as part of the	Contractors	IFC General EHS Guidelines 2 – Occupational Health and Safety. African Development Bank Operational Safeguard (OS) 5 –	• Records of all monitoring and auditing activities will be kept, together with corrective actions. • All incidents including near-misses to be reported through the incident reporting system.	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
			regular Toolbox Talk practise. • Monthly monitoring of achievement against stated performance criteria of maximum number of hours worked without reporting of an unfair or unsafe employment condition. • Annual audit of performance statistics based on which an incentive for achieving no recorded unfair or unsafe conditions can be considered by the ZRA.		Labour Conditions, Health and Safety. Factories Act (Chapter 441 of the Laws of Zambia) (as amended by Statutory Instrument (S.I.) No. 165 of 1989, No. 75 of 1990, and Act No. 13 of 1994). Factories and Works Act [Chapter 14:08 of the Laws of Zimbabwe] Labour Act (Chapter 28:01) as amended by Labour Act [Chapter 28:01] amended 2006 and the Labour Amendment Act, 2005 (Act 7/2005). Mining(Management and Safety) Regulations, 1990 (S.I. 109 of 1990) of the Laws of Zimbabwe		
Employment and Training Management Plan	Monitoring employment and training achievements against contractual employment and training targets.	The Kariba Dam Rehabilitation Project.	• Monthly monitoring of achievement against contractual	Contractors	None.	• Monthly reporting by the Contractor to the ZRA on achievement of contractual employment targets and suggested corrective actions if needed.	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
			employment targets. • Conduct an annual audit of employment statistics.			• The ZARA will comply with Zambian and Zimbabwean regulations pertaining to reporting requirements related to recruitment. • The ZRA will report to the World Band and African Development Bank as per their agreed reporting schedule. • Twice annually progress reporting to interested and affected parties from the Project Area regarding achievement of employment targets and corrective actions if so required.	
Tourism Management Plan	Monitoring of tourists and tourism operators perceptions on the Project.	Individual tourists visiting the Kariba Dam and local tourism operators.	• Monthly monitoring of possible reported grievances or positive comments as captured in the Grievance Mechanism. • Biannual auditing of grievance and positive comments records. • Regular presentations and interaction by the ZRA with tourist operators and other community representatives to	ZRA	None.	• Monthly reporting by Contractor to the ZRA of monitoring information. • Biannual audit reports by the Contractor to the ZRA with presentation of audit outcome.	None.

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
			report on the rehabilitation works process and share monitoring and audit findings with them.				
Cultural Heritage Management Plan	There are no immediate monitoring requirements associated with cultural heritage management.	Active work areas and immediate surrounds.	Record of all artefacts or cultural heritage aspects identified during the duration of rehabilitation works.	Contractors	WB (OP) 4.11 IFC Performance Standard (PS) 8 - Cultural Heritage. Zambian National Heritage and Conservation Act, 1989. Zimbabwean National Museums and Monuments Act (Chapter 25:11).	New indigenous heritage sites identified during rehabilitation works will be reported to the relevant heritage authorities. Notify the Police if human remains are discovered to determine whether the remains are ancient and/or indigenous.	-
Grievance Management and Incident Reporting Plan	The monitoring of grievances will be undertaken by maintaining a complaints register and ensuring that all complaints are resolved.	Across the site and surrounding communities.	• The complaint form will be checked by the EHS Manager within two weeks of complaint receipt to ensure follow-up action has been taken to resolve the issue. • All *ad hoc* complaints and incidents are to be reported to the EHS Manager.	ZRA	IFC Performance Standard (PS) 1 - Assessment and Management of Environmental and Social Risks and Impacts. African Development Bank Operational Safeguard (OS) 1 – Environmental and Social Assessment.	Record of complaints and corrective actions taken.	-

Management Plan	Monitoring Method	Monitoring Location	Monitoring Frequency	Responsibility	Relevant Standard	Reporting Requirements	Additional Information
Environmental Induction and Training Management Plan	Monitoring effectiveness of environmental induction and training.	Kariba Dam Rehabilitation Project.	• Non-compliance with training will be recorded. • The success of the training programs will be assessed and documented on a biannual basis.	Contractors	None.	• All training records will be maintained. • The success of the training programs will be documented.	-
Blasting Management Plan	• Monitoring of adherence to blasting schedule. • Monitoring of the number of complaints received relating to blasting.	• Kariba Dam Rehabilitation Project • Across the site and surrounding communities	• All complaints from residents or landholders will be audited on a bimonthly basis. • Adherence to the blasting schedule will be monitored on a bimonthly basis.	Contractors	Explosives Act (No 10 of 1974) Regulations are in draft stage. Explosives Act (Chapter 10:08)	• Record of complaints and corrective actions taken. • Monthly reporting by Contractor to the ZRA of monitoring information.	-
Emergency Response Plan	Monitoring the effectiveness of the Emergency Preparedness Plan.	Kariba Dam Rehabilitation Project.	The effectiveness of the Emergency Preparedness Plan will be tested at least annually and audited.	Contractors	IFC General EHS Guidelines 3.7 – Emergency Preparedness and Response.	• The Contractor will be responsible for compiling the results of testing and auditing programs. These results will be reported to the ZRA.	-
Dam Safety Management Plan	Monitoring dam safety during the rehabilitation of the Kariba Dam.	The rehabilitation of the Kariba Dam plunge pool and spill way will be carried out in compliance with the OP/BP 4.37 with the Project aimed at ensuring measures are implemented and sufficient resources provided to ensure the continued safety of the dam. As per OP/BP 4.37 an independent Panel of Experts will be appointed to review the investigations, design, and implementation of the rehabilitation works. A copy of the existing Emergency Preparedness Plan is attached as *Annex D* in *Part II* of the ESIA.					

Table 10.2 Surface Water Quality and Aquatic Monitoring Plan

Monitoring Type and Parameter	Location/s	Frequency and Duration	Threshold Values	Adaptive Action
Water quality (*in situ*) (ON SITE MEASUREMENTS)				
pH	• Control site (power station intake) • Test sites:200,- 500- and 1000 m downstream of coffer dam or dewatering point	Weekly during construction.	Between 5-6.5 and 8.5-9 (at any of the monitoring points)	Increase monitoring frequency to once every 4 hours. If values persist for longer than 24 hours, identify cause and stop activity or treat with acid or base addition.
			Values <5 or >9 (at 1000 m monitoring point)	Stop activity immediately. Identify source and or treat with acid base addition.
Electrical Conductivity			150-250 µs/cm (at any of the monitoring points)	Increase frequency of monitoring to daily. If values do not return to <150 µs/cm within 7 days, stop activity, identify source and treat by isolation and evaporation, crystallisation or reverse osmosis.
			>250 µs/cm (at 1000 m monitoring point)	Stop activity immediately, identify source and treat as above. Continue monitoring daily till values return below 150 µs/cm.
Turbidity			10-15% increase compared to control site for < 24 hours (at any of the downstream monitoring points)	Increase monitoring frequency to hourly identify source of increased turbidity.
			>15% increase compared to control site for >24 hours (at 1000 m monitoring point)	Identify source stop activity, mitigate with sedimentation basin or increase size of sump system.
Temperature			>2 ˚C from background average daily temperature or more than 10%, whichever is more conservative, for any period of time at any monitoring point.	Identify the reason for the temperature variation and treat with surface aeration and or flow equalisation.
Dissolved Oxygen (% Saturated)		Daily during construction	7 day mean of measurements taken at dawn over 7 days. Should not be < 80 or >120% saturated at any of the monitoring points.	Identify source and facilitate oxygenation through rapid mixing, oxidation, absorption or size exclusion.
Water quality (*Major ions*)				

Monitoring Type and Parameter	Location/s	Frequency and Duration	Threshold Values	Adaptive Action
Calcium	• Control site (power station intake) • Test sites: 200, - 500- and 1000 m downstream of coffer dam or dewatering point.	Monthly during construction	<150 mg/L	Identify source, stop activity and treat through isolation, concentration and or size exclusion.
Chloride			150 mg/L	
Magnesium			70 mg/L	
Potassium			400 mg/L	
Sodium			100 mg/L	
Sulphate			500 mg/L	
Alkalinity (as $CaCO_3$)			Should not be reduced to less than 20 mg/L	Identify source, stop activity treat through adding $CaCO_3$.
Water quality (*Nutrients*)				
Nitrogen (inorganic)	• Control site (power station intake) • Test sites: 200, - 500- and 1000 m downstream of coffer dam or dewatering point.	Monthly during construction	0.5-2.5 mg/L (mesotrophic)	Increase monitoring frequency to once weekly. If mesotrophic condition persist for more than a month seize activity and treat through isolation, biological nutrient removal, chemical treatment or ion exchange
			2.5-10 mg/L (eutrophic)	Identify source, stop activity and treat through isolation, biological nutrient removal, chemical treatment or ion exchange. Continue monitoring at weekly intervals
Phosphorus (inorganic)			5-25 mg/L (mesotrophic)	Increase monitoring frequency to once weekly. If mesotrophic condition persist for more than a month seize activity and treat through isolation, biological nutrient removal, chemical treatment or ion exchange
			25-250 mg/L (eutrophic)	Identify source, stop activity and treat through isolation, biological nutrient removal, chemical treatment or ion exchange. Continue monitoring at weekly intervals
Water quality (*trace elements)*				
Aluminium	• Control site (power station intake) • Test sites: 200, - 500- and 1000 m downstream of coffer dam or dewatering point.	Monthly during construction	0.01 mg/L	Identify source of contamination and stop activity. Treatment options may include: flash mixing with settling, filtration, chemical oxidation, thermal oxidation, activated carbon, reverse osmosis and evaporation.
Arsenic			0.01 mg/L	
Cadmium (if $CaCO_3$ <60 mg/L)			0.00015 mg/L	
Cadmium (if $CaCO_3$ <60-119 mg/L)			0.00025 mg/L	
Cadmium (if $CaCO_3$ <120-180 mg/L)			0.00035 mg/L	
Cadmium (if $CaCO_3$ >180 mg/L)			0.0004 mg/L	
Chromium (VI)			0.007 mg/L	
Chromium (III			0.012 mg/L	

Monitoring Type and Parameter	Location/s	Frequency and Duration	Threshold Values	Adaptive Action
Copper (if $CaCO_3$ < 60 mg/L)			0.0003 mg/l	
Copper (if $CaCO_3$ 60-119 mg/L)			0.0008 mg/L	
Copper (if $CaCO_3$ 120-180 mg/L)			0.0012 mg/L	
Copper (if $CaCO_3$ >180 mg/L)			0.0014 mg/L	
Cyanide			0.001 mg/L	
Fluoride			0.75 mg/L	
Iron			Should not vary more than 10% from background levels at any time.	
Lead (if $CaCO_3$ < 60 mg/L)			0.0002 mg/L	
Lead (if $CaCO_3$ 60-119 mg/L)			0.0005 mg/l	
Lead (if $CaCO_3$ 120-180 mg/L)			0.001mg/L	
Lead (if $CaCO_3$ >180 mg/L)			0.0012 mg/L	
Manganese			0.18 mg/L	
Mercury			0.00004 mg/L	
Selenium			0.002 mg/L	
Zinc			0.002 mg/L	
Biomonitoring				
Diatoms SPI	ZR1: S 16.51631, E 28.76754	Quarterly during construction	Should exceed 9	Identify driver of change in instream aquatic communities. Do not interoperate response metrics in isolation and make sure that measured variation may not be attributed to sampling effort or season. Address the activity (and driver variable) that resulted in an instream response (i.e. change in water quality, flow or sediment regime). Given the background level of transformation, diatoms will be more likely to effectively monitor an instream response to changes in water quality. While changes in invertebrate and fish assemblages maybe equally be attributed to changes in flow, sediment or water quality.
Diatoms BDI			Should exceed 9	
Diatoms %PTV			Should not exceed 40 %	
Diatoms SPI	ZR2: S 16.45229, E 28.81691		Should exceed 13	
Diatoms BDI			Should exceed 13	
Diatoms %PTV			Should not exceed 20 %	
Diatoms SPI	ZR3: S 16.36638, E 28.84965		Should exceed 13	
Diatoms BDI			Should exceed 13	
Diatom %PTV			Should not exceed 20 %	
Aquatic macroinvertebrates (Sensitivity score)	ZR1: S 16.51631, E 28.76754		Should exceed 14	
Aquatic macroinvertebrates (ASPT)			Should exceed 2	
Aquatic macroinvertebrates (Sensitivity score)	ZR2: S 16.45229, E 28.81691		Should exceed 74	
Aquatic macroinvertebrates (ASPT)			Should exceed 3.9	
Aquatic macroinvertebrates (Sensitivity score)	ZR3: S 16.36638, E 28.84965		Should exceed 41	

Monitoring Type and Parameter	Location/s	Frequency and Duration	Threshold Values	Adaptive Action
Aquatic macroinvertebrates (ASPT)			Should exceed 3.4	Biomonitoring frequency should be increased to 6 weekly if threshold values are not met or when water quality thresholds are exceeded. The frequency can be decreased to quarterly once instream responses have recovered.
Fish (diversity score)	Z1: S 16.51631, E 28.76754		Should exceed 1.28	
Fish (diversity score)	Z2: S 16.45229, E 28.81691		Should exceed 1.68	
Fish (diversity score)	Z3: S 16.36638, E 28.84965		Should exceed 1.84	

11 ESMP Implementation Schedule and Budget

KDRP is expected to take place from 2017 to 2024, followed by continuing operations of Kariba Dam for the project lifetime.

11.1 Implementation Schedule

11.1.1 Mobilisation

Contractors and ZRA will develop and begin implementation of a number of plans prior to, or soon after, the commencement of rehabilitation works. These include:

- Incorporating ESHS requirements in the process of procurement of TS&S Consultant, Plunge Pool Contractor, and Spillway Contractor (completed);
- Detailed design of infrastructural and temporary works, incorporating E&S design measures, by Contractors with TS&S Consultant's review and ZRA approval (completed);
- Establishment of Contractor ESMS and OHS systems and policies, and team (the EHS Unit); and
- Mobilisation of ESHS personnel, the preparation of detailed procedures and Work Method Statements, and training of the workforce.

11.1.2 Rehabilitation

All of the plans and policies set out in Sections 9.3.3 and 9.4.2 will be implemented through the KDRP program by the Contractors and ZRA respectively.

11.1.3 Continuing Operations

During KRDP, ZRA will develop a number of plans for its continued implementation, through the ongoing operations of the Kariba Dam.

11.2 Budget

The estimated costs of developing and implementing the plans outlined in the ESMP during all project phases, which fall under the responsibility of ZRA, are presented in

Table 11.1 below.

The costs of developing and implementing the measures which will fall under the responsibility of the Contractors are not set out here, and are incorporated in the Contractors' tender prices.

Table 11.1 Budget for the Social and Environmental Management (US Dollars)

Item	Unit cost	No.	Total	Note
EHS Unit				
EHS Unit Salaries and professional capacity building	100,000	7	700,000	Annual cost, multiplied by 7 years of KDRP; including salary for GBV specialist
Logistics	25,000	7	175,000	Calculated as 25% of salary cost. To cover EHS Unit car, fuel etc.
Health and Safety Plan for PPE equipment for ZRA staff Training EHS	10,000	7	70,000	
Biodiversity Monitoring	40,000	7	210,000	
-Landscape restoration plan -	25,000	7	175,000	
Covid Prevention plan and other zoonotic diseases	10,000	2	40,000	Tentatively for two years
International capacity building Training in best international practices	25,000	2	50,000	
Panel of Experts				
Environmental and social experts on the panel	20,000	7	140,000	
Resettlement Policy Framework				
No land acquisition anticipated; contingency included below.				
Gender-based Violence Management Plan				
Stakeholder Engagement Plan Development (included below under Community Engagement Plan)				
GBV service mapping	50,000	1	50,000	GBV Action Plan includes 50-100,000
External Gender Specialists for GBV training	500	16	8,000	Consultant with daily rate of USD 500, 16 days
Materials (brochures, posters) for awareness-raising	5,000	7	35,000	Lump sum
Gender Specialist – ongoing advice and monitoring	500	156	78,000	Consultant with daily rate of USD 500, 1 day per week for initial 3 years of project
Social Values Management Plan				
Community Engagement Plan	50,000	1	50,000	Lump sum
Support to training events and preparing local communities for employment opportunities	5,000	7	35,000	
Grievance Management and Incident Reporting Plan				
Awareness-raising materials printing	5,000	7	35,000	
GRM Committee Meetings (Venues, allowances and lunches)	6000	7	42,000	
Grievances verification costs and experts engagement			40,000	
GRM Contigency	10,000	1	10,000	
Tourism Management Plan				
Information boards and materials	50,000	1	50,000	Lump sum
Emergency Preparedness Plan				
EPP preparation internal support team -Community Brigade preparation -Training and knowledge sharing	200,000	1	158,000	Lump sum

HESG Assessment				
HESG Consultants for operation stage assessment	200,000	1	200,000	Lump sum
HESG internal support team	50,000	1	50,000	Lump sum
ZRA Environmental Management Systems				
Auditsudits and logistics	500	140	70,000	Consultant and other Audit cost over 7 years
Contingency			281,400	Contingency of 15% of total
TOTAL			**2,207,400**	

12 Conclusion

ZRA developed (in 2015-2016) the original ESIA-ESMP for the Kariba dam rehabilitation project in accordance to the World Bank and Africa Development Bank Safeguard Policies and the EIA and other environmental regulatory requirements from the government of Zambia and Zimbabwe.

The purpose of the original ESIA report was to:

- Present a detailed baseline review of the physical, biophysical and social characteristics of the Project Area of Influence and surrounds;
- Assess the impacts of the project on the physical, biophysical and social aspects related with the different phases of the proposed Project; and
- Provide mitigation measures and an associated environmental and social management plan to avoid /minimize/mitigate and compensate the severity of identified impacts.

The ESIA process undertaken has identified and assessed a range of potential environmental and social impacts associated with the proposed Kariba Dam Rehabilitation Project; however, provided that the environmental and social mitigation/management measures provided in this ESIA and associated environmental and social management plan are implemented, the majority of these impacts are expected to be prevented and reduced.

Stakeholders were provided the opportunity to provide feedback on the ESIA report. The broad objectives of stakeholder feedback during the ESIA phase were to:

- Present the key social and environmental impacts identified in the ESIA report, and proposed mitigation;
- Involve stakeholders in assessing the efficacy and appropriateness of the proposed mitigation measures;
- Capture stakeholder concerns and opinions on the identified impacts; and
- Identify revisions or additions to the ESIA report where necessary.

On the basis that the mitigation/management commitments provided in the environmental and social management plan are implemented, ZEMA in Zambia and EMA in Zimbabwe gave their authorization of the proposed Kariba Dam Rehabilitation Project.

In October 2020, ZRA underwent a review of the Kariba ESIA-ESMP. The updated ESIA and ESMP (this report) is an update of a three-phase ESIA process undertaken by ZRA with the support of the consultant company ERM Ltd and forms the basis on which the environmental license/approval was issued.

During this update, some of the aspects that were reviewed included: registration of number of workers, enviromental monitoring plans, health and safety, camps management, grievance mechanisms, COVID19 management, communications, remote supervision, among others.

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List of Annexes which are integral part of the ESIA and ESMP of Kariba Dam Rehabilitation Project

Annex A	Administrative and Legal Framework of Zambia and Zimbabwe
Annex B	Consultation Materials and evidence of meetings.
Annex C	IBAT Proximity Report
Annex D	General Requirements
Annex E	Health, Safety, Environmental and Social Requirements included in the ZRA / Contractor contracts
Annex F	Resettlement Policy Framework
Annex G	Covid19 guidance

14 Appendix A – Administrative and Legal Framework of Zambia and Zimmbabwe

14.1 Introduction

This Appendix presents a review of the Zambian and Zimbabwean institutions, and policy and legal framework that may be applicable to the Kariba Dam Rehabilitation Project (KDRP). Specifically, it presents:

- The range of government organizations that may be involved in the regulation of KDRP;
- Zambian and Zimbabwean environmental and social laws and regulations which may be applicable to KDRP; and
- Relevant international treaties, conventions and protocols to which Zambia and/ or Zimbabwe is/are a signatory/ies.

14.1.1 Zambezi River Authority (ZRA)

The Zambezi River Authority (ZRA) is mandated by the governments of Zambia and Zimbabwe to operate and maintain the infrastructure on the Zambezi River.

The ZRA is a statutory body jointly owned by the governments of Zambia and Zimbabwe. The ZRA was established on 1 October 1987 as a result of parallel legislation tabled before the parliaments of the Republics of Zambia and Zimbabwe, which followed the reconstitution of its predecessor, the Central African Power Corporation (CAPCO). Generating assets on the Zambezi River were subsequently handed over to the two national power utilities, the then Zambia Electricity Supply Corporation, now ZESCO Limited (ZESCO) and the then Zimbabwe Electricity Supply Authority now represented by Zimbabwe Power Company (ZPC). The ZRA has responsibility of the operation and maintenance of infrastructure on the Zambezi River (which is common to both Zambia and Zimbabwe), investigation and development of new dam sites on the Zambezi River and collecting, processing, analysing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba.

The ZRA is governed by a Council of Ministers consisting of four members from Zambia and Zimbabwe. The common Ministries in the council are those responsible for Energy and Finance. In terms of the Zambezi River Authority Acts, the Council of Ministers gives direction, through the ZRA Board of Directors, to the ZRA to ensure the most efficient use of the Zambezi River and any other infrastructure developed on it.

The ZRA has the following four main strategic functions, which are outlined in the schedule to the Zambezi River Authority Acts Nos. 17 and 19 of 1987 of Zambia and Zimbabwe, respectively:

1. In consultation with the national electricity undertakings investigate the desirability of constructing new dams on the Zambezi River and make recommendations thereon to the Council;
2. Subject to the approval of the Council, construct, operate, monitor and maintain any other dams on the Zambezi River;
3. Make such recommendations to the Council as will ensure the effective and efficient use of waters and other resources of the Zambezi River; and

4. Submit development plans and programmes to the Council for approval.

14.2 Zambian Institutional Framework

14.2.1 Ministry of Lands, Natural Resources and Environmental Protection

The Ministry of Lands, Natural Resources and Environmental Protection is charged with the critical responsibility of land administration, natural resource management and environmental protection on behalf of the people of Zambia. The following Departments fall under this Ministry:

- Human Resource and Administration;
- Lands and Deeds;
- Lands Department;
- Survey Department;
- Forestry Department; and
- Environment and Natural Resources Management Department (ENRMD).

14.2.1.1 Environment and Natural Resources Management Department

The Environment and Natural Resources Management Department (ENRMD) was established by presidential declaration which merged the then Ministry of Tourism (MOT) and the Ministry of Environment and Natural Resources (MENR) in 2002. It became operational in February 2003 but was not established by an Act of Parliament.

The ENRMD is responsible for the overall policy formulation on environment, natural resources and pollution control in the Ministry which is the focal point for all environmental and natural resource management issues in the country. The department also co-ordinates, monitors and evaluates the operations of the executive agencies that have been created to implement policies on behalf of the government.

The Department of Environment and Natural Resources Management focuses on the achievement of the following six objectives as they relate to issues of the environment and natural resources as outlined in the Strategic Plan (2002 – 2006), which is currently under review):

- To facilitate and promote research and development in environment, wildlife, forestry and cultural heritage in order to increase knowledge and its utilisation;

- To facilitate and monitor the implementation of international agreements and treaties in environment and natural resources in order to promote Zambia's interests and meet international obligations;

- To promote investment in environment and natural resources in order to contribute to employment creation, poverty alleviation and supply of raw materials;

- To facilitate the quality provision of education and training in environment and natural resources in order to contribute to their effective management, sustainable development and utilisation;

- To undertake and facilitate rehabilitation of degraded habitats in order to restore the productivity of Zambian flora and fauna; and

- To promote the effective management of forest, wildlife and heritage resources in order to ensure their sustainable utilisation and contribute to the alleviation of rural poverty.

14.2.1.2 The Zambia Environmental Management Agency

The Zambia Environmental Management Agency (ZEMA) falls under the ENRMD. Accordingly, the ENRMD co-ordinates, monitors and evaluates the operations of ZEMA and is mandated to ensure that the proposed Project is undertaken in a way that it complements the six objectives related to issues of the environment and natural resources as outlined in the Strategic Plan (2002 – 2006).

The Zambia Environmental Management Agency (ZEMA), previously known the Environmental Council of Zambia (ECZ) is the umbrella environmental institution in Zambia and the main lead agency on matters pertaining to environmental impact assessments (EIA). It is empowered by the Environmental Management Act (No. 12 of 2011) to identify projects, plans and policies for which an EIA is necessary.

The general functions of the ZEMA are to ensure the sustainable management of natural resources, the protection of the environment, and the control of pollution, as provided under Section 9(1) of the Environmental Management Act. However, more specifically, the ZEMA serves inter alia to:

- Co-ordinate the implementation of activities of all government ministries, appropriate authorities and conservancy authorities in matters relating to the environment;
- Develop standards and guidelines relating to the protection of air, water, land and other natural resources;
- Provide for environmental monitoring and auditing as well as establishing and managing of the environmental fund;
- Develop and enforce measures aimed at preventing and controlling pollution;
- Advise the government on the formulation of policies on all aspects of the environment and make recommendations for the sustainable management of the environment;
- Advise on all matters relating to environmental conservation, protection and pollution control, including necessary policies, research, investigations and training;
- Initiate, conduct and promote research, surveys, studies, training and investigations in the interests of environmental management;
- Identify projects, plans and policies that need environmental impact assessments;
- Monitor trends with respect to natural resources, their use and impact on the environment and make necessary recommendations to the appropriate authority;
- Undertake general education programmes for the purpose of creating public awareness of the environment;
- Provide for public consultation in environmental decision – making and access to environmental information;

- Request information on proposed projects and advise stakeholders on projects, programmes, plans and policies for which environmental assessment is necessary; and

- Facilitate the implementation of international environmental agreements and conventions to which Zambia is a party.

The services provided by the ZEMA specifically in relation to EIA studies include:

- Assisting the developer to determine the scope of EIA studies;
- Reviewing project briefs, terms of reference, and environmental impact statements (EIS) and decision-making;
- Disclosure of the EIS to the public through the media;
- Holding public hearing meetings to discuss the EIS with stakeholders;
- Conducting verification surveys of the affected environment;
- Monitoring the project once implemented;
- Conducting compliance audits of the project between 12 and 36 months after implementation; and
- General administration of all the Regulations under the Environmental Management Act.

ZEMA has a number of units which control various aspects of environmental pollution planning and environmental management. These have been organised under two departments: the Pollution Control Inspectorate, which is responsible for all pollution and regulation issues pertaining to waste, emissions and toxic substances. This inspectorate also has a dedicated unit responsible for EIAs; and the Planning and Information Management Department, which comprises units in charge of planning, monitoring, education, communication, information, documentation and data management.

14.2.2 Ministry of Mines, Energy and Water Development

The Ministry of Energy and Water Development (MEWD) has been merged with the Ministry of Mines to form a new Ministry of Mines, Energy and Water Development. The Ministry comprises six Departments. The functions of the Department of Energy (DoE) are:

- To develop, articulate and implement a Policy on Energy;
- To formulate programmes for the development of the energy sector;
- To ensure that there are efficient and reliable supplies of energy for socio-economic development;
- To integrate the energy sector into Zambia's national and regional development strategies; and
- To regulate the energy sector through appropriate legislation including the development of new laws and by-laws.

The functions of the Department of Water Affairs (DWA) include the following:

- To oversee and control activities of water resource development and management in order to prevent the indiscriminate consumption of water resources;
- The provision of sufficient and reliable data on water resources availability and demand in the country, to allow for effective planning;
- Utilisation and management of water resources; and
- The development and management of water conservation.

The DWA is comprised of a Groundwater Resources Section, a Surface Water Resources Section and a Water Resources Management Section. The Surface Water Resources Section

and the Water Resources Management Section will have an interest in how the Project will affect surface water flows in the Zambezi River and the effects on current water resource use in the area. These governmental institutions will govern to what extent the current water use system can be altered.

In addition to these two departments, the MMEWD supervises the following statutory/ parastatal bodies: the Energy Regulation Board (ERB); ZESCO Ltd; the Water Resources Management Authority; and the Office for Promoting Private Power Investment (OPPPI).

14.2.2.1 The Energy Regulation Board

The Energy Regulation Board (ERB) has the mandate of regulating the energy sector in line with the provisions of the Energy Regulation Act of 2003. The ERB has the responsibility of ensuring that power generating utilities earn a reasonable rate of return on their investments that is necessary to provide a quality service at affordable prices to the consumer.

In order to carry out this role, the ERB, among other functions, ensures that all energy utilities in the sector are licensed, monitors levels and structures of competition, and investigates and remedies consumer complaints.

14.2.2.2 ZESCO Limited

ZESCO Limited is a parastatal, with the main function of producing power in Zambia, and is the operator of the Kariba North Bank power station. ZESCO produces approximately 80 % of the electricity consumed in the country and has historically been the main player in the generation, transmission and distribution of electricity in Zambia. In addition, ZESCO represents Zambia in the Southern African Power Pool. Due to the ever-increasing demand for electricity both in Zambia and in the region, ZESCO is currently being forced to source more electricity from independent power producers (IPPs) such as Lunsemfwa Hydro Power Company (LHPC).

MEWD, Energy Regulation Board (ERB) and ZESCO Limited are all key stakeholders in KDRP, as it directly concerns the rehabilitation of power generation assets.

14.2.2.3 Water Resources Management Authority

Due to the increase in population, the demand for water for power generation, direct consumption and other uses of water has increased in Zambia. As such, the Water Resources Management Authority was developed in response to these often conflicting demands for water. The Water Resources Management Authority is essentially an executive wing of government which provides necessary information for the control of abstractions from water bodies in Zambia. Any person who wishes to store or divert water from public streams and waterways for primary, secondary, or tertiary use must obtain permission from the Water Resources Management Authority.

The proposed Project has the potential to impact on water quality of the Zambezi River downstream of the excavation works associated with rehabilitation of the plunge pool. Accordingly, the Zambian Water Resources Management Authority were a key stakeholder in the ESIA process.

14.2.3 The Zambia Wildlife Authority

The Zambia Wildlife Authority (ZAWA) is a corporate body established by the Zambia Wildlife Act of 1998. The primary objectives of ZAWA are:

- To improve the quality of life amongst communities in wildlife estates and the maintenance of sustainable biodiversity in national parks and game management areas;
- To reverse the decline in wildlife resources;
- To improve wildlife resource management to a level which will secure a sustainable flow of benefits from such wildlife resources; and
- To considerably improve the wildlife resource base investment in co-operation with the private sector and local communities.

The proposed Project is situated in an area that may be inhabited by faunal species and flora species of concern. Furthermore, the areas downstream of the dam up to the Mozambique border consist of National Parks and extensive transfrontier conservation areas. Accordingly, the Zambian Wildlife Authority is regarded as a key stakeholder and was consulted during the ESIA process.

14.2.4 The National Heritage Conservation Commission

The National Heritage Conservation Commission (NHCC), formally known as the Commission for the Preservation of Natural and Historical Monuments and relics (National Monuments Commission), is the national institution mandated to manage and conserve Zambia's cultural and natural heritage resources, including significant: historic/architectural/buildings; historic sites; anthropological sites; archaeological sites; geomorphological sites; geophysical sites; paleontological sites; and ecological and other sites.

14.2.4.1 The National Museum Board

The National Museum Board of Zambia (NMB) is a corporate body which has the principal role of preserving the nation's history and movable heritage. The Board is mandated to collect, document, present to the public and to preserve for posterity Zambia's movable heritage.

Although it is not anticipated that there are any cultural heritage sites located in the Project Area, there may be sub-surface archaeological resources that could fall within the footprints of proposed ground disturbing activities. Accordingly, the National Museum Board was considered a stakeholder in the ESIA process.

14.2.5 Ministry of Tourism and Arts

The Ministry of Tourism and Arts was created in 2011. This brought together the portfolio functions of tourism from former Ministry of Foreign Affairs and Tourism and the portfolio functions of Culture from the Ministry of Chiefs and Traditional Affairs. This was done in order to streamline and rationalise the functions and operations of the tourism and cultural sector.

The Kariba Dam is a key tourism area and international visitors are attracted to the water body and the surrounding rural/natural environment for a variety of activities, including - safaris, boating, fishing, sunset cruises, canoeing, water sports, bird watching, cultural village tours and visiting look-out points. Accordingly, the Ministry of Tourism and Arts is regarded as a key stakeholder and was consulted during the ESIA process.

14.2.6 Other Line Ministries

Environmental and social issues cut across a wide variety of sectors and there are a number of government institutions and agencies which are involved in environmental and social management. Some of the ministries, sectorial agencies and authorities that may also need to

be consulted as part of the Project are: Ministry of Agriculture and Livestock; Ministry of Health; Ministry of Education, Science and Vocational Training; and Ministry of Local Government and Housing.

14.3 Zambian Environmental and Social Laws and Regulations

Table 14.1 presents a summary of the Zambian national legislation that is considered applicable to KDRP.

14.3.1 National Policy on Environment (November 2007)

The Government of the Republic of Zambia has developed a National Policy on Environment to avoid conflict of interest, harmonise sectorial strategies, and rationalise legislation that concerns the use and management of environment. The purpose of this policy is to attain an integrated approach to development through a national cross-cutting consensus. This Policy was developed through a research and consultative process and will be fully integrated in principles of decentralisation, community participation and privatisation that underpin sustainable development.

Section 7.1.4.2 of the Policy states that EIAs are (where deemed necessary) required to ensure that public and private sector development options are environmentally-sound and sustainable and that any environmental consequences are recognised early and taken into account in project design and implementation.

In this respect, and to fulfil the requirements of the Policy, the ZRA contracted ERM to carry out a detailed ESIA for the proposed Project. The ESIA was carried out in conformance to both the Zambian and Zimbabwean environmental legislation and other international requirements.

14.3.2 The Zambian Environmental Management Act

The Zambian Environmental Management Act (EMA) (Act 12 of 2011) is the principal law on integrated environmental management in Zambia. The Zambian EMA was enacted in April 2011 to repeal and replace the Environmental Protection and Pollution Control Act (EPCCA) (CAP 204) and its Amendments.

Section 4 mentions that every person living in Zambia has the right to a clean, safe and healthy environment and should a person is threatened or is likely to be threatened as a result of an act or omission of any other person, bring an action against the person whose act or omission is likely to cause harm to human health or the environment. Moreover, Section 5 states that every person has a duty to safeguard and enhance the environment. Part IV (Division 1) contains provisions for pollution control including protection of the atmosphere (Section 31), environmental emergency preparedness (Section 41) and regulations around pollution control (Section 43).

Division 2, Sections 45 to 48 of the Act make considerations for water resources. More specifically, Section 46 states that a person shall not discharge or apply any poisonous, toxic, eco-toxic, obnoxious or obstructing matter, radiation or other pollutant, or permit any person to dump or discharge such matter or pollutant into the aquatic environment in contravention of water pollution control standards.

Section 52 of Division 3 (Part IV) of the Act states that ambient air quality standards and guidelines shall be established under this Division and published. Section 68 of Division 6 (Part IV) of the Act states that person shall not emit noise in excess of the noise emission standards established. Section 77 (2) of Division 8 of the Act states that no person shall place

any invasive alien species into any element or segment of the environment. Moreover, Section 78 states that an occupier of any land shall take such measures as are prescribed and are reasonably necessary for the eradication or prevention of the spread of invasive alien species.

14.3.3 Environmental Impact Assessment Regulations

The Environmental Impact Assessment (EIA) Regulations, which provide the framework for conducting and reviewing environmental impact assessments for any project, fall under the EPPCA (Statutory Instruments No. 28 of 1997). The Regulations enacted under the EPPCA are still in force until the Minister enacts new Regulations under the Zambian EMA (Act, No 12 of 2011). The EIA process to be undertaken for this Project is illustrated in Figure 14.1 below.

14.3.4 The Environmental Management (Licensing) Regulations, S.I. No. 112 of 2013

The Environmental Management (Licensing) Regulations were published under the Zambian EMA and provide for licensing requirements pertaining to specific subject areas, including:

- Air and water pollution;
- Waste management;
- Hazardous waste;
- Pesticides and toxic substances; and
- Ozone depleting substances.

The Environmental Management (Licensing) Regulations have provided for the repeal of the following legislation:

- The Waste Management (Licensing of Transporters of Wastes and Waste Disposal Sites) Regulations, S.I. No. 71 of 1993;
- The Water Pollution Control (Effluent and Waste Water) Regulations, S.I. No. 72 of 1993;
- The Pesticides and Toxic Substances Regulations, S.I. No. 20 of 1994;
- The Air Pollution Control (Licensing and Emission Standards) Regulations, S.I. No. 141 of 1996;
- The Environmental protection and Control (Ozone Depleting Substances) Regulations, S.I. No. 27 of 2001; and
- The Hazardous Waste Management Regulations, S.I. No. 125 of 2001.

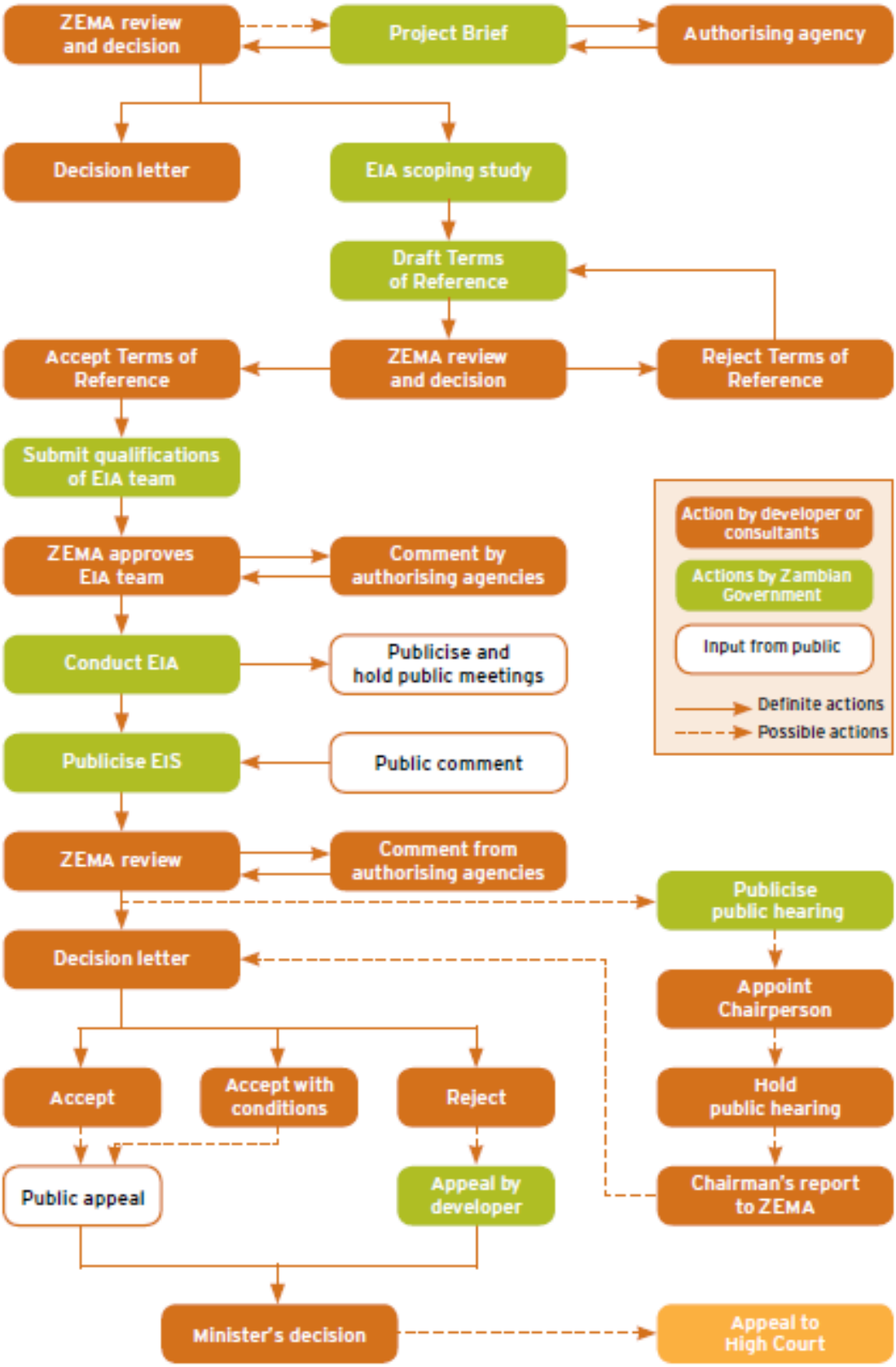


Figure 14.1 Zambian ESIA Process
Source: SADC Environmental Legislation Handbook 2012

The Regulations were published under the Zambian EMA and provide for licensing and management requirements for:

- Air Pollution Monitoring Permits – under the Air Pollution Control (Licensing and Emission Standards) Regulations, 1996;
- Water Effluent Discharge Permits – under the Water Pollution Control (Effluent and Wastewater) Regulations, 1993;
- Waste Management Licenses – under the Waste Management (Transporters of Waste/Operation of Waste Disposal Sites) Regulations, 1993 Hazardous Waste Management Regulations, 2001; and
- Pesticides and Toxic Substances Licences – under the Pesticides and Toxic Substances Regulations, 1994.

The applicability of these specific permits/licenses will need to be considered as Part of final Project Design.

Table 14.1 Summary of Relevant Zambian Environmental and Social Legislation

Component	Applicable Legislative Instrument	Description of Legislative Instrument
		Natural Resources and Heritage
Water Resources	• Water Resources Management Act, No 21 of 2011	Part V (Water Quantity and Quality Management), Section 46 mentions that discharge into a water resource shall be done in accordance with the Environmental Management Act, 2011. According to Section 71 (activities where water permits may be required), a person who intends to carry out activities identified in this Section shall apply for a permit and pay such charges, for the use of the water, as may be prescribed. It is the understanding of this process that a water permit will not be necessary for this Project. In accordance to Section 149 (Part XIV), all significant spills to a water course must be reported to the police, appropriate authorities (including conservation authorities), catchment council and local authority. Such management measures have been considered in this ESIA and associated ESMP, particularly to the Zambezi River downstream of Kariba Dam.
Wildlife and Natural Resources	• Zambia Wildlife Act, No. 12 of 1998	Part VI (Game Animals and protected Animals) includes provisions for game and protected animals. More specifically Section 31 of Part VI states that any person who hunts any game or protected animal, except under or in accordance with the conditions of a valid license issued under Part VII of this Act, shall be guilty of an offence. This is further reiterated in Section 67 of the Act. Notwithstanding anything of the contrary of the Act, Section 78 of Part IX states that a person may kill any wild animal in defence of himself or in defence of any other person if it is necessary – provided that nothing in the Act shall exonerate any person, who at the time of killing any wild animal in self-defence or in defence of any other person, was committing an offence under the Act. Should such a kill take place, the person who killed the animal shall, within a period of forty eight hours, make a report of the facts to the nearest proper officer. In accordance with Section 80 of the Act, any person who kills any game animal or protected species through accident or error shall within a period of fourteen days make a report of the act to nearest proper officer. As the Kariba Dam Rehabilitation Project will be in relatively close proximity to Protected Areas, management/mitigation commitments for the protection of terrestrial fauna will need to be considered in the ESIA and associated ESMP.
Fisheries and Wetlands	• National Policy on Wetlands Conservation, September 2001	This Policy was formulated in response to the fragmented sectoral policies and Acts. It aims to provide a holistic programme of action to promote the conservation and wise use of wetland ecosystems. It acknowledges the importance of wetland ecosystems in Zambia in providing major fisheries and as important habitats for various wildlife species. The management of surface water quality, aquatic environments (including aquatic vegetation) and terrestrial ecology (including fauna utilising wetland habits) is provided in the ESMP. This ESIA has considered the provisions of this National Policy.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
Noise & Vibration	• Part IV of EMA,No.12 of 2011	Section 68 of Division 6 (Part IV) of the Act states that person shall not emit noise in excess of the noise emission standards established.
Explosives	• Explosives Act (No 10 of 1974) Regulations are in draft stage.	Section 3 of the Act states that the Act shall apply (amongst others) to the, storage, use, possession and transportation of explosives. Part I of the Act provides general measures for the storage, handling and use of explosives. Part III includes provisions for the transportation of explosives by waterway, road, rail or air; and Part IV includes provisions for the transportation of explosives around the work site. Part V includes provisions for the storage of explosives at the work site and Part VIII includes requirements for the use of explosives. Blasting management measures are provided for in the ESMP. The development of these measures and detailed design around blasting management for the Kariba Dam Rehabilitation Project has and will take these requirements into consideration.
Energy		
Energy	• Energy Regulation Act, Cap 436, 1995	Provides for the control in the pricing of energy products in the country as well as the quality.
	• The Petroleum Act, (No. 8 of 1995)	The areas of the Petroleum Act of relevance to this project are regulations for the conveyance and storage of petroleum, inflammable oil and liquids.
	• The Electricity Act, 1995	Regulate the transmission, distribution and supply of electricity.
Socioeconomic, Archeology and Cultural Heritage		

Component	Applicable Legislative Instrument	Description of Legislative Instrument
Health	• Factories Act (Chapter 441 of the Laws of Zambia) (as amended by Statutory Instrument (S.I.) No. 165 of 1989, No. 75 of 1990, and Act No. 13 of 1994).	The Factories Act is intended to make further and improved provision for the regulation of the conditions of employment and regards the safety, health and welfare of persons employed therein. Part V (Health: General Provisions) of the Act includes provisions around cleanliness, overcrowding, ventilation, lighting and sanitary requirements for employees and Part VI (Safety: General Provisions) includes provisions for the use of machinery, training, facilities, precautions for the use of explosives, emergency drill training requirements for employees. Moreover, Part IX includes provisions for the welfare of employees, including provisions for drinking water, washing facilities, accommodation and change rooms, first aid and resting facilities. Section 71 of Part X includes requirements for provision of Personal Protective Equipment (PPE) and additional health and safety and welfare measures. The ESIA and associated ESMP has considered and made provision for worker health and safety. Moreover, the ESIA has considered the provisions included in this Act.
Archaeological, Historical and Cultural	• National Heritage and Conservation Act, 1989	Part V of this Act (Conservation of Heritage) states that (Section 35) any person who wishes to destroy, demolish, alter or remove from its original site any monument, relic or ancient heritage shall apply for permission to the Commission. Moreover, Section 37 states that any person who desires to excavate any ancient heritage or collect relics shall apply to the Commission for permission. In accordance with Section 42, any person who discovers a potential ancient heritage or relic shall report the find to the commissions and suspend operations in the immediate vicinity to the discovery. The ESMP presents the Cultural and Heritage Management Plan including a Chance Find Procedure, which has considered the provisions of this Act.
Roads and Land Use Planning		
Roads	• Roads and Road Traffic Act (Cap 464)	Part III and IV of this Act include provisions for the registration and licensing of motor vehicles and trailers. Such provisions include ownership details, vehicle/trailer specifications, etc. Moreover, Part V includes the requirements for the licensing of drivers of motor vehicles and Part VII includes the provisions for third part insurance. The Act stipulates that no person shall drive a motor vehicle on a road unless he is the holder of a valid licence issued to him in respect of motor vehicles of the class concerned. The Act provides the minimum age limits associated with driving of vehicles on roads. Part VI includes the provisions for motor vehicle insurance against third party. Part XI includes the provisions for road safety and driving offences (speed limits, reckless driving, driving under the influence, driving behaviors, vehicle emissions, littering etc.).

Component	Applicable Legislative Instrument	Description of Legislative Instrument
		The ESIA and ESMP presents Road Safety Management and Traffic and Transport Management measures. The provisions of this Act have been included in these measures.
Land use planning issues	• Town and Country Planning Act, Cap 283, 1962, as amended.	Provides for the appointment of planning authorities whose main responsibilities are the preparation, approval and revocation of development plans. It also provides for the control of development and subdivision of land.
	• Lands Conversion of Titles Act	Provides for alienation, transfer, disposition and charge of land.
	• Lands and Deeds Registry Act, Cap 174	An Act to provide for the registration of documents; to provide for the issue of Provisional Certificates of Title and Certificates of Title; to provide for the transfer and transmission of registered land; and to provide for matters incidental to or connected with the foregoing.
	• Lands Act, Cap 173, 1995	The Act guarantees peoples' right to land while enhancing development. The Act recognizes the holding of land under customary tenure and the Chief's role has been legally recognised, such that land cannot be converted or alienated without approval of the chief.
	• Land Acquisition Act No. 2 of 1970	The Act sets out regulations for compulsory acquisition of land and property and compensation for such acquisition.
	• Agricultural Lands Act No. 57 of 1960	Provides for the establishment of the Agricultural Lands Board and provides for tenant farming schemes.
	• The Local Government Act, No 13 of 2010	Provides for the establishment of Councils or Districts, the functions of local authorities and the local government system. Some of these functions relate to pollution control and the protection of the environment in general.
Mining Regulations		
Quarries and Borrow Pits	• Mines and Minerals Development Act, 2008	Regulates the law relating to mines and minerals. The Act provides for the granting of or, renewal and termination of mining rights. It also provides for the control of mining activities with regard to environmental protection.
Investments, Energy Regulation, and Development		
Tourism	• Tourism and Hospitality Act, No 23 of 2007	Provides for the promotion of tourism activities both locally and internationally.
Investment and Taxes	• Public – Private Partnership Act, No 14 of 2009	Provides for the encouragement of private sectors partnering with the government in the development and execution of certain nationally important projects
	• Zambia Development Agency Act No 11 of 2006	An Act to foster economic growth and development by promoting trade and investment in Zambia through an efficient, effective and coordinated private sector led economic development Strategy.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
	• The Zambia Revenue Authority Act (No. 28 of 1993 and all amendments);	The Acts provides for the taxation system in Zambia for various goods and services.
	• Investment Act of 1998	Provides a legal framework for investment in Zambia. The Act relates to the environment by encouraging investment that is not detriment to the environment.
	• Standards Act, Cap 416	Provides for the adherence to prescribed standards in all works.
Employment and Compensation	• Citizens Economic Empowerment Act No 9 of 2006	Provides for the encouragement and support of citizens of Zambia to get involved in business activities for wealth creation and support of livelihoods. More specifically, Part II of the Act provides measures for economic empowerment including (amongst others) the prohibition of discrimination, skills development, education and training, preferential procurement, regional development, codes of good practice and mechanisms for measuring progress. The ESIA and ESMP provide measures to ensure that the Kariba Dam Rehabilitation Project provides opportunities to Zambian citizens.
	• The Employment Act Cap 268	Provide for the employment of persons on contracts of service and for the form of and enforcement of contracts of service, appointment of officers of the Labour Department and for the conferring of powers on such officers and upon medical officers and protection of wages of employees as well as control of employment agencies.
	• Compensation Act (No 10 of 1999)	Provides for the establishment and administration of a Fund for the compensation of Workers disabled by accidents to, or diseases contracted by, such Workers in the course of their employment, and for the payment of compensation to dependants of Workers who die as a result of such accidents or diseases.

14.4 Zambian Development Policies

The national development policies for Zambia that are of applicability to this Project are briefly outlined below.

14.4.1 Zambia Vision 2030

Vision 2030 expresses Zambia's aspirations in respect of economic growth, good governance and developing its people. One key basic principle of Vision 2030 is sustainable development. The vision is supported by key goals to ensure that by the year 2030:

- Zambia's rural and urban population has universal access to clean, reliable and affordable energy by the use of alternative, renewable energy sources such as hydropower.
- There is an upgrade of existing and construction of new infrastructure by developing and implementing private- public partnerships with both local and international industries.
- Zambia's biodiversity is protected in numerous national parks and local forest reserves. There is maintenance of a productive environment and well conserved natural resources to facilitate sustainable socio-economic development.
- There is effective utilisation of fresh water resources for a variety of purposes whilst maintaining the quality of the source.

14.4.2 Sixth National Development Plan: 2011 – 2015

The Sixth National Development Plan (SNDP) aims to materialise the aspirations of the Vision 2030. The objectives of the SNDP are: infrastructure development; economic growth and diversification; rural investment; and poverty reduction and the enhancement of human development.

The SNDP contains sector plans that aim to assist in achieving these objectives. The sector plans most relevant to the Project and their objectives are summarised below.

14.4.2.1 Energy Sector Plan

- To increase electricity generation capacity by at least 1,000MW and build appropriate transmission lines.
- To increase electrification levels in rural areas of Zambia to 15 %, particularly in the Central Province.
- To expand the use of renewable and alternative energy in the country's energy mix.
- To reduce greenhouse gas emissions from the energy sector and strengthen adaptation and resilience to climate change related stresses.

14.4.2.2 Water Sector Plan

- To achieve sustainable water resource development for social and economic development.
- To develop innovative approaches and appropriate technologies for the effective management of the nation's water resources.

14.4.3 Southern Province Regional Development Plan: 2011 - 2015

The Southern Province Regional Development Plan (as set out within the SNDP) provides for a variety of sector specific strategies and programmes to be achieved in the SNDP period. The objectives of some of these strategies and programmes applicable to the Project include:

- Infrastructure development for the movement of goods and services;
- Connecting rural areas to electricity power supply; and
- Expanding and improving infrastructure for electricity generation, transmission and distribution.

14.4.4 Energy White Paper (February 2010)

A national energy study was implemented by Chubu Electric Power Co., Inc. from November 2008 to February 2010, in order to formulate a countrywide power system development master plan. The study was undertaken cooperatively with the Zambian Ministry of Energy and Water Development.

The objectives of the study were to inform the Power System Development Master Plan until 2030, coordinating generation, transmission, and an interconnection plan for the stabilization of the power supply for Zambia and the southern African community. In addition to this, the study was intended to transfer technical skills.

14.5 International Treaties, Conventions and Protocols

Zambia is signatory to a number of international conventions and agreements relating to industry, environmental management and energy. In certain cases these have influenced policy, guidelines and regulations. These conventions must be complied with during the planning, construction and operations phases of the proposed development.

Table 14.2 lists the relevant international conventions and protocols to which Zambia or Zimbabwe is a signatory.

Table 14.2 Ratification of International Conventions

Name of Convention	Date of enactment and status
Protocol on Shared Watercourses in the Southern African Development Community (SADC) The overall objective of this Protocol is to foster closer cooperation for judicious, sustainable and co-ordinated management, protection and utilisation of shared watercourses and advance the SADC agenda of regional integration and poverty alleviation.	07/08/2000
The Basel Convention on Trans-boundary Movement of Hazardous Waste The Basel Convention governs the generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import and trans-boundary movement of hazardous waste.	Zambia: 15/11/1994 (Accession) Zimbabwe: 01/03/2012 (Accession)
Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa The Bamako Convention uses a format and language similar to that of the Basel Convention, but is much stronger in prohibiting all imports of hazardous waste. Additionally, it does not make exceptions on certain hazardous wastes (like those for radioactive materials) made by the Basel Convention.	Zambia: 03/08/2005 (signed) Zimbabwe: 10/07/1992 (ratified)
The Convention Concerning the Protection of the World's Cultural and Natural Heritage The Convention provides for the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage which are of outstanding universal value from the point of view of history, art or science.	Zambia: 04/06/1984 (ratified) Zimbabwe: 16/08/1982 (ratified)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (**CITES**) CITES is an international agreement between governments to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	**Zambia: 24/11/1980 (ratified)** **Zimbabwe: 19/05/1981 (ratified)**

Name of Convention	Date of enactment and status
International Union for the Conservation of Nature and Natural Resources (IUCN) Encourages the preservation of wildlife, natural environments, and living resources and promotes research in the preservation of threatened species, ecology, sustainable development, and environmental law, education, and training.	Zambia: member Zimbabwe: member
African Convention on the Conservation of Nature and Natural Resources Recognises the need to contribute to the conservation of nature and natural resources at a continent level.	Zambia: signatory Zimbabwe: signatory
United Nation Convention to Combat Desertification (UNCCD) Recognises the need to control any form of desertification that may arise as a result of anthropogenic activities. The statutes of the UNCCD, encourages the control of desertification as a result of man's activities.	Zambia: 19/09/1996 (ratified) Zimbabwe: 1997 (ratified)
United Nations Framework Convention on Climate Change (UNFCCC) UNFCCC is an international agreement for the control of climate change.	Zambia: 28 May 1993 (ratified) Zimbabwe: 3/10/1992 (ratified)
The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) An international treaty that sets binding obligations on industrialized countries to reduce emissions of greenhouse gases. The UNFCCC is an environmental treaty with the goal of preventing dangerous anthropogenic (i.e., human-induced) interference of the climate system.	Zambia: 07/07/2006 (ratified) Zimbabwe: 30/06/2009 (ratified)
Convention concerning the Abolition of Forced Labour, 1957 (ILO) Cancels certain forms of forced labour still allowed under the Forced Labour Convention of 1930, such as punishment for strikes and as a punishment for holding certain political views.	Zambia: 22/02/1965 (ratified) Zimbabwe: 27/08/1998 (ratified)
Convention concerning Discrimination in Respect of Employment and Occupation or Discrimination (Employment and Occupation) Convention (ILO) The convention requires states to enable legislation which prohibits all discrimination and exclusion on any basis including of race or colour, sex, religion, political opinion, national or social origin in employment and repeal legislation that is not based on equal opportunities.	Zambia: 23/10/1979 (ratified) Zimbabwe: 23/06/1999 (ratified)
African Charter on Human and Peoples' Rights Is an international human rights instrument that is intended to promote and protect human rights and basic freedoms in the African continent.	Zambia: 10/01/1984 (ratified) Zimbabwe: 30/05/1986 (ratified)
Convention Concerning the Protection of Workers against Occupational Hazards in Working Environments due to Air Pollution and Noise Vibrations Recognises the need to protect workers against hazards in working environments.	Zambia: 19/08/ 1980 (ratified) Zimbabwe: not a member
Agreement on Co-operative Enforcement Operations directed at Illegal Trade in Wild Fauna and Flora The objective of this Agreement is to reduce and ultimately eliminate illegal trade in wild fauna and flora and to establish a permanent Task Force for this purpose.	Zambia: 9/11/1995 (ratified) Zimbabwe: not a member
Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System Is an agreement aiming to develop regional co-operation on environmentally sound water resources management of the common Zambezi river system and to strengthen regional co-operation for sustainable development.	Zambia: 28/05/1987 (ratified) Zimbabwe: 28/05/1987 (ratified)
Constitution of the International Labour Organisation A constitution detailing conditions and standards for acceptable labour practices.	Zambia: (ratified) Zimbabwe: (ratified)
Convention on Biological Diversity The Convention has three main objectives; the conservation of biological diversity, the sustainable use of the components of biological diversity and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Zambia: (ratified) Zimbabwe: (ratified)

Name of Convention	Date of enactment and status
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar) An international treaty for the conservation and sustainable utilization of wetlands. The treaty recognizes the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.	Zambia: (ratified) Zimbabwe: (ratified)
International Plant Protection Convection Is an international agreement on plant health which aims to protect cultivated and wild plants by preventing the introduction and spread of pests.	Zambia: (ratified) Zimbabwe: not a member
Statutes of the International Centre for the Study of the Preservation and restoration of Cultural Property Intergovernmental organisation dedicated to the conservation of cultural heritage. It has a worldwide mandate to promote the conservation of all types of cultural heritage, both movable and immovable.	Zambia: not a member Zimbabwe: ratified
Statutes of the International Union for Conservation of Nature and Natural Resources (as amended) Intergovernmental organisation with the objective to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.	Zambia: not a member Zimbabwe: ratified

14.6 Zimbabwean Institutional Framework

14.6.1 Ministry of Environment, Water and Climate

The ministry with overall responsibility for environmental management in Zimbabwe is the Ministry of Environment, Water and Climate, formerly known as the Ministry of Environment and Natural Resource Management, and the Ministry of Mines, Environment and Tourism. As per the Zimbabwean Environmental Management Act (Chapter 20:27) the general functions of the Minister of Environment, Water and Climate are to:

- Regulate the management of the environment and promote, coordinate and monitor the protection of the environment and the control of pollution.
- Regulate the activities of all government agencies and other agencies in terms of their impact on the environment.
- Present to Parliament a report on the state of the environment every five years.
- Monitor the environment, trends in the utilisation of natural resources, and the impact of such utilisation on the environment.
- Coordinate the promotion of public awareness and education on environmental management.
- Ensure that persons and institutions responsible for causing environmental harm meet the cost of remedying that harm.
- Formulate policies for environmental management and facilitate their implementation.
- Recommend to the government which international and regional conventions and treaties on the environment Zimbabwe should become a party to, and secure their incorporation into domestic law.

Environmental management is regulated by three related agencies in the Ministry of Environment, Water and Climate, namely the National Environmental Council (NEC), the Environmental Management Agency (EMA) and the Environmental Management Board (EMB).

14.6.1.1 National Environmental Council (NEC)

The functions of the NEC are to:

- Give advice on policy formulation and provide directions on the implementation of the Zimbabwean EMA.
- Give advice on national goals and objectives for the protection of the environment.
- Promote cooperation among public departments, local authorities, the private sector, non-governmental organisations and other organisations that deal with environmental issues.
- Review and recommend to the Minister guidelines for environmental management plans and environmental action plans.
- Review national environmental policies, plans and strategies.

14.6.1.2 Environmental Management Agency

The Environmental Management Act of 2002 (Chapter 20:27) provides for the establishment of the Zimbabwean Environmental Management Agency (EMA), formerly known as the Department for Natural Resources. The Agency is responsible for:

- Formulating quality standards on air, water, soil, noise, vibration, radiation and waste management.
- Assisting and participating in any matters pertaining to the management of the environment, such as:
- Developing guidelines for National Plans, environmental management plans and local environmental action plans;
- Regulating and monitoring the collection, disposal, treatment and recycling of waste;
- Monitoring and regulating the discharge or emission of pollutants or hazardous substances into the environment;
- Keeping records in the form of registers of all licences and permits issued under the law;
- Monitoring and regulating the control of invasive alien species;
- Regulating, monitoring, reviewing and approving EIAs;
- Regulating and monitoring the management and utilisation of ecologically fragile ecosystems;
- Making bylaws within the jurisdiction of local authorities;
- Advising government on conventions and treaties that should be incorporated into national law;
- Coordinating the production of a five-year environmental report;
- Developing and implementing incentives for the protection of the environment;
- Carrying out periodic environmental audits of any projects, including projects whose implementation started before a fixed date, to ensure that their implementation complies with the requirements of the Act;
- Regulating and monitoring access by any person to biological and genetic resources; and
- Making recommendations to the Minister on the formulation of any regulations.

The Zimbabwean Environmental Management Agency (EMA) falls under the Ministry of Environment, Water and Climate. The Ministry of Environment, Water and Climate regulates the activities of the EMA and regulates management and protection of the environment and control of pollution. Accordingly, the Ministry of Environment, Water and Climate and the EMA are mandated to ensure that the proposed Project is undertaken in a way that complements Chapter 20:27 of the Zimbabwean Environmental Management Act.

14.6.1.3 Environment Management Board

The Zimbabwean EMA is controlled and managed by the Environment Management Board (EMB), which is composed of experts from the areas of environmental planning and management, environmental economics, ecology, pollution, waste management, soil science, hazardous substances, water and sanitation. In addition, there is a legal representative and a secretary to the Ministry responsible for the environment.

14.6.2 Department of Water

The Department of Water within the Ministry is responsible for the oversight of the water sector. The functions of the Ministry include:

- Formulate and implement sustainable policies on the development, utilization and management of water resources in cooperation with user communities and institutions.
- Design, construct and maintain medium to large size dams and water supplies to satisfy present and future domestic, industrial and mining water requirements.
- Provide clear/treated water for urban areas in consultation with the Ministry of Local Government, Public Works and Urban Development.
- Design, construct and maintain dams, weirs and boreholes to meet present and future irrigation requirements.
- Take responsibility for the overall/national planning, management, regulation and standardisation of irrigation development and adoption of appropriate technology.
- Design, construct, maintain and manage irrigation schemes and projects.
- Develop sustainable underground water resources in consultation with the Ministry of Rural Housing and Social Amenities.
- Manage the water resources of the country (water in rivers, dams and ground water).
- Set tariffs for raw water, treated water and irrigation water in consultation with other line ministries, consumers and stakeholders.
- Manage and administer the Water Fund through the Zimbabwe National Water Authority.
- Administer the District Development Fund.
- Administer the Rural Capital Development Fund.
- Participate in the development and implementation of SADC and other regional and international organisations' water resources management frameworks.

14.6.3 The Zimbabwe National Water Authority (ZINWA)

ZINWA is a parastatal, which acts as an operator and a regulator. ZINWA is responsible for the following functions at the national level:

- Water planning and implementation;
- Management of public dams;
- Supply of bulk water to the agriculture, industrial and mining sectors;
- Supply of bulk water to urban centres; and
- Coordination and supervision of the seven catchment councils.

ZINWA is responsible for water supply to urban centres, while the municipalities supply water to smaller urban settlements. Rural water supply and sanitation is coordinated by the National Action Committee for Water and Sanitation, which is an inter-ministerial committee chaired by the Minister of Local Government. Separating rural and urban domestic water supply into different ministries was identified by SADC (2003a) as leading to the rural water supply perspectives being isolated from the national water program.

The seven Catchment Councils (Gwayi, Manyame, Save, Runde, Mazowe, Sanyati and Mzingwane) established under the Zimbabwe National Water Authority Act are responsible for all aspects of water management within their responsive catchment areas. The Catchment Managers are employees of ZINWA, and not employed by the Catchment Council, which hinders the devolution of authority. Sub-Catchment Councils are under Catchment Councils and Water User Boards are the lowest tier.

KDRP has the potential to impact on water quality of the Zambezi River downstream of the excavation works associated with rehabilitation of the plunge pool. Accordingly, the

Zimbabwean Department of Water and the Zimbabwean National Water Authority (ZINWA) were considered as key stakeholders in the ESIA process.

14.6.4 Ministry of Energy and Power Development

The Ministry is the administering authority in regards to energy and power development in Zimbabwe. The Ministry comprises the following departments: Petroleum; Power Development; Policy and Planning; Energy Conservation and Renewable Energy; Finance Human Resources and Administration; Legal Services; and Internal Audit.

14.6.4.1 The Power Development Department

The Power Development Department is one of the technical departments of the Ministry. Its main role is to facilitate the improvement of availability of electricity to the populace, as well as the attainment of self-sufficiency in electricity generation. The achievement of the strategic goals is centred on the effective administration of the utilities under the Department's purview namely ZESA Holdings (Pvt) Ltd and its subsidiaries: Zimbabwe Power Company (ZPC), Zimbabwe Electricity Transmission and Distribution Company (ZETDC), ZESA Enterprises (ZENT); the Rural Electrification Agency (REA); Zimbabwe Electricity Regulatory Commission (ZERC) and Zambezi River Authority (ZRA) which is a bilateral body owned by Zimbabwe and Zambia.

14.6.5 The Zimbabwe Energy Regulatory Authority (ZERA)

ZERA was created in September 2011 following the promulgation of the Energy Regulatory Act (Chapter 13:23). Its primary mandate is to regulate the Energy Sector in Zimbabwe. The functions of ZERA include:

- Regulatory and Licensing:
    - To regulate the procurement, production, transportation, transmission, distribution, importation and exportation of energy derived from any energy source.
    - To exercise licensing and regulatory functions in respect of the energy industry.
    - To ensure that prices charged by licensees are fair to consumers in the light of the need for prices to be sufficient to allow licensees to finance their activities and obtain reasonable earnings for their efficient operation.
    - To establish or approve operating codes for safety, security, reliability, quality standards and any other sector related codes and standards for the energy industry or any sector thereof.
    - To maintain and promote effective competition within the energy industry.
- Research and development:
    - To promote and encourage the expansion of the energy industry and the advancement of technology relating thereto.
    - To promote, identify and encourage the employment and development of sources of renewable energy.
    - To undertake such other thing which it considers is necessary or convenient for the better carrying out of or giving effect to the functions of the Authority.
    - To increase access and security of supply:
    - To promote the procurement, production, transportation, transmission and distribution of energy in accordance with public demand and recognised international standards.
    - To ensure the maximisation of access to energy by all consumers that is affordable and environmentally sustainable.
    - To create, promote and preserve an efficient energy industry market for the provision of sufficient energy for domestic and industrial use.

    - To promote coordination and integration in the importation, exportation and pooling of energy from any energy source in the SADC and COMESA region.
- Energy efficiency and environmental protection:
    - To advise and educate consumers and licensees regarding the efficient use of energy.
    - To assess, promote studies of and advise the Minister and licensees on the environmental impact of energy projects before licensing.
- Key stakeholder advisory role:
    - To advise the Minister on all matters relating to the energy industry.
    - To establish appropriate consumer rights and obligations regarding the provision of energy services.
    - To arbitrate and mediate disputes among and between licensees and consumers.
    - To represent Zimbabwe internationally in matters relating to the energy industry.

KDRP directly concerns the maintenance of power generation facilities, and therefore the Ministry of Energy and Power Development and associated Power Development Department and Zimbabwe Energy Regulatory Authority were considered as key stakeholders in the ESIA process.

14.6.6 National Museums and Monuments of Zimbabwe (NMMZ)

NMMZ is Zimbabwe's premier heritage organization established under the National Museums and Monuments of Rhodesia Act, 1972 which is now called the National Museums and Monuments Act (Chapter 25:11). NMMZ is a Parastatal, funded through grant by Central Government and falling under the Ministry of Home Affairs. The Act established a Board of Trustees to provide for the establishment and administration of museums' and to provide for the preservation of ancient, historical and natural monuments, relics and other objects of historical or scientific value or interest.

Although it is not anticipated that there are any cultural heritage sites located in the Project Area, there may be sub-surface archaeological resources that could fall within the footprints of proposed ground disturbing activities. Accordingly, the National Museum and Monuments of Zimbabwe (NMMZ) was considered a key stakeholder in the ESIA process.

14.6.7 Other Line Ministries:

A number of other Ministries may have interests in KDRP, and were considered as key stakeholders in the ESIA process:

- Ministry of Lands and Rural Resettlement
- Ministry of Industry and Commerce;
- Ministry of Health and Child Care;
- Ministry of Local Government, Public Works and National Housing;
- Ministry of Lands and Rural Settlement;
- Ministry of Agriculture, Mechanisation & Irrigation Development; and
- Ministry of Public Service, Labour and Social Welfare.

14.7 Zimbabwean Environmental and Social Laws and Regulations

Table 14.3 presents a summary of the Zimbabwean national legislation that is considered applicable to KDRP.

14.7.1 Constitution of Zimbabwe Amendment Act (No. 20 of 2013), Section 73 (Environmental Rights)

According to Section 73 of the Constitution of Zimbabwe, every person has a right to an environment that is not harmful to their health or well-being and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures. To this end, the State must take reasonable legislative and other measures, within the limits of the resources available to it, to achieve the progressive realisation of the rights set out in this section.

1. Every person has the right

a) To an environment that is not harmful to their health or well-being; and
b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that—

   i. Prevent pollution and ecological degradation;
   ii. Promote conservation; and
   iii. Secure ecologically sustainable development and use of natural resources while promoting economic and social development.

2. The State must take reasonable legislative and other measures, within the limits of the resources available to it, to achieve the progressive realisation of the rights set out in this section.

14.7.2 The Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002

The Zimbabwean Environmental Management Act (the Act) (Chapter 20:27), No. 13 of 2002, was enacted in 2002 and amended on 17 May 2011, under the General Laws Amendment Act, 2011 (No 5 of 2011) Government Gazette number Vol LXXXIX, No 23. It aims to 'provide for the sustainable management of natural resources and protection of the environment; [and] the prevention of pollution and environmental degradation'.

The Act also provides for the establishment of EMA and an Environmental Fund. The Act repeals the following former Acts:

- Natural Resources Act (Chapter 20:13);
- Atmospheric Pollution Prevention Act (Chapter 20:03);
- Hazardous Substances and Articles Act (Chapter 15:05); and
- Noxious Weeds Act (Chapter 19:07).

The Act is a general legislative framework and does not cover every environmental aspect. It is a framework law which will be complemented by other laws and policies that are not in conflict with it. However, where there are conflicts, this Act will take precedence. The law will be supported by the setting up of the proposed institutions and the promulgation of Regulations by the Minister. Nevertheless, the Act provides the general environmental principles that should be followed in environmental management.

The provisions of the Zimbabwean EMA that relate to EIAs in particular are set out in Section 97 of the Act and summarised below:

- A person who proposes to embark on any of the projects listed in the First Schedule is expected to submit an EIA report to the Director General.
- The developer can only embark on the project if s/he has obtained a certificate from the Director-General.
- The developer is expected to submit a prospectus to the Director General with information on the assessment and the project.
- It is an offence for any person to knowingly implement a project without a certificate showing that an EIA has been carried out and approved.

Some of the sectors in which EIAs should be carried out include: dams and man-made lakes; drainage and irrigation; housing developments; industry; mining and quarrying; petroleum production, storage and distribution; power generation and transmission; tourist resorts and recreational developments; waste treatment and disposal; water supply; conversion of forest land into other use; and conversion of natural woodland to other use within the catchment area of reservoirs used for water supply, irrigation or hydropower generation or in areas adjacent to parks and wildlife estates.

14.7.2.1 General Management Requirements

This Act aims to provide for the sustainable management of natural resources and protection of the environment; [and] the prevention of pollution and environmental degradation. Section 4 the Act affords all citizens of Zimbabwe the right to live in a clean environment that is not harmful to their health; access to environmental information; the right to protect the environment for the benefit of present and future generations; and the right to participate in the implementation of legislation and policies that prevent pollution and environmental degradation and promote the sustainable management and use of natural resources, as well as justifiable economic and social development.

The Act also includes provisions for aspects including (amongst others) water, air, waste, hazardous wastes, noise, toxic substances, wetlands and control of invasive plant species. These provisions will be discussed in the relevant sections below.

14.7.2.2 Provisions for Water

Section 57 of the Act mentions that any person, who discharges or applies any poison or toxic, noxious or obstructing matter, radioactive waste or other pollutants or permits any person to dump or discharge such matter into the aquatic environment in contravention of water pollution control standards shall be guilty of an offence.

14.7.2.3 Provisions for Terrestrial Ecology

Part XIII of the Act includes provisions for the control of alien plant species. Essentially, every person has the responsibility to clear or cause to be cleared any invasive alien species growing or occurring on the land in respect of which he is responsible.

14.7.2.4 Provisions for Air Quality

Section 63 of the Act mentions that ambient air quality standards need to be established.

14.7.2.5 Provisions for Noise

Sections 79 to 81 (in Part IX of the Act) provide requirements around noise management. More specifically, the Act mentions the need for standards to be established for the emissions of noise and vibration pollution. Section 80 mentions that any person who emits noise in excess of the noise emission standards prescribed in terms of section seventy-nine shall be guilty of an offence.

No reference to noise standards could be sourced and it appears as if these do not yet exist.

14.7.2.6 Provisions for Waste and Hazardous Wastes

Section 69 of Part IX of the Act mentions that no person shall discharge or dispose of any wastes, whether generated within or outside Zimbabwe, in such a manner as to cause

pollution to the environment or ill health to any person. Moreover, Section 69 includes provisions for the transport and disposal of waste.

Section 73 of the Act prohibits the discharge of hazardous substances, chemicals and materials or oil into the environment.

14.7.3 Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations, SI No. 7 of 2007

The Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations (EIA Regulations) deal with the regulation of the EIA process and the protection of ecosystems. Part 11 of the Act stipulates that no industrial project shall be implemented without an EIA having been done. These Regulations provide the methodology for undertaking the EIA. The developer has to submit a prospectus to the EMA (see section 16.4.1), which will issue a licence if satisfied by the contents of the prospectus. The prospectus has to contain details of the environmental impacts of the project and the measures to be taken to contain or mitigate such impacts. In preparing an EIA, a developer is obliged to consult widely with all stakeholders. The EMA will not issue a licence if it is not satisfied that the developer consulted with all stakeholders in the preparation of the prospectus. It should also be noted that projects that began before the Act was promulgated are subject to periodic environmental audits by the EMA.

Section 10 (4 to 7) of the EIA Regulations state the following:

- Before any EIA report is furnished to the Director-General, the developer shall carry out wide consultations with stakeholders;
- During review of the prospectus and EIA report, the Director-General shall verify whether full stakeholder participation was undertaken when the EIA report was prepared;
- Expenses associated with the stakeholder consultation process should be borne by the developer;
- The Director-General may advertise in the print and electronic media when a prospectus or EIA report is being reviewed.

The Regulations neither provide specifically for the manner in which the consultation of stakeholders should be carried out nor do they stipulate the stakeholders. There is also no measure to ensure that the concerns of the stakeholders are incorporated in the prospectus.

14.7.4 Environmental Impact Assessment Guidelines (1997)

In 1997, the then Ministry of Mines, Environment and Tourism published the Environmental Impact Assessment Policy. The goal of the policy is to encourage environmentally responsible investment and development in Zimbabwe. The policy views the EIA process as key to achieving this goal.

To support the 1997 Environmental Impact Assessment Policy, the Ministry of published EIA Guidelines to facilitate the implementation of the EIA process. These guidelines are presented as 10 Volumes.

Volume 1 provides guidance on the EIA Policy and General Guidelines under the following topics: administering the EIA Policy; preparing Terms of Reference (ToR's); preparing EIA Reports; consulting the Public; environmental management; and evaluating the adequacy of EIA Reports. In terms of consulting the public, Section 5 provides guidelines for the stakeholder consultation programme.

Volumes 2 to 10 provide guidance on sector-specific EIAs and cover the following sectors: Mining and quarrying; Forestry; Agriculture; Transport; Energy; Water; Urban infrastructure; and Tourism. For each of these sectors, the guidelines provide examples of major activities that are likely to be undertaken for projects in that sector, the type of environmental impacts, possible measures for managing such impacts, sample Terms of Reference, and sources of information for use in an EIA study. In addition, the guidelines are supported by various appendices which provide guidance on preparing ToR's, EIA methods, sources of information, etc. The guidelines are used by Government authorities, developers and EIA practitioners as they provide valuable assistance with carrying out EIAs, guidance on the review of EIAs and the implementation of the EIA recommendations. In addition, the guidelines contribute to improving the quality of sector-specific EIAs.

Table 14.3 Summary of Relevant Zimbabwean Environmental and Social Legislation

Component	Applicable Legislative Instrument	Description of Legislative Instrument
Environmental		
Water Resources	• Water Act, 2003 (Chapter 20:24)	Section 67 of the Act states that water resource management needs to be consistent with environmental approaches and due consideration should be given to the protection, conservation and sustenance of the environment; and the right of access by members of the public to places of leisure or natural beauty related to water or water bodies. According to Section 69, a person who intends to discharge or dispose into a water course shall apply for a permit and pay such charges, for the use of the water, as may be prescribed. It is the understanding of this process that a water permit will not be necessary for this Project. Part IX includes provisions on the safety of dams. Namely Section 109 and 110 include requirements around procedures for emergency for any sudden or unprecedented flood or alarming or unusual circumstance or occurrence, whether anticipated or existing, which may adversely affect the dam. Such management measures have been considered in ESIA and associated ESMP, particularly for surface water quality management and dam safety management.
	• Zimbabwe National Water Authority Act, 1998 (Chapter 20:25)	Establishes the Zimbabwe National Water Authority and to provide for its functions. Provides for the appointment and functions of a board of the Authority and for the raising of charges for the provision of water and other services by the Authority. In addition, the Act provides for the funds of the Authority and the imposition and collection of a water levy. The Act also repealed the Regional Water Authority Act.
Wildlife and Natural Resources	• Forest Act, 1948 (Chapter 19:05)	Provides for demarcating and conserving forests and nature reserves. More specifically, Part VI (conservation of timber resources) governs the removal of indigenous trees. Prior to the removal of indigenous trees, notice of intention must be provided to the appropriate Commission. Management/mitigation commitments for the protection of terrestrial flora are included in this ESIA and associated ESMP.
	• Parks and Wildlife Conservation Act, 1975 (Chapter 20:14)	Provides for the conservation and control of wildlife, fish and plants; and designates specially protected animals and indigenous plants. More specifically, Part IX (specially protected animals) (Section 45) and Part XII includes provisions around the hunting, removal of animals and animal products. Part X and Part XI of the Act include provisions for protected plants specified in the Seventh Schedule (insertion by Act 19 of 2001 with effect from the 1st June, 2002) and provisions for the control of picking of indigenous plants.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
		The management of terrestrial ecology and revegetation and rehabilitation for the Kariba Dam Rehabilitation Project has considered the provisions of this Act.
	• SI 61 of 2009 Environmental Management (Access to Genetic Resources and Indigenous Genetic Resource Best Knowledge)	The SI requires stakeholders (including communities) to be consulted where access to genetic resources is given to external parties, promoting community participation in the management of genetic resources. Consultation, which is a key aspect of good governance of natural resources, is strengthened by the requirement of Prior Informed Consent.
	• GN 380 of 2013 (Protection of Wetlands) per Section 113 of the Environmental Management Act	This Section of the Act includes provisions for the protection of wetlands in Zimbabwe. Such controls include the preservation of beds, banks; controlling stormwater; restrictions of removing clays and deposits from wetlands; reducing pollution of any kind to wetlands and restoration of wetlands. The management of surface water quality, aquatic environments (including aquatic vegetation) and terrestrial ecology (including fauna utilising wetland habits) is considered in the ESIA and associated ESMP.
	• Communal Land and Forest Produce Act, 1988 (Chapter 19:04)	Controls the use of wood resources within communal lands. Such resources are only for the domestic use of the residents.
Air	• Air Pollution Control Regulations SI 72, 2009.	Provides for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The provisions of these regulations have been considered in the Air Quality and Dust Management Plan (refer to ESMP in Part III).
	• Draft Air Quality and Emission Standards (draft number EN 005 - D977/2)	These have not been enacted; however, Section 4 of these draft standards provides ambient air quality in Zimbabwe. Moreover, Section 7 provides limit values for vehicle emissions.
Waste	• Effluent and Solid Waste Disposal Regulations SI 6, 2007.	This regulation concerns the disposal of effluent and solid wastes. Persons are prohibited from disposing waste into public water courses without initially acquiring permission. Moreover, a generator of waste (other than domestic households) is now required to produce a Waste Management Plan. The plan should deal with sound environment management of wastes. Although waste related impacts have not been included in the ESIA, the ESMP presents a Waste Management Plan. Moreover, the ESMP presents a Rehabilitation and Revegetation Plan. These plans have considered the provisions of these Regulations.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
	• Hazardous Waste Management Regulations SI 10, 2007	Provides for the licensing for generation, storage, use, recycling, treatment, transportation or disposal of hazardous waste. Generators of hazardous waste are also required to prepare waste management plans and targets. Regulates waste collection and management by local authorities. In addition, regulates the importation and exportation of hazardous waste and waste oils. According to this regulation, generators of hazardous waste are required to prepare waste management plans. The ESMP includes a Waste Management Plan, which includes commitments around the management of hazardous waste.
	• Environmental Management (Plastic Packaging and Plastic Bottles) SI 98 of 2010	The Plastic Bottles and Plastic Packaging Regulations encourage a reduction in the use of certain types of plastics. According to Article 3(1), it is prohibited to produce, import or distribute plastic packaging with a thickness of less than 30 microns. The Waste Management Plan (refer to ESMP in Part III) encourages minimization of waste generation and maximization of reuse and recycling of waste products.
Explosives	• Explosives Act (Chapter 10:08)	Part IV of this Act includes provisions for the storage of explosives. No person shall keep explosives in or on any premises unless the premises are licensed. Moreover, Part V of the Act governs the use of explosives. Part VI provides restrictions and provisions for the transport of explosives. The ESMP includes provisions for blasting management. The development of these provisions has taken this Act into consideration. Moreover, detailed design around blasting management for the Kariba Dam Rehabilitation Project has and will take these requirements into consideration.
Energy		
Energy	• Electricity Act (Ch 13:19)	Provides for the establishment of the Zimbabwe Electricity Regulatory Commission and provides for its functions and management. Also provides for the licensing and regulation of the generation, transmission, distribution and supply of electricity.
	• Energy Regulatory Act (Chapter 13:23)	Provides for the creation of the Zimbabwe Energy Regulatory Authority (ZERA) and regulates the energy sector and other sections not provided for by the energy laws, the Electricity Act (13:19) and Petroleum Act (13:22). The Energy Regulatory Act repealed some sections especially those related to the formation of the regulatory institutions in the Electricity Act (Chapter 13:19) and Petroleum Act (Chapter 13:22). The mandate of ZERA is to regulate the Energy Sector in Zimbabwe.
Socioeconomic, Archeology and Cultural Heritage		

Component	Applicable Legislative Instrument	Description of Legislative Instrument
Health	• Public Health Act (Ch 15:09)	Provides for the establishment of the Zimbabwean public health system.
	• Regulation 12 of 2007 Environmental Management Act (Hazardous Substances, Pesticides and other Toxic Substances)	The Regulations prescribe conditions that employers have to observe in the handling of hazardous substances at the workplace, conditions for transporting hazardous substances, and procedures to be followed when there is an accidental spillage of hazardous substances. The Agency is empowered to issue spot fines to any person who violates the law. In addition, any person whose substances affect the environment is liable to pay for the cost of restoring the environment (i.e. the polluter pays principle). The offender is also liable to pay compensation for any damage that the offence caused to any person.
	• Environmental Management (Hazardous Waste Management) Regulation 10 of 2007	The Environmental Management Act (Chapter 20:27) Section 140 read with Statutory Instrument 10 of 2007 (see above), regulates the handling of hazardous waste. Under the regulations, the collection, storage, treatment and transportation is strictly prohibited unless under a license issued by the Environmental Management Agency. The regulations also stipulate that no person shall generate, store, sell, transport, use, recycle, treat, discharge or dispose of hazardous waste to the environment without seeking a permit or license from the Agency.
Immigration	• Immigration Act (Chapter 4:02)	Part III of this Act includes provisions for the entry of persons to Zimbabwe (viz. compliance with the directions of immigration officers, travel document requirements, entry refusals, etc.). Part V of the Act includes the provisions for departure of Zimbabwe. These provisions have been included in the Worker Health and Safety Plan included in the ESMP (refr to Part III of the ESIA).
Protected Places and Areas	• Protected Place and Areas (Chapter 11:12)	This Act includes the provisions for the control of entry of persons into certain places, for the protection of the premises. The control of access to work areas associated with the Kariba Dam Rehabilitation Project will be undertaken in accordance with the provisions/requirements in this Act.
Archaeological, Historical and Cultural	• National Museums and Monuments Act (Chapter 25:11)	Makes provision for the preservation of ancient, historical and natural monuments, relics and other objects of historical or scientific value or interest. Section 21 of the Act requires that the appropriate board be notified of any ancient monument or relic. Moreover, Section 24 states that no person may excavate and ancient monument or national monument without obtaining written permission by the appropriate Board. The Cultural and Heritage Management Plan (refer to the ESMP in Part III of this ESIA) includes a Chance Find Procedure, which has considered the provisions of this Act
Land use planning issues	• Communal Land Act (Chapter 20:04)	Provides for the classification of land in Zimbabwe as Communal Land and for the alteration of such classification; to alter and regulate the occupation and use of Communal Land; and to provide for matters incidental to or connected with the foregoing.
	• Rural District Councils Act, 1989 (Chapter 29:13)	Provides for the establishment of Rural District Councils responsible for initiating and regulating development in rural areas.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
	• Regional Town and Country Planning Act [Chapter 29:12]	Regulates regional planning and provides for the functions of Regional Planning Councils. The Act confers the land-use planning function on urban local authorities and regulates the development of master and local plans; subdivisions, consolidation, acquisition and disposal of land.
	• Traditional Leaders Act (Chapter 29:17)	An Act to provide for the appointment of village heads, headmen and chiefs; to provide for the establishment of a Council of Chiefs and village, ward and provincial assemblies and to define their functions; to provide for the issue of village registration certificates and settlement permits. The Act also provides for the repeal of the Chiefs and Headmen Act (Chapter 29:01) and amends: the Criminal Procedure and Evidence Act (Chapter 9:07); the Communal Land Act (Chapter 20:04); and the Rural District Councils Act (Chapter 29:13).
	• Rural Land Act (Chapter 20:18)	An Act to provide for the acquisition of State land and the disposal of State land; to provide for the control of the subdivision and lease of land for farming or other purposes; to provide for limiting of the number of pieces of land that may be owned by any person and the sizes of such land, and for prohibiting or restricting the rights of non-residents to own, lease or occupy land in Zimbabwe, and to provide for other matters incidental to and connected with the foregoing.
	• Rural Land Occupiers (Chapter 20:26) (Protection from Eviction) Act 2002	Provides for the protection of certain occupiers of rural land from eviction, and regulates matters connected therewith or incidental thereto.
Roads and traffic	• Roads Act (Chapter 13:18)	Provides for the regulation of the standards applicable in the planning, design, construction, maintenance and rehabilitation of roads with due regard to safety and environmental considerations. Provides for road authorities and their functions and for the regulation of the erection of structures or the carrying out of works near certain roads, the entry upon roads from certain land and the acquisition of land and materials for road works.
	• Road Motor Transportation Act, 1997	The proposed Kariba Dam Rehabilitation Project will require the transport of materials and machinery into the Project Area. Part III (Section 7 to 16) of the Road Motor Transportation Act details the requirements for goods vehicles on all roads and that these vehicles/drivers need to hold an operator's license. The operator's license application needs to be assigned for a specific route. Part IV of the Act provides the requirements for the operation of foreign vehicles on Zimbabwean roads. Requirements include the provision of a foreign license. Part V includes the provisions for the inspection of vehicles and the issuance of a certificate of fitness for vehicles. The ESMP (refer to Part III of this ESIA) includes a Road Safety Management Plan and Traffic and Transport Management Plan. The provisions of this Act have been included in these.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
	• Road Traffic Act (Chapter 13:11)	Part II of this Act includes the provisions for the licensing of drivers of motor vehicles and the requirements for licenses (age limits, medical examinations, etc.). The Act stipulates that no person shall drive a motor vehicle on a road unless he is the holder of a valid licence issued to him in respect of motor vehicles of the class concerned, and complies with the conditions, if any, subject to which the licence was issued. Section 7 of the Act provides the minimum and maximum age limits associated with driving of vehicles on roads. Part III makes provision for the issuing of international driving permits. Section 17 states that any person who is an ordinarily resident in Zimbabwe; and the holder of a driver's licence or foreign drivers licence and who wish to drive a motor vehicle outside Zimbabwe, he must apply for an international driving permit. Part IV through to V (and VA) includes the provisions for motor vehicle insurance against third party. Part VI includes the provisions of traffic signs and police directions and the requirements around conformance. The ESMP (refer to Part III of this ESIA) includes Road Safety Management Plan and Traffic and Transport Management Plan. The provisions of this Act have been included in these.
Mining Regulations		
Quarries and Borrow Pits	• Environmental Management Act 2011(Section 23)	Quarries and borrow pits are regulated in terms of the first schedule of the Environmental Management Act. The Project will ensure that materials are sourced from licensed sites.
	• Statutory Instrument 3 of 2011	Regulates borrow pits and sites used for the extraction of sand and rock and associated transportation.
Investments, Energy Regulation, and Development		
Tourism	• Tourism Act (Chapter 14:20)	An Act to establish a Zimbabwe Tourism Authority and to provide for its functions; the appointment and functions of a board of the Authority; to establish a Zimbabwe Tourism Fund; the appointment of a Chief Executive of the Authority, licensing officers and other officers; the designation, registration and grading of tourist facilities and for the licensing of persons who provide services connected with tourism; the imposition and collection of levies in respect of designated tourist facilities; and matters connected with or incidental to the foregoing.
Employment and Compensation	• Labour Act (Chapter 28:01) as amended by Labour Act [Chapter 28:01] amended 2006 and the Labour Amendment Act, 2005 (Act 7/2005)	An Act to declare and define the fundamental rights of employees. Part II (Sections 4 to 7) provides the fundamental rights of employees, including entitlement to be a member of a trade union, protection against discrimination, the right to fair labour standards and the right to a democratic workplace. Part III of the Act provides provisions safeguarding employees to unfair labour practices and Part IV provides the general conditions of employment (viz. dismissal, retrenchment, wages, sick leave, death, maternity leave etc.). The ESIA and associated ESMP for the Kariba Dam Rehabilitation Project makes provision for the rights of employees.

Component	Applicable Legislative Instrument	Description of Legislative Instrument
Public Participation	• General Laws Amendment No. 5 of 2011 (Section 12, paragraph H)	Paragraph h stipulates that results from the public participation process needs to be disclosed.

14.8 Zimbabwean Development Policies

The national development policies for Zimbabwe that are potentially applicable to the Project are briefly outlined below.

14.8.1 Zimbabwe Agenda for Sustainable Socio-economic Transformation

In pursuit of a new trajectory of accelerated economic growth and wealth creation, Government has formulated a new plan known as the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim Asset): October 2013-December 2018.

Zim Asset was crafted to achieve sustainable development and social equity anchored on indigenisation, empowerment and employment creation which will be largely propelled by the judicious exploitation of the country's abundant human and natural resources.

This Results Based Agenda is built around four strategic clusters that will enable Zimbabwe to achieve economic growth and reposition the country as one of the strongest economies in the region and Africa. The four strategic clusters identified are: Food Security and Nutrition; Social Services and Poverty Eradication; Infrastructure and Utilities; and Value Addition and Beneficiation.

14.8.2 Zimbabwean Industrial Development Policy (2012-2016)

The policy's vision is to transform Zimbabwe from a producer of primary goods into a producer of processed value-added goods for both the domestic and export market. The policy mission statement is to create a vibrant, self-sustaining and competitive economy through promotion of viable industrial and commercial sectors as well as domestic and international trade.

The objectives of the policy include:

- The overall objective is to restore the manufacturing sector's contribution to the GDP of Zimbabwe from the current 15% to 30% and its contribution to exports from 26% to 50% by 2015;
- An average real GDP growth of 15% is targeted under this Policy Framework of 2011-2015;
- To create additional employment in the manufacturing sector on an incremental basis as compared to the previous planning period of 2004 to 2010;
- To increase capacity utilisation from the current levels of around 43% to 100% by the end of the planning period;
- To re-equip and replace obsolete machinery and new technologies for import substitution and enhanced value addition;
- To increase the manufactured exports to the SADC and COMESA regions and the rest of the world; and
- To promote utilisation of available local raw materials in the production of goods.

14.8.3 Zimbabwe's National Energy Policy

The National Energy Policy (NEP) seeks to promote the optimal supply and utilisation of energy, for socio-economic development in a safe, sustainable and environmentally friendly manner.

The NEP is intended to fulfil Government's objective of ensuring that the energy sector's potential to drive economic growth and reduce poverty is fully harnessed. The policy therefore provides a guide to decision-makers, policy-makers and development managers in

Government, the private sector, Non-Governmental Organisations and civil society, on Government's intended actions in the energy sector.

The policy recognises that regional cooperation is essential for the development of large-scale hydropower resources and that small-scale hydropower projects may not make a significant impact on national requirements but they help to develop skills and to speed up access for remote communities that are not likely to be connected to the national grid in the foreseeable future.

The policy also makes specific reference to the Zimbabwe Energy Regulatory Authority (ZERA) and states that the Authority is expected to create an enabling environment and establish fair play in the energy sector through licensing regulations, product and service standards and investment promotion.

15 Appendix B – Consultation Materials and evidence of meetings.

16 Appendix C – IBAT Proximity Report

17 Appendix D - General Requirements

17.1 Site Establishment

17.1.1 Site Division

The Contractor will restrict all activities, materials, equipment and personnel to within the area specified, and shall restrict activities to only those areas that are necessary to undertake the works.

A Method Statement detailing the layout and method of establishment of the temporary construction camp, all buildings, offices, lay down areas, fuel storage areas, batching areas and other infrastructure required for the running of the Project shall be submitted.

Disturbed areas rather than pristine or intact landscape areas will preferably be used for the temporary construction camp.

17.1.2 Site Demarcation

The Contractor shall erect and maintain permanent and/ or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities.

17.1.3 Site Clearance

If topsoil / top material is removed from areas cleared of vegetation, it will be retained for future landscaping use. Top material will exclude litter, building rubble, alien plant material or any other waste. All topsoil, and specifically any topsoil from areas which are likely to contain bulbs, must be stripped and stockpiled for re-use in landscaped areas. This will constitute at least a 300 mm layer.

Topsoil will be stored in areas demarcated by the EHS Manager and Engineer and in piles not higher than 2 m, and may not be removed from the site, or used for any purpose other than in the final landscaping of the site. The stockpiles will not be compacted or disturbed, and will be domed at the top to promote runoff. The period between the stockpiling of topsoil and its utilization will be as short as possible, and ideally the topsoil should be transferred to its intended site of use immediately following site clearance and stockpiling. This would also avoid double handling.

Stockpiles that are to be stored for less than three months will be covered with shade-cloth or geotextile fabrics or similarly suitable material to prevent erosion, and kept moderately moist in order to maintain the vitality of the soil. If stockpiles are to be stored for more than three months a protective vegetation layer must be established to cover topsoil stockpiles in order to protect them against erosion and desiccation. The stockpile must be kept moist in order to maintain the vitality of the vegetation. Vegetation may not consist of invasive alien vegetation, but must comprise grass or ground covers.

17.2 General Requirements During the Rehabilitation Works

17.2.1 Materials Handling, Use and Storage

The Contractor will ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the ESMP. The Contractor shall

ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the ESMP.

Materials will be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to, sand, stone chips, fine vegetation, refuse, paper and cement, will have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor will be responsible for any clean up resulting from the failure by his employees or suppliers to properly secure transported materials.

All manufactured and/ or imported material will be stored within the Contractor's temporary construction camp. All lay down areas outside of the temporary construction camp will be subject to the Engineer's approval.

All building materials will be stored at least 50 m away from aquatic ecosystems and the areas bunded appropriately such that there will be no runoff from these areas towards aquatic systems. All building materials will be removed after rehabilitation works.

17.2.2 Fuel (Petrol and Diesel) and Oil

All fuel is to be stored within a demarcated area in the Contractor's temporary construction camp. No refuelling of vehicles or machinery is to take place outside of this demarcated area unless authorised by the Engineer. The Engineer will be advised of the area that the Contractor intends using for the storage of fuel.

The Contractor will ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut. Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks will be sealed and stored in an area where the ground has been protected.
Tanks containing fuels will be situated on a smooth impermeable surface (plastic or concrete) base with a bund (if plastic, it must have sand on top to prevent perishing) to contain any possible spills and prevent infiltration of fuel into the ground. The impermeable lining will extend to the crest of the bund and the volume inside the bund will make up 110 percent of the total capacity of all the storage tanks.

The floor of the bund will be sloped towards an oil trap or sump to enable any spilled fuel to be removed. An Enretech or similar hydrocarbon absorption/remediation product approved by the EHS Manager will be installed in the sump to reduce the risk of pollution. Bulk fuel storage (which is anticipated to include Above Ground Storage Tanks [ASTs] with a volume range of approximately 4.5 to 46 m3) and bunded areas will have overhead cover to prevent rain from entering the bunded area. The Contractor will keep fuel under lock and key at all times.

If fuel is dispensed from, the proper dispensing equipment will be used, and the drum will not be tipped in order to dispense fuel. The dispensing mechanism used to dispense fuel from the drums will be stored in a waterproof container when not in use.

During fuel tanker delivery, the tanker driver must be present at all times during offloading of product. An emergency cut-off switch must be installed to immediately stop fuel delivery should an accident occur. An anti-flash nozzle must be installed at the end of the vent pipe with a fuel dispenser equipped with an automatic cut-off switch to prevent fuel tank overfills.

No smoking will be allowed in the vicinity of the stores. Symbolic safety signs depicting "No Smoking", "No Naked Lights" and "Danger" are to be provided. The volume capacity of the tank will be displayed. The product contained within the tank will be clearly identified using the emergency information system. Any electrical or petrol-driven pump will be equipped and positioned, so as not to cause any danger of ignition of the product.

Areas for storage of fuels and other flammable materials will comply with standard fire safety regulations and may require the approval of the Municipal Fire Prevention Officer. The Contractor will ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, vehicles and equipment shall be refueled at a designated re-fueling area or at the workshop as applicable. If it is not reasonably practical, then the surface under the temporary refueling area will be protected against pollution and drip trays used to the reasonable satisfaction of the Engineer prior to any refueling activities. The Contractor will ensure that there is always a supply of appropriate material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials will be able to handle a minimum of 200 litres of hydrocarbon liquid spill. This material must be approved by the Engineer prior to any refueling or maintenance activities.

17.2.3 Ablution Facilities

Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the facilities provided. Latrine and ablution facilities and first-aid services will comply with the regulations of the local authority concerned and shall be maintained in a clean and sanitary condition to the satisfaction of the Engineer. These facilities will include water borne sewage connected to the local authority mains for the contractors' camp and portable chemical toilets at the active working areas. If connection to the local authority mains is not possible, the use of sceptic tanks and soak away systems will be adopted and implemented. The ablution facilities for men and female shall be separated and with separate entrances to reduce scenarios that may induce GBV.

The Contractor will provide suitable sanitary arrangements at the Contractor's temporary construction camp and approved points around the designated work area to allow easy access for all employees on the site. Project staff are not permitted to commence with work on the site without suitable toilet facilities being available for them.

Sanitary facilities will be located within 100 m from any point of work, but not closer than 50 m to any water body. One chemical toilet is to be provided on site for every 15 contract personnel at each working area. These toilets must have doors and locks and shall be secured to prevent them blowing over. Toilet paper will be provided.

The Contractor will ensure that suitable sanitation facilities are provided for or by all his sub-contractors on the site.

Chemical (portable) toilets are to be periodically emptied on a weekly basis by an approved and reputable contractor. The contractor will ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from the site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

The Contractor shall keep the toilets in a clean, neat and hygienic condition. If the Contractor fails to provide and/or maintain all site sanitation facilities in a clean and hygienic condition, the Engineer may order the Contractor to suspend any or all work on the site until these requirements are met. No payment shall be made for any delays or disruption of the Works caused thereby nor shall extensions of time be granted for such delays.

17.2.4 Eating Areas

The Contractor shall designate eating areas to the approval of the Engineer, which will be clearly demarcated. Sufficient bins will be present in this area. Any cooking on site will be done in a designated area with well-maintained cookers with fire extinguishers present.

17.2.5 Drinking Water

The Contractor will ensure that drinking water is available for all staff on the site. If no potable water source is available, then the Contractor will import drinking water to the site.

17.2.6 Site Structures

The Contractor will supply and maintain adequate and suitable sheds for the storage of materials. Sheds for the storage of materials that may deteriorate or corrode if exposed to the weather will be weatherproof, adequately ventilated and provided with raised floors.

All site establishment components (as well as equipment) will be positioned to limit visual intrusion and the size of the area disturbed. The type and colour of roofing and cladding materials comprising the Contractor's temporary structures will be selected to reduce reflection. The Contractor's camp will be fenced, and the camp area will be screened via the attachment of shade cloth or equivalent to the fence surrounding the site camp.

17.2.7 Workshop, Equipment Maintenance and Storage

Where practical, all maintenance of plant on the site will be performed in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor will obtain the approval of the Engineer prior to commencing activities.

The Contractor will ensure that the workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop will have a smooth impermeable floor either constructed of concrete or thick plastic covered with sufficient sand to protect the plastic from damage. If constructed of concrete the floor will be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil). A Method Statement detailing the design and construction of the workshop must be submitted.

When servicing equipment, drip trays will be used to collect the waste oil and other lubricants. Drip trays will also be provided in active work areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles).

All vehicles and equipment will be kept in good working order and serviced regularly. Leaking equipment will be repaired immediately or be removed from the site

The washing of equipment will be restricted to preventative maintenance requirements only. All washing will be undertaken in the workshop or maintenance areas, and these areas must be equipped with a suitable impermeable floor and sump/oil trap. The use of detergents for washing will be restricted to low phosphate and nitrate containing and low sudsing-type detergents.

17.2.8 "No go" Areas

The demarcated buffer areas around sensitive ecological or heritage areas are to be "no go" areas. The Contractor will ensure that, insofar as he has the authority, no person, machinery, equipment or material enters the "no go" areas at any time.

17.2.9 Construction Personnel Information Posters

The Contractor will erect and maintain information posters for the information of all employees depicting actions to be taken to ensure compliance with aspects of the environmental and social mitigation measures. Such posters will be erected at the eating areas and any other locations specified by the Engineer.

17.2.10 Concrete and Cement Work

Cement powder has a high pH value. Spillage of dry cement powder and concrete slurry will affect both soil and water pH adversely. Careless handling of cement products resulting in spillage can have detrimental effects on the surrounding environment.

The location of the batching area (including the location of cement stores and sand and aggregate stockpiles) will be indicated on the site layout plan and approved by the EHS Manager. A Method Statement indicating the layout and preparation of this facility is required in this regard. Cement is to be stored in a secure weatherproof location to avoid contamination of the environment.

All runoff from batching areas will be strictly controlled so that contaminated water does not enter storm water or run-off into the Zambezi River. Plastering boards and mixing trays will be used at all mixing and supply points. Cleaning of equipment and flushing of mixers will not result in pollution of the surrounding environment.

Suitable screening and containment will be in place to prevent windblown contamination associated with bulk cement silos, loading and batching. All excess concrete will be physically removed to an approved waste site on completion of the concrete pour section and disposed of.

17.2.11 Safety

The Contractor will always observe proper and adequate safety precautions on the site. Telephone numbers of emergency services, including the local firefighting service, shall be posted conspicuously in the Contractor's office near the telephone. A KDRP internal fining system (economic instrument) may be developed and adopted to deter offenders is breaches indicate a recurring trend. The system may apply to all KDRP parties.

17.2.12 Security

With the possible exception of any security staff who may be required to be present overnight at the Contractor’s temporary construction camp, no personnel will be permitted to live on the site. Security staff must be provided with heating and cooking facilities (in order that they do not need to light fires), and access to toilet facilities and communication equipment.

17.2.13 Grievance Procedures

The Contractor will develop a grievance procedure to ensure fair and prompt resolution of problems arising from the Project. The grievance procedure will be underpinned by the following principles and commitments:

- Implement a transparent grievance procedure, and disseminate key information to directly impacted stakeholders;
- Implement and maintain a complaint register;
- Seek to resolve all grievances timeously; and
- Maintain full written records of each grievance case and the associated process of resolution and outcome for transparent, external reporting.

The responsibility for resolution of grievances will lie with the ZRA and its Contractors.

17.2.14 Protection of Natural Features

The Contractor will not deface, paint, damage or mark any natural features (e.g. rock formations and trees) situated in or around the site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause will be restored/ rehabilitated to the satisfaction of the Engineer.

The Contractor will not permit his employees to make use of the Zambezi River for the purposes of swimming, personal washing and the washing of machinery or clothes.

17.2.15 Working Hours

Working hours in terms of the planning approval shall be adhered to. If works are to take place outside of normal working hours, the EHS Manager and the Engineer are to be notified and disturbance to the surrounding residents or land users is to be prevented. The Engineer will, where required, in turn notify the Local Authority of work done outside of normal working hours.

17.2.16 Excavation and Trenching

During excavation and trenching activities, care is to be taken to ensure that the stockpiling of top material is kept separate from sub-soils. Top material thus saved is to be replaced as top material and is to be the final layer when back-filling. The Contractor will reinstate all working areas to the satisfaction of the Engineer.

Areas opened for trenching will be restricted to the minimum required to be worked in and closed up in a working day or as dictated by technical requirements such as length of pipe or cable, in order to prevent them from posing safety hazards to people, traffic and animals and to prevent rainwater erosion. Trenches will be re-filled to the same level as (or slightly higher, to allow for settlement) the surrounding land surface to minimise erosion. Excess soil will be stockpiled in an appropriate manner. No stockpiling must occur within 50 m of a water course.

In the event of material removed during trenching being excessive after backfilling or being unsuitable as overburden, the excess material must be removed from the site to a site agreed upon by the Engineer and, where applicable, the Local Authority

17.2.17 Temporary Site Closure

If the site is closed for a period exceeding one week, a checklist procedure will be carried out by the Contractor in consultation with the EHS Manager. The Contractor is to check the site and report to the Engineer regarding the following:

Fuels / flammables / hazardous materials stores:
- Ensure fuel stores are as low in volume as possible;
- No leaks;
- Outlet secure / locked;
- Bund empty;
- Fire extinguisher serviced and accessible;
- Secure area from accidental damage, e.g. vehicle collision;
- Emergency and Management telephone numbers to be available and displayed; and
- Adequate ventilation.

Other:
- All trenches and manholes secured;
- Fencing and barriers in place;

- Notice boards applicable and secured;
- Security persons briefed and have facility for contact;
- Night hazards checked, e.g. reflectors, lighting, traffic signage;
- Fire hazards identified – local authority notified of any potential threats, e.g. large brush stockpiles, fuels etc.;
- Pipe stockpile wedged / secured;
- Scaffolds secure; and
- Inspection schedule and log by security or contracts staff.

The EHS Manager is to check and report to the Engineer regarding the following issues:
- Wind and dust mitigation in place, e.g. straw, brush packs, irrigation;
- Slopes and stockpiles at stable angle;
- Landscape areas watering schedules and supply secured;
- Fuels/hazardous substances stores secure;
- Cement and materials stores secured;
- Toilets empty and secured;
- Refuse bins empty and lids secured;
- Bunding clean and treated, e.g. Spill Sorb or Enretech #1 powder;
- Drip trays empty and secure; and
- Structures vulnerable to high winds secure.

The Contractor is to ensure that all temporary closure requirements are met before leaving the site.

17.2.18 Chinhoyi Quarry

The Contractor will need to confirm that the Chinhoyi quarry site has current and up to date permits and quarrying guidelines prior to the commencement of rehabilitation and the sourcing of aggregate from the Chinhoyi Quarry.

17.3 Site Clean Up and Rehabilitation

17.3.1 Site Clean Up

The Contractor will ensure that all temporary structures, equipment, materials, waste and facilities used for rehabilitation work purposes are removed upon completion of the rehabilitation works. Site clean-up shall be to the satisfaction of the Engineer and the EHS Manager.

17.3.2 Rehabilitation

Where appropriate, the Contractor shall employ a suitably qualified person (a botanist with experience in restoration of grassland areas) to rehabilitate areas damaged by activities associated with rehabilitation works during the course of the Project, including quarry areas. The Contractor shall be responsible for rehabilitating areas identified by the EHS Manager and the Engineer or recommended by the aforementioned botanist. The Contractor's procedure for rehabilitation shall be approved by the EHS Manager and the Engineer and, where required, the Local Authority’s environmental representative.

18 Appendix E – Health, Safety, Environmental and Social Requirements included in the ZRA / Contractor contracts

19 Appendix F – Resettlement Policy Framework

20 Annex G. COVID-19 Prevention and risk management Proposed Plan

1. Introduction - Recommendations to the government and project

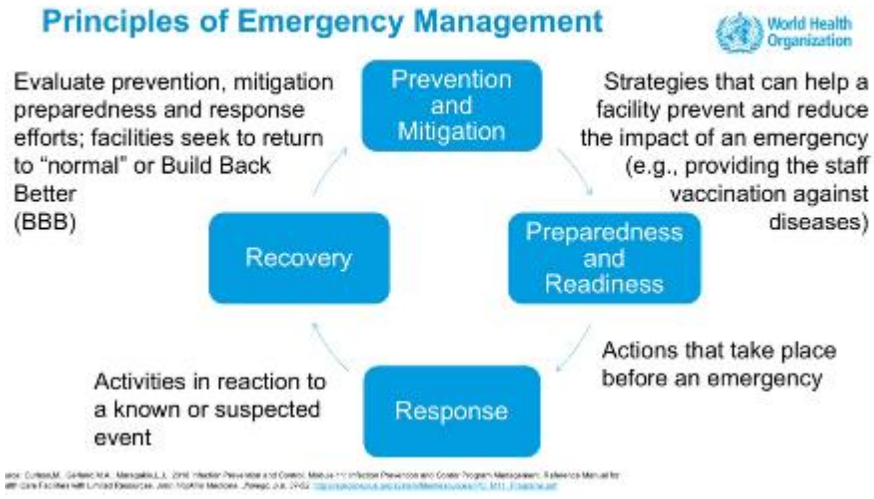
The project will follow this guidance note to prevent and managed risk associated to Covid19 pandemics or other zoonotic diseases outbreaks and to prepare a Covid 19 prevention and risk management plan, following the government installed protocols, the World Bank Interim Note and other measures to agree during project implementation.

The Budge to cover any expense related to the preparation and implementation of this plan will be cover by the project contractors and ZRA.

1. The WHO recommend the following steps to manage a health emergency such as the COVID 19 through four steps:
i) Prevention and mitigation measures,
ii) Preparedness,
iii) Response, and
iv) Recovery (figure below). More information can be found here:
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/infection-prevention-and-control

There are also courses available online at the WHO that can be taken by the EHS teams.
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/training

2. The Prevention and Response for Covid19- in the project needs to ensure proper prevention measures and readiness to respond in case of an outbreak.



Please arrange Plan in at least 3 sections:

I) prevention and mitigation (including movement of people, social distancing, supply and facilities available, training),
II) response (contingency plan)
III) Monitoring. Ensure plan has been agreed and signed with the medical staff that will support the project (health clinic, doctor hired by the project, or other). A template for monitoring the workforce or community is attached at the end.

a. The contractors must ensure protection supplies on site to increase protection and minimize spread in the community by outside workers.
b. Improve the Contingency or Emergency plan in a case of an outbreak;
c. Give maximum priority to the health of all workers and surrounding communities
d. Prepare the weekly Monitoring report
e. Perform a simulation exercise at least 1 month after starting the works

2.2 Detailed measures and recommendations

<table>
<tr><td>A</td><td>Movement of workers/contractors</td></tr>
<tr><td>1</td><td>Describe the measures applicable for Managing movement of international workers from other places to the work sites</td></tr>
<tr><td>2</td><td>Describe the measures applicable for Managing movement of workers from local communities who do not live in the project sites</td></tr>
<tr><td>3</td><td>Describe the measures applicable for Managing movement of casual workers who do not live in the project areas</td></tr>
<tr><td>4</td><td>Describe the measures applicable for Managing movement of contractors that visit the project site to deliver workers, materials, food, water, others? List them all</td></tr>
<tr><td>B</td><td>Hand washing stations</td></tr>
<tr><td></td><td>-Install hand washing stations areas with a table to place - liquid soap, hand sanitizer and paper towel to hand drying. Placed poor-concrete in the foot of this water stations and a simple drainage channel to carry to water away from the site and avoid accumulation of water in the area.
-Place Water tanks with clean water for washing hands. Contractors to demonstrate water with zero Total Coliforms and zero E. coli.
-Indicate the locations where these stations have been placed.
-Request social distancing when using the hand washing station
-Placed a board with a poster or text indicating how to properly wash the hand and communication to Avoid touching the face</td></tr>
<tr><td>C</td><td>Personal Protection Equipment (PPE)</td></tr>
<tr><td></td><td>1-PPE to be in place – Include requirements and evidence of purchase and stock of the following PEP equipment by contractors

<table><tr><td>PPE</td><td>N95 mask, disposable groves, tissues, hand sanitizer, etc.</td><td>Monitored with Copies of purchased – volume and number in site or in transit</td></tr></table>
2.PPE must be in quantity depending of the number of workers working per day in the camp. Please remember that under a potential emergency that PPE should be store for health workers, sick workers and potential collaboration with local health facilities.

3.Explain How often the workers are required to change mask and gloves

4.Indicate how much time will the current supply on site will last (weeks or months)

5. Explain the PPE available for medical staff – comply with the WHO recommendations:</td></tr>
</table>

	https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-%282019-ncov%29-outbreak ○ Do not re-use single-use masks. ○ Discard single-use masks after each use and dispose of them immediately upon removal. ○ Replace masks as soon as they become damp with a new ○ clean, dry mask.
D	**Social distancing**
	1-The plan needs to include measures to prevent infection by social distancing. -Explain how these measures will be enforced in the movement of workers, and workers coming from local communities, common areas such as canteens, shower areas, washing cloth areas, etc. -Add the WHO recommendations: *bent elbow or use paper tissue if coughing or sneezing, dispose of the tissue immediately after use, and perform hand hygiene. Read more detail in the WHO website- updated March 19, 2020.* https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-%282019-ncov%29-outbreak -Describe waste management protocol to collect contaminated used paper towel and used PPE. Contractors must define a protocol to collect used PPE and discarded properly and no disposed in the dumping areas or rivers o wetlands where other people can become contaminated.
E	**Measures in common areas (canteen, offices, showers, washing areas, etc)**
	1. The plan needs to include a section to describe measures and enforcement to prevent infection in common areas of workers such as materials rooms, canteen, cars. -describe how social distancing will be enforced in the common areas like canteens. -describe How the mealtimes are going to be managed to prevent infection to workers -describe the protection measures for kitchen personnel exposed to many workers coming to eat.
F	**Dormitories at camp site**
	1.Please describe all measures taken to prevent zoonotic diseases like malaria, dengue, etc and avoid presence of animals, rats, bats, mosquitos in the rooms that can transmit diseases to workers. In order to improve ventilation – the project needs to repair doors, mosquito nets. *-opening every day their rooms for short periods to increase aeration. All windows with broken mosquito nets will be fixed. Additional mosquito bed nets will be provided to all workers.*
G	**Waste management and cleaning**
	1. The recommended disinfectant by the WHO is soap and water or alcohol-based hand rub (hand sanitizer that contains at least 60% alcohol). -describe the areas that will be clean using disinfectants – office areas, cars, washing area, bathrooms, etc.
	2.Describe how the contaminated waste will he handled (used masks, used gloves, used paper towel, used paper tissues, used material used with sick people, etc).

	-describe the people responsible for waste collection of PPE and cleaning -Describe what protection PPE will be given to these workers, training, -Indicate the disposal site and waste management procedure
H	**Training**
5	*Describe the Trainings activities that the PIU and contractors will implement. There are many topics that need to be explained before the works, during the works and before the works are accepted,* ➢ *Hand washing, protect others when coughing* ➢ *Avoid hand checking, kissing or hugging* ➢ *Community protection* ➢ *Protocol in areas of common areas: offices, traveling, transportation of materials, construction sites, etc.* ➢ *Procedure in case to get sick and information of contact in case of emergency*
I	**Communication of the Covid 19 Prevention and Response Plan**
	Describe how the PIU and contractors will communicate to the workforce, their roles and responsibilities; these should be outlined clearly, and the importance of their behavior to co-workers, local communities and their families, etc.
J	**Emergency Response - *Contingency Planning for an Outbreak***
	1. Coordination local health centers. The PIU and contractors will maintain close communication with the local health department, according to the spread of covid-19 to update the plan. - Ensure that the medical team lead the preparation of this contingency plan, coordinate with the district medical facilities and other contractors in area, and with local community.
	2. **MEDICAL workers.** Make sure the medical staff as required in the bidding document is compliance.
	3. Please describe the Emergency Command Team and responsibilities ✓ PIUs, Environmental and Social Specialists ✓ Medical staff by the contractor ✓ Health authorities from the district?? ✓ Managers, Site supervisors ✓ Workers coordinators ✓ Communities ✓ other
	4.PPE for medical staff. -Describe protocol for health care interaction with sick patient, to ensure health staff wear personal protective equipment (PPE)? -Confirm the PPE supply for medical staff, as minimum there must have: N-95 masks, single use gloves, goggles or a face shield

	5. Response Protocol 1. Plan proposed to move someone displaying symptoms to the observation room. Response protocol must be more detailed. *- Indicate protocol to manage at least 10% of the workforce if this become ill* *-Indicate protocol in case the ill workers need ventilation or medical treatment no available in the camp.* *-Describe the arrangement made with local or private medical facilities to attend sick workers. --Indicate the number of patients that these clinics could provide medical attention- indicate the distance from the camp sites to these clinics.* -Is the local medical facility well equipped (ICU, ventilators, etc)? *-Indicate the protocol in case health workers become sick.* *-Indicate protocol in case closer clinics are in Rwanda and borders are closed* *-Indicate how the project will maintain safety on site and of the community if many workers become ill* *-Ensure clauses in contract of contractors cannot fired sick workers* *-Ensure clauses in contract of contractors they will be pay during their sick leave* *-Ensure clauses in contract of contractors in case workers die for the virus- how compensation will be pay to the family and the payment of funeral.*
	7.The emergency response protocol must be clearly described. The response protocol must include: ✓ Command team and coordination with local Health facilities ✓ The medical team must lead the Training and provision of PPE to health workers ✓ Monitoring plan for health in workers and sick people ✓ Protocol of communication with local community ✓ Protocol and criteria for Isolating sick people or decision to move to clinic ✓ Protocol in case health workers become sick and are place in isolation rooms ✓ Protocol to manage transportation of sick people to other health facilities ✓ Protocol for Communication with the family of sick people ✓ Responsible to feed and care sick people in health facilities ✓ Protocol in case of death of workers from Rwanda or from other countries (compensation, insurance, etc). ✓ What is the plan to manage workers if restrictions are imposed in Rwanda or the project area?
K	**Monitoring**
	Describe the monitoring plan that will be implemented by the project and medical staff. An example template is attached. This report will be sent to the PIU-weekly. The PIU will inform the Bank of the results of all project sites.
I	Other a. PIUs role in raising awareness in community b. Agreed with communities how to manage their concerns c. PIU must hold constant meetings with local workers so the contractor understands their responsibilities to reduce the risk for them and the local communities d. PIU have a responsibility to ensure community safety. e. PIU should coordinate with district and contractors in the case of an outbreak in the local communities

Covid19 Plan- Monitoring template for reporting/monitoring the situation of the workforce.

Name of the Project		
During the COVID19 outbreak, it is necessary to monitor the spread of the disease and to confirm that prevention arrangements are in strict compliance Each contractor should be asked to provide the following data on a weekly basis; The contractors may decide that their medical staff are best placed to provide this information. Project staff will do weekly audits to check project situation		
Contractor:		
Date:		
Reported by:		
Medical staff present on site:		
Number of Workers on site:		
Metrics/Indicators	**Status**	***Respond/ fill this column***
Number of Worker movements	**Number arriving / Number departing**	
Numbers of workers presenting with acute onset of the following symptoms:		
• **Fever (>103F/37.8C)**	Number:	
• **Muscle aches/chills**	Number:	
• **Cough (dry or phlegm)**	Number:	
• **Runny nose**	Number:	
• **Headache**	Number:	
• **Fatigue**	Number:	
□	**Total number**	
□	**Proportion of total workforce:**	
Numbers of community members presenting with acute onset of the following symptoms:		
• **Fever (>103F/37.8C)**		
And one or more of:	Number:	
• **Muscle aches/chills**	Number:	
• **Cough (dry or phlegm)**	Number:	
• **Runny nose**	Number:	
• **Headache**	Number:	

• **Fatigue**	Number:	
□	**Total number**	
□	**Proportion of total workforce:**	
Medical PPE stocks:		
1. Masks (surgical)	Number:	
2. Masks (N95)	Number:	
3. Googles/face screens	Number:	
4. Gowns/aprons	Number:	
5. Gloves	Number:	
Worker training in social distancing, hand washing, hygiene practices	**Number undertaken:**	
Audit of worker behavior	Number of observations: (compliant)	Number of observations: (non-compliant)
Audit of project cleaning, quality of cleaning, materials and PPE use	Number of observations: (compliant)	Number of observations: (non-compliant)
Audit of hand washing facilities (including soap, paper towels; hand sanitizer) and isolation facilities	Number of observations: (compliant)	Number of observations: (non-compliant)
Pleasse describe and explain		
Confirm Interaction with national healthcare providers		
Number of workers transferred into care of national healthcare providers:		
Brief note on assistance requested or provided to local healthcare providers:		

F