Electricity Generation Company (Malawi) Limited

Environmental and Social Management Plan

Rehabilitation of Nkula B Hydropower Station, Malawi

EGENCO
Chayamba Building
P.O. Box 1567
Blantyre

June, 2025

Executive Summary

1.0 Introduction

This is an Environmental and Social Management Plan (ESMP) for the rehabilitation and modernization works of Nkula B Hydropower Station. Nkula B Hydropower Station is owned by Electricity Generation Company (Malawi) Limited (EGENCO) a company wholly owned by the Government of Malawi. The mandate of EGENCO is to produce electricity.

EGENCO was incorporated on 9th September 2016 as a public company under the Companies Act and commenced its operations on 1st January 2017. Currently, EGENCO's total installed capacity on the grid is 441.55 Megawatts (MW) comprising 390.15MW hydro and 51.40MW of diesel generators. The diesel generators were installed to operate as peaking and emergency plants. According to the Integrated Resource Plan released in May 2017, the peak demand in the country was around 449MW in 2017 against an installed capacity of 364MW (IRP, 2017).

2.0 Objectives of the project

Following more than 20 years of commercial operation of Nkula B Hydropower Station, the Units are aged and their availability and efficiency is no longer guaranteed. There are frequent machine downtimes due to failures experienced on the power plants' turbines, generators and unit control systems. Obsolescence of spare parts due to changes and advancements in technology is impacting negatively on ability to maintain the power plants effectively leading to plant inefficiencies.

In light of these challenges, EGENCO wishes to rehabilitate the power plants turbines and generators and modernize the plants control systems to improve performance, availability, efficiency and extend their useful life. The proposed rehabilitation and modernization works will be done with financial resources from the African Development Bank (AfDB). It is estimated that the rehabilitation modernization works will cost about USD 526,000 (Five Hundred and Twenty-Six Thousand United States Dollars) which is equivalent to about One Billion Malawi Kwacha (at the exchange rate of 1 USD to MK1,900).

3.0 Nature and Scope of the project

The proposed rehabilitation works of Nkula B Hydropower station will involve refurbishment of turbines, generators and associated equipment. In addition, modernization of units' control equipment (control, excitation & protection systems) will be done by replacing obsolete and aged controls with modern state of the art technologies. The proposed works shall involve plant overhaul, supply & installation of new parts and recommissioning of the units. The salient features of the proposed rehabilitation work include:

- Refurbishment of turbine and associated components;
- Refurbishment of Main Inlet Valves and Bypass Valves;
- Installation of back-up hydro cyclone filters;

- Refurbishment of generator and associated components;
- Replacement of digital and hydraulic governors;
- Replacement and repositioning of MIV hydraulic system;
- Replacement of Unit Generator and Transformer Protection systems;
- Replacement of obsolete electrical auxiliaries;
- Replacement of obsolete mechanical auxiliaries; and
- Replacement of Unit Control, Common Control & Automation Systems with modern state-of-the-art technologies.

The project is expected to directly employ up to 70 people during the rehabilitation and modernization works and up to 30 people re-deployed within EGENCO's Maintenance and Operations Sections.

4.0 Rationale for preparation of ESMP

The Guidelines for Environmental Impact Assessment in Malawi (1997) provide for a prescribed list of projects for which ESIA is mandatory. According to the Guidelines for Environmental Impact Assessment in Malawi (1997), rehabilitation works for Nkula B Hydropower Station is not in the prescribed list for which an ESIA is mandatory. However, considering the nature of the proposed works and potential risks associated with the works, MEPA has directed that an Environmental and Social Management Plan (ESMP) should be prepared. The preparation of the ESMP will assist in ensuring that social and environmental issues are integrated into the planning and construction phases of the proposed rehabilitation and modernization works.

5.0 Objectives of the ESMP

The main objective of the ESMP is to identify and assess the environmental and social impacts of the proposed project and propose measures to manage the impact. This will enable the developer to integrate environmental and social issues into the planning and implementation phases of the project. Specifically, the objectives of the Environmental and Social Management Plan (ESMP) are to:

- Identify significant environmental and social aspects associated with rehabilitation works of Nkula B Hydropower Station and management measures to prevent, minimize or mitigate against significant environmental and social impacts;
- Review the legal and policy framework pertaining to the proposed project and indicate their impact on the project;
- Conduct consultations with all stakeholders including members of Neno DESC, surrounding communities, MEPA, Department of Energy and MERA;
- Prepare Environmental and Social Management and Monitoring Plans for the proposed works; and
- Undertake stakeholder consultations to ensure that key interested and affected stakeholders are involved in coming up with the ESMP. Incorporate their views in the report and indicate a record of consultations in the appendices as part of the report.

6.0 Methodology for the preparation of the ESMP

The ESMP study was carried out in alignment with the Environment Management Act (EMA) (2017), using a methodology framework developed based on internationally accepted practice, and the professional experience of the study team. The general steps followed during the assessment were: (i) environmental scoping that provided the key environmental issues; (ii) desktop studies; (iii) physical inspection of the site and surrounding areas; (iv) stakeholder consultations; and (v) reporting and documentation. This approach has satisfied requirements for Environmental Assessment as stipulated in the Environmental Impact Assessment (EIA) Guidelines of 1997. Public consultations have also been conducted as part of the assessment.

7.0 Summary of Environmental and Social Impacts

7.1 Main Positive Impacts

i. Improved efficiencies;

Enhancement Measures:

- Procure rehabilitation components from reputable suppliers;
- Identify, regularly measure and report principal energy flows within the facility at unit process level;
- Manage the demand/load side by reducing loads on the system.

ii. Improved/ optimized plant operation

Enhancement Measures:

- Use well-qualified and experienced engineers/contractors;
- Regular comparison and monitoring of energy flows with performance targets to identify where action should be taken to reduce energy use;

iii. Reduced operation and maintenance costs

Enhancement Measures:

- Carry out regular maintenance of the facility;
- Carry out maintenance and modernization work periodically;

iv. Extended life span for Nkula B hydropower plant

Enhancement Measures:

- Conduct a diagnosis of the plants to identify aspects of operation and maintenance to be improved;
- Explore operation and maintenance contractual models to identify which activities will be implemented internally and which will be outsourced;
- Explore organization and staffing options (and organograms) according to owner capacity and requirements for external training and human resources;
- Estimate financial resources required for implementing the selected operation and maintenance model, including any external contracting;
- Monitor key performance indicators of the operation and maintenance strategy through KPIs specified in appropriate agreements and contractual arrangements;

- Stock spare components to avoid loss of generation due to forced outages owing to the rapidly advancing technologies and long procurement lead times.

7.2 Main Negative impacts

i. Risk of water pollution;

Mitigation Measures

- Develop and implement Waste Management Plan;
- Provide waste management receptacles including waste bins and leakage proof containers for managing liquid waste;
- Upgrade components with oil free lubrication such as water lubricated bearings, oil free Kaplan Runner (water filled hub), self-lubricated bushings (Kicket gates, Kaplan blades, Valve Journals, Vane rollers); and governing system with biodegradable and low toxic oil.
- Conduct periodic analysis of water quality (pH, turbidity, nutrients, etc.)

ii. Risk of loss of aquatic biodiversity;

Mitigation Measures:

- Develop and implement an aquatic biodiversity Rescue Plan;
- Limit the period the dam will be empty to minimize the impact that may be caused by dam emptying;
- Rehabilitate hydropower plant using best practices that minimize long-term damage;
- Implement operating guidelines that mimic natural flow conditions;
- Install deterrents near turbine intakes (e.g., screens) and install turbines that minimize mortality (ideally without compromising energy production);
- Conduct continuous monitoring, control, and surveillance of Nkula B hydropower plant to ensure there are no deviations from best practice; and
- Undertake adaptive management actions to reduce or mitigate impacts on biodiversity.

iii. Increased risk of occupational safety and health hazards;

Mitigation Measures:

- Develop and implement OHS Plan;
- Undertake risk assessments before starting the rehabilitation work;
- Provide adequate underground illumination for the safe performance of all work functions;
- Provide separate and independent emergency light sources at all places where a hazard could be caused by a failure of the normal lighting system;
- Provide an adequate automatic lighting system to allow the workers to conduct an emergency shutdown of machinery, and should be tested on a regular basis;
- Underground workers should always have an approved cap lamp in their possession while underground. The peak luminance should be at least 1500 lux at 1.2 meters from the light source throughout the shift;
- Place danger warning signs in strategic places; and
- Enforce the use of appropriate PPE.

iv. Risk of SEA and GBV

Mitigation Measures

- Develop and use GBV and SEA Prevention Plan;
- Change negative social attitudes and discriminatory practices and involve men and boys to prevent GBV;
- Implement projects that challenge the root causes of discrimination against women and gender-based violence through bottom-up empowerment processes; and
- Institute a community-based complaint mechanism to handle reports of sexual abuse and exploitation.

7.3 Public and Stakeholder Consultations

During the preparation of this ESMP, a number of public and stakeholder consultations were carried out from 16th November 2023 to 29th March 2024 through meetings, surveys, interviews, and focus group discussions. These consultations targeted Mtingala and Ngwenyama Villages under T/A Symon of Neno District, Neno and Blantyre District Councils, Malawi Environment Protection Authority (MEPA), Ministry of Labor, local leaders, Ministry of Energy etc. A total of 64 stakeholders were consulted of which 40 were males and 24 females. Further consultations are anticipated during the subsequent phases of the project development process.

7.3.1 Issues raised and perceived mitigation measures:

- Impact on water quality where the project should safeguard control on oil spillages and conduct quality analysis
- Chances on work opportunities which should favour surrounding communities and workers be paid government stipulated minimum wages
- Handling of grievances where issues should be completely resolved in timely manner and fairly.
- Control on traffic management particularly at nearby primary school by installation of humps and signage
- Solid waste management whereby waste from the construction site is properly managed and should not find its way into the river bodies

7.3.2 Development of Stakeholder Engagement Plan

In compliance with the African Development Bank requirements, a Project-specific Stakeholder Engagement Plan (SEP) has been separately developed for the Project which seeks to create a technically and culturally appropriate atmosphere that actively involves project-affected people and other stakeholders in a timely manner. The goal of the SEP is to improve and facilitate decision making by providing sufficient opportunity to the

identified stakeholders to voice their opinions and concerns depending on the stage of the project and the stakeholders' information needs. This will include information on the nature of the project design, the anticipated environmental and social risks and impacts, the proposed mitigation measures and framing how stakeholder views were incorporated in the project design and management of environmental and social risks. The PIU will be responsible for ensuring that SEP's actions are prudently followed and are consistent with the Bank's requirements.

7.4 Grievance Redress Mechanism

Grievance Redress Mechanism (GRM) is developed for a project to guide on handling concerns, complaints, feedback, suggestions and questions raised by Project-affected-persons and all stakeholders. It specifically addresses complaints related to the environmental and social performance of the Project in a timely manner. In compliance with the African Development Bank requirements, a project-specific GRM has been developed separately in order to:

- Reduce conflict, risk of undue delay and complications in project implementation
- Ensure that the rights of affected parties are respected
- Identify and respond to concerns, dissatisfactions and unintended impacts of the projects on individuals
- Enhance effective communication, participation, involvement, support and benefit of stakeholders in the project
- Provide an accessible process to receive grievances, dissatisfaction, concerns or feedback from project affected people (or those likely to be affected), and the public so they are dealt with in an early, transparent and fair manner

7.5 Institutional Arrangement for Implementation of ESMP, SEP and GRM

The ESMP specifies clearly who is responsible for the implementation of the mitigation/enhancement measures and institutions to be responsible for monitoring of performance indicators. EGENCO will be the overall implementing entity of the Nkula B Rehabilitation and Modernisation Project through the selected PIU comprising at least of Project Manager, Project Engineer, Risk Management Specialist, M&E Specialist, Social and Gender Safeguard Specialist, Environmental Safeguards Specialist, Occupational Health and Safety Safeguards Specialist, Procurement Specialist and Financial Management Specialist that are familiar with African Development Bank Operational Guidelines and Operations. The PIU will procure a contractor to execute the works and implement requirements of ESMP. There shall be monitoring agencies to measure performance and compliance and these include MEPA, Ministry of Labour, Malawi Bureau of Standards etc.

7.6 Budget for Implementation of ESMP, SEP and GRM

The overall cost required for the implementation of the ESMP, SEP and GRM is K715,000,000.00 (USD376,315.00). This can be disaggregated as follows:

- Implementation of Environmental and Social Management and Monitoring Plan - MK 115,000,000 (USD 60,526) calculated using the universal 1% of project cost to be set aside by EGENCO for meeting proposed management and monitoring activities.
- Implementation of Stakeholder Engagement Plan – K500,000,000.00 (USD263,157) covering planning, implementation and close-out phases.
- Implementation of Grievance Redress Mechanism Plan – K100,000,000 (USD52,631) that will be instituted in three levels

7.7 Key Performance Indicators

During implementation of the ESMP, the client and contractor(s) will be periodically reporting progress using some of these relevant Key Performance Indicators:

- Employment: Number of locals engaged in a quarter
- Accidents: Number of accident-free hours in a month
- Noise levels: minimal levels as per standard
- Grievances: Number of issues received and resolved
- Water quality: pH levels, turbidity, temperature, nutrient composition etc.

8.0 Conclusion

This ESIA study has therefore proposed mitigation measures for all the anticipated negative impacts and enhancement measures for all the positive impacts. This will ensure that the project is implemented in an environmentally friendly and socially acceptable manner. The ESIA has also proposed an Environmental and Social Management Plan that needs to be implemented; and an Environmental and Social Monitoring Plan that will be used to monitor the implementation of Environmental and Social Management Plan. The implementation of these plans will need human and financial resources, and as such, there is need for EGENCO to put aside required resources for their implementation.

9.0 Recommendations

i. Upgrade components with oil free lubrication such as water lubricated bearings, oil free Kaplan Runner (water filled hub), self-lubricated bushings (Kicket gates, Kaplan blades, Valve Journals, Vane rollers); and governing system with biodegradable and low toxic oil;
ii. The Contractor should develop Contractors Environmental and Social Management Plan (CESMP) before commencement of the construction activities;
iii. EGENCO should develop a Grievance Redress Mechanism (GRM) and a Stakeholder Engagement Plan (SEP) for the project before commencement of rehabilitation activities.
iv. EGENCO should carry out water quality analyses for surface water before commencement of the project that will provide baseline data to monitor the change in surface water quality during the various phases of the project.

v. Ensure rehabilitation works are carried out within the designated timeframe so as not to prolong periods of no electricity for areas depending on Nkula B for generation. Ensure all activities are well planned and all materials/ equipment needed for refurbishment are readily available on site;
vi. Develop an aquatic biodiversity rescue plan and ensure it is adhered to during implementation; and
vii. Ensure that there is a Grievance Redress Mechanism (GRM) for the project so that all grievances are timely addressed.

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List of Acronyms and abbreviations

AfDB	African Development Bank
AIDS	Acquired Immunodeficiency Syndrome
CCAP	Church of Central Africa Presbyterian
CHAM	Christian Health Association of Malawi
CITES	Convention on International Trade for Endangered Species
CMCs	Catchment Management Committees
CSR	Corporate Social Responsibility
DESC	District Environmental Sub-committee
DoE	Department of Energy
E&S	Environmental and Social
EGENCO	Electricity Generation Company
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMF	Electric and Magnetic Fields
ESA	Environmental and Social Assessment
ESA	Environmental and Social Assessment
ESCOM	Electricity Supply Corporation of Malawi
ESI	Electricity Supply Industry
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

GBV	Gender Based Violence
GHG	Green House Gas
GIIP	Good International Industry Practice
GoM	Government of Malawi
GRM	Grievance Redress Mechanism
GRM	Grievance Redress Mechanism
GVH	Group Village Head
HIV	Human Immunodeficiency Virus
IHS5	The Fifth Integrated Household Survey
ILO	International Labor Organization
ISS	Integrated Safeguards System
IUCN	International Union for Conservation of Nature
LEL	Lower Explosive Limit
LPG	Liquefied Petroleum Gas
MBS	Malawi Bureau of Standards
MEGS	Malawi Economic and Growth Strategy
MEPA	Malawi Environment Protection Authority
MERA	Malawi Energy Regulatory Authority
MGDS	Malawi Growth and Development Strategy
MISCOR	Malawi Iron and Steel Corporation Limited
MIV	Main Inlet Valve

MoAIWD	Ministry of Agriculture Irrigation and Water Department
MPRSP	Malawi Poverty Reduction Strategy Paper
MW	Megawatts
MW2063	Malawi 2063
NSO	National Statistical Office
NSP	National Sanitation Policy
NT	Near Threatened
NWRA	National Water Resources Authority
OHS	Occupational Health and Safety
OS	Environmental and Social Operational Safeguard
PAPs	Project Affected Persons
PLHIV	People Living with HIV
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RMC	Regional Member Countries
RTD	Resistance Temperature Detector
SDA	Seventh Day Adventist
SDGs	Sustainable Development Goals
SEA	Sexual Exploitation and Abuse
SEP	Stakeholders Engagement Plan
SESA	Strategic Environmental and Social Assessments

SGBV	Sexual Gender Based Violence
STIs	Sexually Transmitted Infections
SVTP	Shire Valley Transformation Programme
TA	Traditional Authority
ToRs	Terms of Reference
USD	United States Dollars
VIP	Ventilated Improved Pit
VNRMCs	Village Natural Resources Management Committees
VU	Vulnerable
WRU	Water Resources Unit

1. Chapter 1: Introduction

1.1 Introduction

This is an Environmental and Social Management Plan (ESMP) for the rehabilitation and modernization works of Nkula B Hydropower Station. Nkula B Hydropower Station, located in the area of Traditional Authority Symon in Neno District, is owned by Electricity Generation Company (Malawi) Limited (EGENCO).

Electricity Generation Company (Malawi) Limited (EGENCO) is a company wholly owned by the Government of Malawi with a mandate to produce electricity. It was incorporated on 9th September 2016 as a public company under the Companies Act and commenced its operations on 1st January 2017. Currently, EGENCO's total installed capacity on the grid is 441.55 Megawatts (MW) comprising 390.15MW hydro and 51.40MW of diesel generators. The diesel generators were installed to operate as peaking and emergency plants. According to the Integrated Resource Plan released in May 2017, the peak demand in the country was around 449MW in 2017 against an installed capacity of 364MW (IRP, 2017).

Nkula Power Station is the first major hydropower station in Malawi. It comprises of Nkula A with 3 machines, each rated 11.7MW, and Nkula B with 5 machines, each rated 20MW. The last machine at Nkula A was commissioned in 1966 whereas the last machine at Nkula B was commissioned in 1992.

Following more than 20 years of commercial operation of Nkula B Hydropower Station, there is an urgent need to rehabilitate and modernize the units for the Hydropower Station to improve its efficiency. EGENCO has therefore sourced financial resources for the rehabilitation works from the African Development Bank (AfDB) amounting to approximately One Billion Malawi Kwacha (MK 1,000,000,000).

The project is expected to directly employ up to 70 people during the rehabilitation and modernization works and up to 30 people re-deployed within EGENCO's Maintenance and Operations Section.

1.2 Objectives of the project

The objective of the project is therefore to rehabilitate and upgrade/ modernize the Nkula B hydropower plant in order to provide "life extension" to existing facilities at the station such as the reservoir and restore their initial performances, and to install upgraded equipment at the power plant in order to increase its efficiency and improve performance thereby yield greater output.

This has been necessitated by aging units and facilities at the power plant which have resulted in frequent machine downtimes due to failures experienced on the power plants turbines, generators and unit control systems. Obsolescence of spare parts due to changes

and advancements in technology is impacting negatively on ability to maintain the power plants effectively leading to plant inefficiencies.

1.3 Nature and scope of the project

The proposed rehabilitation works of Nkula B Hydropower station will involve refurbishment of turbines, generators and associated equipment. In addition, modernization of unit's control equipment (control, excitation and protection systems) will be done by replacing obsolete and aged controls with modern state of the art technologies. The proposed works shall involve plant overhaul, supply and installation of new parts and recommissioning of the units. The salient features of the proposed rehabilitation work include:

i. Refurbishment of turbine and associated components;
ii. Refurbishment of Main Inlet Valves and Bypass Valves;
iii. Installation of back-up hydro cyclone filters;
iv. Refurbishment of generator and associated components;
v. Replacement of digital and hydraulic governors;
vi. Replacement and repositioning of MIV hydraulic system for Nkula;
vii. Replacement of Unit Generator and Transformer Protection systems;
viii. Replacement of obsolete electrical auxiliaries;
ix. Replacement of obsolete mechanical auxiliaries; and
x. Replacement of unit control, common control and automation systems with modern state-of-the-art technologies.

1.4 Rationale for preparation of ESMP

The Environment Management Act (EMA), 2017 makes provision for the protection and management of the environment and the conservation and sustainable utilization of natural resources. In order to integrate environmental and social considerations in projects, the Act provides for environmental planning and the need for Environmental and Social Impact Assessment (ESIA). Section 31 (10) gives powers to the Minister upon recommendation from the Authority to specify, by notice published in the Gazette, the type and size of a project which shall not be implemented unless an ESIA is carried out and subsection (2) prohibit any person from undertaking any project for which an ESIA is required without the written approval of the Authority, and except in accordance with any conditions imposed in that approval.

In addition, the Guidelines for Environmental Impact Assessment in Malawi (1997) provide for a prescribed list of projects for which ESIA is mandatory. According to the Guidelines, rehabilitation works for Nkula B Hydropower Station are not in the prescribed list for which ESIA is mandatory. However, considering the nature of the proposed works and potential risks associated with the works, MEPA has directed that an Environmental and Social Management Plan (ESMP) should be prepared. The preparation of the ESMP will assist in ensuring that social and environmental issues are integrated into the planning and construction phases of the proposed rehabilitation and

modernization works. Terms of Reference (ToRs) for the ESMP have been provided in Annex 1 of the report.

1.5 Objectives of the ESMP

The ESMP was developed, by a team of experts provided in Annex 5, in accordance with the requirements of the Environment Management Act (2017) and Guidelines for Environmental Impact Assessment for Malawi of 1997. This ESMP will identify and assess the environmental and social impacts of the proposed project and propose measures to manage the impacts before the project is implemented.

Specifically, the objectives of the Environmental and Social Management Plan (ESMP) are to:

- Identify significant environmental and social aspects associated with rehabilitation works of Nkula B Hydropower Station and management measures to prevent, minimize or mitigate against significant environmental and social impacts;
- Review of the legal and Policy framework pertaining to the proposed project and indicate their impacts on the project;
- Conduct consultations with all stakeholders including members of Neno DESC, surrounding communities, MEPA, Department of Energy and MERA.
- Prepare Environmental and Social Management and Monitoring Plans for the proposed works;
- Undertake stakeholder consultations to ensure key interested and affected stakeholders are involved in coming up with the ESMP. Incorporate their views in the report and indicate a record of consultations in the appendices as part of the report.

1.6 Malawi Energy Sector Overview

Energy supply has become a growing concern in the Republic of Malawi and is an important factor in achieving growth and development. Future economic growth crucially depends on the long-term availability of energy from sources that are affordable, accessible, and environmentally friendly. However, the country is faced with serious energy supply problems including, rising energy and electricity demand; insufficient power generation capacity; increasingly high oil import bills; lack of investment in new power generation projects; high transmission and distribution costs, transmission losses; poor power quality and reliability; heavily subsidized pricing; insufficient focus on alternative energy sources; and lack of access to modern electricity for a large segment of the population.

In addition, the country faces a widening gap between electricity demand and supply which is being exacerbated by urbanization, economic development, population growth, and rural electrification. Electricity demand has been growing consistently at 6-8% per annum according to the GoM. As a result, the existing system is greatly strained and the

frequency of blackouts or brownouts is increasing, constraining industrial production and provision of socioeconomic services as well as deterring foreign investment.

1.7 Project Location

Nkula B Hydropower Station is located in the area of Group Village Head Ngwenyama, Traditional Authority Symon in Neno District. Figure 1.1 provides topographic map of Nkula B Hydropower Station while Figure 1.2 is the Location Map.

FIGURE 1.1: TOPOGRAPHIC MAP FOR NKULA B HYDROPOWER STATION

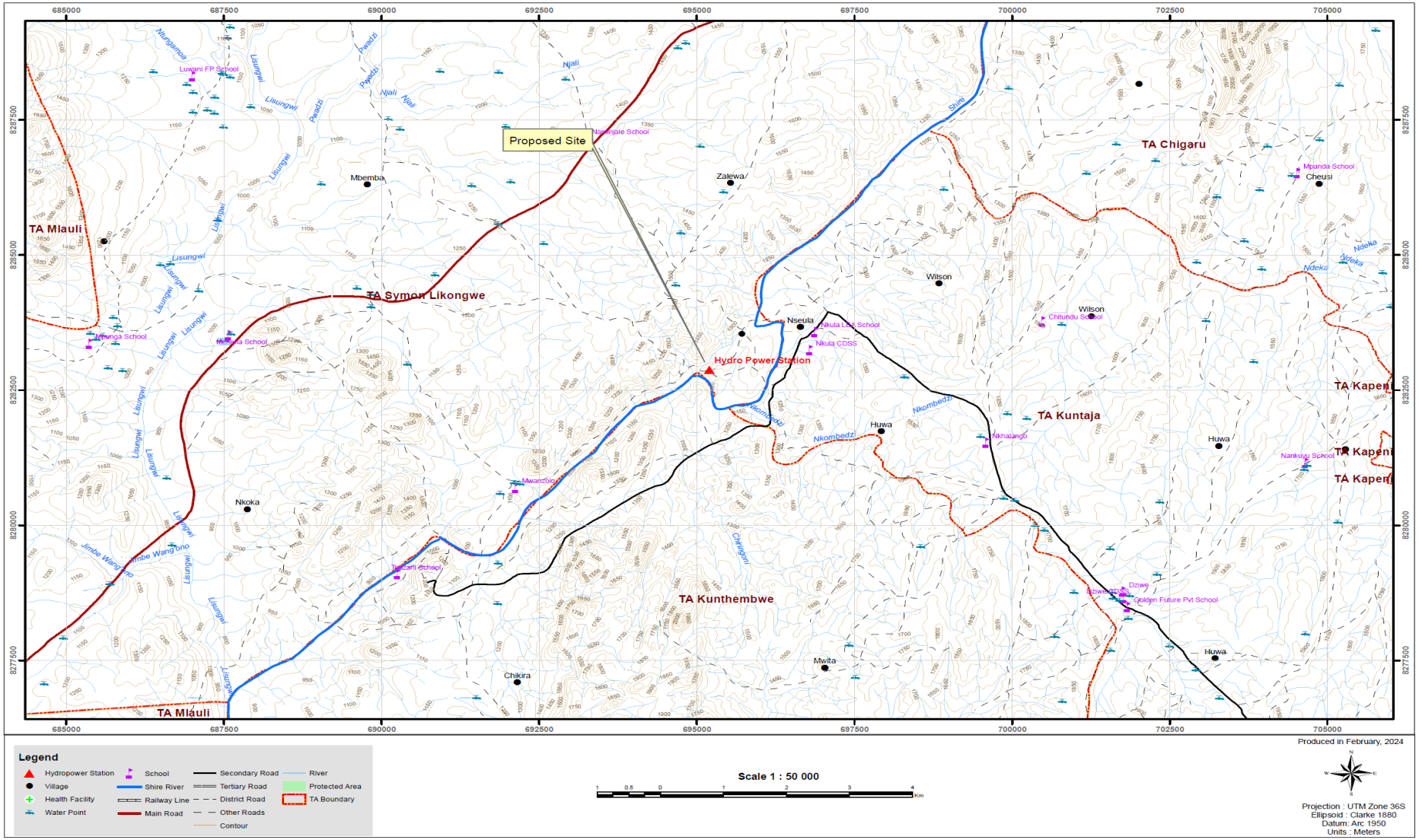

Figure 1-1: Topographic Map of Nkula B Hydropower Station

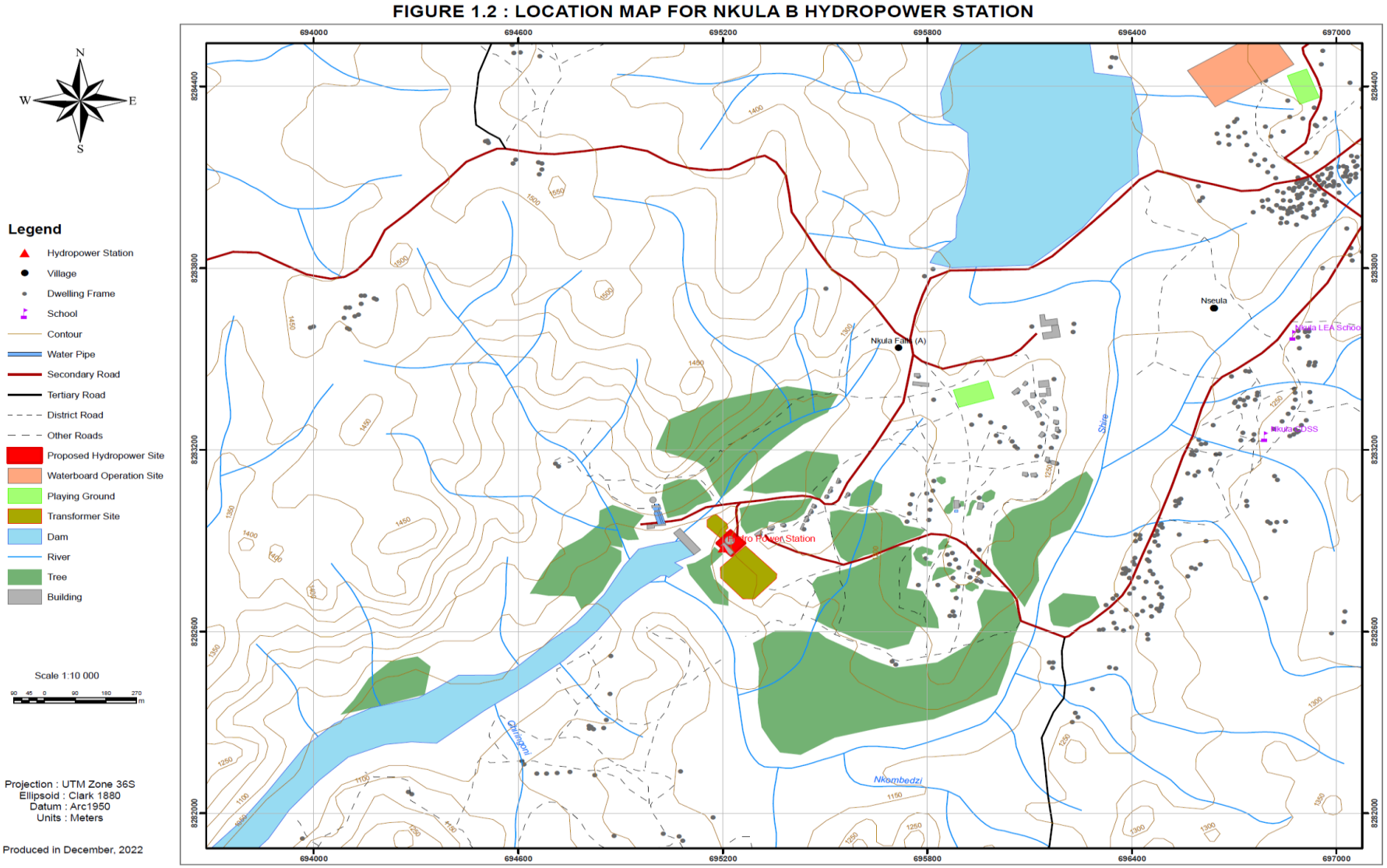

Figure 1-2: Location Map of Nkula B Hydropower Station

1.8 Project Proponent

The proponent of the proposed rehabilitation and modernization works project for Nkula B Hydropower Station is EGENCO. The contact details are as follows:

Proponent Name	:	EGENCO
Postal Address	:	Chayamba Building P.O. Box 1567 Blantyre
Contact Person	:	Dr Maxon Chitawo (Chief Executive Officer)
Email Address	:	mchitawo@egenco.mw

1.9 Methodology for the preparation of the ESMP

This Environmental and Social Management Plan was prepared through:

1.9.1 Desk Study

Some of the information in this report was obtained from the previous Environmental and Social Management Plans for related projects and some selected national documents, policies, and pieces of legislation. Among the documents, the desk study looked at relevant project documents, Environmental Impact Assessment Guidelines, National Environmental Policy, the Environment Management Act, Water Resources Act and the Land Policy.

1.9.2 Field Visits

The experts undertook site investigations to the proposed project site from November 2023 throughout the study period in order to acquaint themselves with the setup of the project site; identify, analyze and assess the potential negative and positive impacts that will be brought about by the project.

1.9.3 Stakeholder Consultations

The experts held a series of stakeholder consultations throughout the study period and the drafting of the report. The mode of consultation involved key informant interviews. Key stakeholders consulted included: MEPA; Neno District Environmental Subcommittee (DESC); Blantyre District Environmental Subcommittee (DESC); and surrounding communities. Figure 1-3 below shows community members of Mtingala Village captured during consultation meeting held in February 2004.

Views and main issues raised by those consulted have been included in Chapter 7 of the report and a list of those consulted has been attached as Annex 2. Detailed peoples' views and recommendations can be found in Annex 3.

Figure 1-3: Local Communities captured during consultations in February 2024

1.9.4 Questionnaires

Questionnaires were also administered at household level to collect baseline socio-economic data. The questionnaires were pretested before being administered to check if the tool was collecting the intended data. A Sample of the questionnaire that was used has been attached in Annex 4 of the report.

1.10 Users of this ESMP

The users of this ESMP include the following but not limited to:

i. African Development Bank;
ii. Neno District Council;
iii. Blantyre District Council;
iv. MEPA;
v. Electricity Generation Company (Malawi) Limited (EGENCO);
vi. National Water Resources Authority (NWRA);
vii. Department of Energy;
viii. Department of Water Resources;

ix. Department of Forestry;
x. Department of Occupation Safety, Health and Welfare; and
xi. Local Communities within the project area.

1.11 Report structure

The structure of this ESMP is summarized below:

- Chapter 1: Introduction
- Chapter 2: Project Description
- Chapter 3: Biophysical and Socio-economic Environment
- Chapter 4: Legal and Policy Framework
- Chapter 5: Identification of Impacts and Management Measures
- Chapter 6: Environmental and Social Management and Monitoring Plans
- Chapter 7: Public and Stakeholder Consultations
- Chapter 8: Institutional Arrangements and Capacity Building for Environmental and Social Management
- Chapter 9: Conclusion and Recommendations

2. Chapter 2: Description of Project Activities

This Chapter gives a detailed description of the project activities during the Planning, Construction, Demobilization and Operation Phases of Nkula B Hydropower Station. These have been presented as follows:

2.1 Planning Phase

During the Planning Phase of the project, EGENCO will ensure that all national, AfDB requirements and procedures are complied with. These include:

a) Assessment of condition of Nkula B Hydropower Station

EGENCO hired the services of Contractor (Voith Hydro) to carry out an assessment of Nkula B Hydropower Station. This was done in order to assess the general conditions of the Hydropower Station and advise the client (EGENCO) on areas or parts that need rehabilitation.

b) Preparation of Preliminary and Detailed designs

The developer engaged a contractor (Voith Hydro) to undertake feasibility study and prepare detailed designs for the proposed rehabilitation works of Nkula B Hydropower Station.

c) Identify the sources of rehabilitation materials

The rehabilitation of Nkula B hydropower plant requires a lot of different machinery that will be used during refurbishment. EGENCO has already identified a contractor (Voith Hydro) who will be responsible for the supply of all the required machinery. All rehabilitation machinery to be used under the rehabilitation works shall comply with National Standards or equivalent international standards.

On the other hand, the rehabilitation and replacement of the generation machines will require some minor to moderate civil works. As such, construction materials like sand, quarry, and cement blocks will be required. Cement and cement blocks will be procured from accredited suppliers while sand will be sourced within Nkula Power Station existing borrow areas.

d) Preparation of Environmental and Social Management Plan

The Environmental and Social Management Plan is being carried out during this phase of the project. The main objective of these studies is to identify environmental and social issues that are anticipated during the design, construction and operation phases of the project and propose measures to manage them. The ESMP has been developed for use by the proponent of the project (EGENCO), AfDB, beneficiary communities, the Contractor, Malawi Environment Protection Authority, Blantyre and Neno District Councils, among other stakeholders.

e) Preparation of tender and construction contract documents

During the Planning Phase, EGENCO will prepare tender and construction contract documents which contain appropriate clauses to allow control of Environmental and Social impacts arising from construction and operation activities.

f) Mobilization of construction material

The project will involve the use of different heavy machinery in order to ensure effective implementation of the rehabilitation works. The contractor will be responsible for the mobilization of all required machinery and equipment required for the project and workforce.

2.2 Summary of Nkula B Rehabilitation Assessment Results

According to the results of the assessment conducted by Voith, Nkula B hydroelectric power plant, requires rehabilitation. In order to achieve sustainable operation of the power plant station, the hydromechanical equipment and generated equipment are recommended for refurbishing or replacement. Table 2-1 shows a summary of observations made.

Table 2-1: List of Components and Observation Results

No.	Part	Observation
1.	Spare parts or devices	• 2 sets of 12 pads for lower bearing purchased from Voith; • 1 slip ring; • 29 stator coils.
2.	Brake disc	• Fixation ok. 6 segments. No signs of cracks on the welds or material failure. • Contact surface to pads with grooves. In-out segment chambers with irregularities. New machine needed.
3.	RTD for stator winding	• According to design, 9 RTD were installed. • To be totally replaced. To be verified installation between coils.

No.	Part	Observation
4.	Stator core RTD	• No access. According to monitoring records, many are out of order.
5.	Stator frame- Lower side	• Good visual conditions. No visual welds issue. Corrosion on the lower plate. Presence of oil.
6.	Lower combined bearing	• No access to inner parts. External and partial visual of the guide segments through the hatch of the cover. Guide bearing pivot system: ball joint type. • Oil leakage can be seen from below in all sealings.
7.	Upper air guide	• Good visual conditions. • No visual issue on welds. No corrosion. Misalignment issue causing scratches by fan on a localized point. Overall gap to fan blades not uniform. See measurement table on item 7.6.3.
8.	Brake system control unit	• System composed of command panel with manual engagement and oil tank. Powerhouse central compressed air supply. Panel easily accessible. Not safe. • Sensors are not working.
9.	Brakes terminal box	• System composed of command panel with manual engagement and oil tank. Powerhouse central compressed air supply. Panel easily accessible. Not safe. • Sensors are not working.
10.	Brake	• Brakes operation with 4 brakes • Signs of corrosion and maintenance are needed. Actuation sensors are not operational.
11.	Brush holder complete	• Steel structure with good visual conditions. Wear signs caused by short circuits in the rings and in the insulation polyethylene external plate.

No.	Part	Observation
12.	Grounding brush	• Installed below the pit cover, fixed in the lower bracket. • Due to the oil leakage, it is totally embedded in oil also in the contact surface to shaft.
13.	Anchor bolt	• Critical corrosion status in the visible edges seen by the foundation´s plate hatch. This is for the bolt and nuts.
14.	Lower bracket sole plate	• Critical corrosion status in the visible edges seen by the foundation´s plate hatch. This is for the bolt and nuts.
15.	Stator frame sole plate	• Critical corrosion status in the visible edges seen by the foundation´s plate hatch. This is for the bolt and nuts.
16.	Wiring in generator	• Overall irregular functioning of instrumentation in all units. Partially dead or malfunctioning. Customer request redesign of a completely new system.
17.	Air to water cooler	• Cooling capacity reduced due to high level of debris in the hot side of the coolers. All gaskets between coolers and stator frame damaged. Water boxes and internal piping coils to be clean. Defective aeration valve.
18.	Lifting diagrams and devices	• From the original supply only the lower bearing device is available. New set of devices to be supplied.

2.3 Construction Phase

2.3.1 General Description of Nkula B Hydropower Station

Production of hydroelectric power requires the strong flow of water which is captured and converted to electricity. After a dam is built, the flow of water is restricted, and water builds up creating a reservoir. Water from the reservoir is concentrated and flows through intakes which have control gates controlling the force of the river flow and into the dam. From the control gate, water moves through the penstock, and into the blades of the turbines. The water pressure at the turbine is extremely high as water is pushed

over and through the turbine, the force of the compressed water is strong, resulting in the rotation of the turbine blades. The water is then released and exits through the outlet and into the riverbed. The rotation of the turbines spins the generator which contain multiple strong magnets, this process produces electricity. This stage of the process is where mechanical energy is converted into electrical energy. Huge transformers in the powerhouse then convert the electricity to the correct voltage and send it to the grid via transmission lines.

Nkula B hydroelectric power plant has a total of five turbines (units). Each Turbine generates about 20 megawatts (MW) with a power generation flow of 39.1m/s. Nkula B Hydropower Station has a combined output of 100 MW (20MW) from each of the 5 Turbines). The main power plant structures consist of a Head of 57m in size, a Runner weighing 6tons, a Penstock and Main Inlet Valve with 2.4m and 2.7m diameter, respectively.

The power plant generator has a 22.2 MVA transformer with a rated power factor of 0.9 and the value of voltage used to designate the switchgear is 11kV, this is related to its operating performance. The rated speed of the generator is 220 rpm with a runway speed of 447rpm and a frequency of 50Hz. The generator also consists of 24 poles, 360 stator slots and a coiled stator winding.

2.3.2 Main Rehabilitation Components and Works

As scope of the rehabilitation works, partial or entire replacement of the components is recommended. These assessments were based on the observations of the units inspected. The main feature under the rehabilitation works include:

i. Refurbishment of turbine and associated components;
ii. Refurbishment of Main Inlet Valves and Bypass Valves;
iii. Installation of back-up hydro cyclone filters;
iv. Refurbishment of generator and associated components;
v. Replacement of digital and hydraulic governors;
vi. Replacement and repositioning of MIV (Main Inlet Valve) hydraulic system for Nkula B;
vii. Replacement of Unit Generator and Transformer Protection systems;
viii. Replacement of obsolete electrical auxiliaries;
ix. Refurbish/replace obsolete mechanical auxiliaries;
x. Replace unit control, common control & automation systems with modern state-of-the-art technologies; and
xi. Testing and recommissioning.

During the rehabilitation works the water reservoir for the hydropower station will be emptied. The emptying of the dam will negatively affect aquatic biodiversity, especially some fauna as they may not survive without the presence of water. Most of the aquatic

flora and fauna will be flashed out together with the water when draining the water. The ESMP has proposed measures to ensure that this impact is mitigated.

2.3.3 Construction of Campsite and Sanitary Activities

The Contractor for the rehabilitation works is expected to either construct a campsite to be used by workers at designated site or use existing guesthouse facilities within the power station. In addition, sanitary facilities such as toilets and bathrooms will be constructed including changing rooms. Sanitary facilities will be used for the management of waste that will be generated. Waste Bins will also be provided for the management of domestic solid waste generated. The contractor will also construct a cafeteria or use existing lounges as part of the camp site where meals will be served to workers. Access roads to these facilities as well as to the project area are already in existence hence there will be no need to create new roads.

2.3.4 Equipment and machinery to be used

The rehabilitation and modernization work will require specialized equipment and machinery. Table 2.2 provides the list and their associated usage:

Table 2-2: List of Equipment and Machinery

No.	Equipment/ Machinery	Usage
1	Pulley Crane	Lifting Heavy objects
2	Forklift	Lifting and moving equipment on a pallet
3	Dump Trucks	Transporting materials i.e., dirt and gravel or demolition waste
4	Pipe Wrench	Turn threaded pipe and pipe fittings for assembly or disassembly
5	Spanners	Provide grip or tighten loosen fasteners
6	Drilling Machines	Create holes in various materials
7	Orbital Sanders	Creating ultra-smooth surface on materials i.e., wood and metal
8	Ultrasonic Flow Meter	Water flow measurement
9	Elastic Pressure Element	Pressure measurement
10	Water Pump	Draining Water
11	Compressor Machine	Drilling
12	Welding Machine	Welding metal parts
13	Grinders	Cutting and smoothening metal surfaces
14	Lathes	Shaping metal parts
15	Utility vehicles	Transporting workers and different materials

2.4 Operation phase

Nkula B hydroelectric power plant has a total of five units which operate to produce a power output of 20 megawatts with a power generation flow of 39.1m/s. The main power plant structures consist of a Head 57m in size; a Runner weighing 6tons; a Penstock of 2.4m and Main Inlet Valve with a diameter of 2.7m.

The powerplant generator has a 22.2 MVA transformer with a rated power factor of 0.9 and the value of voltage used to designate the switchgear is 11kV, this is related to its operating performance. The rated speed of the generator is 220 revolutions per minute (rpm) with a runway speed of 447rpm and a frequency of 50Hz. The generator also consists of 24 poles, 360 stator slots and a coiled stator winding.

The project will improve efficiency and thereby the performance of Nkula B hydropower scheme and will increase electricity generation and extend electricity supply to new areas. This is expected to lead to increased industrial and commercial productivity in the country. Availability of electricity improves the economic value of land and property and is one of the development pushers. A lot of investments and businesses thrive where there is a reliable electricity supply. This is also expected to occur in the newly developed areas where electricity distribution will be extended.

2.5 Demobilization Phase

After the rehabilitation works, the contractor will demobilize. The activities during demobilization phase include demobilization of labor force especially international experts; laying off of local labor force; demolition of temporary structures such as campsite; disposal of waste generated during the rehabilitation works and rehabilitation of area used as a campsite by the contractor.

2.6 Input and Output

2.6.1 Waste Generation

2.6.1.1 Increased Risk of Liquid Waste Generation

The rehabilitation work for Nkula B will generate a lot of liquid waste. Liquid waste will mainly be used oils (lubricants). It is estimated that 16 drums of lubricants with a capacity of 200 liters each drum will be removed from each machine during the rehabilitation works. The estimated volume of used oil will be 3,200 liters (3.2 cubic meters) for each machine. Considering that Nkula B has a total of 5 machines, it is estimated that a total volume of 16,000 liters (16 cubic meters) of used oils will be generated and will need to be managed properly.

Used oil will be kept in leak proof drums (containers) at a designated used oil holding area ready for dispatch to a MEPA licensed used oil dealer. EGENCO signed an agreement with Malawi Iron and Steel Cooperation Limited (MISCOR) to collect all used oil and use it as fuel in its furnaces. Malawi Steel Industry Company uses scrap metal to manufacture steel products such as hoes and steel bars, among other steel products.

Apart from used oils, it is also expected that construction workers will generate wastewater from washrooms. The wastewater will be managed through the use of septic tanks. The Contractor will be required to construct separate toilets, bathrooms and change rooms both for women and men as is required by Occupational Safety, Health and Welfare Act (1997).

2.6.1.2 Solid Waste

From the assessment carried out by the construction company, a number of parts will require replacement and reconditioning. This will generate a lot of waste in the form of scrap metal. This waste will need to be managed properly. During the rehabilitation works it is expected that some parts of the hydropower plant will be replaced. The rehabilitation work is expected to generate about 30 tons of scrap metal and 15 tons of obsolete cables. These will be kept in a scrap yard within Nkula B Hydropower plant and will later be collected by licensed scrap metal dealers.

It is also expected that some general waste will be generated. The contractor will provide waste receptacles such as bins at strategic positions. Organic waste will be composted within Nkula B Hydropower Station while inorganic waste will be disposed of at a designated waste dump site by either Neno or Blantyre District Councils.

3. Chapter 3: Biophysical and Socio-economic Environment

3.1 Physical Environment

3.1.1 Topography

Nkula B Power Station is located across the Shire River in the Southern Region of Malawi, approximately 50 kilometres road distance to the north-west of Blantyre city. It was constructed at Nkula, about 17km from Zalewa Trading Centre, downstream of Kholombidzo Falls and upstream of Tedzani Falls. The project is located in the middle section of the river catchment which includes the Shire Plain- a flat-lying featureless landform on both sides of the Shire River, with elevations ranging from 500m to 1300m above sea level. The plain is bounded by mountains on both sides and the Nkula Dam downstream. It is more extensive to the west of the river than it is to the east. Beginning around Matope, the River falls below the surrounding land and is flanked by alluvial terraces. This section also contains a series of falls (Kholombidzo, Nkula, Tedzani, Hamilton and Kapichira).

3.1.2 Geology

The Middle Shire Valley forms the floor of the Great African Rift Valley and consists of undulating but rugged and densely dissected country. The Rift Valley is separated from the African surface by a scarp zone of broken terrain incorporating an altitude gain of several hundred meters. The area is largely underlain by Precambrian metamorphic rocks (basement complex) of the Fractured Basement rocks overlain by Weathered Basement rocks. Main lithologies consist of gneisses and granulite. Amphibolite (gneissose or granofelsic metamorphic rock mainly consisting of amphibole and plagioclase) and granulite facies are dominant in the western and eastern side of the Shire River, respectively. The geology of an area has an impact on the resulting soils.

3.1.3 Soil

The soil of the project area in general is moderately deep (50-100cm), well drained, reddish brown with weathered rock in the subsoil and gravel and stones throughout the profile. They are categorized as Cambisols in Omuto C.T. & Vargas R., 2019. They are characterized by slight or moderate weathering of parent material and by absence of appreciable quantities of illuviated clay, organic matter, aluminium and/or iron compounds. These soils are in a transitional stage of development, from a young soil to a mature soil with an argic, natric, spodic, or ferralic B-horizon. Appreciable quantities of weatherable minerals and absence of any signs of advanced pedogenesis evidence the fact that Cambisols are in an early stage of soil formation. They tend to occur in regions with a precipitation surplus but in terrain positions that permit surficial discharge of excess water. The soils have a high porosity, are medium to coarse textured, with a good structural stability. They can support structures well, hence are not expected to provide

challenges to the infrastructure to be installed. Cambisols are the commonest soils in Blantyre and Neno Districts. In the steep slopes, the soils are shallow and largely with low vegetation cover. Shallow soils have higher erodibility characteristics. Figure 3.1 depicts soil types of Neno district where the Cambisols are seen to dominate.

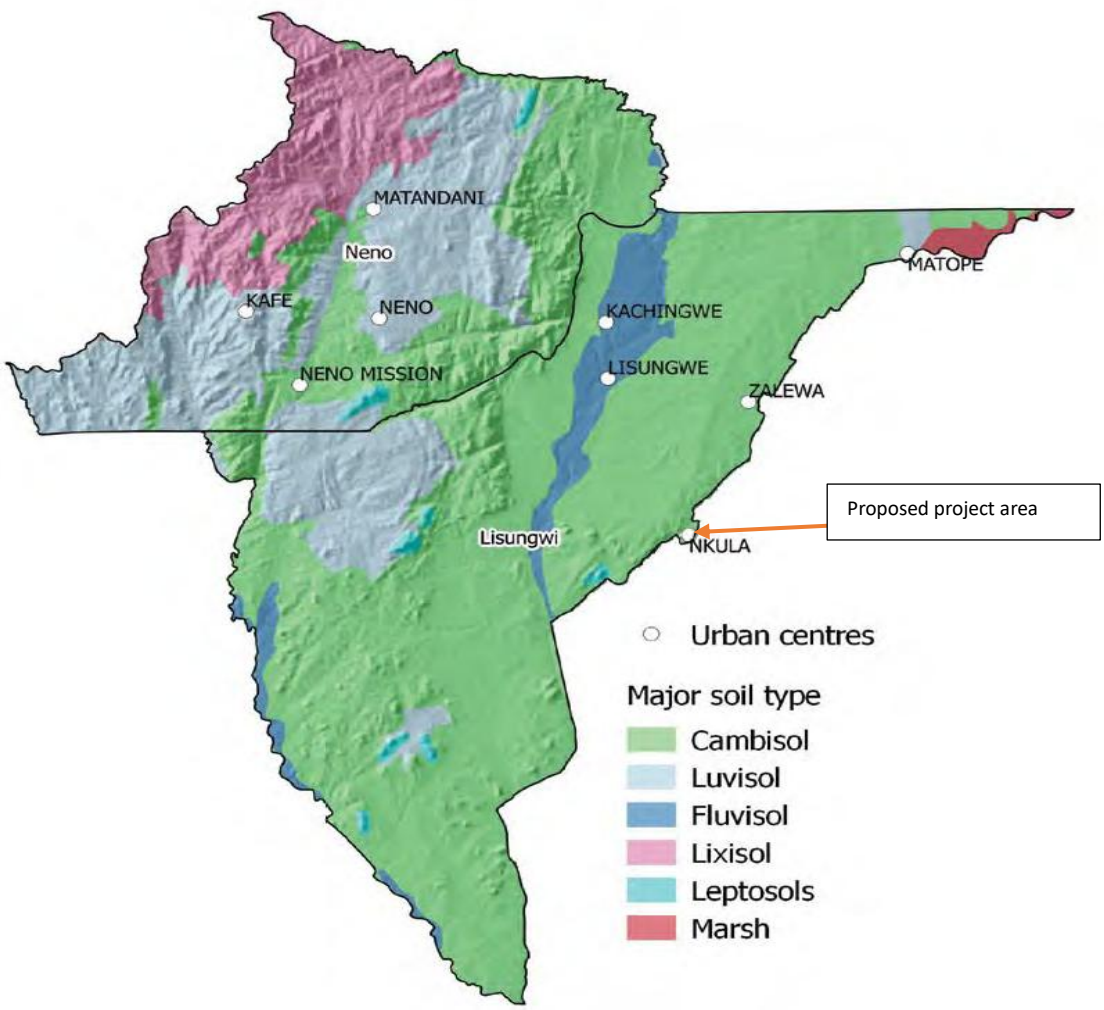

Figure 3-1: Map showing soils of the proposed Project Area
Source: Omuto C.T. & Vargas R., 2019

During the implementation of the project, dam emptying may stir up sediments and carry them downstream potentially damaging spawning grounds and habitat. Also, some soil erosion will potentially occur due to clearing of vegetation and earth moving equipment during the rehabilitation of the power plant, howbeit local. According to Government of Malawi (2015), the middle Shire River catchment has many bright spots (areas experiencing high soil loss but declining trends over time), for example, Neno and Ntcheu in the west and Zomba and Chiradzulu in the eastern side of the river. Estimated soil loss between the year 2000 and 2014 ranged from 0.1 to 21.1 t/ha/year. Clearing of

forests from the catchment has subjected the bare soil to erosion which finds its way into the Shire River downstream to the Nkula Dam as a sink. The heavy siltation at the dam has reduced the volume of water. The volume of the Dam at Nkula Falls, which was 3 million m^3 at its construction in the 1980s, has recently dropped to nearly half of its original size due to massive siltation which consequently resulted in low production of hydroelectricity. Enforcement of regulations of managing forests and riverbank zoning needs to be strengthened by the relevant authorities in the water and forestry sector, including the National Water Resources Authority and local authorities. Population growth needs to be controlled through increased use of family planning. EGENCO can also contribute to the initiatives through the district councils.

3.1.4 Climate

The study area has a tropical climate, more specifically a tropical savanna climate and is greatly influenced by its location in the tropical zone and altitude, marked by hot temperatures and two distinctive seasons: the dry and the rainy seasons. The dry season starts in May and ends in October while the rainy season starts in November and ends in April and 80% of rain falls between November and March. The project should plan to execute most activities during the dry season to reduce work disturbances due to rainfall. Annual average precipitation in the middle Shire River catchment area varies ranging from 750 to 2500 mm. Highlands receive more rain. The annual average temperature of the area is around 23°C, with the Shire Plains experiencing warmer temperatures than the higher areas in the east.

3.1.5 Water Resources

3.1.5.1 Hydrology

The Shire River originates from the outflows of the third largest lake in Africa, Lake Malawi. The Shire River runs through the southern part of Malawi and there are currently 13 Districts having all or part of their area in the river Basin. The river flows approximately 410 km from Mangochi to Ziu Ziu where it joins the Zambezi in Mozambique (Shela, 2000). It is the largest water course in the country and has a catchment area of 18,945 km^2. The river in this middle section flows across a broad plain descending only seven meters in 50 km. It then drops steeply by 360 meters over a distance of around 70 km through a series of rapids and falls, some of which have been harnessed to provide hydropower. In addition, the river in this section has meanders, the rapids are flanked by islets and has abandoned river channels. Several tributaries join the main channel, the most important being the perennial Lisungwe and Mkulumadzi Rivers. The stream density in this section is high mainly due to the Kirk Range and the Shire Highlands. However, most of the tributaries in the middle shire are seasonal. The flow regime of the river in this section therefore displays greater variations between peak flows and low flows than the upper part. Typically – in normal lake outflow periods – the rainy season flow is about one-and-a-half to three times the magnitude of the dry

season flows (SMEC, 2013). Although flood episodes of local origin are important, a significant proportion of peak average flow is due to higher lake levels towards the end of the rainy season. The Nkula B Hydroelectric Power Station is one of the most important structures across the Shire River. The dam at Nkula Falls supplies water into the power station. During the emptying of the dam, EGENCO will release the water carefully to mitigate potential downstream impacts of flooding and riverbank erosion. EGENCO will also ensure that the riverbanks are protected from erosion that may arise from construction activities.

An assessment of the river flow at Liwonde and at Maganga (downstream of Kapichira falls) indicates that the tributaries of the Middle Shire contribute about 30% of the stream flow in the rainy season and less than 10% in the dry season (SMEC, 2013). The nearest gauging stations are Shire at Zalewa (1P6), Lirangwe at Lirangwe (1C1), Lunzu at Whayo (1C9), Lisungwi at Rail bridge and Shire at Mpatamanga. Daily flow data from Surface Water Division of the Water Resources Department shows that there are flow records from 1953 to 2005 for 1P6 while records for Shire at Mpatamanga were not available. The Shire River generally has high annual base flow indices above 0.9 in its stations. The flow of water for power generation in the Shire River is partially regulated by controlling the flow through Kamuzu Barrage and partially contributed from in-flow from the drainage basin downstream of the Lake. The barrage was commissioned in 1965 to regulate the flow of the Shire River to ensure adequate water supply for the Nkula Falls hydropower facility. It was rehabilitated in 2018. The rehabilitation of the barrage and enhanced regulation has contributed to increased water availability in the Lake Malawi in recent years; however, poor management of the catchment impacts availability of water and management of the hydropower station.

Shire River is an important source of livelihood to many people, using the water for agriculture, domestic purposes, and the generation of electricity. The project is expected to have no impact on the water supply from the Shire River. However, most catchment areas within the Shire River Basin are considered severely degraded (Atkins, 2011). These catchments are intensely cultivated, using poor land management systems. High rate of deforestation averaging 4.3% per annum was observed and more pronounced in the western side of the river (Mzuza M. et al, 2019). Continued degradation of the catchments is contributing to increased siltation, flooding and the prevalence of invasive aquatic plants, all of which negatively impact water resources, aquatic life, and hydropower generation. Deforestation in the middle Shire River catchment has resulted in increased soil loss through erosion causing huge accumulation of sediment at the Nkula B Hydroelectric Power Dam downstream and, consequently, causing serious problems with the generation of hydroelectricity (Mzuza M.K et al, 2019).

3.1.5.2 Hydrogeology

The geological setting of the study area offers conditions for groundwater to occur in the fractured basement, overlain by weathered basement rocks, and overlain by fluvial sediments in river channels. These are associated with hard rock, where water occurs in fractures, faults, joints or fissures. The rock types generally have poor permeability; however, the areas with faults and associated zones of deeply fractured bedrock provide potentially good aquifers. Fractured and weathered basement aquifers are in most cases hydraulically connected.

Groundwater flows in the middle Shire Valley are generally towards the Shire River or locally towards its tributaries. Flows follow the surface water drainage with groundwater divided coincident with surface-water divided at regional and local scales. The highest yielding boreholes in these aquifers are expected to be located mainly along linear structures and main streams and near contacts between different aquifers. The basement aquifers in this area are shown to have a poor potential yield of ≤0.25 l/s (Council for Geosciences (2018). Borehole yields in fractured aquifers as observed in data from the Department of Water Resources can be ≥2 litres per second (in exceptional cases). Many of these areas are in contact with alluvium aquifer. Council for Geosciences (2018) indicated that boreholes with the highest yield in Fractured Basement aquifers in the Shire River Basin are associated with the geomorphology of high recharge zones such as rivers and mountains. The project is not expected to have a significant impact on the availability of groundwater in the area. However, during the project, dewatering may be required if high groundwater levels are encountered in construction to maintain a safe and dry working environment.

Currently, existing hydrogeological data for the study area is scanty and does not indicate obtained yields for areas close to the project site. The nearest exploratory boreholes are at Malizakamba Primary school in TA Symon, Neno District and at Mpatseabwire Primary School, TA Kunthembwe, Blantyre District. Malizakamba borehole was drilled to a depth of 128 m. The lithology of the borehole in this Fractured Basement is consolidated silica rich gneiss with little lithological variation. Estimated transmissivity ranges between 0.26-1.3 m2/d. The sustainable pumping rate for Malizakamba borehole is 0.1 L/s if pumped for 24hours per day. The borehole Mpatseabwire School was drilled to 103mbgl. The weathered gneiss rock becomes slightly towards 80 mbgl but a quartz vein was encountered a 50 mbgl. The groundwater strikes were intersected on the contact zones between Gneiss and Granite and where quartz veins exist. The sustainable pumping rate for Malizakamba borehole is 0.1 L/s if pumped for 24 hours. The sustainable 8-hour constant discharge rate was 2.1 L/s, with a transmissive range of between 18 and 27 m2/d. The significant difference in availability of groundwater implies that if there will be need to develop the groundwater for domestic provision to the local area due to increased population resulting from the project, adequate hydrogeological assessments will be required.

3.1.5.3 Water Quality

Water quality downstream may change negatively due to potential spillage of oils during rehabilitation activities, but this impact may be short lived. In addition, hydropower plants are also known to change the concentration of nutrients and water temperature.

The ESMP recommends monitoring of water quality in the river before and during the project to determine the extent of impacts that may arise due to rehabilitation activities and employ corrective measures where necessary. Sampling points shall be upstream and downstream of project impact area whose objective is to identify and measure the presence and concentration of pollutants, contaminants, and other factors that may affect water quality. Key parameters to be analyzed include:

- **pH levels:** An indicator of the acid-base balance in the water which can affect metal corrosion and aquatic life.
- **Turbidity:** Measures the cloudiness of water, which may indicate soil erosion or presence of pollutants.
- **Dissolved Oxygen:** Essential for sustaining aquatic ecosystems and useful in detecting organic matter degradation.
- **Nutrient Composition:** Particularly nitrogen and phosphorus levels which affect algae growth and overall water health.
- **Temperature:** Affects biochemical reactions and can inform adjustments in plant operations.

Regarding groundwater quality in the area, Malawi Government (2022) indicates the EC in sites around the proposed project area is generally low, usually less than 800 ~S/cm and commonly below 500 ~S/cm; other elements like sodium, sulphate, chloride are also below the threshold. This indicates that the weathered zone is highly leached of soluble minerals and that the groundwater is likely to be derived from relatively recent recharge.

3.2 Socio-economic Environment

There are 4 Traditional Authorities in Neno District. Nkula B is located in TA Symon. According to the 2018 Population and Housing Census, the population of TA Symon is currently estimated to be 49,153. Women represent 51% of the population, at 25,068. The population of the TA was 43,657 in 2018 (NSO, 2018). The population of Neno district is currently at 155,702 with an Intercensal Annual Growth rate of 2.4%, which is lower than the rate for the southern region at 2.7% (NSO, 2018). The population density for the district was 89 per square km in 2018, lower than the national average population density

of 186 and the southern region average density of 244 per square km (NSO, 2018). Maintaining this relatively low population density will sustain reasonable access to resources such as land holding sizes.

Figure 3.2 depicts populations of the TAs and shows that TA Symon Likongwe has the highest population of 49,153 while TA Chekucheku has the lowest population of 26,630. GVH Ngwenyama, where the site is located, has more than 300 households, which translates into an approximate population of 1290 considering that on average, a family in the district has about 4.3 members (NSO, 2018). This is the population that is closest to the project site hence local impacts are likely to be felt more by them than any other group of people.

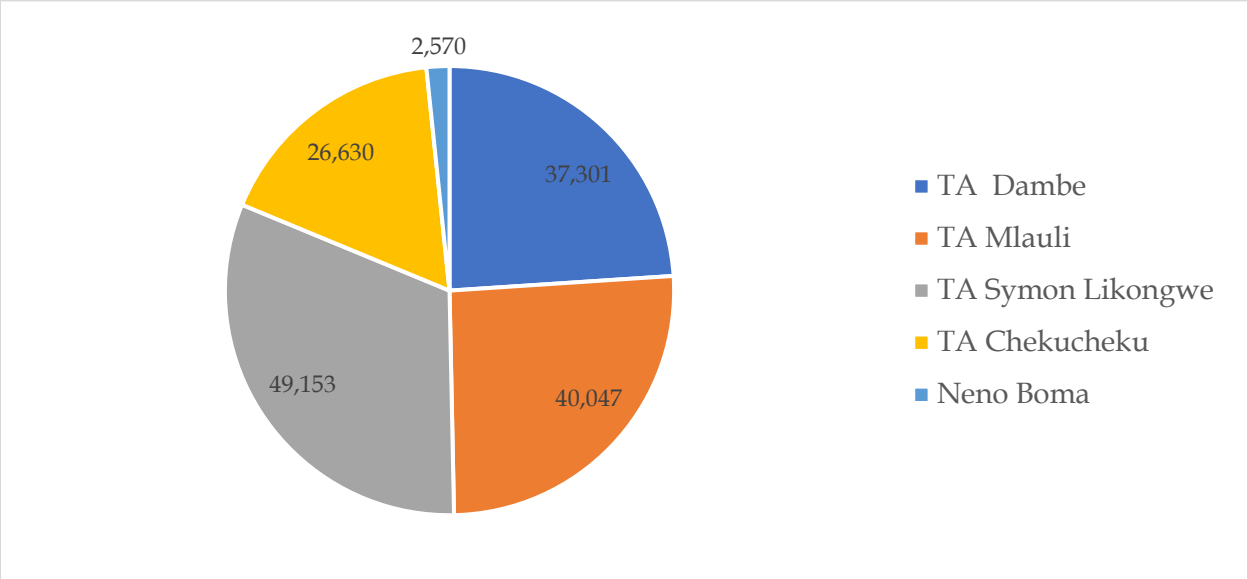

Figure 3-2: Population per Traditional Authority
Source; NSO, 2018

3.2.1 Health

The Government through the Ministry of Health is the major provider of health services. In Neno district, the health delivery system comprises hospitals, health centers and clinics/dispensaries. Health services are provided at three levels, that is primary, secondary and tertiary levels. These levels together provide curative, preventive, promotive and rehabilitative services. At primary level, services are delivered through rural hospitals, health centers, health posts, outreach clinics and village health clinics. District and Christian Health Association of Malawi (CHAM) hospitals provide secondary level health care services to back up the activities of the primary level while tertiary hospitals provide services similar to those at secondary level, along with a range of specialist surgical and medical interventions.

The nearest Government health facility in the area is the Nkula Health Centre which is depicted in Figure 3.3. It is located within the Nkula B Power station premises and is one of the 8 Health Centers in Neno district, among other health facilities. The Health Centre provides primary level health service delivery which is done mostly by community-based cadres such as clinicians, nurses, community midwives, health surveillance assistants, community-based distributing agents, village health committees, and other community-based health volunteers. The Health Centre provides services to both the families of staff members as well as the surrounding community. The health centre is conveniently located; hence it will be very beneficial in case of any accidents or health issues amongst employees during the project implementation, including working with the contractor to sensitize employees and the local community to dangers of HIV and AIDS and other sexually transmitted diseases. Referral cases are taken to Lisungwi Community Hospital.

Figure 3-3: Nkula Health Centre
Source: Consultant photobank

Prevalence of diseases around the Nkula Health Centre during the period July to December 2023 is presented in Table 3-1. The table indicates malaria as the leading cause of morbidity followed by Pneumonia and Diarrhoea.

Table 3-1: Prevalence of diseases in surrounding communities

Disease	Month of the year						
	July	August	September	October	November	December	Total
Malaria	614	575	622	469	266	273	**2819**
Pneumonia	31	27	18	9	16	10	**111**
Diarrhoea	6	10	30	9	19	19	**93**
STI	6	14	15	11	4	9	**59**

Asthma	12	2	8	5	3	4	**34**
Dysentery	1	1	0	2	1	**2**	**7**
ARI	7	2	11	5	6	5	**36**
HIV	1	0	0	1	2	2	**6**

Source: Nkula Health Centre

The communities around the proposed project area indicated that malaria is the greatest cause of morbidity, and the other common disease is stomachache. They also indicated that cholera was experienced in the area and there were 2 deaths in the GVH during the last episodes. During the project, employees will be encouraged to use mosquito nets. EGENCO Health Centre can as a social responsibility assist with regular Health education/ awareness programs to encourage communities to drape insecticide treated mosquito nets over their sleeping places/ beds, covering as much of the skin as possible with clothing, and indoor residual spraying to prevent malaria.

3.2.2 Education

Neno District had a literacy rate of 70% in 2018 (NSO, 2018). Among its neighboring districts it was surpassed by only Blantyre which had 75% literacy rate. The majority of students in communities surrounding the proposed project area access Public Primary Schools. The nearest Primary School is Nkula Full Primary School which is located at a distance of approximately 1.5km from the project site, in GVH Nkula, TA Kuntaja, Blantyre. Thus, for the project employees who will bring their families, the school is conveniently located for their children. Figure 3 depicts the school blocks of standard 3 to standard 8 classes.

Figure 3-4: Nkula B Primary School
Source: Consultant photobank

In November 2023, the school had a total enrolment of 704 pupils comprising 371 boys and 333 girls. The pupils come from surrounding Group Village Headmen Nkula, Nseule, Mtingala, Chiputula and Katchakwala among others. The farthest distance pupil(s) walk to school is approximately 4.5km, from GVH Katchakwala. The distribution of pupils in the various classes is depicted in Figure 3.5.

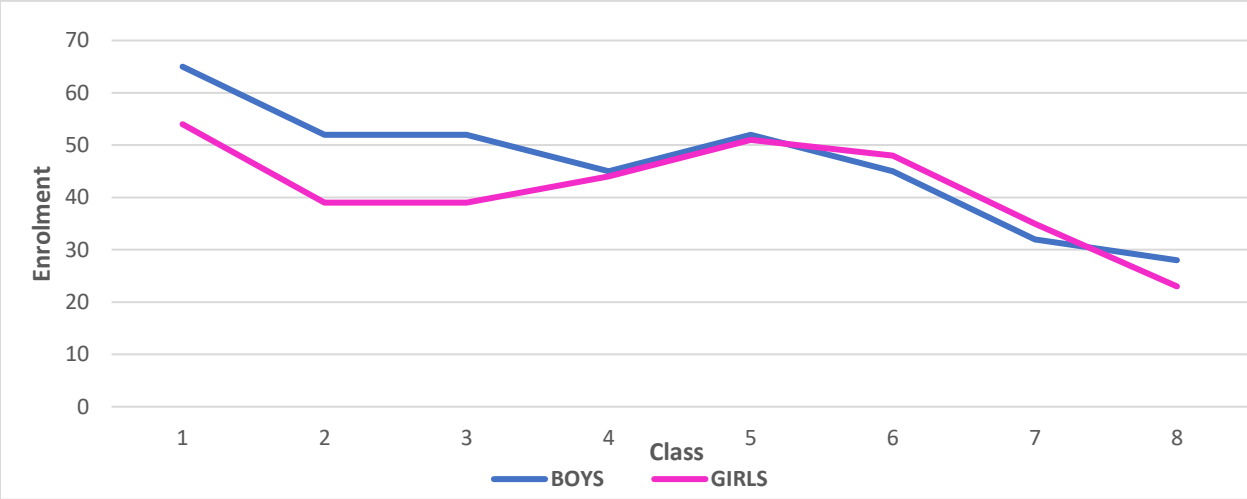

Figure 3-5: Enrolment at Nkula Full Primary School
Source: Nkula FP School

The school had 17 teachers in November 2023, 82% of whom were female. It is observed that the enrolment of both girls and boys takes a decreasing trend towards the higher classes. The Head teacher for the school explained that this is because many students come with parents who come for temporary employment hence, they transfer to other schools when the parents' employment comes to an end. The school is conveniently located for any pupils who will come with parents to work on the project.

The Primary School Leaving Certificate examination pass rate was 100% in the previous academic year and selection rate was 50%. Most pupils at this school are selected to go to Nkula Community Day Secondary School (CDSS) and usually few who do better are selected to Lunzu Secondary School. The Head teacher for the Primary School mentioned that housing for teachers at the school is inadequate, as there are only 2 teacher houses at the school even though EGENCO has given the institution some additional houses inside its premises.

Nkula CDSS is situated adjacent to Nkula Full Primary School. It has a total of 141 students for the Day classes and 83 students for the Open classes. Figure 3.6 depicts the enrolment by gender for the Day learning at Nkula CDSS. There is generally a decrease in number of students to the higher classes apart from the increased number of girls in Form 4 which the Head teacher said is due to some leaving for schools with better structures and enough resources.

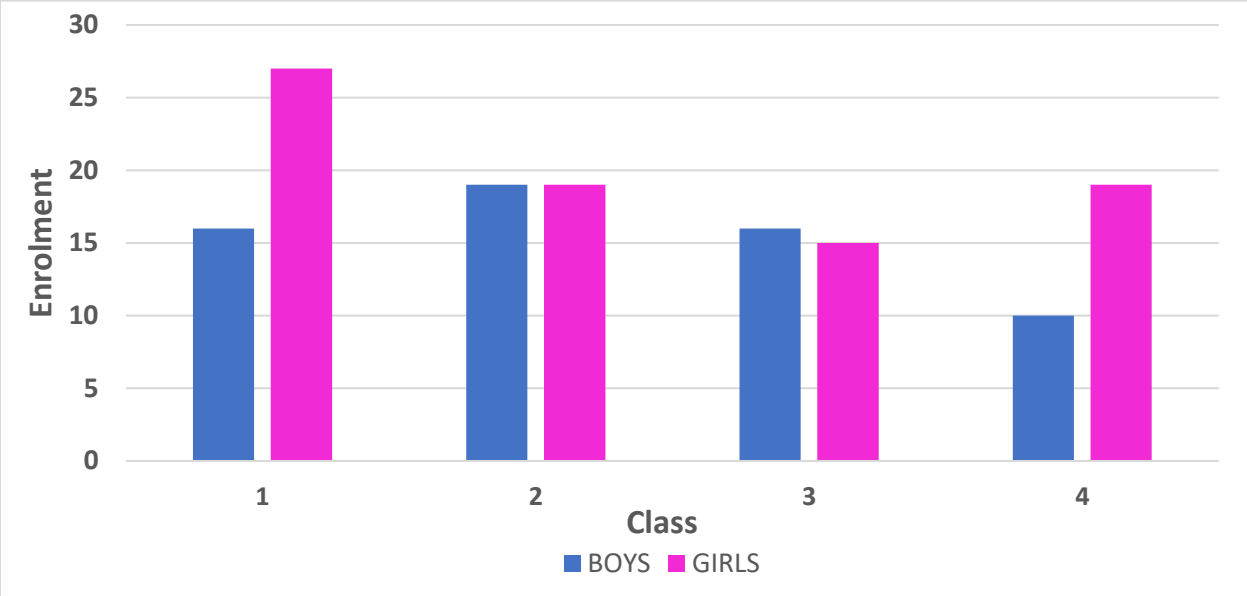

Figure 3-6: Enrolment at Nkula CDSS, November 2023
Source: Nkula CDSS

The pass rate for MSCE examinations in the past academic year was 40%. There are 12 teachers at the school, of whom 3 are female. The head teacher laments the lack of science laboratories as a setback towards motivation of students; poor structures at the school which make most students to leave to other schools which have enough resources, especially when they get to the senior classes; and the lack of proper sanitary facilities for girls like change rooms which also poses a challenge towards maintaining girls in the school. EGENCO can take up to assist through lobbying for or provision of resources in to address these problems as part social responsibility.

To protect school going children, the project should ensure that it employs people that are aged 18 and above in accordance with labour laws in the country, and the contractor employees should be sensitised against enticing sexual relationships with girls in the area.

3.2.3 Ethnic Groups and Culture

The area has a mixed set of tribes due to the urban setting and some urban-rural mixed environment in other communities near the project site. At the workplace there are many tribes; Chewa, Ngoni, Lomwe, Mang'anja, Yao, Tumbuka etc. The major tribes in

communities around the proposed project site are Ngoni followed by Lomwe. Though these have their original languages, most speak Chichewa well. The native tribes have lost their language little by little through mixing with different cultures due to intermarriages. They are subsistence farmers and many are traders. These tribes are matrilineal. Thus, family leadership roles are passed down through the female's family and upon a marriage, the husband moves into the wife's village. The Ngoni are descendants of Eswatini's Swazi people and the Zulu of South Africa. Traditionally, the Ngoni wear the skins of animals to show that they are real hunters. In the past the Lomwe made distinct scarification marks on their cheeks, but the practice has almost died out. It is expected that the project implementation will not be considerably affected by cultural traditions and will not hinder any cultural practices in the area.

3.2.4 Religion

The people in communities surrounding the proposed project area are mostly Christians, and they worship at several different churches. The community members indicated that most Christians belong to Church of Central African Presbyterian, Catholic, Anglican, Seventh Day Adventist, Assemblies of God, and Zion congregations. There is also 'Nyau' culture in some communities around the area which some take as a religion. The contractor is expected to tolerate the various religious beliefs in the area as well as those of incoming employees.

3.2.5 Current Land use and Land Tenure

Villagers access land through traditional procedures such as historical settlement and family inheritance. In Malawi, land is clearly seen as family property, and it has become a highly contested asset when it is inadequate. In the dominant tribes in the area, the land belongs to women and the power of women over land is strong in these matrilineal cultures. The land at the proposed project site belongs to EGENCO and is already being managed by EGENCO. Conflicts are therefore not expected to arise concerning landownership.

3.2.6 Economic Activities

The proposed project area has a rural plus small- scale urban/ business environment. Nkula B Hydroelectric Power Station is one of the most important structures across the Shire River in the middle section of the river. Apart from electricity generation, the Shire River is an important source of livelihood to many people, using the water for agriculture and domestic purposes.

Some people in the area are employed in various Departments at Nkula Hydroelectric Power station. EGENCO employs both natives and emigrants who have transferred to the area specifically due to employment. The emigrants are employed in both skilled and unskilled labor. The consultant was informed that unskilled labor employment is mostly

periodic (temporary) as it becomes available when there are construction projects. To boost the local economy, it is expected that the contractor will employ the majority (80%) of the unskilled labour from the local communities. In addition, the contractor will consider gender considerations in line with the National Gender Policy.
The Shire River at Nkula Walkers Ferry (located upstream of the Nkula Power station) is the main source of potable water for Blantyre City and surrounding areas, pumping 96 million litres per day (BWB, 2024). It thus contributes to the economic importance of middle Shire to the country. It also contributes to boosting the local economy by offering employment to residents, which includes natives of the area.

The communities in the surrounding areas, especially the original inhabitants, also depend on agricultural activities for their livelihood. The main crop that is cultivated is maize. Maize is the main staple food in the district. They also grow groundnuts. However, some community members mentioned that the land is not productive in agriculture and for most households the produce is adequate for food only, but in distant areas such as around Dziwe (to the southeast) the soil is better for agricultural production. Some communities have gardens in flood plains along the Shire River. They are able to grow maize and cultivate green maize which they sell to residents around Nkula. The people also rear animals such as cattle, goats, chickens but for the cattle and goats they indicated it is not common nowadays.

The socioeconomic survey found out that there is no well recognized trading centre near Nkula. The residents at Nkula working for EGENCO mentioned that they travel to Zalewa market to buy groceries using a staff bus. They said the bus in some days goes to Mdeka when there is market day there. It is expected that the same arrangements will be made for the project employees.

The local community are also involved in lending facilities such as *Banki Nkhonde*. Some have opened bank accounts at Mwanza Bank or Lunzu. They expressed the need for banks at Zalewa.

3.2.7 Service infrastructure within the area

3.2.7.1 Energy Sources

Nkula B Hydropower station has a power generation capacity of 100 megawatts. Together with Nkula A Hydropower station, Nkula Hydroelectric power scheme produces 135MW which is about 40% of the current hydropower generation in the country hence it is of significant economic importance to the nation. The proposed project will rehabilitate and modernize the hydropower plant thereby improving efficiency of the power generation.

The commonly used source of energy among the local communities is firewood and charcoal which they buy from vendors. Construction workers will increase the demand for energy in the area. The contractor will sensitize employees of the project who will not have access to electricity to use sustainable energy sources in their homes such as gas stoves and efficient energy stoves for workers, and to support local people in tree planting for future fuel needs. Charcoal is a major contributor to deforestation in the middle Shire. Poor crop productivity in the area under study has forced the local people to be cutting down trees for charcoal as a livelihood strategy. There is serious need for multi-sectoral catchment rehabilitation efforts, to involve both men and women, since both men and women utilize resources such as trees for important economic activities within their social responsibilities.

Some residents also use solar as a source of energy, mainly for operating music systems. Torches that use solar or batteries are also commonly used for lighting.

3.2.7.2 Domestic Water Supply

Nkula Hydropower Station and the public institution around it such as the schools are supplied with water from the Shire River at Walker's Ferry. This water is supplied by the Blantyre Water Board. The main source of water supply in the rural communities surrounding the proposed project site is groundwater. Boreholes are used by the majority for potable domestic water supply. GVH Ngwenyama mentioned that the boreholes in his area are not adequate for water supply and there is usually lot of queuing which delays the women to doing other economic activities. In the village near to Walkers Ferry, there is a tap used to supply potable water as supplied by Blantyre water Board; however, it services only a part of the village. IHS 5 indicated that Neno has the lowest access to improved water supply sources among all the districts in the country, at 66.4%. Initiatives at district level to alleviate this situation should therefore be priority inclusions in development interventions wherever possible. The project will provide safe and clean potable water at the project site for drinking, hand washing, and washing facilities, with sanitary detergents. This is important considering the recent cholera outbreaks experienced in the area. Moreover, diarrhoea is one of the most common diseases in communities around the project area.

3.2.7.3 Sanitation

Various types of sanitation facilities are used by the local communities around Nkula B Hydropower Scheme. Within the Nkula Hydropower Station premises, flush toilets are used. Most members of the surrounding communities use traditionally constructed pit latrines (without slabs -unimproved) for disposal of excreta. Some households within Ngwenyama village use toilets with slabs which they collected from the refugee camp at Luwani when the refugees left. Some residents at Nkula mentioned that in the villages a

significant number of houses are practicing open defecation. At Nkula Full Primary School, the Head teacher mentioned that the ratio of latrines to pupils is low.

In the local communities, wastewater from bathrooms is drained into earth surface drainage system. Many households in the area use refuse pits (rubbish pits) within proximity to their houses.

District level interventions should include initiatives to observe basic hygienic procedures, especially waste disposal through appropriate pit latrines and washing of hands with soap. The IHS5 shows that basic latrine coverage (pit latrine without slab) in Neno district is at 58.7%; and that 27% of households have access to improved sanitation facilities.

Adequate sanitary facilities will be established at the project site for both men and women, and the solid waste and wastewater disposed properly to avoid contamination of the environment.

3.2.7.4 Communication

Various types of transportation are used by the communities surrounding the project area. The roads within the Nkula premises are tarmacked. There is an access gravel road that connects the project area to the main road (M6), and schools, markets and trading centres. The distance from the proposed project site to the M6 Road is approximately 7.5km. There is a staff bus at EGENCO which takes the residents to trading centres on specific days and times. There are also other company vehicles, and some staff own vehicles which they use to commute. Apart from the use of vehicles, kabaza transport (bicycles and motorbikes) is also used in the area. This shows that communication in the project area will not be a challenge.

Regarding telecommunications, the project area is run by both Airtel and TNM. Both networks are said to be currently performing well on connectivity.
People around the project area can tune in to different Television and Radio Stations. Among these are Malawi Broadcasting Corporation (MBC) Television and Radio Stations, which are state owned; Zodiak Radio and Television and FM Radio Station which are privately owned.

3.2.7.5 Security

Communities at Nkula Hydropower Station and around the area are serviced by Nkula Police Unit, Luwani Police Unit on the other side of tarmac or Zalewa Police Unit. Security around the area is also enhanced by private security guards for the companies operating in the area, some of whom are armed. Therefore, security is expected to be available at the project site. Cases that are criminal in nature are reported to this facility

while civil cases are handled by traditional or local leaders. There is Community Policing in the area. People that are convicted of criminal offences are arrested and kept at Luwani Prison (for fewer jail years) and Mwanza Prison or Chichiri Prison in Blantyre for longer jail sentences. GVH Ngwenyama told the consultant that there is a village policing forum which assists in the security of the local communities, thus project employees who will reside in the village setup are expected to be served by this.

3.3 Biological Environment

3.3.1 Flora

3.3.1.1 Terrestrial Flora

The Miombo woodland vegetation is the most dominant terrestrial eco-zones in Malawi, including the proposed project area in Neno District. The Central and Southern regions of the country are dominated by the Zambezian Miombo Woodland Zone, which is characterized by miombo woodland trees, shrubs and understory herbs and grassland (Wild & Fernandes, 1967). Some of the examples of miombo trees belong to the following genera *Brachystegia* and *Julbernardia*, including scattered genera of *Acacia, Combretum* and *Terminalia*. The socio-economic profile for the district indicates that the most dominant miombo flora species include *Brachystegia boehmii* (Mombo), *B. floribunda* (Tsamba), *Diplorhynchus condylocarpon* (Wild rubber), *Combretum apiculatum* (Red bushwillow), *C. microphylla* (Burning bush-combretum), *C. zeyheri* (Large-fruited bushwillow), *Terminalia sericea* (Silver-cluster leaf tree), *Lonchocarpus capassa* (Apple-leaf tree), *Julbernardia paniculata* (*Tsamba*), *J. globiflora* (*Tsamba*), *Dalbergia arbutifolia* (Eastern-climbing Dalbergia), *D. nyassae* (Mane-pod tree), *Pericopsis angolensis* (East African afrormosia) and *Bauhimia petersiana* (Large white bauhimia), among others. However, deforestation, loss of habitat, overexploitation, alien invasive species, pollution and climate change are the biggest problems in the district that cause loss of flora species, depletion of woodland and forest resources in the area.

Significant land use and land cover changes that have occurred in the middle Shire River catchment in the recent years have affected the Nkula Reservoir. Forestland and shrubland have declined, while cultivated land and artificial surfaces have increased in the area. Deforestation appears to be more pronounced in the western side of the middle Shire River leading to severe siltation. Studies conducted by *Mzuza et al, 2019* seems to suggest that catchment degradation is strongly linked to increased soil erosion. Land cover degradation is exacerbated by rapid population growth which has led to clearing of vegetation and cutting of trees for firewood, charcoal making, new settlements, and cultivation.

To solve these problems, the study suggests the need to review and amend weak policies that encourage noncompliance with regulations for managing forests. For example, all or

settlement policies that may encourage or result in soil erosion such as riverbank cultivation must be amended. Powers should be invested in local authorities to take part in protecting the environment and/or in planting trees, and the government should be able to provide seedlings for the operation. This should be done in a competitive manner so that the village which will perform well should be given some incentives. There is also need to increase fertilizer use so that land expansion for farming is curbed, and yields are improved. In addition, population growth can be controlled through increased use of family planning. EGENCO can also assist in catchment management interventions such as the provision of seedlings. Encouraging children to go to school to avoid early marriages might also help to reduce poverty which will help to avoid cutting down of trees carelessly. Deliberate programs should be instituted by the government to curb further effects of climate variability such as droughts and floods. Such programs may include good agricultural practices that conserve soil and protect it from water erosion, discourage riverbank cultivation, intensify afforestation programs, and ban the burning of charcoal. Findings in this study and the combination of methods used can possibly be applied in areas where similar environmental problems have occurred.

The field investigation and assessment that was carried out established that the project area comprises indigenous woodland as shown in Figure 3-7. A total of more than 100 flora species were identified. Out of these only 3 species were classified as protected under the National Forestry Act in Forestry Amendment Rules of 2012 and under the National Parks and Wildlife Act (Chapter 66:07) in National Parks and Wildlife (Protected, Endangered and Listed Species) (Declaration) Order of 2017; and were classified as Vulnerable (VU) under the National Plant Red-Data List for Malawi were recorded from the proposed project area. One of the two was classified as near threatened (NT) under the IUCN Red-List of Threatened Species while the rest were classified as least concern category under the IUCN Red List as shown in Table 3-2.

Figure 3-7: Vegetation type for Nkula B (Source: Consultants Photos)

Table 3-2: Protected and threatened flora species from the proposed project area

Species Name	**Local Name**	**Protected/National Plant Red-List Status Category**	**IUCN Red List Status Category**
Sterculia appendiculata	Tall sterculia	Protected	Least Concern
Sterculia africana	African star-chestnut	Protected	Least Concern
Bridelia micrantha	Mitzeeri	Protected	Least Concern
Dalbergia melanoxylon	African blackwood	Vulnerable (VU)	Near-threatened (NT)
Pterocarpus angolensis	African teak	Vulnerable (VU)	Least Concern

It is expected that the planned rehabilitation and modernization works for Nkula B Hydropower Station may have no effect on conservation status of terrestrial flora. However, the proposed construction works of Construction camp may have little effect on the vegetation and this will depend on the choice of the site. Once a site is identified for camp construction, EGENCO will prepare a camp site ESMP to mitigate any impacts that may arise, especially highlighting issues of waste management, deforestation and community safety and Health, among other issues.

3.3.1.2 Aquatic Flora

An inventory of aquatic flora was carried out at Nkula B Hydropower station. Most of the plant species were herbs and others were in the form of grass. However, none of the

recorded species were either endemic nor endangered, therefore outside the IUCN Red list category (Table 3-3).

Table 3-3: List of aquatic flora recorded at Nkula Hydropower Station

TAXA	FAMILY	FORM	IUCN STATUS	USES
Ludwigia stolonifera	Onagraceae	Herb	Data deficient	Medicinal
Crassula natans	Crassulaceae	Herb	Data deficient	Environmental use
Azolla filiculoides	Azollaceae	Herb	Data deficient	Environmental use
Azolla nilotica	Azollaceae	Herb	Data deficient	Environmental use
Potamegeton thunbergii	Potamegetonaceae	Herb	Data deficient	Environmental use
Ipomea aquatica	Convolvulaceae	Herb	Data deficient	Environmental use
Myrophyllum aquaticum	Holoragaceae	Herb	Data deficient	Environmental use
Nymphaea lotus	Nymphaeaceae	Herb	Data deficient	Environmental use
Vossia cuspidata	Poacaea	Grass	Data deficient	Environmental use
Sesbania bispinosa	Fabaceae	Shrub	Data deficient	Environmental use

3.3.2 Fauna

3.3.2.1 Terrestrial Fauna

During the study period, different types of animals were recorded in the project area and these included birds, amphibians, reptiles, insects and mammals. These animals were recorded by using different methods that included observation, literature review and administering semi-structured questionnaires.

During the preparation of the ESMP, nine bird species were recorded in the project area. These included Grey Heron (*Scopus umbretta),* Speckled Mousebird (*Colius striatus),* Pied Crow (*Corvus albus),* Heuglin Robin Chat (*Cossypha heuglini),* Folk-tailed Drongo (*Dicrurus adsimilis),* Common Waxbill (*Estrilda astrild),* Red-throated Twinspot (*Hypargos niveoguttatus*), African Piedwagtail (*Motacilla aguimp*) and Black-eyed Bulbul (*Pycnonotus tricolor*). None of the recorded bird species were either endemic or endangered, therefore outside the IUCN Red list category and National Fauna Red-List Status protected under the Forestry Act and Wildlife Act.

A number of mammals were reported to be found in the project area. These included Four-toed elephant shrew (*Petrodromus tetradactylus),* Elephant shrew (*Elephantulus fuscus),* Sun squirrel (*Heliosciurus mutabilis),* Silvery mole rat (*Heliophobius argenteocinereus),* Porcupine *(Hystrix africae australis),* Fat mouse (*Steatomys pratensis),* Hyena (*Crocuta crocuta),* Hare *(Lepu saxatilis).* None of the recorded mammal species were either endemic or endangered, therefore outside the IUCN Red list category and National Fauna Red-List Status protected under Forestry Act and Wildlife Act.

Reptiles were also observed in the project area. These included snakes, lizards, chameleons and tortoises. The Nile crocodile (*Crocodylus niloticus)* is generally widespread in the Shire River and Lake Malawi. Reptiles play a very important role in nutrient cycling within the ecosystems and population control of their prey.

3.3.2.2 Aquatic Fauna

The survey conducted at Nkula reveals that the reservoir has lesser species diversity as compared to immediate downstream. The lesser species diversity in the reservoir could be attributed to anoxic conditions which cannot support diverse biodiversity. Table 3-3 provides a list of aquatic species that were recorded in the reservoir and immediately downstream. None of the recorded species were either endemic or endangered, therefore outside the IUCN Red list category and National Fauna Red-List Status. However, *Bitis gabonica* (Gabon Viper) was categorized as vulnerable under the IUCN Red list category.

Some fish species were also recorded at Nkula and these included *Otopharynx tetrastigma (Kambuzi), Oreochromis mossambicus* (*Makakana*), *Clarias ngamensis* (Mlamba), *Oreochromis shiranus chilwae (Chambo),* and *Chilotilapia rhoadesii* (G*undamwala)*. These are categorized as vulnerable because these are hunted by people for both consumption and sale.

Table 3-4: List of aquatic Fauna

	Family Name	**Species Name**	**Local Name**	**ICUN Red List 2022**
1	Coenagrionidae	*Aciagrion africanum*	Slender damselfly	Least Concern
2	Aeshnidae	*Aeshna minuscula*	Friendly hawker	Least Concern
3	Belestomatidae	*Lethocerus niloticus*	Toe bitter bug	Not Evaluated
4	Coenagrionidae	*Aciagrion africanum*	Slender damselfly	Least Concern
5	Aeshnidae	*Aeshna minuscula*	Friendly hawker	Least Concern
6	Aeshnidae	*Anax imperator*	Emperor dragonfly	Least Concern
7	Notonectidae	*Anisops sardeus*	Water bug	Not Evaluated
8	Culicidae	*Anopheles arabiensis*	Malaria mosquito	Not Evaluated
9	Belestomatidae	*Lethocerus niloticus*	Toe bitter bug	Not Evaluated
10	Crocodylidae	*Crocodylus niloticus*	Crocodile	Least Concern
11	Viperidae	*Bitis gabonica*	Gaboon Viper	Vulnerable

4. Chapter 4: Policy and Legal Framework

This Chapter reviews Malawi's' Legal, Policy and Administration Framework that will be applicable to the proposed rehabilitation and modernization works of Nkula B Hydropower Station. In addition, Malawi is a signatory to various international conventions and agreements which it is bound to adhere to. Such being the case, a review of applicable international conventions and agreements has been done.

4.1 Policy Framework

4.1.1 The National Environmental Policy (2004)

The Policy was adopted by the Government in June 2004. The mandate of the policy is derived from Section 13 of the Malawi Constitution. In the policy, it is noted that Malawi has a diversified natural resource base and if properly utilized, the resources may provide the basis for sustainable socio-economic development of the country. The policy also takes note of the fact that the resources are subject to increasing pressure. There is serious degradation of the environment. The overall policy goal is the promotion of sustainable social and economic development through the sound management of the environment and natural resources.

Underlying these broad policy goals are certain key principles, which will guide policy development and implementation strategies. One of the guiding is that every person has a right to a clean and healthy environment and a duty to maintain and enhance the environment.

There are strategies on environmental planning and environmental impact assessment, audits and monitoring, among others. On environmental planning, the objective is to ensure that national and district development plans integrate environmental concerns, in order to improve environmental management and ensure sensitivity to local concerns and needs. On ESIAs, the objective is to regularly review and administer the guidelines for ESIAs, audits, monitoring and evaluation so that adverse environmental impacts can be eliminated or mitigated, and environmental and social benefits enhanced.

In line with the environmental policy (on planning and ESIAs, among others), EGENCO will integrate environmental and social concerns during the whole cycle of the project, i.e., planning, design, and implementation. This will ensure that the rehabilitation of Nkula B Hydropower Station is not only environmentally friendly but also socially acceptable to the project beneficiaries and surrounding communities.

4.1.2 National Energy Policy (2018)

The Ministry of Natural Resources, Energy and Mining (MoNREM), through its Department of Energy (DoE), formulated the first energy policy for Malawi in 2003 to

make the energy sector more responsive to the development needs of the country. The Policy has since been revised to accommodate current changes in the Energy sector. This was necessary in order to spur development as aspired for in the Malawi Growth and Development Strategy (MGDS) III in the national agenda, and Sustainable Energy for All Initiative and Sustainable Development Goals (SDGs) in the international agenda. The National Energy Policy (2018) overall goal, therefore, is to provide a guiding framework for increased access to affordable, reliable, sustainable, efficient and modern energy for all sectors and every person in the country. It emphasizes the importance of private sector participation in the sector and provides an environment conducive for such participation. The policy has also emphasized the importance of mitigating environmental, social, safety and health impacts of energy production and utilization.

This Policy seeks to guide the planning and implementation of programmes, projects and activities in the energy sector with the aim of increasing the access to affordable, reliable, sustainable, efficient and modern energy services by every person in the country. The Policy reflects the latest developments in the energy sector and new national goals.
The broad objectives of the National Energy Policy are:

a) To strengthen the Electricity Supply Industry (ESI) and make it more efficient to support industrialization, rural transformation, sustainable economic development and wealth creation, as well as to facilitate regional electricity trading;
b) To ensure adequate production and supply of petroleum and biofuels at affordable prices;
c) To ensure availability of Liquefied Petroleum Gas (LPG), biogas and natural gas in sufficient quantities at affordable prices for industrial and domestic use;
d) To promote a coal supply industry that is more efficient and competitive, and harnesses clean technologies that eliminate or greatly reduce harmful emissions;
e) To ensure that biomass is sustainably used, and carbon emissions are reduced through the use of energy efficient technologies;
f) To establish a vibrant, reliable, incentivized and sustainable private sector-driven Renewable Energy Technology industry; and
g) To promote energy programming, budgeting and monitoring routinely address all aspects of social and economic development in energy programmes and services.

While acknowledging various challenges in the energy sector, the policy's overall goal is to provide a guiding framework for the increased access to reliable, sustainable, efficient and modern energy for all sectors and every individual in the country. Through rehabilitation of the Nkula B hydropower station, EGENCO aims at improving the current energy supply in line with the Policy.

4.1.3 National Water Policy (2005)

The policy aims at providing comprehensive and integrated water resources conservation and management. It addresses all aspects of water including resource management, development, and service delivery conforming to the current global and regional trends and the requirements as reflected under the Millennium Development Goals. The overall policy goal is sustainable management and utilization of water resources to:

a) Provide water of acceptable quality and of sufficient quantities;
b) Ensure availability of efficient and effective water and sanitation services that satisfy the basic requirements of every Malawian; and
c) Enhance the country's natural ecosystems.

One of the objectives of the policy is the promotion of public and private sector participation in water resources management, development, supply and conservation. The principles that will guide the implementation of the proposed project in relation to the policy include the following:

i. Management, protection and conservation of water resources to be undertaken in an integrated manner;
ii. Water resources shall be optimally, equitably and rationally allocated and regulated to ensure sustainable optimal economic returns and social enhancement;
iii. Water resources management will be based on the concept of decentralization and will promote local participation with the catchment as the unit of water management;
iv. Promote the empowerment of user communities to own, manage and invest in water resources development; and
v. Pollution of water resources shall follow the "Polluter Pays" principle to ensure water user responsibility.

Activities of the proposed rehabilitation of Nkula B Hydropower station have the potential to negatively affect the water resources and aquatic biodiversity of Shire River. It is therefore recommended that during rehabilitation works, waste generated from the activities should be properly managed and handled to prevent polluting water in the Shire River. One of the hazardous wastes that could be generated from the rehabilitation works is lubricants (oils).

4.1.4 National Forest Policy (2016)

The goal of the National Forest Policy is for the conservation, establishment, protection and management of trees and forests for the sustainable development of Malawi. The Policy set out the following Outcomes:

i. Sustained management and utilization of forest resources;
ii. Improved and sustained financial benefits and other livelihoods outcomes (including food, biomass, shelter, health) from forests;

iii. Sustained conservation and enhancement of forest biodiversity and ecosystem services;
iv. Increased opportunities for eco-tourism and recreation;
v. Improved and sustained financing to the forestry sector;
vi. Improved knowledge base and its application in forestry;
vii. Increased participation of all stakeholders in forest conservation and management;
viii. Improved, well-regulated and monitored forestry sector; and
ix. Enhanced cooperation and collaboration in forestry related issues at regional and international levels.

The Policy Priority Area 4 "Policy Priority Area 4: Forest Regulation and Quality Control" aims at achieving a well-regulated forestry sector with clearly defined forest standards and guidelines for sustainable forest management. Strategy 1 of the priority area 4 ensures that the Forest Policy, Forestry Act, regulations, standards, guidelines, EIAs, in sustainable forest management are reviewed, amended and adhered to.

EGENCO will ensure that conservation of forestry resources is promoted by among other things minimizing careless cutting of trees. In addition, EGENCO will ensure that only trees that will be affected by the rehabilitation works are cut and will collaborate with the Department of Forestry to plant new trees.

4.1.5 National Fisheries and Aquaculture Policy (2016)

This Policy is designed to meet the challenges and emerging issues of the fisheries sector, and to provide linkages with the emerging cross-cutting policies, plans and activities of national and regional bodies where they affect or interact with fisheries. The main objective of this Policy is to sustainably increase fisheries and aquaculture productivity for accessible nutritious food and increased contribution to economic growth.

One of the objectives of the National Fisheries and Aquaculture Policy (2016) which is in line with the project is to promote applied research in fisheries and aquaculture and monitor the impact of pollution and environmental changes including climate change. The Policy has seven priority areas namely Capture Fisheries; Aquaculture Development; Fish Quality Control and Value Addition; Governance; Social Development and Decent Employment; Research and Information; and Capacity Development. While numerous issues could be considered to address the problem of limited supply of fish in Malawi, implementation of this Policy will concentrate on the seven Policy priority areas within the next five years. Section 1.3 of the policy emphasizes linkages with other policies and one of the policies is the National Environmental Policy, 2004. The National Fisheries and Aquaculture Policy (2016) states that key policies and strategies with linkages to this Policy include National Environmental Policy of 2004, Malawi Nutrition Policy of 2009, National Land Resources Management Policy of 2000, Wildlife Policy of 2000 and the Water Resources Policy of 2005 among others.

However, the generation of electricity on Shire River may negatively affect the water quality and quantity which may affect aquatic orgasms including certain fish species. The EGENCO shall, therefore, implement measures to avoid, reduce and mitigate negative impacts of the proposed project on aquatic organisms including fish.

4.1.6 Malawi National HIV and AIDS Policy (2012)

The National HIV and AIDS Policy is formulated to guide the implementation of the HIV and AIDS National Response. The Policy is intended to sustain the National Response; target the key drivers of the epidemic; address the existing and emerging national and global issues; and achieve Zero new infection, Zero related deaths and Zero discrimination. The purpose of the Policy is to facilitate:

i. Evidence-based programming and strengthening of the National HIV and AIDS Response while recognizing the emerging issues, gaps, challenges and lessons learnt during the implementation of the first Policy;
ii. Scaling up of evidence based innovative interventions; and
iii. Re-alignment of the National HIV and AIDS Response to the Government development agenda.

The Policy identifies 8 priority areas and outlines policy statements aimed at addressing the challenges in each priority area: (i) Prevention, (ii) Treatment, care and support; (iii) Comprehensive multi-sectoral and multi-disciplinary response to HIV and AIDS; (iv) Impact mitigation; (v) Protection, participation and empowerment of People Living With HIV (PLHIV), key populations and other vulnerable populations; (vi) Mainstreaming and linkages; (vii) Sustaining National HIV and AIDS Research Agenda ; and (viii) Capacity development.

Under the implementation arrangement of the Policy, MEPA shall be responsible for coordinating integration and mainstreaming of HIV and AIDS in Environmental and Social Impact Assessments (ESIA) of capital projects. Large capital projects have been associated with rising HIV incidence in areas where they are implemented. The ESIA process is seen to be the best entry point in addressing HIV prevention and mitigation of the impacts of AIDS brought about by the large capital projects.

The Policy recognizes that, during the implementation of infrastructure projects, migrant workers and women as highly vulnerable people to the transmission of HIV and AIDS and other sexually transmitted diseases. In addition, increased disposal of income from migrant workers may enhance some workers to indulge in extra-marital affairs within the surrounding villages. These sexual activities would enhance the spread of HIV and AIDS among workers and local people.

Therefore, it is proposed that during the implementation of Nkula B rehabilitation works EGENCO shall, through the Neno District AIDS Coordinator, develop an HIV and AIDS workplace policy which will guide the developer on prevention and management of HIV and AIDS for the project. It is also recommended that during the construction phase of the proposed project much of the unskilled labour force should be sourced from the surrounding communities to reduce the influx of migrant workers who may exacerbate the HIV and AIDS situation in the project area.

4.1.7 National Gender Policy (2015)

The purpose of the policy is to strengthen gender mainstreaming and women empowerment at all levels in order to facilitate attainment of gender equality and equity in Malawi. The main policy outcomes include:

i. Increased meaningful participation of women, men, girls and boys in decision making, wealth creation and poverty reduction;
ii. Reduced gender-based violence at all levels;
iii. Enhanced gender mainstreaming across all sectors; and
iv. Enhanced institutional capacity of the National Gender Machinery.

The policy is targeting the following priority areas; Gender in education and training; health; agriculture, food security and nutrition; natural resources, environment and climate change management; economic development; governance and human rights. The policy also prioritizes gender perspective in gender-based violence and capacity of the national gender machinery. The policy recognizes that agriculture is key to food security, economic growth and wealth creation and that women play important roles in agriculture. They constitute 70% of full-time farmers, carry out 70% of the agricultural work, and produce 80% of food for home consumption and therefore they ensure nutrition security at household level.

The policy recognizes that Gender Based Violence, especially violence against women, girls and the vulnerable groups is impediment to social wellbeing and poverty reduction in Malawi. This project, therefore, has to integrate consideration of needs of both males, females and other vulnerable groups in project activities. The potential considerations could be equal employment opportunities to both male and female during the implementation of the project in order to enhance income for both, involvement of women in the irrigation scheme and fishponds operation and targeting vulnerable household and child headed families with free water connection.

During the implementation of the proposed project, EGENCO will ensure that the 40:60 employment ration is implemented. The proponent and Contractor will ensure that deserving and qualified women and girls are recruited and fully participate in the economic activities of the project. All women and girls shall be protected from all forms of Gender Based Violence, Sexual Harassment and other forms of abuse.

4.1.8 National Cultural Policy (2015)

The National Cultural Policy formally establishes the mechanism that the Malawi Government must follow to adequately fulfil its program to deliver Cultural Services to all Malawians in line with the need to strengthen our cultural identity in the face of foreign influences. It considers the need to support poverty reduction initiatives as developed in the Malawi Poverty Reduction Strategy Paper (MPRSP) and the Malawi Growth and Development Strategy (MGDS III).

The National Cultural Policy also considers the need to preserve the natural environment and protect it from further degradation. Like most other developing countries, Malawi realizes that she can no longer ignore the role of culture in sustainable economic development. Obviously, Malawi's economic development will, for a long time to come, continue to depend on imported technology and skills. The nation, however, realizes that it will not achieve satisfactory economic development, particularly in the rural areas if it ignores the fundamentals of culture. Past examples do exist where the successful implementation of some projects was hampered because project planners ignored cultural factors in their planning.

One of the objectives of the National Cultural Policy is to promote environmental and biodiversity conservation and preservation methods that are in harmony with cultural beliefs. Strategies to achieve this objective include:

i. Facilitate the introduction of community-based land use programs whose benefits shall accrue to the local communities themselves;
ii. Encourage traditional and environment friendly architectural designs that use less plant material;
iii. Facilitate the provision of well-maintained open spaces and parks in urban areas to encourage mental relaxation, and the erection of sculptures by Malawian artists; and
iv. Provide civic education on environmental conservation from the cultural point of view.

For these strategies to be achieved, the project has created platforms through which these strategies can be achieved. These include supporting Village Natural Resources Management Committees (VNRMCs) and Catchment Management Committees (CMCs) which advocate for conservation of environment through tree planting and promotion of natural regeneration.

4.1.9 National Sanitation Policy (2008)

The main objective of the National Sanitation Policy (NSP) is to promote effective coordination and develop mechanisms for the delivery of sanitation and hygiene promotion at national level. In line with the project, the overall policy objective is to achieve universal access to improved sanitation, and safe hygiene practices while ensuring sustainable environmental management for economic growth. The NSP aims at

providing a framework for the development of programs and initiatives that shall address sanitation and hygiene challenges as cited in the policy. These programs will contribute to improving the health and quality of human life, a better environment and a new way for sustainable wealth creation.

Among other specific objectives related to the project, the policy under section 3.1.3.24 emphasizes the need to ensure that every workplace shall be kept clean, and free from any effluent from any drain, sanitary convenience or nuisances. In addition, section 3.1.3.25 provides for dirt and refuse to be regularly removed by a suitable method at any workplace and in the same vein section 3.1.3.26 calls for the provision and maintenance of sufficient and suitable improved sanitation facilities for persons of both sexes with a distinct entrance for persons of each sex wherever appropriate. Lastly, section 3.1.3.27 provides that labour-related provisions of the policy shall be implemented in line with the Occupational Safety, Health and Welfare Act of 1997.

The NSP is linked with other relevant government policies and programs, among them the Constitution of Malawi revised in 1995 which enshrines responsible management of the environment to provide a healthy living and working environment for all the people of Malawi; also linked to the NSP is the Malawi Growth and Development Strategy, which was developed in 2006, and among other things seeks to increase access to clean water and sanitation, improve the nutritional status of children and ensure food security; furthermore the NSP is linked to the National Environmental Policy, adopted in 2004 which outlines the need for pollution control and the proper disposal of wastewater, solid waste and the protection of water bodies, with the general principle of 'polluter pays'.

Among other policy directions, the policy spells out that all sectors of the economy shall be obliged to address issues of improved sanitation and hygiene promotion in their development agenda and that enforcement of responsible disposal of litter, human waste including excreta or urine in public places shall be enhanced.

The implication of the policy is that EGENCO should ensure that both the construction site and campsite have adequate sanitation facilities such as toilets to ensure that human excreta is properly managed.

4.1.10 National Youth Policy (2013)

The National Youth Policy (2013) defines youth as all persons from age 10 to 35 years regardless of their sex, race, education, culture, religion, economic, marital, and physical status. It recognizes that youth is a definitive social entity that has its own specific problems, concerns, needs, and aspirations. The policy further notes that the definition of youth has continuously changed variably in response to political, economic and social perspectives, hence uses the word "youth" and "young people" interchangeably.

The goal of the National Youth Policy is to create an enabling environment for all young people to develop to their full potential in order to contribute significantly to personal and sustainable national development. The overall objective of the policy is to provide a framework that guides youth development and implementation of all youth programs that contribute to the improvement in the welfare of the youth in Malawi.

Among its specific objectives, the policy provides for a number of rights to the youth including section 3.1.2 which calls for increased participation of youth in development initiatives at community and national level. Other objective provisions include the right to participate in all decision-making processes relating to the welfare of the youth, as well as governance issues, the right to social and economic services and the right to gain decent employment opportunities either in any sector on completion of formal or non-formal education and/or when entering the legal working age in the country. The policy has placed economic, social and cultural responsibilities on the youth such as to actively take part in all national development processes and undertake initiatives for their own economic development.

Considering that youths are energetic, strong, industrious, innovative and healthy and constitute a significant proportion of the country's population, the implication of the policy on the project is that EGENCO should promote the participation of the youth through employment.

4.1.11 National Policy on Equalization of Opportunities for Persons with Disabilities (2006)

The Policy was developed in order to promote the rights of people with disabilities and to integrate them so as to enable them play a full and participatory role in society. The aim of the Policy is to ensure that people with disabilities access the same fundamental rights and responsibilities as any other Malawian citizen and that they are included in all political, social and economic development initiatives in Malawi.

At national level, the Policy is based on the aspirations of the Constitution of Malawi and other national policies, such as the Malawi 2063, the Malawi Poverty Reduction Strategy Paper (MPRSP) and the Malawi Economic and Growth Strategy (MEGS) with an aim to reduce poverty through the stimulation of economic growth and development. All these national and international developments pose a challenge to people with disabilities to redefine the role and contribute to the attainment of the goals and objectives enshrined in these instruments.

Over the recent past years, disability has been repositioned as a human rights and development issue with the recognition that people with disabilities are equal citizens of Malawi and as such should have the same rights and obligations as all other citizens. It is now widely accepted that disabled people have a right to live a dignified and

independent life-style within the community; to take an active part in the general, social and economic development of the country; and to receive education, medical care and social services.

In line with the Policy, EGENCO will ensure that people with disabilities are allowed to freely participate in various activities of Nkula B Hydropower Stations rehabilitation project including membership to different committees and associations that are related to the proposed project. In addition, people with disabilities will not be discriminated against during the recruitment of workers, especially during construction phase.

4.1.12 National Biodiversity Strategy and Action Plan (2015 – 2025)

This National Biodiversity Strategy and Action Plan II is a framework for action that will guide Malawi to sustainably manage its biodiversity. The strategy outlines the status of biological resources in Malawi and provides strategies, targets and action to be taken to ensure their sustainable management.

The goal of the strategy is to enhance the management of biodiversity for economic growth and well-being of the present and future generations. The strategy outlines that this will be achieved through the attainment of such specific strategic goals as reduced direct pressures on biodiversity and improved status of biodiversity by safeguarding ecosystems, species and genetic diversity.

The strategy recognizes that Biodiversity provides goods and services in the form of ecosystems, species and genetic resources for human well-being and economic development. Malawi is endowed with unique flora, fauna and ecosystems, which provide various benefits such as food, shelter, medicine, ecological as well as cultural and spiritual services. Furthermore, the strategy acknowledges that the sustainability of biodiversity in Malawi is threatened by habitat loss and fragmentation, overexploitation of biological resources, pollution, climate change and infestation of invasive alien species. On habitat loss and fragmentation, the strategy recognizes that over the past years, increasing human population and economic development have led to several land use changes in Malawi that have driven biodiversity loss.

The strategy further recognizes that 43% of all households in urban areas use charcoal for cooking, 41.8% use firewood and only 13.6% use electricity (NSO). Approximately 1.4 million cubic meters of wood, equivalent to 15,000 hectares of trees, are cut per year to produce 6.08 million Standard bags of charcoal in the four major cities of Malawi. The clearing of vast amounts of forests for charcoal production has led to alteration of species compositions in the forests, as most of the trees favoured for charcoal production have been removed, leaving behind woodlands of lower quality. This has resulted in the loss of species important for use in traditional medicine, timber and food. Alternative land uses for urban development, agricultural expansion, infrastructure development and

mining have also contributed to the reduction or degradation of important habitats and ecosystems in the country.

On invasive alien species, the strategy highlights that invasive alien species (IAS) in Malawi cover both terrestrial and aquatic ecosystems and are in the form of plants, animals and microorganisms. One of the most notable invasive alien species in Malawi is water hyacinth (Eichhornia crassipes), notable for its economic implications and detrimental effects on biodiversity by reducing oxygen content in the aquatic ecosystems. Water hyacinth is widely spread in Shire River where it affects the generation of hydroelectric power and irrigation programs, hindering economic development of the country in the process.

The strategy also recognizes sectors like agriculture, energy, trade, manufacturing and irrigation that have potential to promote economic development and reduce poverty are greatly affected by biodiversity loss. At the same time, actions taken to attain economic development and poverty reduction contribute to biodiversity loss.

The implication of this strategy on the project is that during rehabilitation works attention will be made to the protection of biodiversity by ensuring that deforestation, pollution and other factors that result in loss of biodiversity are properly managed.

4.1.13 National Land Policy (2002)

The National Land Policy of 2002 focuses on land as a basic resource common to all people of Malawi. It provides the institutional framework for democratizing the management of land and outlines the procedures for protecting land tenure rights, land-based investments and management of development at all levels. It ultimately seeks to promote optimum utilization of Malawi's land resources for development. The policy provides opportunities for the people of Malawi to embark on a path of socially and environmentally sustainable development. In addition, the policy highlights a number of approaches for addressing problems facing the land resources sector. The policy requires that an environmental and social impact assessment be undertaken for all big land development projects and those planned in fragile ecosystems in order to protect biodiversity and water resources. In addition, the policy:

i. Recognizes several sectoral policies and strategies in physical planning, fisheries, environment, forestry and mining. For this reason, it encourages a multi-sectoral approach in land use and management at local and district level; and
ii. Recognizes social actions that influence and control people's use of land and realizes that the rights of women, children and the disabled are usually denied on the basis of customs and traditions; or disregarded due to prejudice and lack of effective presentation. In view of this and of the increasing land pressure due to population growth, the policy calls for clear consideration of gender and the rights of children

and the disabled (including those affected by the HIV and AIDS pandemic) in planning and implementation strategies of land-based investments.

The rehabilitation of Nkula B Hydropower Stations will need land that may belong to some people, and this may trigger land acquisition and compensation. In line with the provisions of the policy, where land acquisition is required, the affected persons will be compensated accordingly.

4.1.14 National Employment and Labour Policy (2017)

The National Employment and Labour Policy (NELP) seeks to place employment as a central objective of social and economic policies; making it one of the major drivers of poverty reduction. In order to achieve this, the policy will be implemented around ten priority areas. Taken together, the priority areas are expected to address the challenges facing the labour market with regard to employment creation and ensuring safe and gainful employment. The priority areas include Economic Growth and Employment; Labour Market Information; Skills Development and Labour Productivity; Private Sector Growth and Employment; Improving Informal Sector, Micro, Small and Medium Scale Enterprises; Improving Labour Administration and Labour Standards; Employment of Vulnerable Groups and Promotion of Gender Equality; Youth Employment; Protection of Migrant Workers; and Promotion of Agriculture and Rural Employment.

The overriding goal of the policy is to promote the attainment of full employment and decent work in the country. One of its objectives is to promote a conducive environment for private sector growth and expansion in order to create more decent and productive jobs. The policy also provides a conducive business environment for the Micro, Small and Medium Enterprises (MSMEs) and supports the creation of safe and gainful employment and availability of skilled labour.

Among the policy priority areas is to ensure the development of a skilled and productive human resource. Other priority areas include employment of vulnerable groups and promotion of gender equality; youth employment; and protection of migrant workers.

In line with this policy, EGENCO will, among others, ensure that the contractor and other employees hired during the project have the right skills. The company will also ensure equality in employment and ensure that expatriate-held positions are limited only to those areas where the country does not have adequate skills as stipulated in the Employment of Expatriates and Employment Permit Guide.

4.1.15 National Decentralization Policy (1998)

The National Decentralization Policy devolves administration and political authority to the district level; integrates governmental agencies at the district and local levels into one administrative unit, through the process of institutional integration, manpower

absorption, composite budgeting and provision of funds for the decentralized services; diverts the centre of implementation responsibilities and transfers these to the districts; assigns, functions and responsibilities to the various levels of government; and promotes popular participation in the governance and development of districts.

The main objective of the National Decentralization Policy is to create a democratic environment and institutions in Malawi for governance and development at the local level which will facilitate the participation of the grassroots in making public service more efficient, more economical and cost effective; to promote accountability and good governance at the local level in order to help Government reduce poverty; and to mobilize the masses for socio-economic development at the local level. The policy creates a new local government system made up of District Assemblies. Cities and Municipalities will be districts in their own right. In addition, District Assemblies will have powers to create committees at Area, Ward or Village level for purposes of facilitating participation of the people in the Assembly's decision making.

Among other functions, the District Assemblies will be responsible for making policy and decisions on local governance and development for the district; promoting infrastructural and economic development through district development plans and making by-laws which facilitate its functions. One of the responsibilities for the District Assemblies is environmental services which include burial services, refuse disposal, sewage removal, environmental reclamation and environmental education.

In line with this policy, EGENCO will liaise with Neno District Council to ensure that waste generated by the facility is well managed. The management of the hydropower station will also ensure that there are adequate waste receptacles for handling waste. Neno District Council, especially the DESC, will have the legal mandate to monitor activities at the facility including management of solid and liquid waste.

4.1.16 Guidelines for Environmental Impact Assessment (1997)

The EIA Guidelines of 1997 outline the process for conducting ESIAs to ensure compliance with the ESIA process as required in the Environment Management Act of 1996.

The Guidelines contain a list of prescribed projects for which an ESIA is mandatory and those that may require an ESIA. According to the guidelines, the rehabilitation and modernization works do not require an ESIA but the development of an ESMP. In accordance with the guidelines, the project developer prepared a project brief and submitted it to the MEPA to inform the Director General that a project is being considered and to facilitate project screening for a decision on whether a full ESIA should be carried out or not. MEPA advised EGENCO that an Environmental and Social Management Plan should be developed and prepared ToRs.

4.2 Legal framework

4.2.1 Constitution of the Republic of Malawi (1995)

The Constitution of the Republic of Malawi is supreme over any legal policy or Act in Malawi. Any Act of Government or any law that is inconsistent with the provisions of this Constitution shall, to the extent of such inconsistency, be invalid (Section 5). As such, the reviewed policies and legislation relevant to the project have to be in line with the Constitution.

Section 12 provides the fundamental principles on which the Constitution was founded upon, and part iii encourages accountability and transparent decision-making.
The principle is based on the presumption that when society appoints authorities, they retain the right to have an input in decision-making and enforcement processes, and they expect transparency in government decision-making.

Part (d) of Section 13 sets out a broad framework for sustainable environmental management at various levels. Among other issues, the section provides environmental issues under Principles of National Policy. Section 13 (d) of the Constitution provides that the state shall actively promote the welfare and development of the people of Malawi by progressively adopting and implementing policies and legislation aimed at managing the environment responsibly in order to: -

i) Prevent the degradation of the environment;
ii) Provide a healthy living and working environment for the people of Malawi;
iii) Accord full recognition to the rights of future generations by means of environmental protection and the sustainable development of natural resources;
iv) Conserve and enhance the biological diversity of Malawi; and
v) Enhance the quality of life in rural communities with the ultimate aim of attaining sustainable development.

The Constitution further provides for a framework for the integration of environmental consideration into any development programs. The implication of this provision is that Government, its cooperating partners and the private sector have a responsibility of ensuring that projects are undertaken in an environmentally responsible manner. EGENCO therefore complies with this section through the development of an ESMP. The project also has to promote gender equality and human rights. Under Section 13 (e), it is the responsibility of the state to achieve gender equality for women through:

- Full participation of women in all spheres of the Malawian society, on the basis of equality with men;
- Implementation of principles of non-discrimination and such other measures as may be required;

- Implementation of policies to address social issues such as domestic violence, security of the person, maternal benefits, economic exploitation and rights to property.

4.2.2 Malawi 2063

The Malawi 2063 (MW2063) aims to transform Malawi into a wealthy and self-reliant industrialized 'upper middle-income country' by the year 2063. Pillar 2 of the vision is on Industrialization and spells out the vision of Malawians to reduce the current shortage in electrical power generation which has resulted into frequent power outage leading to the diminishing growth of the mining and production industry.

The vision recognizes the vital role that energy contributes to socio-economic development. Malawi's power sector is one of the most severely constrained in sub-Saharan Africa – less than 10% of the population of 18 million is connected to the electrical grid. For 80% of the people living in rural areas, access to electricity is less than 1%. Estimates indicate that shortage of capacity frequently exceeds 60 MW, or over 17% of peak demand in Malawi. With no reserve margin and a stressful system, the reliability and quality of electricity supply is poor. Investment in energy infrastructure is necessary to improve security and regularity in supply and meet a growing demand.

The vision realizes that some of the factors that have contributed to the low energy generation and insufficient distribution facilities include effects of climate change which are leading to less rainfall in some years and therefore less water available for generating power while in some years there are heavy and violent rains that cause damage to electricity generation infrastructure; and environmental degradation. One of the causes of this environmental degradation is deforestation which leads to siltation of water intakes at hydropower stations.

In addition to this, the vision also highlights that in order for industrial growth to be achieved there is need to focus on the energy sector. It also points out diminished industrial growth as a result of, among other factors, inefficiencies in the energy supply. In accordance with Malawi 2063, EGENCO through rehabilitation of Nkula B hydropower stations aims at ensuring adequate, affordable, reliable and accessible electrical power supply.

4.2.3 Environment Management Act (2017)

The Environment Management Act makes provision for the protection and management of the environment and the conservation and sustainable utilization of natural resources. The Act is the principal piece of legislation on the protection and management of the environment.

Section 4(1) of the act stipulates that every person has the right to a clean and healthy environment and has the duty to safeguard and enhance the environment. The duty to enhance and safeguard the environment imposed under section 4 (1) includes the duty to inform the Authority or a relevant lead agency of all activities or phenomena that may affect the environment significantly and shall be exercisable by individual persons, public authorities, non-governmental organizations, or local environment and natural resources committees.

Section 7 of the Act establishes an Authority to be known as the Malawi Environment Protection Authority (MEPA) which shall be the principal agency for the protection and management of the environment and sustainable utilization of natural resources. One of the functions of the Act is to review and approve Environmental and Social Impact Assessments (ESIA), Strategic Environmental and Social Assessments (SESA) and other relevant environmental assessments in accordance with this Act.

Section 31(1) gives powers to the Minister upon recommendation from the Authority to specify, by notice published in the Gazette, the type and size of a project which shall not be implemented unless an Environmental and Social Impact Assessment is carried out. Subsection (2) prohibits any person from undertaking any project for which an Environmental and Social Impact Assessment is required without the written approval of the Authority, and except in accordance with any conditions imposed in that approval.

In line with the provisions of this Act, the project developer developed an ESMP to ensure that environmental and social concerns are integrated in the rehabilitation and modernization project implementation.

4.2.4 Water Resources Act (2013)

The Water Resources Act (2013) provides for the management, conservation, use and control of water resources; for the acquisition and regulation of the rights to use water; and for matters connected therewith or incidental thereto.

Part VIII, Section 89 (1) prohibits any person who owns, controls, occupies or uses land on which an activity or process is or was performed to pollute water resources and which, unless authorized under this Part, causes, has caused or is likely to cause pollution of a water resource. The Act tasks all occupiers of land to prevent pollution from occurring, continuing or recurring. As such it is an offence to alter the flow of or pollute or foul any public water. The Act defines pollution or fouling of public water to mean the discharge into or in the vicinity of public water or in a place where public water is likely to flow, of any matter or substance likely to cause injury whether directly to public health, livestock, animal life, fish, crops orchards or gardens to which such water is used or which occasions, or which is likely to occasion a nuisance.

Part V section 39(1) of the Act further prohibits abstraction and use of water without a permit from NWRA. The Act further prohibits any person from diverting, dam, store, abstract or use public water for any other purpose except in accordance with the provisions of this Act.

In compliance with the provisions of the Water Resources Act, EGENCO will ensure that water use from Shire River for generation of electricity at Nkula B Hydropower station is done in accordance with the provisions in the Act i.e. renewing water use permit annually from the National Water Resources Authority.

4.2.5 Local Government Act (1998)

The Act, as read with Section 146 of the Republican Constitution, provides the mandate to the Local Councils in planning, administration, and implementation of various development programs in their areas. It further provides for environmental functions, which include urban management, local planning, local afforestation programs, and control of soil erosion, among others.

The District Environmental Sub-committee (DESC) for Neno looks at all environmental issues in the district. During the development of ESMP for the rehabilitation of Nkula B Hydropower Station, the developer engaged with Neno DESC to ensure that environmental and social concerns are addressed during project implementation. The District Environmental Officer for Neno is mandated to coordinate all the environmental issues in the district and report to the DESC.

4.2.6 National Forestry Act (1997)

The Forestry Act, 1997 and the Amendment of 2020 provides for participatory forestry, forest management, forestry research, forestry education, forestry industries. Protection and rehabilitation of environmentally fragile areas and international cooperation in forestry and for matters incidental thereto or connected therewith.

Section 34 of the Act states that any person who or community which protects a tree or forest, whether planted or naturally growing in any land which that person or community is entitled to use, shall acquire and retain the ownership of the tree and forest with the right to sustainable harvest and dispose of the produce. In this regard, the project shall ensure that naturally growing trees and planted ones are protected during the implementation of project activities. The developer for the project shall also be advised to minimize cutting trees by minimizing clearance of land during construction activities.

Part VI of the Act is on afforestation. Section 35 of the Act provides for the promotion of tree growing in forest reserves, public land, customary land and private land by the government, non-governmental organizations and the community.

In line with the Act, EGENCO in collaboration with the Department of Forestry, will ensure that all the trees that have been affected by the rehabilitation works have been replaced. This could be through supporting afforestation programs by Catchment Management Committees (CMCs).

4.2.7 Occupational Safety, Health and Welfare Act (1997) and Amendment Act (2015

The occupational safety, health and welfare Act (1997) and the Amendment Act of 2015 regulate work conditions with respect to safety, health, and welfare of workers. The duty of ensuring safety, health, and welfare of workers rests with the employer. However, every employee is required to take reasonable care for his/her own safety and that of other workers.

In compliance with the requirements of the Act, the Contractor for the construction works will develop an Occupational Safety, Health and Welfare Policy and program. Furthermore, according to Section 58 (Part VI) all workers for the construction works will be provided with appropriate personal protective equipment (PPE) and these include work suits, industrial boots, hard helmets and gloves during the construction period.

In addition, EGENCO shall ensure that a well-stocked First Aid Box is made available at the construction site for use by workers as provided for under Section 33 (Part IV) of the Act. The First Aid Box shall be under the charge of a well-qualified person. In line with Part II, Section 6 of the Occupation Safety, Health and Welfare Act, the contractor should apply for the registration of the construction camp as a workplace.

4.2.8 Gender Equality Act (2013)

An Act to promote gender equality, equal integration, influence empowerment, dignity and opportunities, for men and women in all functions of society, to prohibit and provide redress for sex discrimination, harmful practices and sexual harassment, to provide for public awareness on promotion of gender equality and to provide for connected matters.

Section 6(1) of the Act states that a person who commits an act of harassment if he or she engages in any form of unwanted verbal, non-verbal or physical conduct of a sexual nature in circumstances, would have anticipated that the other person would be offended, humiliated or intimidated, and (2) a person who sexually harasses another in terms of the foregoing subsection is liable to a fine and imprisonment specified under subsection (2).

Section (7) of the Act makes provision for Government to take active measures to ensure that employees have developed and are implementing appropriate policy and procedures aimed at eliminating sexual harassment in the workplace. In line with the provisions of this Act, the developer will ensure that it promotes gender equality in all of its operations.

In line with the provision of the Act, the developer will ensure that the contractor for Nkula B Rehabilitation Project adheres to 40:60 ratio during employment of laborers. The implication of the Gender Act for this project is to ensure that women are given same opportunities as their male counterparts and that issues of gender-based violence and sexual abuse and exploitation are minimized.

4.2.9 Employment Act (2000)

The legal framework for child labor in Malawi is contained in the Employment Act of 2000 (CAP 55:01). The Act sets the minimum age for admission of a child to employment at 14 years. The Act further prohibits children between the ages of 14 and 18 from working in hazardous environments. The employment (amendment), 2021 has redefined "industrial undertaking" as (a) mine, quarry and other works for the extraction of minerals from the earth, (b) an industry in which articles are manufactured, altered, or demolished, or in which materials are transformed including ship building and the generation, transformation and transmission of electricity or power of any kind; (c) construction, maintenance, or demolition works of any infrastructure; and (d) transport of passenger or goods by road, rail, sea or in land waterway, including the handling of goods at docks, quays, wharves and warehouses.

In line with the provisions of this Act, EGENCO will ensure that all Contractors that have been hired to conduct rehabilitation works not engage under-aged individuals (less than 14 years old) at the site.

4.2.10 Public Health Act (1948)

The Public Health Act of 1948, as amended in 1992, amends and consolidates the law regarding the preservation of public health. Section 59 of the Act prohibits any person from causing nuisance on any land or premises owned or occupied by him. The developer should therefore not cause any nuisance during the construction and implementation of the project.

The Act under Part X requires developers to provide adequate sanitary and health facilities to avoid harmful effects of waste on public health. Further, Section 82 prohibits people from disposing of certain matters into public waters. The matters include petroleum spirit and any substance that may cause injury to public health. The developer will have to comply with the requirements of this Act by providing waste disposal facilities in accordance with the anticipated volumes of waste. The developer will further have to comply with the relevant provisions of the Act which are aimed at the preservation of public health.

The Act, in Sections 79, 87 and 88, empowers local authorities to enforce the provision of sewage works for large-scale development projects. Section 87 stipulates the need for properly designed drainage works for new buildings so as to carefully drain out storm

water and sub soil from building sites and cartilage. Section 88 stipulates the requirements for separate toilets for both male and female persons in public buildings.

In line with the provision of this Act, the developer will ensure that contractor to engaged for the construction works of the proposed Nkula B Hydropower Stations Rehabilitation Project provides adequate sanitary facilities for both men and women during the construction phase of the project.

4.2.11 Disability Act (2012)

An Act to make provision for the equalization of opportunities for people with disabilities through the promotion and protection of their rights; to provide for the establishment of a Disability Trust Fund; and to provide for matters connected with or incidental to the foregoing.

Section 13 (1) stipulates that no person shall be discriminated against on the basis of disability with regard to all matters concerning all forms of employment including conditions of recruitment; hiring and restructuring of employment; continuation of employment; career development; and safe and healthy working conditions. In line with the provisions of this Act, especially Section 13 (1), during the implementation of Nkula B Hydropower Stations Rehabilitation Project, the developer shall ensure that people with disabilities are not discriminated against during employment by the contractor engaged to do construction works.

Section 16 of the Act stipulates that every person with a disability shall have the right to form and join any group or association of his choice; and be represented at any level in such a group or association.

4.2.12 HIV and AIDS (Prevention and Management) Act, 2018

The HIV and AIDS Management and Prevention Act of 2018 makes a provision for the prevention and Management of HIV and AIDS; provides for the rights and obligations of people living with HIV or affected by HIV and AIDS; and also provides for the establishment of National Commission.

Section 8 (1) of the Act prohibits discrimination and unfair treatment subjected to an employee solely on the grounds that he is perceived to be or is living with HIV. Section 32 (1) stipulates that employers should develop and implement an HIV and AIDS policy at the workplace.

Section 26 prohibits an employer from subjecting any person to HIV testing as a pre-condition for recruitment while section 27 prohibits any employer from terminating the employment of an employee solely on the grounds that the employee is living with HIV or is perceived to be living with HIV.

Section 31 (1) provides for employers to provide appropriate training, protective equipment and clear and accurate information and guidelines on minimizing the risk of the spread of HIV where a person is employed in an occupation or is required to provide services where there may be a risk of transmitting or acquiring HIV.

In line with the provisions of this Act, EGENCO will ensure that no one is discriminated against based on the grounds that he/she is living with HIV. In addition, pre-employment testing by the developer will not be tolerated as this is prohibited under Section 26 of the Act. EGENCO will provide training, awareness and condoms to all employees to reduce the risk of transmitting and acquiring HIV.

4.2.13 Environment Management (Waste and Sanitation) Regulations (2008)

Waste Management Regulations were developed to provide guidance for the management of waste in Malawi. These regulations were developed to enforce the implementation of the Environment Management Act. The regulations were reviewed, however the new regulations (Waste Management Regulations, 2020) have not yet been gazetted by the Ministry of Justice as such reference is being made to Waste Management Regulations of 2008.

Part II of the Regulations is on Management of General or Municipal Solid Waste. Section 7 stipulates that any person who generates or collects solid waste shall sort out the waste by separating hazardous waste from the general or municipal solid waste. Further, the section stipulates that general or municipal solid waste shall be further sorted out into categories of wastes that can be recycled or reclaimed and waste that is earmarked for disposal. In line with these regulations the proponent of the project will ensure that waste generated at the facility is sorted out and disposed of in different containers.

Section 8 (1) stipulates that every generator of waste shall be responsible for the safe and sanitary storage of all general or municipal solid waste accumulated on his or her property so as not to promote the propagation, harborage or attraction of vectors or the creation of nuisances.

In line with the regulations, EGENCO will ensure that it provides waste management facilities to ensure that waste generated at the construction camp or site by workers is safely stored at the site and disposed of properly.

4.2.14 Electricity Act (2004)

The Act is applicable to the ESMP for Nkula B rehabilitation works as it puts the Environmental and Social Assessment study as one of the preconditions for a license to implement an electrification project. According to Section 7 (2) (a) the ESIA must indicate the extent of any potential damage to, or pollution of the environment or social disruption and the steps proposed to be taken by the applicant to the environment generally and in terms of existing environmental legislation.

The Electricity Act has provisions for notifying and compensating for land affected by the development of electricity infrastructure. Section 39 of the Act allows easements without compensation, for construction of transmission and distribution lines, provided a 30-day notice is given and no structures are affected. Compensation is, however, required if any structures are affected and for any losses or damage caused. This is contrary to Operating Standard for African Development bank which requires compensation to be paid for affected areas, whether or not they have structures.

The Act provides for the regulation of the generation, transmission, wheeling distribution, sale, importation and exportation, use and safety of electricity and related matters. It stipulates that no person, owner, occupier or lessee shall grow trees or undergrowth or allow trees or undergrowth to grow or to be grown on the land he owns, occupies or leases in such a manner as to interfere with the supply of electricity.

According to the Act, a licensee has the right to enter any land they may need to survey in the course of their duties, subject to giving the landowners/occupiers a 14-day written notice. The same period of notification is required if plants are to be removed. EGENCO or a licensee:

- Has to obtain the permission of the occupants of any building under which it wishes to lay an electricity cable or related fixtures;
- It is required by law to give landowners/occupiers a month 's notice prior to construction work;
- Shall make good to the reasonable satisfaction of local or other authority, or the owner as the case may be, of all public/private roads, streets and paths opened or broken in the course project implementation and operation;
- Shall pay fair and reasonable compensation or rent or both for all losses or damage caused in the execution of its powers in the Act;
- Is liable for any damages that may result from work carried out on its behalf;
- It is required to notify the relevant Minister of any accident to have caused loss of life or serious injury in connection with transmission lines or other equipment.

On the other hand, EGENCO or a licensee may place any energy generation and associated structures (substations and towers) in, on, through or over any land or against any building; with the consent of the Authority if, in their opinion, the consent is being unreasonably withheld. In any such cases, the Authority shall determine the amount of compensation, whether lump sum payment, annual rental, or both to the owner, lessee or occupier.

4.2.15 Land Act (2016) and Land (Amendment) Act, 2022

The Land Act of 2016 makes provision for land in Malawi and for all matters incidental or connected thereto. The Act, among other things, deals with issues of landownership, land transfer, use of land and compensation. The issues of land tenure and land use are

recognized as critical in sustainable environmental management in Malawi. The Act clearly defines security of tenure. This is essential as people are more inclined to properly manage land that belongs to them.

In accordance with Section 18 of the Act, any person who suffers any disturbance of or loss or damage to any interest which he may have or, immediately prior to the occurrence of any of the events referred to in this section, may have had in such land, shall be paid compensation for such disturbance, loss or damage as is reasonable. In line with the provisions of the Act, any person whose property or land will be affected by the implementation of Nkula B Hydropower Stations Rehabilitation project will get compensated.

4.2.16 Monuments and Relics Act (1990)

The Act makes provision for the conservation, preservation and study of cultural heritage including places of distinctive natural beauty and of sites, buildings and objects of archaeological, paleontological, geological, anthropological, ethnological, historical, pre-historic and other interests. The Act also provides for the declaration of protected monuments and relics and acquisition thereof by the Government and the acquisition by the Government of rights and trusteeship over monuments and relics and for the preservation thereof by agreement with the owners; and to provide for the listing of monuments and the registration of monuments and relics; and to provide for the procedure to be followed in relation to the discovery, excavation, removal, sale, exportation and importation of monuments, relics and collections of cultural heritage; and to establish an advisory council to advise the Minister on matters aforesaid; and to provide for matters connected therewith or incidental thereto.

According to Section 25 (1) of the Act, all monuments and relics, whether movable or immovable, lying on or beneath the surface of the ground or in a river, a lake or other waters will be declared to be the absolute property of the Government, except for privately-owned monuments whose owners establish title thereto and privately-owned monuments or relics which have been registered by the owners.

During rehabilitation of Nkula B Hydropower Station, excavation activities have potential to expose some archaeological remains such as cultural artefacts such as pottery and stone tools. When that happens, these will be recorded, and Department of Museums and Monuments will be engaged. The Department will collect the remains for analysis at the Department of Museums and Monuments repository. In this case the contractor will be trained by the Department of National Monuments and Museums of Malawi on how to handle this scenario and indeed consult the Department immediately such objects are suspected for further analysis.

4.2.17 Energy Regulation Act (2004)

The Act provides for the establishment of an Energy Regulatory Authority to regulate the energy sector, to define the functions and powers of the Energy Regulatory Authority, to provide for licensing of energy undertakings, and for matters connected therewith and incidental thereto.

Part II of the Act is on the establishment of the Malawi Energy Regulatory Authority (MERA), its constitution, functions, powers and duties. Powers and duties of MERA include:

- regulate the energy industry in accordance with the Energy Regulation Act and the Energy Laws; facilitate increasing access to energy supplies;
- grant, revoke or amend licenses granted under the Energy Regulation Act and the Energy Laws;
- monitor compliance with licenses granted under the Energy Regulation Act and Energy Laws;
- develop and enforce performance and safety standards for the energy sector;
- arbitrate commercial disputes under the Energy Regulation Act and Energy Laws;
- resolve or mediate consumer complaints against licensees;
- in conjunction with other relevant agencies, formulate measures to minimize the environmental impact of the exploitation, production, transportation, storage, supply and use of energy;
- enforce such measures by the inclusion of appropriate conditions to licenses held by energy undertakings.

Part IV is on the Regulation of the Energy Sector. Section 28 (1) states that No person may establish, operate, carry on or be involved in any manner in an energy undertaking in Malawi, without a licence issued by the Authority. In line with this provision, EGENCO is licenced by MERA to generate electricity at Nkula B Hydropower Station.

However, MERA cannot provide an energy generation license to EGENCO without satisfying the requirements of the Environment Management Act (2017). The preparation of this ESMP was therefore done in fulfilment of the requirements of the legislation.

4.2.18 Waste Management Regulations (2008)

Waste Management Regulations were developed to provide guidance for the management of waste in Malawi. These guidelines were developed to enforce the implementation of the Environment Management Act (1996). These regulations were reviewed, however, the new regulations (Waste Management Regulations, 2020) have not been gazetted by the Ministry of Justice, as such reference is being made to Waste Management Regulations of 2008.

Part II of the Regulations is on Management of General or Municipal Solid Waste. Section 7 stipulates that any person who generates or collects solid waste shall sort out the waste by separating hazardous waste from the general or municipal solid waste. Further, the section stipulates that general or municipal solid waste shall be further sorted out into categories of wastes that can be recycled or reclaimed and waste that is earmarked for disposal. In line with these regulations the proponent of the project will ensure that waste generated at the facility is sorted out and disposed of in different containers.

Section 8 (1) stipulates that every generator of waste shall be responsible for the safe and sanitary storage of all general or municipal solid waste accumulated on his or her property so as not to promote the propagation, harborage or attraction of vectors or the creation of nuisances. It is for this reason that EGENCO will ensure that the Contractor that will be hired for the rehabilitation works provides waste management facilities to ensure that waste generated at the construction camp or site by workers is safely stored before its final disposition.

4.2.19 Environment Management (chemicals and toxic substances) Regulations (2008)

These Regulations apply to any person in Malawi whose undertaking involves or includes the manufacturing, repackaging, importation, exportation, transportation, distribution, sale or other mode of handling toxic substances and chemicals and in respect of any activity in relation to toxic substances and chemicals which involves a risk of harm to human health or the environment.

These regulations are applicable to this project considering that rehabilitation and modernization works for Nkula B Hydropower station will involve generation of used oil which is classified as hazardous substance because of the potential harm it can cause to the aquatic and terrestrial environment when not managed properly. According to Part 1, Section 2 "hazardous waste" includes all unwanted substances or materials generated in any process be it chemical or otherwise which can cause danger to human health or the environment and which has been so designated by the Director.

Part II, Section 25 (1) of the Act gives power to Local authorities to make by-laws for the management of chemicals and toxic substances and chemical waste in their respective areas of jurisdiction. It further states in Section 1 (b) of the section that such by-laws should ensure that the disposal method of chemical waste is environmentally sound. It also continues in Section 26 (1) to highlight that the regulations also place a duty on industries or medical facilities not to discharge any chemical waste in any state into the environment unless such waste has been treated in accordance with acceptable international methods that are approved by the Director in consultation with relevant local authority. There is also a requirement in section 29 (2e) on disposal or treatment of highly toxic or hazardous chemical wastes, that highly toxic or hazardous chemical

wastes shall be disposed of or treated in accordance with conditions specified in the license or in accordance with any general guidelines issued by the Director in consultation with the Director responsible for local government.

In line with Regulations, EGENCO manages the used oil properly so that it does not pollute the environment by firstly keeping it in a leak proof tank before it is collected by used oil handling companies. EGENCO ensures that all used oil handling companies that collect used oil from the facility are licensed by MEPA.

4.3 African Development Bank's Integrated Safeguards System Requirements

4.3.1 Environmental and Social Operational Safeguard 1 (OS1)

This Environmental and Social Operational Safeguard 1 is aimed at mainstreaming environmental and social (E&S) considerations, including those related to climate change vulnerability, into AfDB operations and thereby contributing to sustainable development in the continent.

The Environmental and Social Assessment carried out under this OS helps to determine the scope and extent to which other OSs are addressed. It sets out the Borrower's responsibilities for assessing, managing, and monitoring E&S risks and impacts associated with each stage of an operation supported by the AfDB. The Bank reviews and discloses all documentation related to an operation's Environmental and Social Assessment in accordance with this OS, OS10, and the Bank's Policy on Disclosure and Access to Information, prior to presenting an operation to the Bank's Board of Directors.

The specific objectives of OS 1 are as follows:

- To identify and assess the E&S risks and impacts including those related to gender inequalities, climate change, and vulnerability of Bank lending, investment, and grant-supported operations, in their areas of influence in a manner consistent with the OS;
- To provide opportunity for stakeholder engagement and consultation in assessing and managing the E&S risks and impacts;
- To adopt a mitigation hierarchy approach;
- To adopt differentiated measures so that adverse impacts do not fall disproportionately on the vulnerable to prevent them from being disadvantaged in sharing development benefits and opportunities resulting from the project;
- To utilize national E&S institutions, systems, laws, regulations, and procedures in the assessment, development and implementation of projects, whenever appropriate;

- To contribute to strengthening Regional Member Countries' (RMC) systems for E&S risk management by assessing and building their capacity to meet Bank Group requirements set out in the Integrated Safeguards System (ISS).

The Government of Malawi through EGENCO has, in line with the requirements of OS1, developed this ESMP which will set out measures and actions required for the project to achieve compliance with the OSs over a specified time frame.

4.3.2 Environmental and Social Operational Safeguard 2 (OS2)

OS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions. Respect for workers' rights is one of the keystones for developing a strong and productive workforce. This OS is informed by the International Labour Organization's (ILO) Declaration on the Fundamental Principles and Rights at Work, and the United Nations Guiding Principles on Business and Human Rights.

Specific objectives of OS 2 are as follows:

- To protect workers' rights;
- To promote safety and health in the workplace;
- To promote the fair treatment, non-discrimination, and equal opportunity of project workers;
- To protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, in accordance with this OS) and migrant workers, contracted workers, community workers, and primary supply workers, as appropriate;
- To prevent the use of all forms of forced labour and child labour;
- To support the principles of freedom of association and collective bargaining of project workers, and align Bank requirements with ILO's Fundamental Principles and Rights at Work, the United Nations Convention on the Rights of the Child, and the Convention on the Elimination of All Forms of Discrimination Against Women, where national laws do not provide equivalent protection;
- To provide project workers with accessible means to raise workplace concerns;
- To require that the Bank, and national competent authorities, as appropriate, be promptly informed of any material adverse impacts and events relating to labour protection, and health and safety at the workplace.

This OS2 is applicable to direct workers, primary supply workers and community workers. In compliance to OS2, EGENCO will ensure that the contractor for the rehabilitation works of Nkula B Hydropower Station has well-laid out labour

management procedures that are acceptable by the AfDB. The procedures should set out minimum wages, Grievance Redress Mechanism and address occupational health and safety issues.

4.3.3 Environmental and Social Operational Safeguard 3 (OS3)

This Operational Safeguard (OS) recognizes that economic activities often cause air, water, and land pollution, and consume finite resources that may threaten people, ecosystem services, and the environment at the local, regional, and global levels. The current and projected atmospheric concentration of greenhouse gases (GHGs) threatens the welfare of current and future generations. In addition, more efficient and effective resource use, pollution prevention, and GHG emission avoidance, and mitigation technologies and practices have become more accessible and achievable.

OS3 sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle in a manner consistent with Good International Industry Practice (GIIP).

Specific objectives of OS3 include:

- promote the sustainable use of resources, including energy, water, and raw materials;
- avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities;
- avoid or minimize project-related emissions of short and long-lived climate pollutants;
- avoid or minimize generation of hazardous and non-hazardous waste; and
- minimize and manage the risks and impacts associated with pesticide use.

According to this OS, EGENCO is required to assess and evaluate resource efficiency and pollution-prevention techniques and implement them, taking into consideration their technical and financial feasibility and cost-effectiveness. This ESMP has laid out measures that will be implemented to ensure that the risk of pollution that will come about because of rehabilitation works is mitigated. This will be done throughout the different phases of the project's life cycle, i.e. planning and design, construction, commissioning, operations, and decommissioning.

4.3.4 Environmental and Social Operational Safeguard 4 (OS4)

This OS recognizes that project activities can increase community exposure to risks and impacts, both directly and indirectly. The OS addresses the health, safety, and security risks to and impacts on project-affected communities and the corresponding responsibility of the Borrower to avoid or minimize them, with particular attention to people who, due to their particular circumstances, may be vulnerable.

Specific objectives of this OS are to:

- anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project or operation lifecycle from both routine and non-routine circumstances;
- help promote public health and safety across the project's area of influence by, inter alia, promoting and supporting programmes that aim at preventing the spread of major communicable diseases;
- promote quality and safety, and considerations relating to climate change in the design and construction of infrastructure, including dams;
- avoid or minimize community exposure to project-related traffic and road safety risks, diseases, and hazardous materials;
- ensure that effective measures to address emergency events are in place.

In line with this OS, the ESMP has proposed measures that will promote Community Health, Safety and Security. This will be done by ensuring that measures are in place to minimize risks that would come about because of over-speeding construction vehicles, among others.

4.3.5 Environmental and Social Operational Safeguard 6 (OS6)

This operational safeguard (OS) recognizes that the project can affect ecological functions of habitats that are complex and include terrestrial freshwater marine biodiversity. Biodiversity often underpins ecosystem services valued by humans for livelihood especially in the Africa context that includes surrounding communities i.e. project affected parties, vulnerable groups and other water users.

Specific objectives of this OS6 are as follows:

- To protect and conserve biodiversity and differing types of habitats.
- To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity, with the aim of conserving biological diversity and ecosystem integrity.
- Endeavour to reinstate or restore biodiversity informed by the mitigation hierarchy, including, where some impacts are unavoidable, through implementing biodiversity offsets to achieve "no net loss but net gain" of biodiversity.
- To promote sustainable management of living natural resources.
- To support livelihoods of local communities, including vulnerable groups, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities.
- Sustain the availability and productivity of ecosystem services to maintain benefits to the affected communities and sustain project performance.
- To integrate natural resources effectively into sustainable economic development and protect the vital local and global environmental services and values of natural resources.

In line with this OS, the ESMP has proper measures that will promote protecting and conserving biodiversity and sustainably managing natural resources.

4.3.6 Environmental and Social Operational Safeguard 7 (OS7)

Economic and social rights are an integral part of human rights according to the African Development Bank. The Bank respects the principles and values of human rights as set out in the United Nations Charter and the African Charter of Human and Peoples' Rights. Through the requirements of OS7, the Bank requires Borrowers to observe international human rights norms, standards, and best practices, and to reflect in Bank operations national commitments made under, *inter alia*, international human rights covenants and the African Charter of Human and Peoples' Rights.

Subject to the type of project and its area of influence, some of the vulnerable groups are female-headed households, the landless, the elderly, youth and children, persons with disabilities, groups who are marginalized on the basis of ethnicity, religion, language, sexual orientation, and gender identity, and highly vulnerable rural minorities (HVRM), including groups referred to as indigenous peoples in some contexts.

Requirements

- The Borrower shall take the necessary measures to appropriately manage the risks and adverse impacts of the project on vulnerable individuals and groups, including on women and girls, minorities and HVRM.
- The Borrower shall avoid, minimize, or otherwise mitigate or remedy the exposure of vulnerable populations to project-related risks and adverse impacts.
- The Borrower shall properly address discriminatory practices, inequalities and other factors that contribute to vulnerability and will, as appropriate, strengthen the adaptive capacity of vulnerable individuals or groups by promoting inclusive development and benefit-sharing.

In line with the requirements of OS7, EGENCO shall ensure that vulnerable groups such as women, the elderly and youth and children, persons with disabilities are not marginalized when implementing the Nkula B rehabilitation project. This will be done by ensuring that their views and needs are taken care of during the planning and construction phases on the project. In addition, EGENCO will ensure that the Contractor that will be hired for the rehabilitation activities provide equal employment opportunities to both men and women so long as they have requisite qualifications and experience.

4.3.7 Environmental and Social Operational Safeguard 10 (OS10)

This OS recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.

Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

Stakeholder engagement is an inclusive process conducted throughout the project life cycle. When properly designed and implemented, it supports the development of strong, constructive, and responsive relationships that are important for successful management of a project's E&S risks. Stakeholder engagement is most effective when initiated at an early stage of the project development process and is an integral part of early project decisions and the assessment, management, and monitoring of the project's environmental and social risks and impacts.

Objectives of OS 10

- To establish a systematic approach to stakeholder engagement that will help borrowers identify stakeholders and build and maintain a constructive relationship and channels of communication with them, in particular project-affected parties.
- To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be considered in project design and E&S performance.
- To promote and provide the means for safe, effective, and inclusive engagement with project affected parties, inclusive of women's perspectives, in an equitable manner, and vulnerable groups, in a manner free of reprisal, throughout the project life cycle on issues that could potentially affect them.
- To enhance project benefits and mitigate harm to local communities.
- To ensure that appropriate project information on E&S risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format.
- To provide project-affected parties with accessible and inclusive means to provide input, raise issues, questions, proposals, concerns, and grievances, and allow Borrowers to respond to and manage such grievances.
- To promote development benefits and opportunities for project-affected communities, considering the needs of women, including vulnerable groups, in a manner that is accessible, equitable, culturally appropriate, and inclusive.

In line with OS10, EGENCO engaged a number of stakeholders both at local and national level during the planning phase of the rehabilitation works. Names of the stakeholders engaged have been put in Annex 2 of the report while their views and comments have been attached in Annex 3.

4.3.6.1 The Stakeholder Engagement Plan

In consultation with AfDB, EGENCO shall develop and implement a Stakeholder Engagement Plan (SEP) proportionate to the nature and scale of the rehabilitation project of Nkula B Hydropower Station and its potential risks and impacts. The SEP shall identify

all stakeholders for future engagement. The SEP shall be approved by the Bank before disclosure.

EGENCO shall ensure that views raised by all stakeholders at local, district and national level are considered during the planning, construction and implementation phases of the project. Further, EGENCO shall ensure that stakeholder engagement is ongoing, not a once-off activity.

In certain circumstances, depending on the level of information available about the project, the SEP will outline the general principles and a collaborative strategy to identify stakeholders and plan for an engagement process in accordance with this OS, which will be further developed and implemented in accordance with this OS once the location(s) is (are) known.

4.3.6.2 Grievance mechanisms

According to requirements of OS10, EGENCO shall respond to concerns and grievances of project-affected parties related to the environmental and social performance of the project in a timely manner. EGENCO shall propose and implement a grievance mechanism to receive and facilitate resolution of all projects associated with grievances.

The grievance mechanism is expected to address concerns promptly, effectively, transparently, and in a manner that is culturally appropriate and readily accessible to all project-affected parties, at no cost and without retribution. The mechanism, process or procedure will not prevent access to judicial or administrative remedies. EGENCO should inform the project-affected parties about the grievance process in the course of its community engagement activities and will make publicly available a record documenting the responses to all grievances received.

Grievances will be handled in a culturally appropriate, accessible, and understandable manner, and will be discreet, objective, sensitive, and responsive to the needs and concerns of the project-affected parties. The mechanism will also allow for anonymous complaints to be raised and addressed.

4.4 Regulatory Approvals and Licenses

Regulatory licences and approvals needed for the proposed project to ensure that it is in line with sound environmental management practices and follows relevant existing legislation include:

i. Approval of the ESMP as stipulated by the Environment Management Act (2017). The approval will be granted by Malawi Environment Protection Authority (MEPA);

ii. License for handling, storage of hazardous waste from MEPA as provided for under the Environment Management Act (2017);
iii. Workplace Registration Certificate during construction as stipulated by Occupation Safety and Health Act in line with Part II, Section 6 of the Occupation Safety, Health and Welfare Act. This Certificate will be issued by Directorate of Occupational Safety and Health; and
iv. Water (Use) Abstraction Permit as stipulated by Part V of Section 39 of the Water Resources Act (2013).

5. Chapter 5: Identification of Impacts and their management Measures

This chapter presents the assessment of potential impacts associated with the proposed rehabilitation and modernization of Nkula B Hydropower Station located in Neno district. The assessment aims at assigning the relative significance to predicted impacts associated with the project and to determine how the impacts can be avoided, mitigated, or managed. The potentially significant environmental impacts were identified by carefully studying receiving environment, reviewing the proposed activities, and considering the issues that were expressed during the consultation process. Specifically, the aim of chapter is to:

a) Predict the potential environmental and social impacts arising from implementation of the project;
b) Assess the possible extent /severity of the predicted impacts;
c) Assess the significance of the predicted impacts; and
d) Recommend measures to manage the impacts.

5.1 Impact identification

A combination of techniques was used to isolate the impacts as well as the causes and sources. A Leopold matrix has been used to identify direct potential environmental impacts that can arise from the project. Both the direct and indirect impacts on the biophysical, social and cultural environment were identified using professional judgment and expert consultations. Table 5.1 below outlines the identified impacts.

Table 5-1: Modified Leopold Matrix on impact identification of the project

Project Activities / **Environmental component**		**Planning phase**	**Construction phase**	**Operational/ Maintenance phase**
Component	**Impact**			
Socio-economic	Creation of employment	x	x	
	Knowledge and skills transfer to skilled and unskilled (especially the people from within the district)		x	x
	Improved efficiencies, improved/optimized plant operation and reduction in operation and maintenance costs		x	x
Water	Increased risk of liquid wastes generation		x	x

Project Activities / Environmental component		Planning phase	Construction phase	Operational/ Maintenance phase
Component	**Impact**			
Land and soil	Generation of solid wastes		x	x
OHS	Injuries, diseases, accidents, electrocution		x	
Environment	Risk associated with Climate Change		x	x
OHS	Risk of working in confined spaces		x	x
OHS	Risk of Traffic accidents and fatalities		x	
OHS	Noise		x	
OHS	Risk of Fall from Heights		x	
Socio-economic	Incidences of HIV, AIDS and STIs		x	
	Impact on Fisheries, ecological services		x	x
Socio-economic	Risk of SEA and GBV		x	
Water	Risk of Impacts on Water Quality			x
	Extension of hydro power plant life span			x
Land and soil	Risk of Non-ionizing Radiation:		x	
Water	Loss of aquatic fauna and flora		x	x

Note: x = Possible Impact

5.2 Environmental Impact Assessment Methodology

An analysis to determine the extent and significance of the impacts was conducted following the identification of the positive and negative impacts that the project will have on the environment. The main aspects that were considered include magnitude, significance, probability of occurrence and duration of impacts.

- Magnitude is the measure of the general degree, extensiveness, or scale of impact and it was scored at three levels i.e. household level, local level and regional level.
- Probability of occurrence provides an estimate of the probability of an impact occurring before mitigation is applied. Three levels of occurrence were considered i.e. possible (impact may occur but it is not probable), probable (the impact is very likely to occur) and definite (impact is unavoidable).
- Duration refers to the period of time in which an impact may occur, from once-off to continuous for the life of the project. Duration of impacts was considered in terms of short term (less than 5 years); medium term (between 5 and 10 years) and long term (over 10 years).
- Significance is a measure of the importance of a particular action on the environmental factor in the specific instance under consideration. This was scored

using values ranging from +3 to -3 where a score of 1 represents low impact, 2 moderate impacts and 3 high impacts. Negative impacts were assigned a minus (-) sign and positive impacts are given a plus (+) sign. Table 5.2 shows an impact matrix with the analysis of results.

Table 5-2: Impact scoring matrix with significance levels

Project / **Activities** / **Environmental component**		**Probability of occurrence**	**Duration of impact**	**Magnitude of impact**	**Significance of impact**
Component	**Impact**				
Socio-economic	Creation of employment	Definite	long term	Local and national level	+3
	Knowledge and skills transfer to skilled and unskilled (especially the people from within the district)	Definite	long term	Local and national level	+3
	Improved efficiencies,	Definite	long term	Local and national level	+3
	Generation of liquid wastes	Definite	long term	Local and national level	-1
	Generation of solid wastes	Definite	long term	Local and national level	-1
	Occupational health and safety Risks	Definite	Short term	Local and national level	-1
	Risk of electrical hazards	Definite	long term	Local and national level	-1
	Risk of working in confined spaces	Definite	Short term	Local and national level	-1
	Risk of Traffic accidents and fatalities	Definite	Short term	Local and national level	-1

Project / Activities / Environmental component		Probability of occurrence	Duration of impact	Magnitude of impact	Significance of impact
	Noise	Definite	Short term	Local and national level	-1
	Incidences of HIV, AIDS and STIs	Definite	Short term	Local and national level	-1
	Impact on Fisheries, ecological services	Definite	Long term	Local and national level	-1
	Risk of SEA and GBV	Definite	Short term	Local and national level	-1
	Risk of Impacts on Water Quality	Definite	Long term	Local and national level	-1
	Extension of hydropower plant life span	Definite	Long term	Local and national level	+3
	Risk of non-ionizing radiation:	Definite	Short term	Local and national level	-1
	Risk of Fall from Heights	Definite	Short term	Local and national level	-1

The project has slightly more negative scores (-13) compared to positive scores (+12) however most of the negative impacts are of low magnitude and mainly of short-term in nature. This means that these can easily be reduced or mitigated to acceptable levels. The positive impacts are socio-economic in nature and are mostly felt when the facility is operational. The impacts are long term and will have a positive bearing on the development of the country. Hence the project has a net benefit for the socio-economic development of the country.

5.3 Evaluation of main impacts and their management measures

5.3.1 Planning Phase

5.3.1.1 Positive impacts

i. Creation of temporary employment

Cause and comment: During the planning phase of rehabilitation and modernization works of Nkula B hydroelectric power plants, consultants will be engaged to do Feasibility Studies, develop ESMP and other related studies. These consultancies create employment for people.

Enhancement measure:

- Ensure that Consultants that are engaged to do different studies should include at least 50% Malawians as part of their personnel to enhance capacity building.

5.3.2 Construction Phase

5.3.2.1 Positive impacts

i. Creation of temporary employment

Cause and comment: Rehabilitation activities of Nkula B Hydroelectric power plant project will employ about 20 people from elsewhere and from within the project area. This will create employment not only to local Malawians but also from other parts of the world.

Enhancement measure:

- Engage at least 80% of the labour force from the surrounding communities where possible, especially for non-specialized or non-skilled labour;
- Pay workers at least the minimum wage recommended by the Government, and
- Ensure that at least 50% of the required labour force are Malawians where an international contractor is engaged.

ii. Knowledge and skills transfer to skilled and unskilled employees

Cause and comment: The engagement of local people in the rehabilitation activities of Nkula B hydroelectric power station will facilitate the transfer of skills to people in the construction sector.

Enhancement measure:

- Engage at least 80% of the labour force from the surrounding communities where possible especially for non-specialized or non-skilled labour; and
- Ensure that at least 50% of the required labour force are Malawians where an international contractor is engaged.

iii. Increased disposable income by employed people

Cause and Comment: People who will be employed by the project will be earning some income and the surrounding communities will also have business opportunities, hence boosting their economic status.

Enhancement Measures:

- Provide remunerations to the labour force on time as recommended by the Ministry responsible for labour.

5.3.2.2 Negative impacts

i. Increased risk of oil spillages

Cause and comment: Oils and lubricants are categorized as Hazardous waste because of the potential damage these can cause to the environment. During rehabilitation works, there is a potential risk of leakage of lubricants including oils and grease into water from Shire River. Leakages of mineral oil and grease could potentially pollute the river thereby impacting negatively on aquatic life and fishing.

Mitigation Measures:

- Develop and use Waste Management Plan;
- Upgrade components with oil free lubrication. These include Water lubricated bearings; Oil free Kaplan runner (water filled hub); Self-lubricated bushings (Wicket gates, Kaplan blades, Valve journals or trunnions, Vane rollers) and a Governing system with biodegradable and low toxic oil;
- On-site or off-site biological, chemical, or physical treatment of the waste material to render it nonhazardous prior to final disposal;
- Treatment or disposal at permitted facilities specially designed to receive the waste; and
- Store waste in closed containers away from direct sunlight, wind and rain.
- Conduct periodic analysis of water quality upstream and downstream of the project impact area

ii. Increased risk of liquid waste generation

The rehabilitation works for the Hydropower station will generate huge volumes of oils and lubricants, categorised as hazardous waste. Oils and lubricants are classified as hazardous waste because of the potential damage to both terrestrial and aquatic environment. This will need to be managed properly to avoid spillage into Shire River. In addition, the construction camp will generate a lot of domestic waste some of which will be liquid waste.

Mitigation Measures:

- Develop Waste Management Plan and ensure it is implemented;
- Segregate general waste from hazardous waste and provide separate waste receptacles for each category and label them;
- Properly dispose of 'hazardous waste' such as hydrocarbon containers, oily rags, soil contaminated with hydrocarbons at designated places;
- Provide waste receptacles and toilets including leak proof containers for the management of liquid waste;

- Construct and maintain oil/water separator, dedicated hydrocarbon interceptor and a concrete paved forecourt;
- Ensure that storm water drains are constructed up slope and down slope so that all liquid is contained and not mixed with the storm water; and
- Construct a septic tank for handling all effluents.
- Conduct periodic analysis of water quality upstream and downstream of the project impact area.

iii. Increased risk of solid waste generation

Cause and comment: The solid wastes will be generated from the project during rehabilitation and modernisation works. Lubricant containers, plastics, papers, food wrappings, food remains etc. are likely to be introduced at the site. This impact is applicable in all three stages.

Mitigation Measures:

- Develop and implement Waste Management Plan;
- Provide waste receptacles such as bins at strategic positions;
- Dispose of waste at designated sites by Neno District Council;
- Put "keep clean" signage in all strategic places; and
- Allow scrap metal dealers to collect scrap metal from the facility.

iv. Increased risk of occupational safety and health hazards

Cause and comment: The hazardous nature of the operation that will occur during rehabilitation and modernisation of Nkula B hydropower station has the potential to impact on the safety workers. The safety risks may be caused by inadequate illumination for underground performance of works, uncoordinated opening of water tunnels that can lead into drowning of workers, and movement of workers and equipment.

Mitigation measures:

- Develop and implement OHS Plan;
- Undertake risk assessments before starting the rehabilitation works;
- Provide adequate underground illumination for the safe performance of all work functions.
- Provide separate and independent emergency light sources at all places where a hazard could be caused by a failure of the normal lighting system.
- Provide an adequate automatic lighting system to allow the workers to conduct an emergency shutdown of machinery and should be tested on a regular basis.
- Underground workers should always have an approved cap lamp in their possession while underground. The peak luminance should be at least 1500 lux at 1.2 meters from the light source throughout the shift.
- Place danger warning signs in strategic places.
- Enforce the use of appropriate PPE.

v. Increased risk to electrical accidents

Cause and comment: Energized equipment and power lines can pose electrical hazards for workers at the hydropower power plant.

Mitigation measures:

- Mark all energized electrical devices and lines with warning signs;
- Lock out (de-charging and leaving open with a controlled locking device) and tag-out (warning sign placed on the lock) devices during rehabilitation;
- Check all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools;
- Label service rooms housing high voltage equipment (electrical hazards) and where entry is controlled or prohibited; and
- Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.

vi. Risk of working in confined spaces

Cause and comment: Confined spaces can occur in enclosed or open structures or locations. Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space. Specific areas for confined space entry may include turbines and turbine wells, as well as certain parts of generator rooms.

Mitigation measures:

- Develop and use OHS Plan;
- Carry out risk assessment before starting work;
- Provide permanent safety measures for venting, monitoring, and rescue operations, to the extent possible;
- Provide ample room for emergency and rescue operations to the area adjoining an access to a confined space;
- Disconnect, de-energize, lock-out, and brace mechanical equipment in the confined space;
- Test the atmosphere within the confined space to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL); and
- Ventilate the confined space if the atmospheric conditions are not met, until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.

vii.Risk of traffic accidents and fatalities

Cause and Comment: Risk of traffic accidents and fatalities is one of the potential Community Safety and Health Risks for the project. Rehabilitation and modernisation

work of Nkula B hydropower station shall use vehicle fleets for transport of workers and materials. This has potential to cause traffic accidents to workers and surrounding communities including children.

Mitigation measures:

- Develop and use Traffic Management Plan;
- Coordinate and control vehicle operation from one central authority during the rehabilitation/construction phase;
- Put speed limit signage at strategic positions including speed humps;
- Establish procedures and signage, and position traffic safety personnel to achieve separation of light and medium vehicles from heavy vehicles;
- Equip light and medium-sized vehicles with devices (for example, a pole-mounted flag) to improve their visibility to other operators;
- Require defensive driving training for all drivers, including contractors and subcontractors;
- Implement traffic safety procedures to coordinate safe transport of workers to and from the workers' camp;
- Maintain roads, particularly emphasizing major slopes, to ensure slope stability and the safety of heavy vehicle operation;
- Inform affected communities about potential traffic-related safety risks and issues, such as vibration and dust;
- Implement specific measures to ensure pedestrian safety (that is, define crossing areas and speed limits in populated areas) and use best efforts to avoid heavy traffic during in-and-out school times or during major harvesting events or cultural or religious festivities and gatherings.

viii. Increased incidences of HIV and AIDS and other STIs

Cause and comment: Interactions between migrant workers and local communities or amongst migrant workers have potential to increase incidences of HIV and AIDS. Additionally, cases of promiscuity are therefore likely as a result of loose behaviour through sexual indulgence. The behaviour may aid the spreading of HIV and AIDS including other sexually transmitted diseases. This is one of the Community Safety and Health Risks for the project.

Mitigation measures:

- Develop and use Workplace HIV and AIDS Policy;
- Provide civic education on HIV and AIDS and sexually transmitted infections (STIs);
- Distribute condoms to the workforce as well as the community to mitigate the problem.

ix. Risk of loss of aquatic biodiversity

Cause and comment: The water reservoir for the Hydropower Station will be emptied. This will negatively affect aquatic biodiversity. Additionally, used oils and lubricants can easily contaminate water in the Shire River, and this can lead to aquatic biodiversity loss.

Mitigation Measures:

- Slowly empty the reservoir to minimize damage to biodiversity that could be caused by turbulence caused by high-speed water;
- Limit the period the reservoir will be empty to minimize the impact that may be caused by reservoir emptying;
- Rehabilitate hydropower plant using best practices that minimize long-term damage;
- Implement operating guidelines that mimic natural flow conditions;
- Install deterrents near turbine intakes (e.g. screens) and install turbines that minimize mortality (ideally without compromising energy production);
- Conduct continuous monitoring, control, and surveillance of Nkula B hydropower plant to ensure there are no deviations from best practice; and
- Undertake adaptive management actions to reduce or mitigate impacts on biodiversity.

x. Risk of SEA and GBV

Cause and comment: Gender-based violence (GBV) comprises harmful acts perpetrated against a man, woman, boy or girl based on socially ascribed differences. GBV includes physical, sexual, economic, emotional and psychological violence, and the denial of resources and services. This type of violence is pervasive and persistent in emergency situations. The prevalence of GBV is exacerbated by among others food insecurity, poverty, disasters, crises, conflicts and health outbreaks, such as cholera and COVID-19 pandemics.

On the other hand, Sexual Exploitation and Abuse (SEA) is a type of Sexual Gender Based Violence (SGBV). Sexual exploitation includes any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes. This includes, but is not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. It is also the actual or threatened physical intrusion of a sexual nature (either by force or under unequal or coercive conditions), including inappropriate touching.

Mitigation Measures:

- Develop and use GBV and SEA Prevention Plan;
- Change negative social attitudes and discriminatory practices and involve men and boys to prevent GBV.
- Implement projects that challenge the root causes of discrimination against women and gender-based violence through bottom-up empowerment processes.

- Institute a community-based complaint mechanism to handle reports of sexual abuse and exploitation.

xi. Risk of water pollution

Cause and comment: The rehabilitation works are expected to generate large amounts of used oils and solid waste that may pollute the river. Additionally, leakages of oils and grease have potential to pollute water in the Shire River. Water quality in the river may have an adverse impact on water uses such as irrigation, water supply and aquatic biodiversity.

Mitigation Measures:

- Develop and implement Waste Management Plan;
- Provide waste management receptacles including waste bins and leakage proof containers for managing liquid waste;
- Upgrade components with oil free lubrication such as water lubricated bearings, oil free Kaplan Runner (water filled hub), self-lubricated bushings (Kicket gates, Kaplan blades, Valve Journals, Vane rollers); and governing system with biodegradable and low toxic oil.
- Conduct periodic analysis of water quality upstream and downstream of the project impact area

xii. Increased risk of hazardous waste generation

Cause and comment: The rehabilitation works at Nkula B may produce hazardous waste such as used oils, electronic waste, mercury containing waste e.g. switches and relays etc. This waste will need to be managed properly to avoid contaminating both terrestrial and aquatic environment.

Mitigation measures:

- Segregate general waste from hazardous waste and provide separate waste receptacle for each category and label them; and
- Properly dispose of 'hazardous waste' such as hydrocarbon containers, oily rags, soil contaminated with hydrocarbons at designated places. This should be done in liaison with Environmental District Officer for Neno District Council.

xiii. Increased risk of child labour

Cause and Comment: The rehabilitation works have potential to increase risk of Child Labour. This could be directly through employment at the camp or construction site or indirectly through sale of at the merchandise at the camp.

Mitigation Measures:

- Develop a Labour Management Plan;
- Restrict employment of people aged below 18; and
- Ensure that minors are not allowed to sell merchandise at the camp site.

xiv. Air pollution

Cause and comments: During the construction phase of the project, vehicles will be travelling to and from the project site using gravel roads. These vehicles will be transporting construction materials and ferrying construction workers, and, in the process, dust will be generated and this could be a Community Health and Safety Risk.

Mitigation Measures:

- Sprinkle water on road surface using water bowser to suppress dust; and
- Enforce speed limit for all road users to minimize dust that may be generated by installing speed limit signage and speed humps.

xv. Noise and vibrations

Cause and comments: During the rehabilitation works some noise and vibrations will be generated from grinding, drilling and blowing activities. When noise levels are above 85 Decibels (db) workers will have to be provided with appropriate PPE such as ear plugs to ensure that the noise does not lead to hearing impairment.

Mitigation Measures:

- Provide appropriate PPE such as ear muffles /plugs to workers subjected to noise levels above 85 decibels; and
- Use light machinery in the rehabilitation works.

xvi. Risks associated with climate change

Cause and comments: Climate Change may have some risks that may impact negatively on the operations of Kapichira 1 Hydropower Station. Some of the risks may include high water levels that may lead to flooding of the Shire River and Kapichira dam.

Mitigation Measures:

- Install climate resilient machinery i.e. machinery that can withstand flooding when water levels are high and that is efficient and can operate on low levels of water.

xvii. Disruption of power supply

Cause & comments: During the rehabilitation works, 2 No. machines will be alternatively switched off which will lead to less amount of power generation hence leading to load shedding to the public and industries.

Mitigation measures

- Conduct periodic awareness to communities, public and media
- Utilize existing strategies on switching on peaking plants utilities such as Salima solar project.

- Through communications between EGENCO & ESCOM, utilize energy from Mozambique
    - Malawi interconnection to supply sensitive institutions e.g Water Boards, Hospitals etc.

xviii. Water supply disruption

Cause & comments: at some point, the project will require draining of the pond to allow installation &/ or reparation of underwater parts e.g. turbines, MIV and related systems. Communities, particularly staff will be deprived of portable water supply.

Mitigation measures

- Engage and notify key stakeholders and the public on days and periods of water disruption
- For the station, EGENCO should provide alternative sources of water e.g. water bowser, functioning boreholes, etc.

xix. Risk of fire

Cause & comments: Since rehabilitation works will result into decanting of large volumes of oils as well as refills into rehabilitated equipment, there will be high risks of fires from these flammable petroleum products. This could lead to loss of property possible injuries and fatalities to EGENCO & contractor workers.

Mitigation measures

- Install danger warning signs for fire hazards including no smoking, no mobile phone signs at work.
- Conduct training and drills for emergency and firefighting to all workers
- Ensure that dry powder and carbon dioxide fire extinguisher, and the power station's fire-fighting equipment are readily available, accessible and functioning.

5.3.3 Operation Phase

5.3.3.1 Positive impacts

i. Improved efficiencies

Cause and comment: Significant generation benefits from improved efficiencies will be realized as a result of the rehabilitation works. This would include additional effective installed capacity.

Enhancement Measures:

- Procure rehabilitation components from reputable suppliers;
- Carry out maintenance and modernization work periodically;
- Use well-qualified and experienced engineers/contractors;
- Identify, regularly measure and report principal energy flows within the facility at unit process level;
- Regular comparison and monitoring of energy flows with performance targets to identify where action should be taken to reduce energy use;
- Manage the demand/load side by reducing loads on the system.

ii. Improved or optimized plant operation

Improved/optimized plant operation is expected to yield an increase in performance of the hydropower plant.

Enhancement Measures:

- Carry out maintenance and modernization work periodically;
- Use well-qualified and experienced engineers/contractors;
- Carry out regular maintenance of the facility; and
- Manage the demand/load side by reducing loads on the system.

iii. Reduction in operation and maintenance costs

Rehabilitation with an upgrade in combination with recovery of degraded performances (efficiency, availability and reliability) and changes in technology (efficiency and output) will lead to a reduction in operation and maintenance costs.

Enhancement Measures:

- Carry out regular maintenance of the facility;
- Carry out maintenance and modernization work periodically;

iv. Increased lifespan of Nkula B hydropower plant

Cause and comment: A key distinguishing feature of hydropower is its potential longevity. A hydropower facility can operate for 100 years or more, compared with 20-30 years for most other generation technologies. Sustainable rehabilitation of power plants will also maintain their longevity

Enhancement Measures:

- Conduct a diagnosis of the plants to identify aspects of operation and maintenance to be improved;
- Explore operation and maintenance contractual models to identify which activities will be implemented internally and which will be outsourced;
- Explore organization and staffing options (and organograms) according to owner capacity and requirements for external training and human resources.;
- Estimate financial resources required for implementing the selected operation and maintenance model, including any external contracting;

- Monitor key performance indicators of the operation and maintenance strategy through KPIs specified in appropriate agreements and contractual arrangements;
- Stock spare components to avoid loss of generation due to forced outages owing to the rapidly advancing technologies and long procurement lead times.

5.3.3.2 Negative impacts

i. Risk of electrical hazards

Cause and comment: Energized equipment and power lines can pose electrical hazards for workers at the hydropower plants.

Mitigation measures:

- Mark all energized electrical devices and lines with warning signs;
- Lock out (de-charging and leaving open with a controlled locking device) and tag-out (warning sign placed on the lock) devices during rehabilitation;
- Check all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools;
- Label service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited;
- Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.

ii. Risk of working in confined spaces

Cause and comment: Confined spaces can occur in enclosed or open structures or locations. Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space. Specific areas for confined space entry may include turbines and turbine wells, as well as certain parts of generator rooms.

Mitigation measures:

- Implement engineering measures to eliminate, to the degree feasible, the existence and adverse character of confined spaces.
- Provide permanent safety measures for venting, monitoring, and rescue operations for permit-required confined spaces.
- Provide ample room for emergency and rescue operations to the area adjoining access to a confined.
- Disconnect, de-energize, locked-out, and brace, as appropriate mechanical equipment in the confined space.
- Test the atmosphere within the confined space to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable

gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL).

- Ventilate the confined space if atmospheric conditions are not met, until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.

iii. Risk of non-ionizing radiation:

Cause and comment: Power plant workers may experience higher exposure to electric and magnetic fields (EMF) than the public because of working in proximity to electric power generators, equipment, and connecting high-voltage transmission lines. Occupational EMF exposure should be prevented or minimized by preparing and implementing an EMF safety program.

Mitigation measures:

- Identify potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities.
- Train workers in the identification of occupational EMF levels and hazards.
- Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure and limit access to properly trained workers.

iv. Risk of fall from heights

Cause and comments: Falls from elevations associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common causes of fatal or permanent disabling injury at construction or decommissioning sites.

Mitigation measures:

- Train staff and use temporary fall prevention devices, such as rails or other barriers able to support a weight of 400 Kilograms, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface;
- Train staff and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 4500 Kilograms as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 4500 Kilograms; and
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones.

v. Air pollution

Cause and comments: During the rehabilitation of Nkula B Hydropower Station, vehicles will be travelling to and from the project site using gravel roads. These vehicles will be ferrying construction materials and workers, and, in the process, dust will be generated. This is one of the community health and safety risks as surrounding communities will be affected.

Mitigation Measures:

- Sprinkle water on road surface using water bowser to suppress dust; and
- Enforce speed limit for all road users to minimize dust that may be generated by installing speed limit signage and speed humps.

vi. Noise and vibrations

Cause and comments: During the rehabilitation works some noise and vibrations will be generated from grinding, drilling and blowing activities. When noise levels are above 85 Decibels (db) workers will have to be provided with appropriate PPE such as ear plugs to ensure that the noise does not lead to hearing impairment.

Mitigation Measures:

- Provide appropriate PPE such as ear muffles /plugs to workers subjected to noise levels above 85 decibels; and
- Use light machinery in the rehabilitation works.

vii. Increased risk of liquid waste generation

Operation and maintenance of the hydropower station will be generating huge volumes of oils, lubricants and effluents categorized as hazardous waste because they have potential to damage both terrestrial and aquatic environment. This will need to be managed properly to avoid spillage into Shire River.

Mitigation Measures:

- Implement Waste Management Plan
- Segregate general waste from hazardous waste and provide separate waste receptacles for each category and label them;
- Provide waste receptacles and toilets including leak proof containers and/or septic tanks for the management of liquid waste;
- Construct and maintain oil/water separator, dedicated hydrocarbon interceptor and a concrete paved forecourt;
- Conduct periodic analysis of water quality upstream and downstream of the project impact area.

viii. Risks associated with climate change

Cause and comments: Climate Change may have some risks that may impact negatively on the operations of Kapichira 1 Hydropower Station. Some of the risks may include high

water levels that may lead to flooding of the Shire River and Kapichira reservoir and low water levels that may negatively affect power generation.

Mitigation Measures:

- Install climate resilient machinery i.e. machinery that can withstand flooding when water levels are high and that is efficient and can operate on low levels of water.

ix. Risk of fire

Cause & comments: Since rehabilitation works will result into decanting of large volumes of oils as well as refills into rehabilitated equipment, there will be high risks of fires from these flammable petroleum products. This could lead to loss of property possible injuries and fatalities to EGENCO & contractor workers.

Mitigation measures

- Install danger warning signs for fire hazards including no smoking, no mobile phone signs at work.
- Conduct training and drills for emergency and firefighting to all workers
- Ensure that dry powder and carbon dioxide fire extinguisher, and the power station's fire-fighting equipment are readily available, accessible and functioning.

5.3.4 Demobilization Phase

Cause and comments: The main activities to be undertaken during demobilisation phase are demolition of campsite, demobilization of workers and re-vegetating areas that were cleared by the Contractor at the campsite.

5.3.4.1 Positive impacts

i. Reduced risks associated with rehabilitation works

Cause and comments: Cessation of rehabilitation works will result in reduced risks associated with rehabilitation works. The impact is positive, will definitely occur and is of low significance.

Enhancement Measures

- Carry out maintenance work for the Nkula B Hydropower Station regularly

5.3.4.2 Negative Impacts

i. Loss of employment

Cause and comments: At the end of the rehabilitation work, the contractor will lay off workers involved in construction works. This will result in a loss of employment and

reduced income capacity for the people to be laid off. The impact is negative, will definitely occur and is of low significance.

Mitigation Measures

- Sensitize workers on when rehabilitation works shall cease so that people are well prepared; and
- Pay off terminal benefits to the workers.

Chapter 6: Environmental and Social Management and Monitoring Plans

This chapter includes an Environmental and Social Management Plan (ESMP) and an Environmental and Social Monitoring Plan for all of the anticipated environmental and social impacts and risks associated with the rehabilitation and modernization of Nkula B Hydroelectric Power Station Project implementation. These have been presented below:

6.1 Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) is an action plan that defines responsibilities and task schedules for project implementation. Table 6-1 below provides an Environmental and Social Management Plan for the rehabilitation works for Nkula B Hydropower Station based on the potential significant impacts highlighted in Chapter 5. The implementation of these activities may differ to accommodate alterations that may be required as the project is being implemented. The plan establishes a framework to ensure that negative environmental and social impacts are minimized or avoided, and that positive impacts are enhanced. In this sense, certain adjustments should be allowed to maximize benefits during implementation.

The implementation of ESMP activities require financial resources. The consultant used the universal 1% (Canter, 1995) of project cost to calculate the amount of money to be set aside by EGENCO for meeting the cost of implementing the proposed management measures as well as monitoring activities that are currently not included in the project cost. The total cost for implementing the Management and Monitoring Plan is MK 115,000,000(USD 60,526).

Table 5-3: Environmental and Social Management Plan for Nkula B rehabilitation Works

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
Planning Phase					
Positive Impact					
1	Creation of temporary employment	• Ensure that Consultants that are engaged to do different studies should include at least 50% Malawians as part of their personnel to enhance capacity building	During Planning Phase	EGENCO	No Cost
Construction/ Rehabilitation Phase					
Positive Impacts					
1	Creation of temporary employment	• Engage at least 80% of the labour force from the surrounding communities where possible especially for non-specialised or non-skilled labour. • Pay workers at least the minimum wage recommended by Government, and • Ensure that at least 50% of the required labour force are Malawians where an international contractor is engaged	During Construction/ Rehabilitation Phase	Contractor	No Cost

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
2	Knowledge and skills transfer to skilled and unskilled employees	• Engage at least 80% of the labour force from the surrounding communities where possible especially for non-specialised or non-skilled labour • Ensure that at least 50% of the required labour force are Malawians where an international contractor is engaged	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	No cost
3	Increased disposable income by employed people	• Provide remunerations to the labour force in time as recommended by the Ministry responsible for labour	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	No cost
Negative Impacts					
1	Increased risk of oil spillages	• Develop and use Waste Management Plan; • Upgrade components with oil free lubrication. These include Water lubricated bearings; Oil free Kaplan runner (water filled hub); Self-lubricated bushings (Wicket gates, Kaplan blades, Valve journals or trunnions,	During construction/ rehabilitation	EGENCO/ Contractor	10,000,000 (USD 5,263)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		Vane rollers) and a Governing system with biodegradable and low toxic oil; • On-site or off-site biological, chemical, or physical treatment of the waste material to render it nonhazardous prior to final disposal; • Treatment or disposal at permitted facilities specially designed to receive the waste; and • Store waste in closed containers away from direct sunlight, wind and rain. • Conduct periodic analysis of water quality			
2	Increased risk of liquid waste generation	• Develop waste Management Plan and ensure it is being implemented; • Segregate general waste from hazardous waste and provide separate waste receptacle for each category and label them;	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Properly dispose of 'hazardous waste' such as hydrocarbon containers, oily rags, soil contaminated with hydrocarbons at designated places; • Provide waste receptacles and toilets including leak proof containers for the management of liquid waste; • Construct and maintain oil/water separator, dedicated hydrocarbon interceptor and a concrete paved forecourt; • Ensure that storm water drains are constructed up slope and down slope so that all liquid is contained and not mixed with the storm water; and • Construct a septic tank for handling of all effluents. • Conduct periodic analysis of water quality			
3	Increased risk of solid waste generation	• Develop and implement Waste Management Plan;	During Construction/	EGENCO/ Contractor	10,000,000 (USD 5,263)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Provide waste receptacles such as bins at strategic positions; • Dispose of waste at designated sites by Neno District Council; • Put "keep clean" signage in all strategic places and • Allow scrap metal dealers to collect scrap metal from the facility.	Rehabilitation Phase		
4	Increased risk of occupational safety and health hazards	• Develop and implement OHS Plan; • Undertake risk assessments before starting the rehabilitation works; • Provide adequate underground illumination for the safe performance of all work functions; • Provide separate and independent emergency light sources at all places where a hazard could be caused by a failure of the normal lighting system;	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	10,000,000 (USD 5,263)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Provide for an adequate automatic lighting system to allow the workers to conduct an emergency shutdown of machinery, and should be tested on a regular basis; • Underground workers should always have an approved cap lamp in their possession while underground. The peak luminance should be at least 1500 lux at 1.2 meters from the light source throughout the shift; • Place danger warning signs in strategic places; • Enforce use of appropriate PPE.			
5	Increased risk of electrical accidents	• Mark all energized electrical devices and lines with warning signs; • Lock out (de-charging and leaving open with a controlled locking device) and tag-out (warning sign	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		placed on the lock) devices during rehabilitation; • Check all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools; • Label service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited; • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.			
6	Risk of working in confined spaces	• Develop and use OHS Plan; • Carry out risk assessment before starting works; • Implement engineering measures to manage the adverse character of confined spaces;	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	10,000,000 (USD 5,263)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Provide permanent safety measures for venting, monitoring, and rescue operations, to the extent possible; • Provide ample room for emergency and rescue operations to the area adjoining an access to a confined space; • Disconnect, de-energize, lock-out, and brace mechanical equipment in the confined space; • Test the atmosphere within the confined space to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL); • Ventilate the confined space if the atmospheric conditions are not met, until the target safe atmosphere is achieved,			

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		or entry is only to be undertaken with appropriate and additional PPE.			
7	Risk of traffic accidents and fatalities	• Develop and use Traffic Management Plan; • Coordinate and control vehicle operation from one central authority during the rehabilitation/construction phase; • Put speed limit signage at strategic positions including speed humps; • Establish procedures and signage, and position traffic safety personnel to achieve separation of light and medium vehicles from heavy vehicles; • Equip light and medium vehicles with devices (for example, a pole-mounted flag) to improve their visibility to other operators; • Require defensive driving training for all drivers,	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		including contractors and subcontractors; • Implement traffic safety procedures to coordinate safe transport of workers to and from the workers' camp; • Maintain roads, particularly emphasizing major slopes, to ensure slope stability and the safety of heavy vehicle operation; • Inform affected communities about potential traffic-related safety risks and issues, such as vibration and dust; • Implement specific measures to ensure pedestrian safety (that is, define crossing areas and speed limits in populated areas) and use best efforts to avoid heavy traffic during in-and-out school times or during major harvesting events or cultural or religious festivities and gatherings.			

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
8	Incidences of HIV and AIDS and other STIs	• Develop and use Workplace HIV and AIDS Policy; • Provide civic education on HIV and AIDS and sexually transmitted infections (STIs); • Distribute condoms to the workforce as well as the community to mitigate the problem.	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)
9	Risk of loss of aquatic biodiversity	• Slowly empty the reservoir to minimize damage to biodiversity that could be caused by turbulence caused by high-speed water; • Limit the period the reservoir will be empty to minimize the impact that may be caused by reservoir emptying; • Rehabilitate hydropower plant using best practices that minimize long-term damage; • Implement operating guidelines that mimic natural flow conditions;	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Install deterrents near turbine intakes (e.g. screens) and install turbines that minimize mortality (ideally without compromising energy production); • Conduct continuous monitoring, control, and surveillance of Nkula B hydropower plant to ensure there are no deviations from best practice; and • Undertake adaptive management actions to reduce or mitigate impacts on biodiversity			
10	Risk of SEA and GBV	• Develop and use GBV and SEA Prevention Plan; • Change negative social attitudes and discriminatory practices and involve men and boys to prevent GBV; • Implement projects that challenge the root causes of discrimination against women and gender-based	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		violence through bottom-up empowerment processes; • Institute a community-based complaint mechanism to handle reports of sexual abuse and exploitation.			
11	Risk of water pollution	• Develop and implement Waste Management Plan; • Provide waste management receptacles including waste bins and leakage proof containers for managing liquid waste; • Upgrade components with oil free lubrication such as water lubricated bearings, oil free Kaplan Runner (water filled hub), self-lubricated bushings (Kicket gates, Kaplan blades, Valve Journals, Vane rollers); and governing system with biodegradable and low toxic oil. • Conduct periodic analysis of water quality	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
12	Increased risk of hazardous waste generation	• Segregate general waste from hazardous waste and provide separate waste receptacle for each category and label them; and • Properly dispose of 'hazardous waste' such as hydrocarbon containers, oily rags, soil contaminated with hydrocarbons at designated places. This should be done in liaison with Environmental District Officer for Neno District Council.	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	5,000,000 (USD 2,632)
13	Increased risk of Child labour	• Develop a Labour Management Plan; • Restrict employment of people aged below 18; and • Ensure that minors are not allowed to sell merchandise at the camp site.	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	1,500,000 (USD 789)
14	Air pollution	• Sprinkle water on road surface using water bowser to suppress dust; and • Enforce speed limit for all road users to minimize dust	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	3,500,000 (USD 1,842)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		that may be generated by installing speed limit signage and speed humps.			
15	Noise and vibrations	• Provide appropriate PPE such as ear muffles /plugs to workers subjected to noise levels above 85 decibels; and • Use light machinery in the rehabilitation works.	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	3,500,000 (USD 1,842)
16	Risks associated with climate change	• Install climate resilient machinery i.e. machinery that can withstand flooding when water levels are high and that are efficient and can operate on low levels of water.	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	To be Determined
17	Disruption of power supply	• Conduct periodic awareness to communities, public and media • Utilize existing strategies on switching on peaking plants utilities such as Salima solar project. • Through communications between EGENCO & ESCOM, utilize energy from Mozambique	During Construction/ Rehabilitation Phase	EGENCO	500,000 (USD 263)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		○ Malawi interconnection to supply sensitive institutions e.g Water Boards, Hospitals etc.			
18	Water supply disruption	• Engage and notify key stakeholders and the public on days and periods of water disruption • For the station, EGENCO should provide alternative sources of water e.g. water bowser, functioning boreholes, etc.	During Construction/ Rehabilitation Phase	EGENCO	500,000 (USD 263)
19	Risk of fire	• Install danger warning signs for fire hazards including no smoking, no mobile phone signs at work. • Conduct training and drills for emergency and firefighting to all workers • Ensure that dry powder and carbon dioxide fire extinguisher, and the power station's fire-fighting	During Construction/ Rehabilitation Phase	Contractor/ EGENCO	2,500,000 (USD 1,316)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		equipment are readily available, accessible and functioning.			
Demobilisation Phase					
Positive Impacts					
1	Reduced risks associated with rehabilitation works	• Carry out maintenance works for the Nkula B Hydropower Station regularly	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	To be Determined
Negative Impacts					
1	Loss of employment	• Sensitize workers on when rehabilitation works shall cease so that people are well prepared; and • Pay off terminal benefits to the workers.	During Construction/ Rehabilitation Phase	EGENCO/ Contractor	To be Determined
Operation Phase					
Positive Impacts					
1	Improved efficiencies	• Procure rehabilitation components from reputable suppliers; • Carry out maintenance and modernization work periodically;	During Operation Phase	EGENCO	To be Determined

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Use well qualified and experienced engineers/contractors; • Identify, regularly measure and report principal energy flows within the facility at unit process level; • Regular comparison and monitoring of energy flows with performance targets to identify where action should be taken to reduce energy use; • Manage the demand/load side by reducing loads on the system.			
2	Improved and optimised plant operation	• Carry out maintenance and modernization work periodically; • Use well qualified and experienced engineers/contractors; • Carry out regular maintenance of the facility; • Manage the demand/load side by reducing loads on the system.	During Operation Phase	EGENCO	To be Determined

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
3	Reduction in operation and maintenance costs	• Carry out regular maintenance of the facility; • Carry out maintenance and modernization work periodically;	During Operation Phase	EGENCO	To be Determined
4	Increased lifespan of Nkula B hydropower plant	• Conduct a diagnosis of the plants to identify aspects of operation and maintenance to be improved • Explore operation and maintenance contractual models to identify which activities will be implemented internally and which will be outsourced; • Explore organization and staffing options (and organograms) according to owner capacity and requirements for external training and human resources • Estimate financial resources required for implementing the selected operation and maintenance model,	During Operation Phase	EGENCO	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		including any external contracting • Monitor key performance indicators of the operation and maintenance strategy through KPIs specified in appropriate agreements and contractual arrangements • Stock spare components to avoid loss of generation due to forced outages owing to the rapidly advancing technologies and long procurement lead times			
Negative Impacts					
1	Risk of electrical hazards	• Mark all energized electrical devices and lines with warning signs; • Lock out (de-charging and leaving open with a controlled locking device) and tag-out (warning sign placed on the lock) devices during rehabilitation; • Check all electrical cords, cables, and hand power tools	During Operation Phase	EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools; • Label service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited; • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.			
2	Risk of working in confined spaces	• Implement engineering measures to eliminate, to the degree feasible, the existence and adverse character of confined spaces; • Provide permanent safety measures for venting, monitoring, and rescue operations for permit-required confined spaces; • Provide ample room for emergency and rescue	During Operation Phase	EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		operations to the area adjoining an access to a confined space; • Disconnect, de-energize, locked-out, and brace, as appropriate mechanical equipment in the confined space; • Test the atmosphere within the confined space to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL); • Ventilate the confined space if conditions atmospheric are not met, until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.			
3	Risk of non-ionizing radiation	• Identify potential exposure levels in the workplace, including surveys of	During Operation Phase	EGENCO	4,000,000 (UDS 2,105)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		exposure levels in new projects and the use of personal monitors during working activities • Train workers in the identification of occupational EMF levels and hazards • Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure and limiting access to properly trained workers			
4	Risk of fall from heights	• Train staff and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 400 Kilograms, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or	During Operation Phase	EGENCO	8,000,000 (USD 4,211)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		through an opening in a work surface; • Train staff and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 4,500 Kilograms as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 4,500 Kilograms; • Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones.			
5	Risk of fire	• Install danger warning signs for fire hazards including no smoking, no mobile phone signs at work. • Conduct training and drills for emergency and firefighting to all workers	During Construction/ Rehabilitation Phase	Contractor/ EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Timeframe	Responsibility for implementation of measures	Estimated Budget (MK)
		• Ensure that dry powder and carbon dioxide fire extinguisher, and the power station's fire-fighting equipment are readily available, accessible and functioning.			
Total					**115,000,000** (USD 60,526)

6.2 Environmental and Social Monitoring Plan

The Environmental and Social Monitoring Plan (Table 6-2) has been developed to cover all projected impacts, verifiable indicators, frequency of monitoring, and responsible organizations for monitoring. The Environmental and Social Monitoring Plan is critical for ensuring that the ESMP is implemented as expected. The cost of implementing environmental and social monitoring plan has been estimated to be MK 97,000,000(USD 51,052).

Table 5-4: Environmental and Social Monitoring Plan for Nkula B rehabilitation works

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
Planning Phase						
Positive Impact						
1	Creation of temporary employment	• Ensure that Consultants that are engaged to do different studies should include at least 50% Malawians as part of their personnel to enhance capacity building	• Number of people employment segregated by age and gender	Bi-Annual	Neno District Labour Office	2,000,000 (USD 1,053)
Construction/ Rehabilitation Phase						
Positive Impacts						
1	Creation of temporary employment	• Engage at least 80% of the labour force from the surrounding communities where possible especially for non-specialised or non-skilled labour; • Pay workers at least the minimum wage recommended by Government, and • Ensure that at least 50% of the required labour force are Malawians where an international contractor is engaged	• Number of people employed segregated by age and gender	Bi-Annual	Neno District Labour Office	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
2	Knowledge and skills transfer to skilled and unskilled employees	• Engage at least 80% of the labour force from the surrounding communities where possible especially for non-specialised or non-skilled labour • Ensure that at least 50% of the required labour force are Malawians where an international contractor is engaged	• Number of local artisans employed	Bi-Annual	Neno District Labour Office	2,000,000 (USD 1,053)
3	Increased disposable income by employed people	• Provide remunerations to the labour force in time as recommended by the Ministry responsible for labour	• Number of people engaged in business segregated by age and gender	Bi-Annual	Neno District Council	2,000,000 (USD 1,053)
Negative Impacts						
1	Increased risk of oil spillages	• Develop and use Waste Management Plan; • Upgrade components with oil free lubrication. These include Water lubricated bearings; Oil free Kaplan runner (water filled hub); Self-lubricated bushings (Wicket gates, Kaplan blades, Valve journals or trunnions, Vane rollers) and a	• Water quality analysis (Oil and grease Test; pH; Temperature; Turbidity; Nutrient; Dissolved Oxygen)	Bi-annual	Neno District Council; MEPA; MBS	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		Governing system with biodegradable and low toxic oil; • On-site or off-site biological, chemical, or physical treatment of the waste material to render it nonhazardous prior to final disposal; • Treatment or disposal at permitted facilities specially designed to receive the waste; and • Store waste in closed containers away from direct sunlight, wind and rain. • Conduct periodic analysis of water quality				
2	Increased risk of generation of liquid waste	• Develop and use Waste Management Plan • Upgrade components with oil free lubrication. These include Water lubricated bearings; Oil free Kaplan runner (water filled hub); Self-lubricated bushings (Wicket gates, Kaplan blades, Valve journals or trunnions,	Water Quality Analyses (Oil and grease Test; pH; Temperature; Turbidity; Nutrient; Dissolved Oxygen)	Quarterly	MEPA; Neno District Council	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		Vane rollers) and a Governing system with biodegradable and low toxic oil • On-site or off-site biological, chemical, or physical treatment of the waste material to render it non-hazardous prior to final disposal • Treatment or disposal at permitted facilities specially designed to receive the waste • Store waste in closed containers away from direct sunlight, wind and rain				
3	Increased risk of solid waste generation	• Develop and use Waste Management Plan; • Provide waste receptacles such as bins at strategic positions; • Take particular care regarding the disposal of materials that could be wind-borne, waterborne or thin plastics to ensure that the release of these materials is minimized;	Water Quality Analyses (Oil and grease Test; pH; Temperature; Turbidity; Nutrient; Dissolved Oxygen)	Quarterly	MEPA; Neno District Council	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Store litter and generated waste for collection by Neno District Council; • No burning of wastes will be allowed; • Put "keep clean" signage in all strategic places; and • Allow scrap metal dealers to collect scrap metal from the facility.				
4	Increased risk of occupational safety and health hazards	• Develop and implement OHS Plan; • Undertake risk assessments before starting the rehabilitation works; • Provide adequate underground illumination for the safe performance of all work functions • Provide separate and independent emergency light sources at all places where a hazard could be caused by a failure of the normal lighting system • Provide for an adequate automatic lighting system to allow the workers to conduct	• Incident reports that include type, number and level of injuries;	Quarterly	Ministry of Labour, Neno District Council; EGENCO; MEPA	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		an emergency shutdown of machinery, and should be tested on a regular basis • Underground workers should always have an approved cap lamp in their possession while underground. The peak luminance should be at least 1500 lux at 1.2 meters from the light source throughout the shift; • Place danger warning signs in strategic places; • Enforce use of appropriate PPE.				
5	Increased risk of electrical accidents	• Mark all energized electrical devices and lines with warning signs; • Lock out (de-charging and leaving open with a controlled locking device) and tag-out (warning sign placed on the lock) devices during rehabilitation; • Check all electrical cords, cables, and hand power tools for frayed or exposed cords	• Warning Signs; • high voltage and prohibited rooms labels	Quarterly	Ministry of Labour, Neno District Council; EGENCO; MEPA	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools • Label service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited; • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.				
6	Risk of working in confined spaces	• Develop and use OHS Plan; • Carry out risk assessment before starting works; • Provide permanent safety measures for venting, monitoring, and rescue operations, to the extent possible; • Provide ample room for emergency and rescue operations to the area adjoining an access to a confined space;	• Incident reports that include type, number and level of injuries;	Quarterly	Ministry of Labour, Neno District Council; EGENCO; MEPA	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Disconnected, de-energize, lock-out, and brace mechanical equipment in the confined space; • Test the atmosphere within the confined space to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL); • Ventilate the confined space if the atmospheric conditions are not met, until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE				
7	Risk of traffic accidents and fatalities	• Develop and use Traffic Management Plan; • Coordinate and control vehicle operation from one central authority during the rehabilitation/construction phase;	• Traffic Management Plan; • Speed limit signage; • Speed humps;	Quarterly	EGENCO; Neno District Council; MEPA; Road Traffic Directorate	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Put speed limit signage at strategic positions including speed humps; • Establish procedures and signage, and position traffic safety personnel to achieve separation of light and medium vehicles from heavy vehicles; • Equip light and medium vehicles with devices (for example, a pole-mounted flag) to improve their visibility to other operators; • Require defensive driving training for all drivers, including contractors and subcontractors; • Implement traffic safety procedures to coordinate safe transport of workers to and from the workers' camp; • Maintain roads, particularly emphasizing major slopes, to ensure slope stability and the safety of heavy vehicle operation;				

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Inform affected communities about potential traffic-related safety risks and issues, such as vibration and dust; • Implement specific measures to ensure pedestrian safety (that is, define crossing areas and speed limits in populated areas) and use best efforts to avoid heavy traffic during in-and-out school times or during major harvesting events or cultural or religious festivities and gatherings.				
8	Increased risk of HIV/AIDS and STIs	• Provide civic education on HIV and AIDS and sexually transmitted infections (STIs) • Distribute condoms to the workforce as well as the community to mitigate the problem	• Number of people from surrounding communities attended awareness meetings • Report on number of condoms provided; • Presence of condoms in washrooms for collection by workers	Quarterly	Neno DAC; Neno DHO;	2,000,000 (USD 1,053)
9	Risk of loss of aquatic biodiversity	• Slowly empty the reservoir to minimize damage to biodiversity that could be	• Number of aquatic animals including fish dead	Quarterly	Department of Fisheries; EGENCO; MEPA	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		caused by turbulence caused by high-speed water; • Limit the period the reservoir will be empty to minimize the impact that may be caused by reservoir emptying; • Rehabilitate hydropower plant using best practices that minimize long-term damage; • Implement operating guidelines that mimic natural flow conditions; • Install deterrents near turbine intakes (e.g., screens) and install turbines that minimize mortality (ideally without compromising energy production); • Conduct continuous monitoring, control, and surveillance of Nkula B hydropower plant to ensure there are no deviations from best practice; and • Undertake adaptive management actions to				

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		reduce or mitigate impacts biodiversity.				
10	Risk of SEA and GBV	• Develop and use GBV and SEA Prevention Plan • Change negative social attitudes and discriminatory practices and involve men and boys to prevent GBV • Implement projects that challenge the root causes of discrimination against women and gender-based violence through bottom-up empowerment processes • Institute a community-based complaint mechanism to handle reports of sexual abuse and exploitation	• GBV and SEA Prevention Plan; • Presence of GRM	Quarterly	MEPA; EGENCO; Neno District Council	2,000,000 (USD 1,053)
11	Risk of water pollution	• Develop and implement Waste Management Plan; • Provide waste management receptacles including waste bins and leakage proof containers for managing liquid waste; • Upgrade components with oil free lubrication such as water lubricated bearings, oil	• Waste Management Plan; and • Waste Receptacles • Water Quality Analyses (Oil and grease test; pH; Temperature; Turbidity; Nutrient; Dissolved Oxygen)	Quarterly	MEPA; Department of Water Resources; National Water Resources Authority.	5,000,000 (USD 2,632)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		free Kaplan Runner (water filled hub), self-lubricated bushings (Kicket gates, Kaplan blades, Valve Journals, Vane rollers); and governing system with biodegradable and low toxic oil.				
12	Increased risk of hazardous waste generation	• Segregate general waste from hazardous waste and provide separate waste receptacles for each category and label them; and • Properly dispose of 'hazardous waste' such as hydrocarbon containers, oily rags, soil contaminated with hydrocarbons at designated places. This should be done in liaison with Environmental District Officer for Neno District Council.	Water Quality Analyses (Oil and Grease Test; pH; Temperature; Turbidity; Nutrient; Dissolved Oxygen)	Quarterly	MEPA	2,000,000 (USD 1,053)
13	Increased risk of Child labour	• Develop a Labour Management Plan; • Restrict employment of people aged below 18; and	• Copies of National Identity Cards attached to employment contract	Monthly	Ministry of Labour, EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Ensure that minors are not allowed to sell merchandise at the camp site.				
14	Air pollution	• Sprinkle water on road surface using water bowser to suppress dust; and • Enforce speed limit for all road users to minimize dust that may be generated by installing speed limit signage and speed humps.	• Speed limit signs; • Schedules for sprinkling water on road surface	Quarterly	MEPA	2,000,000 (USD 1,053)
15	Noise and vibrations	• Provide appropriate PPE such as ear muffles /plugs to workers subjected to noise levels above 85 decibels; and • Use light machinery in the rehabilitation works.	• Availability of PPE (ear plugs); and • Zoning of noisy arears.	Quarterly	Department of Occupational Safety Health and Welfare	2,000,000 (USD 1,053)
16	Risks associated with climate change	• Install climate resilient machinery i.e. machinery that can withstand flooding when water levels are high and that are efficient and can operate on low levels of water.	• Climate resilient machinery	Quarterly	EGENCO; Ministry of Energy	2,000,000 (USD 1,053)
Demobilisation Phase						
Positive Impacts						

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
1	Reduced risks associated with rehabilitation works	• Carry out maintenance works for the Nkula B Hydropower Station regularly	• Maintenance records	Quarterly	Department of Energy; MERA	2,000,000 (USD 1,053)
Negative Impacts						
1	Loss of employment	• Sensitize workers on when rehabilitation works shall cease so that people are well prepared; and • Pay off terminal benefits to the workers.	• Minutes on Sensitisation Workshop	Quarterly	MERA	2,000,000 (USD 1,053)
Operation Phase						
Positive Impacts						
1	Improved efficiencies	• Carry out maintenance and modernization work periodically; • Use well qualified and experienced engineers/contractors; • Identify, regularly measure and report principal energy flows within the facility at unit process level; • Regular comparison and monitoring of energy flows with performance targets to	• Maintenance Records	Annually	Department of Energy; MERA	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		identify where action should be taken to reduce energy use; • Manage the demand/load side by reducing loads on the system.				
2	Improved and optimised plant operation	• Procure rehabilitation components from reputable suppliers; • Carry out maintenance and modernization work periodically; • Use well qualified and experienced engineers/contractors; • Identify, regularly measure and report principal energy flows within the facility at unit process level; • Regular comparison and monitoring of energy flows with performance targets to identify where action should be taken to reduce energy use; • Carry out regular maintenance of the facility;	• Maintenance Records	Annually	Department of Energy; MERA	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Manage the demand/load side by reducing loads on the system.				
3	Reduced operation and maintenance costs	• Carry out regular maintenance of the facility; and • Carry out maintenance and modernization work periodically;	• Maintenance Records	Annually	Department of Energy; MERA	2,000,000 (USD 1,053)
4	Increased lifespan of Nkula B hydropower plant	• Conduct a diagnosis of the plants to identify aspects of operation and maintenance to be improved; • Explore operation and maintenance contractual models to identify which activities will be implemented internally and which will be outsourced; • Explore organization and staffing options (and organograms) according to owner capacity and requirements for external training and human resources; • Estimate financial resources required for implementing	• Maintenance Records	Annually	Department of Energy; MERA	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		the selected operation and maintenance model, including any external contracting; • Monitor key performance indicators of the operation and maintenance strategy through KPIs specified in appropriate agreements and contractual arrangements; and • Stock spare components to avoid loss of generation due to forced outages owing to the rapidly advancing technologies and long procurement lead times.				
Negative Impacts						
1	Risk of electrical hazards	• Mark all energized electrical devices and lines with warning signs • Lock out (de-charging and leaving open with a controlled locking device) and tag-out (warning sign placed on the lock) devices during rehabilitation	• Report on electrical hazard; • Maintenance Records.	Annually	Department of Energy; MERA; EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Check all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools • Label service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work				
2	Risk of working in confined spaces	• Implement engineering measures to eliminate, to the degree feasible, the existence and adverse character of confined spaces; • Provide permanent safety measures for venting, monitoring, and rescue operations for permit-required confined spaces;	• Confined space permit; • Confined space oxygen content	Annually	Department of Energy; MERA; EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		• Provide ample room for emergency and rescue operations to the area adjoining an access to a confined space; • Disconnect, de-energize, locked-out, and brace, as appropriate mechanical equipment in the confined space; • Test the atmosphere within the confined space to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL); • Ventilate the confined space if conditions atmospheric are not met, until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.				
3	Risk of non-ionizing radiation	• Identify potential exposure levels in the workplace,	• Survey report of exposure levels;	Annually	Department of Energy;	2,000,000

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		including surveys of exposure levels in new projects and the use of personal monitors during working activities; • Train workers in the identification of occupational EMF levels and hazards; • Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure and limiting access to properly trained workers.	• Training Report on occupational EMF levels and hazards.		Department of Occupational Safety Health and Welfare; MERA; EGENCO	(USD 1,053)
4	Risk of fall from heights	• Train staff and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 400 Kilograms, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or	• Work on Height permit; • Training report on use of harness and energy absorbing lanyards	Annually	Department of Energy; Department of Occupational Safety Health and Welfare; MERA; EGENCO	2,000,000 (USD 1,053)

No.	Potential Impact	Mitigation/Enhancement Measure	Monitoring Indicator	Monitoring Frequency	Responsible Monitoring Institution	Estimated Budget (MK)
		through an opening in a work surface; • Train staff and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 4500 Kilograms as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 4500 Kilograms; • Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones;				
Total						**97,000,000** (USD 1,052)

6.3 Monitoring and Reporting Requirements

The Environmental and Social Monitoring Plan involves a routine check on the progress of the implementation of the ESMP. These will be checked against the performance indicators that have been developed using the mitigation/enhancement measures in the ESMP. Monitoring procedures will comprise field visits and workers interview to verify if contractual terms, mitigation/enhancement measures and recommendations put forward in the ESMP are implemented in accordance with signed code of conduct, employment contract and existing national laws, regulations. The environmental and social monitoring plan (Table 6-2) has been designed to cover all the potential risks and impacts, verifiable performance indicators, frequency of monitoring, responsible organisations/institutions and the estimated required financial resources.

6.3.1 Project Reporting Commitments

The Contractor will be required to prepare regular reports (monthly, quarterly, and annually) on environmental, social, health and safety performance of the sub-project, and periodic reports on emergency environmental and social will be prepared on time and submitted to EGENCO.

6.3.2 External Monitoring

Environmental and social authorities will have a significant role to play in monitoring the implementation of the ESMP to ensure compliance with the existing national laws, regulations and standards, including African Development Bank Operational Standards.

6.3.3 Regulatory institutions and bodies

i. MEPA for surveillance on the risks and impacts management and compliance by the contractor(s) in collaboration with the developer;
ii. Ministry of Labour which will be involved in the surveillance of public and workers on the Occupational Health and Safety, Community Health and Safety, transportation of construction materials and workers, to keep a watch on the compliance of labour laws and regulations, and control child labour and gender equity;
iii. Neno and Blantyre District Councils to be involved in handling public concerns and especially where there are environmental and social conflicts; and
iv. NWRA for monitoring water use and pollution.

6.4 Specific construction project management plans to be developed by the Contractor

The Contractor will be required to develop Contractor's Environmental and Social Management Plan (CESMP) and specific management plans which will guide proper management of mitigation and enhancement measures identified during the ESIA process. These management plans will be developed by the Contractor and must be approved by the developer. The following is the list of critical management plans to be

developed by the contractor, which will help him and its workers to implement the ESMP in line with existing national policy, legal and administrative frameworks, including AfDB Operational Standards:

i. Water Management Plan
ii. Traffic Management Plan
iii. Air Quality Monitoring and Management Plan
iv. Noise and Vibration Management Plans
v. Occupational Health and Safety Plan
vi. Community Health, Safety and Security Management Plan
vii. Emergency Response Plan
viii. Labour Management Plan
ix. Quarries, Borrow and Spoil Disposal Sites Rehabilitation and Restoration Plan etc.

7. Chapter 7: Public and Stakeholder Consultation

7.1 Rationale for consultation

Public and stakeholder consultation is a strategy to communicate environmental and social impacts of any development project with project stakeholders in order to gain their support for the project. The process informs the public, key stakeholders, interested parties and those affected by the project about the purpose and aims of the project and the key activities that will be carried out during the development and implementation phases of the project. During the preparation of this ESMP, significant public and stakeholder consultations were carried out through meetings, surveys, interviews, and focus group discussions. Further consultations are anticipated during the subsequent phases of the project development process, especially during the preparation of site-specific environmental and social impact assessments as well as development of contactors' ESMPs.

7.2 Purpose

The purpose of conducting public and stakeholders consultation in this ESMP are:

- To provide an opportunity for people to be affected to get clear, accurate and comprehensive information about the proposed project and its anticipated environmental impacts.
- To provide an opportunity for people that will be affected by the project to give their views, raise their concerns regarding the project and give possible alternative arrangements that may assist in the development of the project to avert some of the environmental and social impacts
- To provide people to be affected with the opportunity of suggesting ways of avoiding, reducing, or mitigating negative impacts or enhancing positive impacts of the proposed project activities
- To enable the project proponents to incorporate the needs, preferences and values of the project as seen by the stakeholders into the proposed project
- To provide opportunities to avoid and resolve disputes and reconcile conflicting interests by the stakeholders of the project
- To enhance transparency and accountability in decision making

7.3 Methodology of engaging stakeholders

The experts undertook site investigations to the proposed project site from November 2023 throughout the study period in order to acquaint themselves with the setup of the project site, identify, analyze and assess the potential negative and positive impacts that will be brought about by the project. A series of stakeholder consultations were held

throughout the study period and the drafting of the report. The mode of consultation involved:

- Public consultative meetings, particularly with communities and technical officials from the government
- Interviews with different key informants in relation to the proposed project/programme
- Focus group discussions with community leaders and community members from surrounding villages
- Questionnaires were also administered at household level to collect baseline socio-economic data. The questionnaires were pretested before being administered to check if the tool was collecting the intended data. A Sample of the questionnaire that was used has been attached in Annex 4 of the report.

Figure 7-1: Local Leaders participating in the consultations held on 6th December 2023

Figure 7-2: Mtingala villagers captured during consultations at Neno on 22nd February 2024

Key stakeholders consulted included Malawi Environment Protection Authority (MEPA); Neno District Environmental Subcommittee (DESC); Blantyre District Environmental Subcommittee (DESC); Ministry of Labor etc. Figure 1.3 below shows members of Neno DESC captured during consultations held on 16th November 2023 while figures 1-3, 1-4 and 1-5 represent local communities during consultation meetings

7.4 Key Issues Raised During Public and Stakeholder Consultations

Views and main issues raised by those consulted have been included in Chapter 7 of the report and a list of those consulted has been attached as Annex 2. Detailed peoples' views and recommendations can be found in Annex 3.

7.4.1 Engagement with District Council Officials

7.4.1.1 Solid waste management

If dumping of waste from the construction site is not managed properly, waste may find its way into the river bodies affecting both the people and animal life relying on the water from the water bodies

There is also need to properly manage solid waste that will be generated from the rehabilitation works, some of which may be electronic waste which is very hazardous.

7.4.1.2 Incidence of HIV/AIDS & Communicable diseases

During the rehabilitation and maintenance works of Nkula B Hydropower Station, EGENCO must make sure that there are preventative measures for the speared of HIV and AIDS. Surrounding communities and workers should be protected against HIV and AIDS

7.4.1.3 Impact on water quality

The developer must ensure that the rehabilitation works should not lead to pollution of Shire River through spillage of lubricants and oils.

During the rehabilitation and maintenance works for Nkula B Powers Station, the developer must ensure that the riverbanks for Shire River are protected

Oils from machinery can also affect water quality in the Shire River. There is need for proper management Measures

There is a need to ensure that used oils from the rehabilitation works are properly handled to ensure that aquatic biodiversity is not negatively affected.

7.4.1.4 Wages for workers

The government has gazette minimum wages for employees. Such been the case the Contractor needs to know this requirement and ensure that all workers are not paid less than the recommended rate by government

7.4.1.5 Riverbank protection

The developer must ensure that the rehabilitation works should not lead to pollution of Shire River through spillage of lubricants and oils.

During the rehabilitation and maintenance works for Nkula B Powers Station, the developer must ensure that the riverbanks for Shire River are protected

7.4.1.6 Roles and support to district councils

There is need for the District Environmental Subcommittee to visit Nkula B Power Station, the site for the rehabilitation works

The consultant needs to come out clearly on the role of then DESC in the implementation of the project

7.4.1.7 Handling of grievances

The project should ensure that there is a Grievance Redress Mechanism (GRM) for the project to ensure that all grievances are timely addressed

7.4.1.8 Regulation of water flows

Will there be any controls in the water flowing in the Shire River during the rehabilitation works? Both low and high flows can have effects on the communities and animal life if there are communities around that use the water for various purposes.

7.4.1.9 Impact on aquatic biodiversity

If dumping of waste from the construction site is not managed properly, waste may find its way into the river bodies affecting both the people and animal life relying on the water from the water bodies

Oils from machinery can also affect water quality in the Shire River. There is need for proper management Measures

There is a need to ensure that used oils from the rehabilitation works are properly handled to ensure that aquatic biodiversity is not negatively affected.

7.4.2 Engagement with Communities

7.4.2.1 Employment opportunities

EGENCO must ensure that when engaging unskilled labour force, people from Mtingala Village should be given special consideration. This is due to the fact that Nkula B Hydropower station is located in Mtingala Village. Other surrounding communities should just benefit but priority should be given to Mtingala Village.

7.4.2.2 Traffic management at nearby primary school

There is an indication that there will be a number of construction vehicles that will be travelling to and from the construction site past Mlonde Primary School. What will EGENCO put as measures to ensure that the pupils are protected?

7.4.2.3 Social responsibility to nearby primary school

Mlonde Primary School is a Junior Primary School that runs from Standard 1 to 4. As corporate Social Responsibility if communities around EGENCO could come to assist in building some school blocks so that Mlonde is a full primary School.

7.4.2.4 Wages for workers

There is a need to inform the contractor that they will be hired to do the rehabilitation work and pay workers timely. In addition, the contractor should not pay workers less than the minimum wage recommended by the Government of Malawi. This is usually a common practice by subcontractors because they usually wait for payment from the Main contractor thereby by subjecting workers to suffering.

7.4.2.5 Relocation of households

There are rumors that are circulating indication that the rehabilitation works will lead to relocation of Mtingala Village. There is a need for EGENCO to make clarification on the matter.

7.4.2.6 Continuous consultations and community engagements

Surrounding communities appreciate very much the engagement that EGENCO is doing with surrounding communities on the planned Nkula B rehabilitation works. There is a need to ensure that this is not a once off thing but should continue.

7.5 Consultative meetings held during the preparation of this ESMP

During the development of the ESMP, several consultative meetings were held. The consultations were undertaken with reference to the updated AfDB's Integrated Environmental and Social Impact Assessment (IESIA) Guidance Notes on consultation, participation and broad community support, which also provides guidance on affected communities' involvement in the process of project planning, implementation and monitoring. Consultations were carried out with government and regulatory officials from various MDAs such as Malawi Environment Protection Authority, Environmental Affairs Department, Ministry of Labor, Ministry of Energy, Ministry of Water and Sanitation. Community members that participated in the consultative process were from Mtingala Village under T/A Symon in Neno District. The consultations were preceded upon providing adequate project and environmental and social information to ensure that participants are fully informed. The consultation and public participation are a continuous process during the project cycle and begins at an early stage during project preparation and will continue as needed. The consultations have been conducted in a timely manner in the context of key project preparation steps, in an appropriate language, and in accessible places.

This having been identified as a Category 2 project, the affected communities and stakeholders were mainly consulted about the draft environmental and social assessment report and the draft ESMP as a guide. Consultations were conducted mainly with the objective of ensuring that the project has broad community support, and that affected people endorse the proposed mitigation and management measures.

The list of the people consulted is provided in Annex 3.

Figure 7-3: Members of Neno DESC captured during consultations

8. CHAPTER 8: INSTITUTIONAL ARRANGEMENTS AND CAPACITY BUILDING FOR ENVIRONMENTAL AND SOCIAL MANAGEMENT

8.1 ESMP Institutional Implementation Arrangements and responsibilities

The ESMP specifies clearly who is responsible for the implementation of the mitigation/enhancement measures and institutions to be responsible for monitoring of ESMP (i.e. monitoring of the implementation of remedial and positive impacts measures, training, financing, and reporting). Institutional collaboration should also be strengthened between the developer and institutions identified on monitoring the implementation of the ESMP. Where necessary, the ESMP should propose strengthening and support to relevant institutions responsible for monitoring the implementation of the ESMP to ensure environmental and social sustainability.

8.2. Implementing Entities

8.2.1 Electricity Generation Company (Malawi) Limited (EGENCO)

EGENCO will be the overall implementing entity of the Nkula B Rehabilitation and Modernisation Project. The Company will create a PIU for the Project within EGENCO's Planning & Development Division that is responsible for implementation of major projects.

Composition of the PIU will at most include a Project Manager, Project Engineer, Risk Management Specialist, M&E Specialist, Social and Gender Safeguard Specialist, Environmental Specialist, Occupational Health and Safety Specialist, Procurement Specialist and Financial Management Specialist that are familiar with African Development Bank Operational Guidelines and Operations. The PIU will procure a contractor to execute the works and implement requirements of ESMP.

EGENCO as the implementing agency will be responsible for overseeing the implementation of the environmental and social mitigation/enhancement measures of the ESMP and participate in the monitoring aimed at determining the effectiveness of the implementation of the ESMP by the contractor(s) in line with the requirements of the national environmental and social legislation, regulations and standards, including African Development Bank's Operational Guidelines and Procedures.

8.2.2 The Contractor

The Contractor will be responsible for executing rehabilitation and modernization works of Kapichira 1 and Nkula B Hydropower Plants. In addition, he will be responsible for the implementation of the ESMP and Code of Conduct (CoC) for the workers among

others. Furthermore, the Contractor is expected to fully implement the OHS measures for workers with reference to the AfDB Operational Standards and the Labor Management Procedures to ensure adequate environmental and social management during the lifecycle of the projects.

8.3 Monitoring Entities

8.3.1 The Malawi Environment Protection Authority (MEPA)

The Malawi Environment Protection Authority (MEPA) is the administrative authority of the Environment Management Act (2017). Part VI - Section 31 to 34 and Part VII Sections 35 to 44 of the Act mandate MEPA to administer, regulate and oversee the implementation of the Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan (ESMP), Environmental Audits and Environmental Impact Assessment (EIA) in the country through the EIA Guidelines for Malawi of 1997. The Authority will therefore conduct routine monitoring visits through its inspectorate unit to ensure compliance with the implementation of the ESMP and recommendations made in ESMP. The developer shall support the monitoring visits by the Government and Non-State counterparts. The Authority is therefore responsible for the management of development projects in the country to ensure they are implemented in an environmentally and socially sound manner.

8.3.2 Neno and Blantyre District Councils

Nkula B Hydropower Station is partly in Neno and partly in Blantyre Districts. Such being the case, the two District Councils are responsible for overseeing that the rehabilitation works are in line with the respective Councils' development plans. The planning committees at these Councils are responsible for scrutinizing designs of the projects intended to be implemented in their districts. Further to this, Neno and Blantyre District Councils will be responsible to regularly monitor the construction works and ensure the rehabilitation works are implemented according to the approved designs and that during the works solid and liquid waste is appropriately managed and disposed of.

8.3.3 National Water Resources Authority

Part V Section 39(1) of the Water Resources Act prohibits abstraction and use of water without a permit from NWRA. The Act further prohibits any person from diverting, dam, store, abstract or use public water for any other purpose except in accordance with the provisions of this Act.

In compliance with the provisions of the Water Resources Act, NWRA will ensure that water use from Shire River for generation of electricity at Nkula B Hydropower station is done in accordance with the provisions in the Act i.e. renewing water use permit annually. In addition, during implementation of the rehabilitation activities, NWRA will ensure that the activities do not pollute water from the Shire River.

8.3.4 Interested Stakeholders

Various stakeholders interested in this project could use this ESMP to monitor the implementation of the rehabilitation works. This will help to ensure that the project is being implemented in an environmentally friendly and socially acceptable manner.

9.0 Chapter 9: Conclusion and Recommendations

This chapter provides the conclusion of the Environmental and Social Management Plan for the rehabilitation of Nkula B Hydroelectric Power Plant.

9.1 Conclusion

This ESMP has identified both positive and negative impacts that are anticipated during the rehabilitation and modernization of Nkula B Hydroelectric Power Plant. The study has also proposed enhancement measures for the positive impacts and mitigation measures for the negative impacts. The mitigation measures proposed in this report will assist to either eliminating or reducing the impacts to acceptable levels to ensure that the project is implemented in a sustainable manner while the enhancement measures have been proposed to maximize the benefits that will come along with the project implementation.

This environmental and social assessment study has also proposed an Environmental and Social Management Plan that needs to be implemented; and an Environmental and Social Monitoring Plan that will be used to monitor the implementation of Environmental and Social Management Plan. The implementation of these plans will need human and financial resources. Such being the case, there is a need for EGENCO to put aside required resources for their implementation.

9.2 Recommendations

The ESMP has put forward a number of recommendations for implementation, these include:

i. The Contractor should develop Contractors Environmental and Social Management Plan (CESMP)before commencement of the construction activities isolating management measures that will be implemented by the contractor. This

should also follow the development of applicable auxiliary plans for use during construction phase and these include:

- Traffic Management Plan;
- Occupational Health and Safety Plan;
- Community Health, Safety and Security Management Plan;
- Emergency Response Plan; and
- Labour management plan.

ii. EGENCO should periodically conduct water quality analyses to assess the effect of the Hydropower station on the quality of water downstream. Further it is recommended that the first water quality analysis should be carried out before commencement of the rehabilitation activities as this will provide baseline data for water quality.

iii. Upgrade components with oil free lubrication such as water lubricated bearings, oil free Kaplan Runner (water filled hub), self-lubricated bushings (Kicket gates, Kaplan blades, Valve Journals, Vane rollers); and governing system with biodegradable and low toxic oil.

iv. Ensure rehabilitation works are carried out within the designated timeframe so as not to prolong periods of no electricity for areas depending on Nkula B for generation. Ensure all activities are well planned and all materials/ equipment needed for refurbishment are readily available on site.

v. Develop an aquatic biodiversity rescue plan and ensure it is adhered to during implementation.

vi. Ensure that there is a Grievance Redress Mechanism (GRM) for the project so that all grievances are timely addressed

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Our Reference No: MEPA / / / /
Your Reference No: .....
Communications should be addressed to:
The Director General

Malawi Environment Protection Authority
P/ Bag 317
Lilongwe 3
Tel: +265 1771111

Protecting the environment, Protecting life

13th April, 2023

The Chief Executive Officer
Electricity Generation Company (Malawi) Limited
P.O Box 1567
Blantyre.

Dear Sir,

REQUIREMENT OF AN ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR THE PROPOSED REHABILITATION AND MODERNIZATION OF NKULA B HYDROPOWER STATION

Reference is made to the project brief on the above captioned subject which was submitted to the Department for review and guidance.

Considering the nature and scope of the proposed project, I wish to advise that you are required to prepare an Environmental and Social Management Plan (ESMP) before implementation of activities on the proposed project site. Find attached Terms of Reference for preparing the ESMP.

Should you require any further information or clarification on the foregoing, please do not hesitate to contact us.

Yours Faithfully,
MALAWI ENVIRONMENT PROTECTION AUTHORITY

Tawonga Mbale-Luka
ACTING DIRECTOR GENERAL

Attd: Terms of Reference for ESMP

REQUIREMENT OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR THE PROPOSED REHABILITATION AND MODERNIZATION OF NKULA B HYDROPOWER STATION

1. Provide a brief description of the nature and location of the proposed project with respect to the name of the proponent, postal address, aim and objectives of the project, the spatial location of the site with aid of appropriate topographical maps of the area (at least at a scale 1:50,000); the estimated cost of the project, the size of land for the project sites, the number of people to work on the project (provide a breakdown of males and females, locals and non-locals).

2. Provide a site-specific visible map of the area (scale 1: 50,000) showing the proposed site and (1:10,000) showing existing establishments in the area and surrounding areas including natural endowments like rivers and streams. A site plan for the project should be provided. All maps should be in color to portray the themes clearly and must be printed on A3 paper.

3. Provide a brief description of the existing biophysical characteristics and the socio-economic environmental status of the proposed area.

4. Briefly review the legal framework pertaining to the proposed project and indicate their impacts on the project. Reference should at least be made to Environment Management Act, Energy Act, Employment Act, Land Act, Water Resources Act, National Water Policy, National Land Policy, Public Health Act, Occupational Safety, Health and Welfare Act, Waste Management Regulations and other policies and pieces of legislations.

5. Briefly describe main activities to be undertaken for the project. In the description include the type of machinery to be used, type of infrastructure associated with the proposed rehabilitation and modernization, nature and estimated quantity of wastes (both solid and liquid) that will be generated, circularity to waste management i.e. state the means of reducing waste to a minimum by reusing and recycling of waste, facilities for appropriate disposal of waste that cannot be recycled or reused, including estimated costs for the activities.

6. Propose an Environmental and Social Management Plan (ESMP) for the project. The ESMP should be in tabular form and should specify the predicted impacts, mitigation measures/enhancement measures. Also indicate the budget for the recommended mitigation measures, specifications of who will be responsible for these measures and the schedule when these measures will take place.

7. Propose an Environmental and Social Management and Monitoring Plan by which all mitigation measures recommended in Environmental and Social Management Plan will be monitored. The Environmental and Social Monitoring Plan should include the activities, frequency of monitoring, the key monitoring indicators, resources required and the authorities responsible for monitoring the exercises.

8. Undertake stakeholder consultations to ensure key interested and affected stakeholders are involved in coming up with the ESMP. Incorporate their views in the report and indicate a record of consultations in the appendices as part of the report.

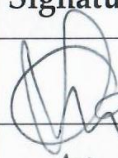
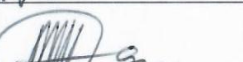
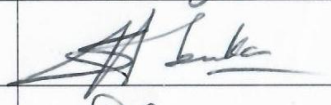
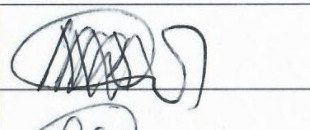
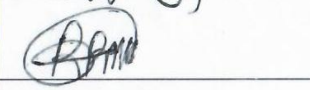
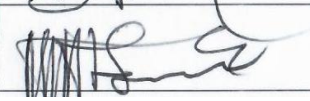
9. Submit 5 hard copies and a soft copy of the ESMP to the Director General for MEPA. Submit a copy of the ESMP to the Blantyre District Council.

Annex 2: List of people consulted

Consultations at National level on rehabilitation of Kapichira 1 and Nkula B Hydropower Stations

Name	Position	Phone Number	Signature
CLEMENT TIKUWA	MEPA MANAGER(1)	0993715971	
Cathy Musa	EO-EAD	0995346466	
MHANGO EMMANUEL	MOL-OSH	0888694723	
Bryson Msiska	MOE-ES	0993010399	
SHADRICK MAGOMBO	MoL-CHH	0999419252	
Eng. Emmanuel Chiunda	MoWS-PWRDO	0882849246	

List of Members of Neno DESC Consulted on the rehabilitation and modernization of Nkula B, Neno

Name	Designation	Phone Number	Signature
Charles Lomani	DPD	0888385045	
Sungani Chirwa	EDO	0881976622	
Austin Ndengu	IO	0888612502	
Vincent Sambuka	LRCO	0881345166	
Whytone S. Fole	PAO	0991935652	
Veronica Chimesa	DLO	0888582992	
Chancy Gondwe	DFO	0999151399	
Richard Mkandawire	DWDO	0997327824	
Rabton Dyeratu	DCDO	0995782607	
Aubrey Machera	ADFO	0884 229435	
Lucius Njobvu	PNHAO	0888176388	

Name	Designation	Phone Number	Signature
Leonard Mchombo	CAO	0883462994	
Happy Kalibwangi	M & E. Ass	0881491489	

Members of the Blantyre District Subcommittee consulted, 13th March 2024

Name	Designation	Phone Number	Means of Consultation
Maxwel Mbulaje	Environmental District Officer	0999942117	Phone Call
Tamara Zembeni	District Water Officer	0888056060	Phone Call
Joseph Sambo	District Labour Officer	0999468866	Phone Call

Consultations with local communities on the Nkula B Rehabilitation project

SN	Name	Village	Phone Number	Signature
1	Richardi Kwenda	G.V.H. Ngwenyama	0881535400	
2	MOSES. Chimuyu	V. H Ntingala	0993247573	
3	Jemedee Pensio	NTingala		
4	Manase Mulinde	Ntingala	0887360965	
5	AUSTIN ZUZE	Ntingala		
6	MOSES KAMWENDO	H/TEACHER	0884204321	
7	STELLA KATUMBI	TEACHER	0881955886	
8	yonas. Smawo	ntingala		
9	Paul Chizengeng'anda			
10	Chimwemwe maziya			
11	Symon Kaludzu	Ntingala		
12	nikolasi alan	ntingala		
13	Philip fabiano	nAingala		

LUTE CHICOMBO V/H CHITSOTSO - 0883747630 - LCB

SN	Name	Village	Phone Number	Signature
14	Solomon kachulu	ntingala		
15	Wonfried Chingwelu	ntingala		
16	mike zuze	ntingala		
17	Patrick zuze	ntingala		
18	ALEX KOLOVIKO	NTINKADA		
19	Edwin. kapalamba	ntingala		
20	Gift chilongwe	ntingala		
21	KASTON Dulamenya			
22	magileti adam	ntingala		
23	Solofina matias	ntingala		
24	Bonifes benito	ntingala		
25	mere mwaluwa	ntingala		
26	Haniyeti yohan	ntingala		
27	fayines chikafa	ntingala		

SN	Name	Village	Phone Number	Signature
28	Esinati machaka	ntingala		
29	Christina inock	ntingala		
30	lose kapalamula	ntingala		
	Getrude chakbala	ntingala		
	Joyce hasten	ntingala		
	Chifundo kachamba	ntingala		

Esinne machaka
meletina chikafa
Emile finiyasi
Laina Laston
Dhellian william
mayi ngopola
mayi
~~mayi~~ njoka
jho
meresi Phiri
~~Et~~
khricy matias

Annex 3: Views of Stakeholders raised during consultations.

Comments made during Consultations with Neno DESC

SN	Comment	Response/How the issue has been addressed in the Report	Name or Position of the person that raised the issue
1	During the rehabilitation and maintenance works of Nkula B Hydropower Station, EGENCO must make sure that there are preventative measures for the speared of HIV and AIDS. Surrounding communities and workers should be protect against HIV and AIDS	Management Measures for HIV and AIDS have been discussed in Chapters 5 and 6 of the ESMP	L. Njovu
2	The District Environmental Subcommittee for Neno wanted to know when the rehabilitation works are starting	The rehabilitation works of Nkula B will start as soon as all the preparatory works have been finalized and the ESMP for the project has been approved by the MEPA	Director of Planning and Development
3	During the rehabilitation and maintenance works for Nkula B Powers Station, the developer must ensure that the River Banks for Shire River are protected	Management Measures for the water resource have been discussed in Chapters 3 and 6 of the ESMP	Environmental District Officer
4	The consultant needs to come out clear on the role of then DESC in the implementation of the project	The role of the DESC in the implementation of the project has been clearly spelt out in the Environmental and Social Monitoring Plan that has been presented in Chapter 6 of the report specifically Table 6-2.	Director of Planning and Development

SN	Comment	Response/How the issue has been addressed in the Report	Name or Position of the person that raised the issue
5	There is need for the District Environmental Subcommittee to visit Nkula B Power Station, the site for the rehabilitation works	This will be communicated to the developer EGENCO to avail all required logistical arrangements	Environmental District Officer
6	The developer must ensure that the rehabilitation works should not lead to pollution of Shire River through spillage of lubricants and oils.	Management Measures have been discussed in Chapters 5 and 6 of the ESMP	Director of Planning and Development
7	The project should ensure that there is a Grievance Redress Mechanism (GRM) for the project to ensure that all grievances are timely addressed	This has been addressed in Section 7.2	Director of Planning and Development

Comments made during Consultations with Blantyre DESC

SN	Comment	Response/How the issue has been addressed in the Report	Name or Position of the person that raised the issue
1	Will there be any controls in the water flowing in the Shire River during the rehabilitation works? Both low and high flows can have effects on the communities and animal life if there are communities around that uses the water for various purposes.	During the rehabilitation works, water reservoir for Nkula B Hydropower will be emptied and this may slightly affect water levels which may not affect communities	District Water Officer (Tamara Zembeni)
2	If dumping of waste from the construction site will not be managed properly, waste may find its way into the river bodies affecting both the people and animal life relying on the water from the water bodies.	This has been addressed in then report as one of the anticipated impacts. Reference can be made to chapters 5 and 6 (Tables 6.1 and 6.2)	District Water Officer (Tamara Zembeni)
3	Oils from machinery can also affect water quality in the Shire River. There is need for proper management Measures	This has been addressed in then report as one of the anticipated impacts. Reference can be made to chapters 5 and 6 (Tables 6.1 and 6.2)	District Water Officer (Tamara Zembeni)
4	There is need to ensure that used oils from the rehabilitation works is properly handled to ensure that aquatic biodiversity is not negatively affected.	This has been addressed in then report as one of the anticipated impacts. Reference can be made to chapters 5 and 6 (Tables 6.1 and 6.2)	Environmental District Officer (Maxwel Mbulaje)
5	There is also need to properly manage solid waste that will be generated from the rehabilitations	This has been addressed in then report as one of the anticipated impacts. Reference	Environmental District Officer (Maxwel Mbulaje)

SN	Comment	Response/How the issue has been addressed in the Report	Name or Position of the person that raised the issue
	works some of which may be electronic waste which is very hazardous.	can be made to chapters 5 and 6 (Tables 6.1 and 6.2)	
6	Government has gazetted minimum wages for employees. Such been the case the Contractor needs to know this requirement and ensure that all workers are not paid less than the recommended rate by government	This has been addressed in then report as one of the anticipated impacts. Reference can be made to chapters 5 and 6 (Tables 6.1 and 6.2)	District Labour Officer (Joseph Sambo)
7			

Comments made during consultations with surrounding community members

SN	Comment	Response/How the issue has been addressed in the Report	Name of the person that raised the issue
1	EGENCO must ensure that when engaging unskilled labour force people from Mtingala Village should be given special consideration. This is due to the fact that Nkula B Hydropower station is located in Mtingala Village. Other surrounding communities should just benefit but priority should be given to Mtingala Village.	The ESMP has made a recommendation that 80% of the unskilled labour force should come from surrounding communities. This has been highlighted in Chapters 5 and 6 including Tables 6.1 and 6.2	Laston Mdulamanja
2	There is an indication that there will be a number of construction vehicles that will be travelling to and from the construction site past Mlonde Primary School. What will EGENCO put as measures to ensure that the pupils are protected?	A Mitigation measure for this impact or risk has been included in Chapters 5 and 6 including Tables 6.1.	Moses Kamwendo
3	Mlonde Primary School is a Junior Primary School that runs from Standard 1 to 4. As corporate Social Responsibility if communities around EGENCO could come to assist in building some school blocks so that Mlonde is a full primary School.	This has been noted and will be communicated to the developer for response. However, EGENCO has CSR and under the program local communities are usually engaged to make an indication on what can be done using the available resources.	Moses Kamwendo

SN	Comment	Response/How the issue has been addressed in the Report	Name of the person that raised the issue
4	There is need to inform the contractor that will be hired to do the rehabilitation works pay workers timely. In addition, the contractor should not pay workers less than the minimum wage recommended by the Government of Malawi. This is usually a common practice by subcontractors because they usually wait for payment from the Main contractor thereby by subjecting workers to suffering.	A Mitigation measure for this impact has been included in Section 5.3.2.1 and Tables 6.1 and 6.2.	Mike Zuze
5	There are rumors that are circulating indication that the rehabilitation works will lead to relocation of Mtingala Village. There is need for EGENCO to make clarification on the matter.	This is just a rumor and there is no truth in it. However, there is another project that will be implemented (Mpatamanga Hydropower Project) which will involve construction of the dam. The construction of the dam will lead to submergence of some land and the affected people will definitely be compensated but this will not lead to relocation of the whole village.	Geoffrey Pensulo
6	Surrounding communities appreciate very much for the engagement that EGENCO is doing with surrounding communities on the planned Nkula B rehabilitation works. There is need to ensure that this is	This has been noted and the consultants will communicate this to the client (EGENCO) to continue engaging with surrounding communities on planned activities that may involve surrounding communities.	Manase Chimutu

SN	Comment	Response/How the issue has been addressed in the Report	Name of the person that raised the issue
	not a once off thing but should continue.		

Annex 4: Household Questionnaire for ESMP Development

AA: Identification panel

AA1.District ……. AA2. Traditional Authority…… AA3.Village……..			AA4. Household Number (listed)	
			AA7. Head of household name	

AB: Interview Section control

AB1. Interview results

Complete=1, Partially completed=2, Not at Home=3, Refused=4, Incapacitated=5, other specify=6	

BB: Household Roaster

Id	BB1.Name List all members of the household start with the head, spouse, and children: start with the oldest. List all other relatives then move to non-relatives	BB2.What What is (Name) Relation to the household head? Head=1 Spouse=2 Children=3 Relative= 4 Non-relative =5	BB3. Sex of Name Male=1 Female=2	BB4 Age (Name)	BB5.has (Name) ever attended School? Yes….1 No…..2 ….. next person	BB6.Is (Name) current attending school? Yes…1 No…2 If no and above 17 years Next person	BB7.Why is (name) not currently in school? Not interested=1 Impregnated=2 Told to quit=3 Lack of support=4 Others, Specify=5	BB8.What is the highest class that (name) attempted? USE EDU CODES BELOW

Education codes

Standard one=1, Standard two=2, standard three=3 standard four=4 standard six=6, standard seven=7, standard eight=8, form one=9 form two=10, form three=11, form four = 12, Post-secondary education= 13							
BC: Economic Activity							
Id	BC1.LIST Name all members above age of 5 from the household roaster but do not change id	BC2.Did (Name) work in the last three months? Yes= 1 No=2 If no probe if he has work in tobacco field	BC3. What activities (Name) was engaged with? Agriculture Activities=1 Business Activities=2 Household Chores=3 Employment =4	BC4.What was the main activity (Name) was doing? [take option from BC3].[Main activity in form of time] 1>>next person 2>> BC5	BC5. What is the profit per month? [include withdraws and the goods and services that household derived from the business activities] where applicable	BC6.What is the amount that (name) receives from his work related employment	BC7.Total [Check to make sure that all multiple responses have corresponding payments]

			Supporting HH Business= 5 (multiple answers allowed)	3>>> next person 4>>>BC6			

BD: Environmental Health

Id	BD1.Name List all members from the household roaster but do not change id	BD2.Dis (Name) fall sick from Malaria in last three months? Yes=1 No=2	BD3.Did (Name) Discharge blood during urination three months? Yes=1 No=2	BD4.Did (Name) Diarrheal disease three months? Yes=1 No=2	BD5. Did (Name) suffer from any disease that requires medical attention three months/ Yes=1 No=2	BD6.Did (Name) Sleep in the mosquito treated net in the three months? Yes=1 Not insect treated Net but net=2	BD7. What does (Name) eat for breakfast? Porridge……1 Porr with sugar…..2 Porr+tea(sugar).3 Tea+ Cassava or potatoes…….4 Tea+bread…..5

BG: Household Assets: **Does the household have?** Circle either 1 or 2

BG1. Electricity? Yes……..1 No…….2	**BG2.** Koloboyi? Yes……..1 No…….2	BG3. Paraffin lamp? Yes……..1 No…….2	**BG4.**Radio? Yes……..1 No…….2	**BG5.**Television? Yes……..1 No…….2	**BG6.**Cellular? Yes……..1 No…….2
BG7. Telephone? Yes……..1 No…….2	**BG8.**Bed with mattress? Yes……..1 No…….2	**BG9.** A sofa set? Yes……..1 No…….2	**BG10.** Table and chair? Yes……..1 No…….2	**BG11.** Refrigerator? Yes……..1 No…….2	**BG12.** Ox-Cart? Yes……..1 No…….2
BG13. Watch? Yes……..1 No…….2	**BG14.** Bicycle? Yes……..1 No…….2	**BG15.** Motor cycle? Yes……..1 No…….2	**BG16.** Car or track? Yes……..1 No…….2	**BG17.** Treadle pump? Yes……..1 No…….2	**BG18.** Any other engine? Yes……..1 No…….2

How many of the following animals does the household own?

BG19. Goats? Yes……..1 No…….2	**BG20.** Sheep? Yes……..1 No…….2	**BG21.** Pigs? Yes……..1 No…….2	**BG22.** Cattle? Yes……..1 No…….2	**BG23.** Chicken? Yes……..1 No…….2	**BG24.** ducks Yes……..1 No…….2	**BG25.** Pigeons? Yes……..1 No…….2	**BG26.** Rabbits? Yes……..1 No…….2

BH: Housing characteristics					
BH1. MAIN MATERIAL ON THE EXTERIOR WALLS RECORD OBSERVATION	**NATURAL WALLS** No walls……11 Cane/Palm……12 Dirt……13 **RUDIMENTARY WALLS** Bamboo/tree trunks with mud….21 Stone with mud……22 Plywood……23 Cardboard…..24 Reused wood….25 **FINISHED WALLS** Cement……..31 Stone with lime/cement….32 Burnt bricks……..34 Cement blocks….35	**BH2.** MAIN MATRIAL OF THE ROOF RECORD OBSERVATION	**Natural roofing** No Roofing……11 Thatched/palm leaf…12 **RUDIMENTARY ROOFING** Grass thatched……23 **FINISHED ROOFING IRON** sheet…..31 Tiles….32	**BH3.**MAIN MATERIAL OF THE FLOOR RECORD OBSERVATION	**NATURAL FLOOR** Dusty floor…..11 Mud floor (yozila)……12 **RUDIMENTARY FLOOR** Rockwall…...21 Stone……22 Plywood….23 **FINISHED FLOOR** Cement……31 Stone with lime/cement…..32 Burnt bricks…….33 Wood planks…..34

	Wood planks…….36				
BH4. MAIN SOURCE OF DRINK WATER	**BH4** Piped water into dwelling unit……1 Stand communal pipe…..2 Borehole……3 Dug well……4 Surface water…..5 Other…….6	**BH5.** TOILET FACILITY	**BH5.** Flush toilet…….1 Ventilated improved pit latrine……..2 Pit latrine with slab……3 Open pit latrine/without slab…..4 No facility……..5	**BH6**. MAIN SOURCE OF ENERGY COOKING LIGHTING	**BH6** Wood…..1 Paraffin…..2 Biomass…….3 Candle……..4 Cow dug…..5 Electricity…….6

Annex 5: List of Experts involved in the preparation of the ESMP

Name	Qualifications	Area of Expertise	Position	Tasks Assigned
Rex Kanjedza	MSc (Env); BEd (Chemistry)	Environmental and Social Impact Assessment	Team Leader (Key Expert)	• Environmental Planning and Design; • Project Environmental and Social Description and Analysis; • Environmental and Social Management Impact Assessment; • public consultations
Tobias Moyo	MSc (Conservation Biology) BEd (Biology)	Freshwater Biology	Aquatic Ecologist (Key Expert)	• Undertake Aquatic Biodiversity Assessment
Noel Lihiku	MA(Econs) BSoc (Econs)	Sociology	Socio-economic and Gender Expert (Non-Key Expert)	• Social Impact assessment; • socio-economic assessment, • Gender Analysis. • Stakeholder Analysis and Stakeholders • Undertake public consultations
Potiphar Kaliba (PhD)	PhD (Conservation Biology) MSc (Conservation Biology) BEd(Biology)	Zoology	Biodiversity Expert (Non-Key Expert)	• Undertake Terrestrial Biodiversity Assessment; • Inventory of affected fauna and Flora; • Develop Biodiversity Management Plan

Name	Qualifications	Area of Expertise	Position	Tasks Assigned
Zione Butao	BSc (Earth Sciences); MSc (Water and Environmental Management)	Hydrology	Hydrologist (Non-Key Expert)	• Document hydrology of the project area
Jamestone Kamwendo	MSc (Conservation Biology); BSc (Conservation Biology)	Ecologist	Ecologist (Non-Key Expert)	• Carry out inventory of terrestrial flora;