NORTHERN REGION WATER BOARD

MALAWI NRWB WATER EFFICIENCY PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR LUNYANGWA DAM RAISING

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EXECUTIVE SUMMARY

INTRODUCTION

The Northern Region Water Board, with support from the European Investment Bank (EIB). intends to carryout quick interventions which will sustain the water supply to Mzuzu City, Ekwendeni Town and the surrounding areas. One of such interventions is raising of the Lunyangwa dam.

The NRWB has the Lunyangwa Dam which was designed and built between 1988 and 1992 as the main source of fresh raw water for the Mzuzu Water Supply System. The dam is built on the Lunyangwa River around coordinate locations 36L 615990; 8735597 and 614708; 8734679. The Lunyangwa River rises from the east of Mzuzu City in Kaning'ina Hills. The Lunyangwa Dam was formed by impounding the head waters of this river through an earth embankment. Currently about 82% of the total households of Mzuzu City are provided with piped water from the system (NSO Housing Census, 2018). The un-served population gets water from informal and unprotected sources such as boreholes, dug wells and streams. The population in the Mzuzu City and surrounding areas including Ekwendeni Town is continuously growing and currently the water demand from the whole service area of the Mzuzu Water Supply System stands at some 24,900 m^3/day against an available supply of 21,200 m^3/day. It is envisaged that this demand will continue to grow and there is a threat that as the water supply becomes more limited, more people might be going back to utilising the unsafe water sources.

The project will increase the water supply capacity of the Lunyangwa Dam by raising the full water supply level of the dam by 1.5 m. This increase in the dam storage capacity will mean that there will be an estimated increase of 3,200m^3/day to the water supply capacity of the Mzuzu water supply system.

PROJECT DESCRIPTION

The main components of the project are as provided below. To develop the structures, main construction activities are expected to include:

i. Construction works to raise the spillway level in concrete by 1.5 metres
ii. Construction works to raise the dam height by erecting a 1.5m high parapet wall and adding 65cm of fill behind the wall
iii. Ramping up of access bridge across spillway channel; involving the removal of the current bridge across the spillway channel, scabbling of the existing concrete support beam over an area of 6m^2, construction of formwork for raising the support beam and replacement of the removed access bridge with a new one which will be raised up to the new dam level.
iv. Installation of a new penstock type gate of 40cm diameter together with all its associated components at the current off-take point of the dam intake tower (located at a level of 1281 metres above sea level) and;
v. Formation of an additional orifice of diameter 40cm at the intake tower of the dam; this additional orifice (proposed to be located at elevation 1284 metres above sea level

Out of the people to find employment during the project construction phase, some 45% are expected to be employed as casual (non-skilled) labourers from the surrounding communities. The rest are expected to be skilled and semi-skilled workers including engineers, surveyors, environmental health and safety workers and foremen

METHODOLOGY

The methodology for the ESIA involved the following tasks:

PHASE 1: PROJECT KICK-OFF AND PRODUCTION OF INCEPTION REPORTS

Task 1.1: Project Kick-off Meeting

Task 1.2: Reconnaissance site visit

Task 1.3: Production of Inception Reports

Task 1.4: Mobilisation of project team

Task 1.5: Desktop Review

Task 1.6: Stakeholder mapping and analysis

Task 1.7: Field work planning

PHASE 2: ESIA REPORT

Task 2.1: Baseline Studies

Task 2.2: Stakeholder Consultations

Task 2.3: Identification and Evaluation of Impacts

Task 2.3.1: Impact identification

Task 2.3.2: Evaluation of Impacts

Task 2.3.3: Analysing and presenting alternatives

Task 2.3.4: Determination of impact management measures

Task 2.4. Preparation of draft Environmental and Social Management and Monitoring Plans

Task 2.5: Compilation and submission of ESIA report

Phase 3: Final ESIA Report

Phase 3.1: Additional studies

Phase 3.2: Compilation of final report

ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROJECT

Analysis of project activities against the baseline data for the project has facilitated the identification of positive impacts, which have been outlined in the ESMP for this ESIA report. The key positive impacts during the implementation of the project include:

a) **Creation of employment opportunities**
   Introduce the planning team to stakeholders of the project i.e. Community Leaders and sensitizations

b) **Increase in trade opportunities: The project will create demand for construction materials, goods and services by construction workers.**
   The contractor should willingly consider giving job opportunities to the people living in the surrounding areas of the Lunyangwa Dam and the contractor should comply to both the gender policy and the Labour Act

c) **Training Opportunities in Vocational Skills for youth**
   Contractors to consider high potential women for skills training program and
   Contractors to consider focused training program to optimize skills transfer to unskilled workers

d) **Improvement of Natural Resources and Wildlife Conservation**
   Promote and support wildlife conservation programs by engaging the Ministry of natural resources and wildlife and the nearby Mzuzu Government Secondary School wildlife club and train the employees to understand the importance of wildlife.

e) **Improved reservoir capacity of water supply to Mzuzu City, Ekwendeni Town and the Surrounding Areas**

   - Ensure water reservoir tanks have adequate water all the time to cover periods of no water pumping
   - Sustain the desired performance of the water supply system through timely preventive maintenance.
   - Quickly carryout maintenance works and restore water supply when there are problems.
   - Adequately treat water at the treatment plant.

f) **Enhanced gender and women participation in development as a result of removal of the burden of fetching water.**
   Women form a high percentage of the project areas' population. however, they are inadequately participating in development activities due the burden of fetching water. Increased availability of water (including short distances to fetch water) will relieve them of these burdens, thereby availing them the opportunity to engage in development activities.

This ESIA has also identified the following negative impacts, which will occur during planning and designing phase:

a) Unrealistic expectations with regard to lands/compensation/resettlement negotiations:

Mitigation measures: Conduct adequate and thorough public and sensitization meetings in regard to land laws, land acquisition and compensations; observe transparency and accountability when evaluating the land and property and paying the compensations.

Negative impacts identified for the construction phase:

a) **Degradation of water quality**:
Mitigation measures:
Provide a schedule for excavation works, encourage use of mortar and debris traps during construction, Strategic stakeholder consultations, mix cement in areas which are not directly connected to natural drainage systems, shutters to be properly erected and monitored

b) **Air Pollution:**
Mitigation measures: Use new or fairly new machinery that is within the acceptable emission limits, erect safety signboards to warn other road users about the volume of traffic, Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits, Use the water bowsers to spray water along the access roads used by the haulage trucks, provide protective gear (dust masks) to workers and ensure that they wear them.

c) **Soil contamination and land degradation:**
Mitigation measures: Fuel and oil leaks from construction plant and vehicles, spills from vehicle maintenance operations, and spills from waste oil containers discarded from plant and vehicle maintenance during construction activities; Civil works construction wastes such as packaging materials, cement bags, oils and paints, accidental or deliberate disposal of construction waste and chemicals; improper disposal of soils from excavations and stockpiling; unsustainable sand mining and quarrying – this is likely to result in land degradation outside the project site in sand mining and quarrying areas.

d) **Loss of vegetation cover:**
Mitigation measures: Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation; plant appropriate trees and grasses in all disturbed area.

e) **Accidents and hazards from trenches and burrow pits:**
Mitigation measures: limit making deep pits when extracting construction materials, refill all burrow pits to be created during the upgrading; barricade all trenches and open pits and place clear signs to protect animals and people from falling into them.

f) **Disruption of water supply**
Mitigation measures: Give adequate notice of potential water disruption to the water users that could be affected, provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate, the contractor to Provide a works schedule with strategically staggered activities to avoid total flow disruption during construction

g) **Water pollution and siltation:**
Mitigation measures; Mix cement in areas, which are not directly connected to natural drainage systems; Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses; Line surfaces where cement, paints and oils will be stored.

h) **Occupational incidents and accidents:**
Mitigation measures; Induct workers on OSH requirements and repeat reminders on the same; Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of practice for various tasks are followed by workers at all times; Provide appropriate personal protective equipment

i) **Disturbances and accidental damage to assets:**
Mitigation measures; Provide adequate notice before conducting construction activities at a private or public property; Provide detours and appropriate traffic signs for vehicles and pedestrians where constructions are being conducted across a road; Restore work sites to their state before construction activities where possible.

j) **Noise and vibrations:**
Mitigation measures; Use appropriate and well-maintained noise mufflers on vehicles and machinery; Regularly service and carry maintenance of equipment; Provide ear muffs for the workers in noisy areas; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings; Notify the public of upcoming loud events.

k) **Increase in sexual relationships, unplanned pregnancies, breaking up of families:**
Mitigation measures; Sensitize all contractors, workers and communities on the STD and HIV/AIDS; Enforce punitive and disciplinary measures on any project workers involved in any social malpractices with surrounding communities; Provide both male and female condoms to workers for appropriate use.

l) **Incidence of sexual abuse and harassment:**
Mitigation measures; Sensitise workers and surrounding communities to avoid sexual abuse and harassment; Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment in the homes; Enforce punitive and disciplinary measures on any project workers involved sexual abuse and harassment.

m) **Diseases and increased pressure on community health services:**
Mitigation measures; Conduct public awareness and sensitization on community health, HIV and AIDS; Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required; Construct adequate sanitation facilities at the work sites and surrounding area.

n) **Unequal employment opportunities:**

Mitigation measures; Encourage the contractor to employ 30% women as well; Conduct gender meetings to sensitize and encourage women and to instil confidence that they can also do the work that men do.

Negative impacts during operational phase:

a) **Solid waste generation:**
Mitigation measures; Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale; Provide solid waste storage bins and skips; Monitor skips so that they do not become overfilled; Ensure that collected solid waste is disposed of in an approved disposal site.

b) **Increased pollution from wastewater and sludge:**
Mitigation measures; Enforce proper excreta and wastewater management especially in the town; Enforce the use of licensed liquid waste handlers for liquid waste.

c) **Emergencies:**
Mitigation measures; Design and implement an emergency response plan; Install fire hydrants within the proposed development; Regularly monitor and maintain the water supply system; Install a fire extinguisher at the plant and train workers on how use.

d) **Potential risks of water leakage and flooding from theft and vandalism:**
Mitigation measures; NRWB must periodically conduct consultations and sensitizations with villages and group village heads and security personnel; Reward for reports of vandalism and theft that may lead to capture.

Negative impacts during demobilization phase:

a) **Loss of jobs and businesses:**
Mitigation measures; Provide adequate notice to employees; Pay severance benefits to leaving workers in line with the labour regulations; Provide alternative employment to employees where possible e.g. as maintenance staff.

b) **Abandonment of excavated areas for construction materials:**
Mitigation measures; Fill up and close pits after the construction works; Rehabilitate all work site; Construction materials e.g. sand and clay soils should be sourced from licensed suppliers.

The costs for management of the impacts have been determined to be 93,766.57 USD per year; and the costs for monitoring are estimated to be 11,273.20 USD per year (1 USD=754 MKW).

CONCLUSION

The Proposed Malawi NRWB Water Efficiency Project is one of the strategic projects that has been prepared taking into account of the National Water Policy, the Malawi Growth and Development Strategy III. The Project is positive as it will help the Northern Region Water Board to address some of the challenges, which it has been facing in its operations because of inadequate water supply and old infrastructure, resulting in failure to meet the increased

demand for social and economic development. However, development of the structures is also expected to generate some negative impacts on the biophysical and socio-economic environment. The ESIA has therefore prepared the Environmental and Social Management and Monitoring Plans, including mitigation and enhancement measures for negative and positive impacts respectively and schedule for implementation. Additionally, to ensure sustainable implementation of the project, the following recommendations are made:

a) Water abstraction has to be in accordance to the Water Right, which NRWB will be required to obtain before the project can be implemented.
b) The project should be fully supported by all the relevant institutions;
c) Adequate financial support should be allocated to realise the full potential to improve the socio-economic wellbeing of the targeted communities;
d) The environmental and social impacts should be avoided or minimised to the greatest extent possible by fully implementing the enhancement and mitigation measures advanced in this report;
e) The communities have a negative perception of NRWB and how it calculates water tariffs, the NRWB must conduct adequate sensitization on water supply pricing and management.
f) NRWB must allocate additional funds in cooperate social responsibilities to improve its image among the communities,
g) During construction, the contractor should avoid clearing any protected or endangered plant species. Where they are removed, they must be replanted.
h) Adequate and fair compensation must be given to all the affected people before construction activities start;

NRWB and the respective key stakeholders should support and facilitate employment of women, the youth and vulnerable groups to eliminate potential gender and social imbalances; where possible and appropriate, employment of local people from the project area must be prioritised to encourage community ownership and sustainability of the project.

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LIST OF ACRONYMS

AIDS	Acquired Immuno-Deficiency Syndrome
BBTV	Banana Bunchy Top Virus
BOQ	Bill of quantities
COMSIP	Community Service Investment Programme
DEC	District Executive Committee
DI	Ductile Iron
DLO	District Land Officer
DPD	Director of Planning and Development
EAD	Environmental Affairs Department
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMA	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Impact Plan
ESCOM	Electricity Supply Corporation of Malawi
FMB	First Merchant Bank
GI	Galvanised Iron
GoM	Government of Malawi
HIV	Human Immune Virus
IAS	Invasive Alien Species
MBS	Malawi Bureau of Standards
MCC	Mzuzu City Council
MGDS	Malawi Growth and Development Strategy
MDHS	Malawi Demographic Health Survey
MIEO	Monitoring, Information and Evaluation Officer
MNREM	Ministry of Natural Resources, Energy and Mines
MP	Monitoring Plan
MPC	Malawi Postal Corporation
mPVC	Modified polyvinyl chloride
MTL	Malawi Telecommunications Limited
MWK	Malawi Kwacha
NAPA	National Adaptation Programme of Action
NBM	National Bank of Malawi
NBS	New Building Society
NEAP	National Environmental Action Plan
NCE	National Council on Environment
NRWB	Northern Region Water Board
NSOER	National State of the Environment and Outlook Report
NSP	National Sanitation Policy
OFID	OPEC Fund for International Development
OPEC	Organisation of the Petroleum exporting countries
OS	Operational Safeguard
OSH	Occupational Safety and Health
OSHW	The Occupational Safety, Health and Welfare
SEP	Social Economic Profile
SOBO	Southern Bottlers
STIs	Sexually Transmitted Infections
TCE	Technical Committee on Environment
TNM	Telecommunication Network of Malawi
uPVC	un-plasticised polyvinyl chloride
US	United States Dollars
VNRMCs	Village Natural Resource Management Committee
VSCS	Village Sanitation Committee
VSL	Village Savings and loan
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation
WTP	Water Treatment plant
WWEC	Water Waste and Environment Consultants

CHAPTER 1 : BACKGROUND AND INTRODUCTION

1.1. PROJECT BACKGROUND

The Northern Region Water Board (NRWB) was created under the Waterworks Act No 17, 1995 to be responsible for the supply of potable water and the disposal of waterborne sanitation in all the urban centers of the Northern Region of Malawi. Mzuzu Water Supply System in Mzuzu City is one of the schemes within the mandate of the Northern Region Water Board. The water Supply System provides potable water to Mzuzu City and surrounding areas. The city covers an area of about 144 km^2. The current population residing in the service area for the Mzuzu Water Supply System is estimated at more than 220,000 (2018 NSO Malawi population and housing census reports). The Service area for the water supply scheme also covers Ekwendeni Town which is located at some 20 km northwest of the Mzuzu City.

The NRWB has the Lunyangwa Dam which was designed and built between 1988 and 1992 as the main source of fresh raw water for the Mzuzu Water Supply System. Currently about 82% of the total households of Mzuzu City are provided with piped water from the system (NSO Housing Census, 2018). The un-served population gets water from informal and unprotected sources such as boreholes, dug wells and streams. The population in the Mzuzu City and surrounding areas including Ekwendeni Town is continuously growing and currently the water demand from the whole service area of the Mzuzu Water Supply System stands at some 24,900 m^3/day against an available supply of 21,200 m^3/day. It is envisaged that this demand will continue to grow and there is a threat that as the water supply becomes more limited, more people might be going back to utilising the unsafe water sources.

In the long term, the solution to this challenge is construction of another dam to supplement the freshwater that is currently supplied by the Lunyangwa Dam. However, being a major undertaking, construction of the additional dam and the associated water supply facilities will take several years. Accordingly, there is need for quick interventions which will sustain the water supply to Mzuzu City, Ekwendeni Town and the surrounding areas while funds for construction of the new dam and associated facilities are being sourced. One of the interventions that have been identified is the raising of the Lunyangwa Dam. The raising of the dam will be done as part of the Malawi NRWB Water Efficiency Project which is financed by the European Investment Bank (EIB).

The project will increase the water supply capacity of the Lunyangwa Dam by raising the full water supply level of the dam by 1.5 m. The planning and design phase of the project, currently on going, is mostly using the existing NRWB employees; similarly, when the construction works are complete, there will be limited direct employment opportunities. The cost of the project is estimated at some €565,000.00 or MWK 493,781,750.00, converted using a rate of €1= MWK 873.95, quoted on the Reserve Bank of Malawi website on 5 July, 2019. This cost estimate is still subject to change upon final review of project designs.

To ensure that the project activities are implemented sustainably, the Northern Region Water Board engaged Water, Waste and Environment Consultants (WWEC) to conduct an Environmental and Social Impact Assessment (ESIA). Hence, the preparation of this ESIA report.

1.2. EXISTING LUNYANGWA DAM

The Lunyangwa Dam was commissioned in 1994 to be the principal source of water for the Mzuzu water supply system. The dam is built on the Lunyangwa River around coordinate locations 36L 615990; 8735597 and 614708; 8734679. The Lunyangwa River rises from the east of Mzuzu City in Kaning'ina Hills, the Lunyangwa Dam was formed by impounding the head waters of this river through an earth embankment.

The earth embankment dam was sized to cope with a water demand of 18 500 m^3/d and has a maximum capacity of 4.3 million m^3. It is generally a typical earth embankment, comprising inclined central clay core, supported by earth-fill shoulders and protected on the upstream face by rip rap. The foundation of the dam is on soft rock, seepage through which is prevented by a key trench and cement grout curtain.

As shown in figure 1.1, the spillway for the dam is in reinforced concrete comprising of:

- An un-gated free-flow weir which is L-shaped and has an end section of 6.95m long, a curved section of length 8.72m and a longer leg of 24.45m long.
- A side channel of 73m × 10m and inclined at about 3% slope.
- A 70m × 10m chute with its foundation on highly weathered granite and inclined at a slope of 20.5%
- A 20m × 15m stilling basin
- A 30m long downstream channel

Figure 1.1 shows the existing embankment as well as the spillway for the dam.

Figure 1.1: Existing embankment (Left) and spillway (right) for the Lunyangwa Dam

More general details concerning the existing dam are as summarized in table 1.1:

Table 1.1: General information for the existing Lunyangwa Dam

Dam Parameter	Detail
Dam type	Zoned earth dam
Maximum height of dam	18m
Length and width of dam crest	540m × 5m
Upstream slope	1:3.4 (below berm) & 1:3.25 (above berm)
Downstream slope	1:3.0
Design capacity of spillway	287 m^3/s (in the event of a 1: 10,000-year flood)
Maximum spill height	2.19 m
Dam catchment area size	25 km^2
Retention water level in the dam	1284.50 masl
Surface area of dam at retention	86 Ha

Each year the spillway at Lunyangwa Dam is overtopped for 4 or 5 months during the wet season, discharging an average of almost 10 Million m^3 each year.

1.3. PROJECT OVERVIEW

In view of the increased water demand for the Mzuzu Water Supply System and the fact that there is a lot of spilled water at the Lunyangwa Dam in most wet seasons, the project has been planned to raise the spillway crest of the dam by 1.5m to capture some of the spilled water and increase the storage capacity of the dam by about 27% to approximately 5.5 million m^3. This increase in the dam storage capacity will mean that there will be an estimated increase of 3,200m^3/day to the water supply capacity of the Mzuzu water supply system. The project intends to capture the additional water at the dam by raising the dam spillway crest in concrete and heightening the dam with 65cm of fill as well as with a 1.5m high parapet wall.

1.4. PROJECT LOCATION

The project will be implemented at the Lunyangwa Dam which is located within the boundaries of the Kaning'ina Forest Reserve to the east of Mzuzu City. The Mzuzu City which is located in Mzimba District is the administrative headquarters for the Northern Region of Malawi and it is located at some 367 km northwards of Lilongwe (Malawi Capital City) and at some 117 km north-eastwards of the Mzimba Boma.

Figure 1.2 shows the location of Mzuzu City in Malawi. The proposed area to be covered under the project is shown in the figure 1.3.

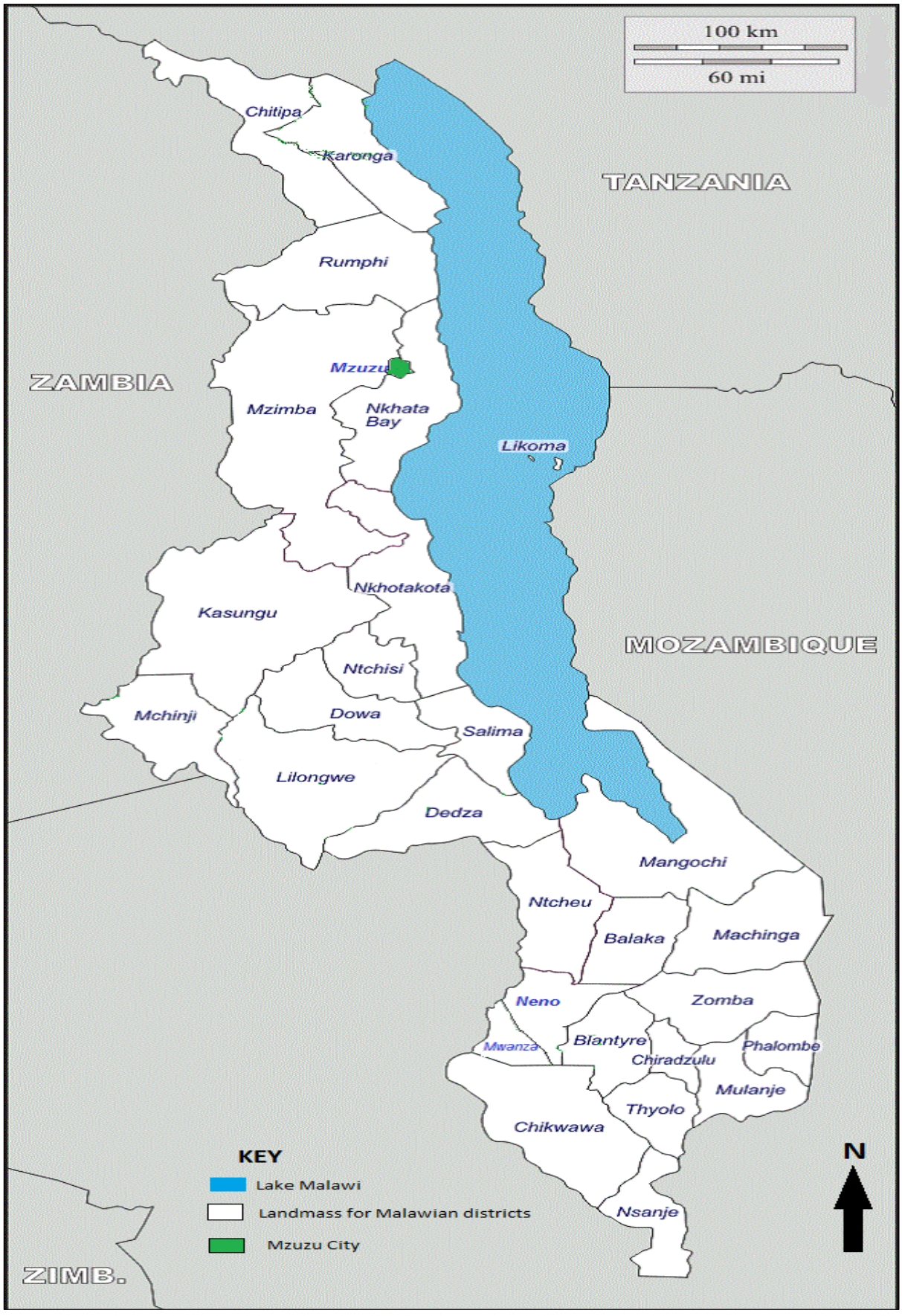

Figure 1.2: Location of Mzuzu City in Malawi (source: Mzuzu Urban Profile 2013)

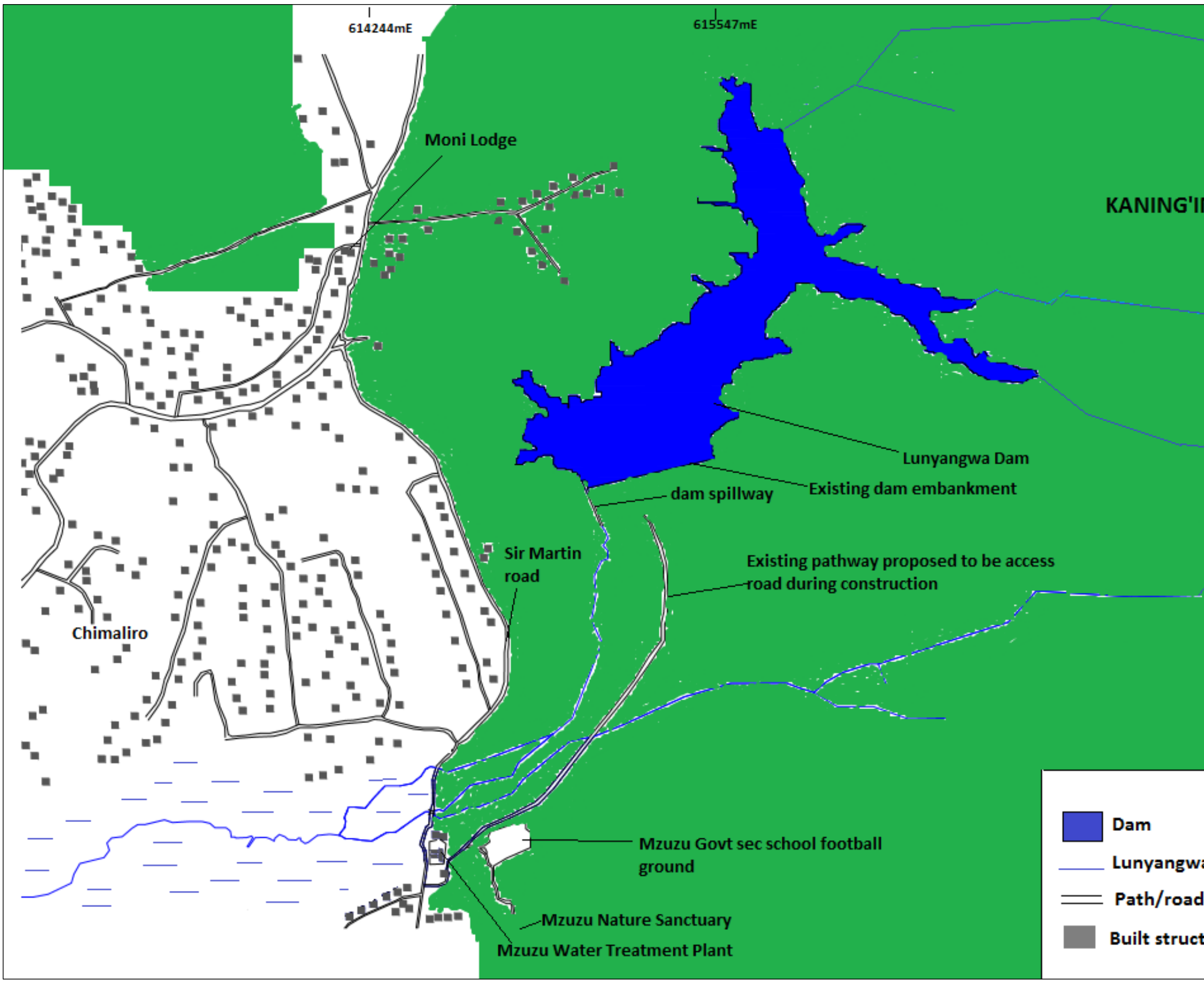

Figure 1.3: Proposed area to be covered under the project

1.5. PROJECT PROPONENT

The project' proponent is Northern Region Water Board whose contact details are:

Proponent	Northern Region Water Board
Address	Street Address: Bloemwater Street Floor/Room number: 6 Town/City: Mzuzu Private Bag: 94 Country: Malawi
Telephone	01310254/255
Contact Person	Name: T.C Mtegha Position: The Chief Executive Officer

1.6. PURPOSE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Environmental and Social Impact Assessment is aimed at improving the overall environmental performance of the project through enhancing positive impacts and minimizing negative impacts. Specifically, the objectives of the ESIA are:

1. To identify potential significant environmental and social impacts of the proposed project, due to the construction and operation of the proposed new water intake, the bulk water transportation and storage infrastructure and the water treatment plant.
2. To recommend mitigation measures for the identified impacts by preparing Environmental and Social Impact Assessment (ESIA) report that will include Environmental and Social Management Plan and Environmental and Social Monitoring Plan, among others.

The ESIA study was to be undertaken in accordance with the Environment Management Act of 1996, Guidelines for Environmental Impact Assessment of 1997 and Environmental Impact Assessment Guidelines for Water Sector Projects of 2006. According to the Malawi EIA Guidelines of 1996, prescribed projects in the water sector include:

- Water pumping stations adjacent to lakes, rivers, and reservoirs which withdraw more than 2 cubic metres per second (Appendix B, Section A3.3);
- Drinking water supply schemes to serve a population of greater than 10,000 people, or expansions of existing schemes to serve a population water reticulation networks with more than 10 kilometres of pipeline (Appendix B, Section A3.4);
- Projects in proximity to or which have the potential to affect water bodies (Appendix B, Section A13), sub-section A13.4.

The proposed project, therefore falls within the above category of prescribed projects and by Malawi standards, requires an ESIA.

1.7. SCOPE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

To satisfy the requirements of the Terms of References, while also meeting the national regulations and standards for Malawi, the scope for ESIA included the following:

i. **Baseline assessment:** To identify the extent of the area (s); which will be affected by the proposed developments and to carry out an analysis of the existing condition of the environment and traditional society in order to compare with the situation after implementation of the project.
ii. **Description of legal requirements:** Outlining the Malawi Government and the financiers' policies and legal instruments related to environmental and social issues that apply to the project at hand. The consultant was also expected to describe how the issues raised in the policies and legal framework shall be addressed in the project.
iii. **Public Consultations**: Undertaking public consultations to ensure that all interested and affected parties are involved in the Environmental and Social Impact Assessment. Views of the stakeholders shall be incorporated and evidence of consultations shall be provided in the reports.
iv. **Social Impact Assessment:** Assessing the positive and negative impacts of the proposed project on the traditional society within the influence of the project area.
v. **Environmental Impact Assessment:** Assessing the impacts of the proposed developments on natural resources including terrestrial wildlife as well as aquatic life within the study area and their consequences on the local as well as on national economy.
vi. **Preparation of Environmental/Social Management Plan and environmental/Social Monitoring Plan** detailing the positive and negative effects of the proposed developments on the environment and traditional society, and shall recommend appropriate solutions to minimize any undesirable effects resulting from the proposed developments.
vii. **Cost Estimates:** determine costs for implementing the recommended mitigation measures. The costs shall be based on similar works implemented recently in Malawi.

1.8. METHODOLOGY FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Consultant reviewed the feasibility study report which also includes project design and the Environmental and Social Screening information; documents with information and data for the project area including the Mzuzu Urban Profile, environmental profiles and maps; and policies and pieces of legislation relevant to the project. The reviewed documents have been included in the reference section.

Field investigations and baseline assessments were conducted for the Consultant to be acquainted with the set-up of the project site. The investigations facilitated verification of information from literature, with what is on the ground. Information was collected through transect walks and observations, onsite consultations and expert assessments. The information included the following:

- Biological environment: plant and animal species likely to be affected by the proposed development in the proposed project areas and surroundings;

- Geo-physical environment: geology, topography, soils, vegetation and surface water bodies;
- Socio-economic and cultural environment: cultural issues and economic activities, current land use and future development activities; and
- Existing physical developments: existing projects such as infrastructure and business enterprises.

Stakeholder consultations with the communities in the project area and project area of influence were conducted using Focus Group Discussions (FGD) and Key Informant Interviews (KII). Consultations were also carried out at the national, regional and district levels. The consultations were conducted over a period running from March 24th to April 5th 2019. The outcomes of these consultations are provided in Appendix 3; while the list of people consulted is given in Appendix 4.

Identification and analysis of potential impacts of the project involved a review of impacts identified during the environmental and social screening, the use of checklists matrices, review of information collected through consultations, and the use of experts' knowledge. Subsequently, for each negative impact, mitigation measures were identified and recommended for implementation as outlined in the Environmental and Social Management Plan (ESMP) and Monitoring Plan (MP) that have been developed; while positive impacts of the proposed project have been recommended for enhancement.

1.9. STRUCTURE OF THE REPORT

The report has been organised into the following chapters:

Chapter 1: Background and Introduction - provides the background to the project and the ESIA, outlines the objectives of the project, its location and project proponent, land ownership, justification and the methodology for impact assessment to the project. The chapter also gives the objectives, approach and methodology for the ESIA study.

Chapter 2: Detailed description of the proposed project - discusses the main project activities, equipment and materials to be used in the project and environmental considerations in the project.

Chapter 3: Project alternatives considered - It reviews alternative project options and highlights reasons for preferring the recommended option.

Chapter 4: Project relevant policy, legal and administrative framework - provides an outline of the Malawi's policies, procedures and legislation which govern preparation of the ESIA. It also outlines regulatory licences and approvals and environmental standards to be met by the developer to ensure that the project activities are line with sound environmental practices. In addition, relevant Safeguard Policies and international conventions and agreements ratified by Malawi Government have been reviewed.

Chapter 5: Description of the project environment - describes the existing environmental and social conditions including physical, biological and socioeconomic aspects. Physical aspects

include spatial location, topography and soils, drainage, climate (rainfall and temperatures), land use patterns, Geo-hydrological aspect. Biological aspects include flora and fauna. Socioeconomic aspects cover population characteristics, health situations in the project area, agriculture, and degree of gender mainstreaming among others.

Chapter 6: Assessment of environmental and social impacts - outlines the approach and methodology for impact identification. It provides information on affected environmental components, based on the project phases and proposed project activities. The chapter also covers impact assessment and determination of mitigation measures.

Chapter 7: Environmental and social management plan – this provides a tabulated Environmental and Social Management Plan (ESMP) for managing the identified impacts. It also provides a summary of costs for managing the identified impacts and irreversible and unavoidable impacts due to the proposed project.

Chapter 8: Environmental and social monitoring plan - provides a tabulated Environmental and Social monitoring plan (ESMP) for effective implementation of the impacts enhancement and mitigation measures. It also provides a summary of costs for monitoring the implementation of the environmental and social management plan.

Chapter 9: Public Consultations **–** this chapter discusses the approach, objectives and methods and results of stakeholder consultations during the ESIA process, for the proposed Project.

Chapter 10: Conclusions and recommendations - highlights the conclusions of the report, based on the major findings of the ESIA study and the major positive and negative impacts of the proposed project. The Chapter also outlines the recommendations to be taken into account during project implementation.

CHAPTER 2 : DETAILED DESCRIPTION OF THE PROPOSED PROJECT

The proposed project to raise the Lunyangwa Dam has been developed as one of the quick interventions aimed at increasing the water supply capacity of the Mzuzu Water Supply System. The raising of the dam is expected to add approximately 3,200m³/day of potable water to the supply system which will in turn reduce the supply shortfall which is currently standing at some 3,700 m^3/day below the required water demand of 24,900m^3/day from the supply area.

The proposed construction work of the project is planned to be implemented over a period of 6 months at a time when the spillway of the dam is not discharging. The project is having the following notable activities described as follows in the three phases of planning, construction as well as demobilisation and operation.

2.1. PROJECT COMPONENTS/ACTIVITIES FOR THE PLANNING PHASE

Main activities during the planning phase include:

i. **Feasibility studies:** The project is based on the Technical Options Report for the raising of the Lunyangwa Reservoir which was prepared by the NRWB with assistance from a joint venture of international engineering consultancy firms vitens Evides and Posch & Partners. The report was concluded in December 2018 after studies were done aimed at assessing the feasibility and viability of the proposed project to raise the height of the Lunyangwa Dam. Feasibility assessments were conducted from technical, financial as well as environmental perspectives. These assessments were conducted over a period from September 2017 to December 2018 by the technical assistance consultant (vitens Evides and Posch & Partners) under the supervision of the NRWB.

ii. **Site identification and selection:** Identification and selection of sites for access roads to the project site for construction activities is also one of the main activities for this planning phase. The selection of the access road sites is taking into consideration the need to minimize negative impacts on the natural environment as well as the surrounding communities.

iii. **Technical Design:** Northern Region Water Board through the technical assistance consultant has prepared designs for the project. Activities during the design included surveying, site planning and preparation of maps as well as technical drawings and bills of quantities. Prior to the technical design, the activities which were concluded included developing and presenting of project proposals to donors, approval of the project proposals for financing and procurement of the technical assistance consultant. The technical assistance consultant was to help with the conducting of both the feasibility assessments and technical design.

iv. **ESIA studies:** WWEC will prepare the ESIA report. WWEC activities in the current phase involved conducting baseline and socioeconomic surveys, desk studies, map preparations and public consultations.

The project is currently in the planning and design phase. Construction works will commence soon after completion of the design studies and after the necessary approvals and certificates have been granted and issued.

Prior to the commencement of the construction works, the following activities are planned for implementation:

i. Preliminary cleaning out and inspection works; including cleaning out of the weir box at the dam downstream toe and inspections for signs of seepage at the dam, for working conditions of five inspection wells downstream of the dam as well as for conditions of surface settlement points on the dam upstream face near dam crest level.
ii. Transportation of people and equipment to the site;
iii. Establishment of on-site access roads;
iv. Erection of work site signs posts and temporary fences where appropriate.

2.2. PROJECT COMPONENTS/ACTIVITIES FOR THE CONSTRUCTION PHASE

2.2.1 Construction works to raise the spillway level in concrete by 1.5 metres

The spillway crest is planned to be raised by 1.5m and the outcome of the construction work to raise it will be as shown in figure 2.1:

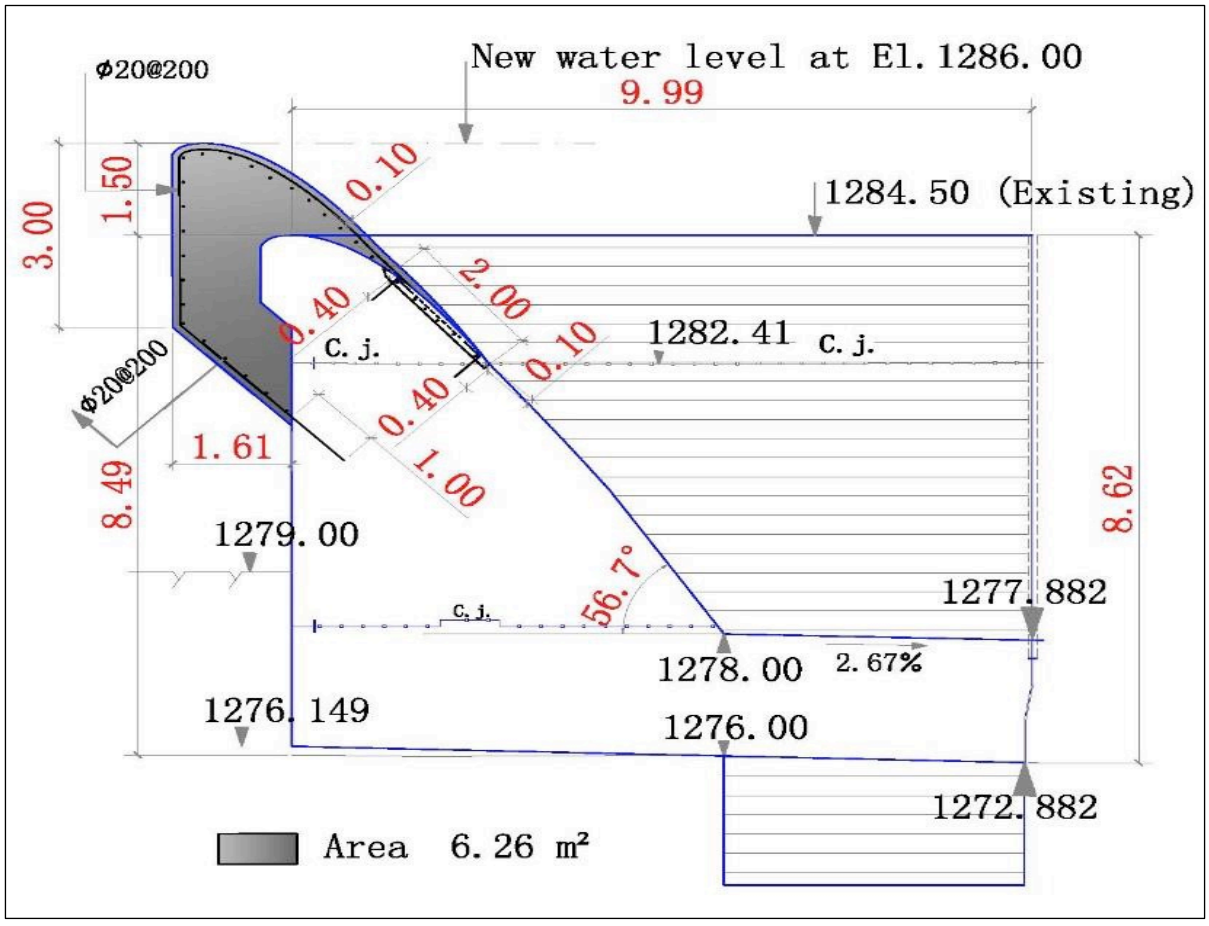

Figure 2.1: Details of proposed raising of the spillway crest by 1.5m (dimensions in figure are in metres except where indicated)

The crest is to be raised in concrete and an additional area of about 6.26m^2 of concrete plus steel reinforcement will be provided to maintain an ogee profile of the crest as shown in figure 2.1. This additional area of 6.26m2 of reinforced concrete for the raising of the spillway crest is however subject to change after final reviews are made to the design. Construction activities to reform the crest ogee profile without creating a feather edge will include:

i. scabbling of the existing concrete on the upstream (contact) surface of the spillway for an area of about 92.8m^2 and
ii. cutting back of the existing concrete on the downstream face of the spillway by at least 12cm depth over an area of about 36m^2.

The scabbling and cutting back of the concrete on the upstream and downstream faces of the spillway respectively is aimed at ensuring that the new ogee shape of the crest is constructed with a durable thickness. This will mean that the crest is well anchored to the existing concrete to resist the hydraulic thrust of the dam water.

To provide the nominal steel reinforcement for the raising of the concrete crest, 65mm diameter holes will be drilled (to a depth of about 1.5m) into the existing concrete, 1 or 2 rows, with 25mm dowels at 2m centres. The steel reinforcement will prevent surface cracking of the concrete.

Temporary construction activities for the raising of the spillway level will mainly include the construction of formwork as follows:

a) Construction of formwork for raising training walls
b) Construction of formwork for raising spillway crest from upstream face up to start of ogee crest
c) Construction of plane inclined formwork downstream of ogee crest as well as
d) Construction of curved formwork downstream of ogee crest

The water level in the reservoir will also have to be drawn down to about 2m below the existing spillway crest level during the construction.

2.2.2 Construction works to raise the dam height and adding fill behind the wall

A parapet wall of effective height 1.5m is planned to be constructed on top of the dam embankment to maintain the average difference of 3m between maximum water level and the dam crest as well as to guard against erosion of the crest from wave action during high winds and floods.

The parapet wall to be constructed in reinforced concrete (fig 2.2) will be provided with about 65 cm of fill behind it.

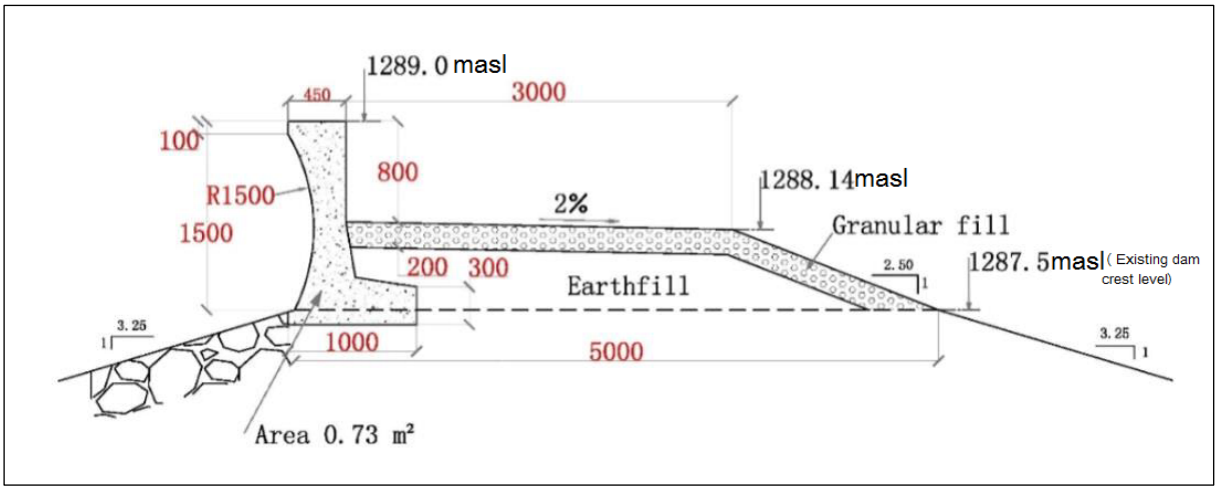

Figure 2.2: Details of proposed raising of the dam crest by erecting a 1.5m high parapet wall with addition of fill behind the wall (dimensions in figure are in millimetres except where indicated)

The arrangement of the fill behind the parapet wall will be such that the top of fill will be at a level of about 1288.14 metres above sea level (which is the theoretical water level of a 1: 10,000-year flood). The fill behind the parapet wall will be placed by laying a layer of about 45cm thick earth-fill and then laying another layer of granular fill of thickness 20cm. The composition of the earth-fill will generally be that of low plasticity sandy silts, sands and clays; as well as non-plastic silts, silty sand and fine sand. The granular fill placed above the earth fill will be that of road base type material. The extra top section of the parapet wall (of about 85cm long) will be without any support of fill behind it and it will primarily be for the provision of the protection against wave action.

Further construction activities to be completed as part of the erecting of the parapet wall and placing of fill behind the wall include:

a) Scarifying of the existing dam crest surface over a total area of about 2,800m^2
b) Excavation and preparation of foundation for the parapet wall
c) Clearing and stripping borrow areas for a total area of about 1.5 hectares
d) Obtaining new fill material from borrow areas
e) Construction of plane vertical formwork for parapet wall
f) Construction of curved formwork for parapet wall
g) Provision of steel reinforcement for parapet wall and
h) Formation of expansion joints at 10m centres, using flexcell and polysulphide filler.

2.2.3 Construction activities for ancillary works

Three main activities will be done during the construction work to supplement the raising of the spillway crest as well as the erecting of the backfill supported parapet wall. The planned auxiliary construction works are:

a) Ramping up of access bridge across spillway channel; involving the removal of the current bridge across the spillway channel, scabbling of the existing concrete support beam over an area of 6m^2, construction of formwork for raising the support beam and

replacement of the removed access bridge with a new one which will be raised up to the new dam level.

b) Installation of a new penstock type gate of 40cm diameter together with all its associated components at the current off-take point of the dam intake tower (located at a level of 1281 metres above sea level) and;
c) Formation of an additional orifice of diameter 40cm at the intake tower of the dam; this additional orifice (proposed to be located at elevation 1284 metres above sea level), will function as an extra off-take of the intake tower to ensure that the drawn off water does not become stagnant.

2.3. PROJECT COMPONENTS/ACTIVITIES FOR THE DEMOBILISATION AND OPERATION PHASE

For the demobilisation phase, all temporary works and structures will be removed as soon as possible after their use. These include temporary fences and barriers, workers' camp, scaffolding materials, work site signs posts, steel cuttings and materials stockpiles among others. The construction sites will be cleared and the affected areas will be appropriately restored. Negative impacts might arise from the modes of removal of the temporary structures and their disposal upon the completion of the construction works.

During the operation phase of the proposed project, it is expected that there will not be any major changes to the activities that are currently being carried out for operation and maintenance of the existing dam. However, with the raising of the dam and spillway levels, it is expected that there will be an increased off-take/abstraction of water at the intake tower of the dam during the operation phase. It is expected that an estimated 3,200m^3/day will be added to the amount of water abstracted from the intake points of the dam after the commissioning of the raised dam.

All the other activities during the operation phase will be the normal routine activities of mowing or brushing out encroaching weeds and shrubs, cleaning up of debris from spillways and monitoring of reservoir water levels, erosion issues as well as responding to emergencies.

2.4. LABOUR AND MATERIAL REQUIREMENTS FOR PROJECT ACTIVITIES

On the project, excavation of trenches will be done using backhoe excavators and compactions will be done using trench compactors. Hence, backhoe excavator and compactor operators and assistants, including labourers to assist the operators, will be employed by the project contractor. Offering of employment opportunities will consider where possible the recommendation of the national gender policy. Out of the people to find employment during the project construction phase, some 45% are expected to be employed as casual (non-skilled) labourers from the surrounding communities. The rest are expected to be skilled and semi-skilled workers including engineers, surveyors, environmental health and safety workers and foremen.

Construction of reinforced concrete walls, beams and spillway crest will require machinery such as crawler dozer for clearing the sites. Concrete mixers and vibrator pokers will be required for the concrete works. In addition, labourers will be required to perform some

functions including shaping the foundations and concrete works. It is estimated that about 30 people will be employed for these activities. Tippers will be used for movement of materials such as quarry stones, gravel and sand. Crawler dozers will be utilized for clearing construction sites as well as access roadways to construction sites.

It is expected that there will not be additional new employments during the operation phase after completion of the project construction works. This will mainly be due to the fact that there is not expected to be any major changes to the operation activities that are currently taking place at the dam after its raising.

Table 2.1 presents some of the major plant, equipment and materials that will be required for the construction works to raise the level of the Lunyangwa Dam. The table also gives the project outputs and by-products that are to be expected from use of the equipment and material.

Table 2.1: Major equipment and materials

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
1.	Crawler Dozer	Creation of access roads and clearing construction sites	To be provided by the contractor	Access roads and construction sites dust, noise
2.	Backhoe excavator	Excavation of trenches	To be provided by the contractor	Compacted trenches, firm foundation bases, dust and noise
3.	Trench compactor	Compaction of trenches	To be provided by the contractor	Compacted beds for foundations, noise
4.	Concrete mixer	Mixing concrete	To be provided by the contractor	Well mixed concrete, noise
5.	Tippers and trucks	Transportation of construction materials such as fine/course aggregate, sand and cement.	To be provided by the contractor	Various construction materials, dust and noise
6.	Vibrating pokers	Concrete compaction	To be provided by the contractor	Well mixed concrete, noise
7.	Carpentry tools	For carpentry works during construction	To be provided by the contractor	Complete constructed formworks for concrete work
8.	Fine and course aggregate	For concrete formulation	To be sourced locally. Course aggregate could be sourced from the nearby quarry which is the	Completed structures

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
			Zunguziwa Quarry located within the Mzuzu City.	
9.	River sand and gravel	For concrete formulation and other construction works including placing as fill on embankment	To be bought from suppliers. Probable areas where gravel and sand will be sourced locally are mostly located along the Mzuzu-Ekwendeni Road but the actual source sites will be identified during the construction phase.	Completed structures
10.	Cement	For concrete formulation and other construction works	To be sourced locally or outside the country depending on quantity, quality and cost factors.	Completed concrete structures
11.	Water	• For concrete formulation and other construction works	To be sourced from approved suppliers	Potable water Polluted water
12.	Reinforcement metal bars	For concrete reinforcement	To be sourced locally	Concrete walls, beams and ogee structure of spillway
13.	jack hammers and compressor	For formation of holes at the intake tower and other locations	To be provided by the contractor	Formed neat holes

The activities mentioned above and all the other activities related to implementation of the project may cause positive and negative environmental impacts for which the enhancement and mitigation measures to be discussed in the full ESIA report.

2.5. PROJECT COST

The cost for implementing the project has been estimated. The estimates have been prepared based on rates obtained from recently completed similar projects in other countries. Table 2.2 provides a summary of the estimated costs for the components of the proposed project to raise the Lunyangwa Dam.

Table 2.2: Cost estimate for the proposed project

No	ACTIVITY	COST (€)	COST (MWK)
1	**Mobilisation**	32,812.00	28,676,047.40
2	**Ancillary works at intake tower**		
2.1	Formation of additional orifice at the intake tower	1,200.00	1,048,740.00
2.2	Supplying and installing new penstock type gate at the current off-take point of the dam intake tower	8,000.00	6,991,600.00
3	**Ancillary work of ramping up the access bridge across spillway channel**		
3.1	Removing bridge across spillway channel	5,000.00	4,369,750.00
3.2	Scabbling existing concrete support beam	12,600.00	11,011,770.00
3.3	Installing formwork for raising support beam	423.00	369,680.85
3.4	Supplying and casting concrete of grade M30	293.00	256,067.35
3.5	Construction of a new raised bridge across spillway channel	5,000.00	4,369,750.00
4	**Construction work to raise the spillway concrete ogee crest by 1.5m**		
4.1	Installing formwork for raising training walls	5,550.00	4,850,422.50
4.2	Supplying and casting concrete for raising training walls	4,620.00	4,037,649.00
4.3	Supplying and installing steel reinforcement for raising training walls	6,930.00	6,056,473.50
4.4	Scabbling contact surface of spillway	1,856.00	1,622,051.20
4.5	Cutting back concrete to 12cm depth in downstream part of ogee	3,600.00	3,146,220.00
4.6	Drilling holes 65mm dia 1.5m deep, insert 25mm dia steel dowels and grout	1,027.00	897,546.65
4.7	Installing plane formwork for raising spillway crest (upstream face up to start of ogee crest)	10,600.00	9,263,870.00
4.8	Installing plane inclined formwork downstream of ogee crest	10,860.00	9,491,097.00
4.9	Installing curved formwork downstream of ogee crest	840.00	734,118.00
4.10	Forming of ogee crest	3,040.00	2,656,808.00
4.11	Supplying and casting concrete for raising spillway	37,650.00	32,904,217.50
5	**Construction work to raise the dam height by erecting a 1.5m high parapet wall and adding 65cm of fill behind the wall**		
5.1	Scarifying existing dam crest surface	2,800.00	2,447,060.00
5.2	Excavating and preparing foundation for wall	494.00	431,731.30
5.3	Clearing and stripping borrow areas	1,160.00	1,013,782.00

No	ACTIVITY	COST (€)	COST (MWK)
5.4	Obtaining new fill material from borrow areas	8,721.00	7,621,717.95
5.5	Placing fill in the embankment	7,069.00	6,177,952.55
5.6	Placing granular fill/road base to dam crest	9,001.00	7,866,423.95
5.7	Installing plane vertical formwork for parapet wall	33,600.00	29,364,720.00
5.8	Installing curved formwork for parapet wall	58,800.00	51,388,260.00
5.9	Supplying and installing steel reinforcement for parapet wall	19,470.00	17,015,806.50
5.10	Supplying and casting concrete for parapet wall	61,320.00	53,590,614.00
5.11	Forming expansion joints at 10m centers	6,600.00	5,768,070.00
	TOTAL	**360,936.00**	**315,440,017.20**

The total estimated cost is €360,936.00 or MWK 315,440,017.20, converted using a rate of €1= MWK 873.95, quoted on the Reserve Bank of Malawi website on 5 July, 2019. This cost estimate for the proposed project is to be revised and may change after final checks are made to the design.

2.6. ENVIRONMENTAL CONSIDERATIONS

The scope of the proposed project has been developed after a different number of alternatives for raising the dam height were assessed. Details of all the alternatives which were assessed mainly from technical, financial and environmental perspectives are presented in chapter 3 of this report. The outcome of the evaluation of the alternatives led to the recommendation of this option of raising the dam through raising the concrete spillway ogee and associated walls by 1.5m as well as erecting a 1.5m parapet wall on the embankment and adding 65cm of fill behind the wall. The following environmental considerations were taken into account when coming up with the recommended project scope:

a) The planned project of raising the concrete spillway ogee and raising the embankment as well as constructions of a parapet wall avoids the alternative of constructing an auxiliary spillway on the left bank of the dam. The construction of the auxiliary spillway would have resulted into excavation of an approach channel upstream of the dam (suggested dimensions 200m long by 50m wide, average 50cm deep). Another flood relief channel would have had to be created through the forest downstream of the dam over an area of about 4ha. Both of these channels would have hence led to deforestation of large areas of forest (an estimated 5ha) within the forest reserve area, which would have been a huge environmental drawback.

b) The current scope of the project of raising the concrete spillway ogee and raising the embankment with fill and a parapet wall also avoids the use of automated panel and flap gates. The automated gates would have exerted an increased demand for power supply which is currently an already limited resource in the country. Increased demand on this limited resource therefore increases the likelihood of having more power shortages/outages particularly during dry seasons which consequently lead to more homes turning to firewood/charcoal for their domestic energy needs.

2.7. WASTE MANAGEMENT

The table 2.3 below details how various kinds of wastes generated due to the proposed project will be managed:

Table 2.3: Management of wastes generated from the proposed project

Waste type	Waste source	Management
Concrete	Concrete construction works at construction phase	✓ Concrete wastes will not be allowed to enter storm drains or any nearby watercourses. ✓ Concrete trucks and other concrete- coated equipment will be washed onsite. ✓ Concrete wastes will be dumped into temporary concrete washout facilities/pits. ✓ A sign will be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facility. ✓ Concrete wastes will also be used to backfill borrow pits.
Oils	Activities of lubricating construction vehicles and other construction machinery during construction works	✓ Used oil will be kept for oiling shutters during other constructions.
Steel	Cutting of steel bars/ members during construction works	✓ All steel cut offs will be stockpiled on one protected area. ✓ After sometime the steel cut offs will be sold to other companies which can use them.
Tyres	Construction vehicles	✓ Defective tyres will be kept for recycling. ✓ If the tyres cannot be recycled, they will be sold off to other potential users (i.e. shoe makers).
Saw Dust	Wood cutting activities during construction works	✓ Saw dust will be used as an absorber where leaking oils will be made to fall to avoid soil contamination. ✓ Other saw dust will be thrown into waste collection skips and arrangements will be in place to get the collected waste disposed at the waste management facility for the Mzuzu City Council.
Plastic Papers	Use by workers to be employed at the construction site	✓ Plastic papers will be recycled where possible. Otherwise they will be put in bins then thrown into waste collection skips and arrangements will be in place to get the collected waste disposed at the waste management facility for the Mzuzu City Council.
Office Papers	Use by workers to be employed at the construction site	✓ Office papers will be recycled where possible. Otherwise they will be put in bins then thrown into waste collection skips and arrangements will be in place to get the collected waste disposed at the waste management facility for the Mzuzu City Council.

Waste type	Waste source	Management
Foods	Foods consumed by workers to be employed at the construction site	✓ All food wastes will be deposited into a nearby dust bin and later into a rubbish pit. ✓ After some time the rubbish pit will be covered with a layer of soil to avoid flies and to facilitate decomposition.
Waste Water	Workers at the project site	✓ Waste water from latrine facilities at the project site will be drained into a septic tank.
Exhaust Fumes	Construction vehicles and other construction machinery	✓ Machinery will be well maintained and the most modern machines will be used, where possible.

CHAPTER 3 : PROJECT ALTERNATIVES CONSIDERED

3.1. THE "NO ACTION" OPTION

Since there is already clean water supply infrastructure serving the Mzuzu City and immediate surrounding communities within the City, there are no other feasible/ cost effective alternatives identified other than the upgrading and rehabilitation of the existing water supply facilities. This is necessary so that the system will not only have the capacity to supply safe and clean water to the people of Mzuzu City, but also those residing in immediate surrounding communities.

With this said, the environmental and social consequences of a "no action" option are that:

a) People of Mzuzu City and immediate surrounding areas would not have access to adequate potable water and efficient water supply services.
b) Those that do not have piped water would continue to utilize unsafe, and at times unreliable water supply sources.
c) Women would continue to bear the burdens of fetching water from long distances and girls would have to spend more time helping their mothers to fetch water, consequently limiting their time that would have otherwise been utilized for school.
d) Many people, especially the young and the elderly, would be exposed to water related ailments stemming from the use of unsafe water.

On the other hand, the "no action" option would mean that the project-associated environmental and social impacts would not be felt by the communities in the project and surrounding areas. Also, the environment, as well as natural resources would be spared from the project negative effects.

3.2. TECHNICAL ALTERNATIVES

Technical and economical options have been presented in table Table 3.1

Table 3.1: Technical and Economical Alternatives Considered for the Project

No	Alternative	Advantages	Disadvantages
1.	Installing panel gates on the upstream face of the spillway and constructing an auxiliary spillway on the left bank of the dam	• It is the least cost option when it comes to construction	• The gates have to be well controlled, meaning when floods are known to be on the way, the gates have to be opened. If they are not, or they are jammed shut, and a large flood arrives, the dam is at risk of being overtopped. • The capacity of the spillway is reduced by 31% because of the need for intermediate columns; • Construction would require two dry seasons to complete,

No	Alternative	Advantages	Disadvantages
			and the reservoir would have to be drawn down 4.5m so that the base beam and lower gate guides could be constructed, and gates installed; • Increased maintenance costs, the need for a power supply and associated risk of theft of components; • The auxiliary spillway will need a large channel to be formed through bush on the upstream left bank and through forest on the downstream side; this is not environmentally attractive; it would be subject to erosion and need periodic maintenance.
2	Install smaller panel gates on the upstream face of the spillway, increase the height of the spillway, and construct an auxiliary spillway on the left bank of the dam	• construction might be possible in one year • lake level would not have to be drawn down so much as with the first option	• The gates have to be well controlled, meaning when floods are known to be on the way, the gates have to be opened. If they are not, or they are jammed shut, and a large flood arrives, the dam is at risk of being overtopped. • The capacity of the spillway is reduced by 31% because of the need for intermediate columns; • Increased maintenance costs, the need for a power supply and associated risk of theft of components; • The auxiliary spillway will need a large channel to be formed through bush on the upstream left bank and through forest on the downstream side; this is not environmentally attractive; it would be subject to erosion and need periodic maintenance.

No	Alternative	Advantages	Disadvantages
3	Raise the spillway 1.5m in concrete and raise the dam crest height 1.5m. (selected option)	• The cheapest way of raising the embankment • Avoids environmental damage of auxiliary spillway • Less maintenance and operation costs as there are no panel gates	• Construction Cost is some 12% more than the cheapest solution • Reservoir level has to be drawn down 2m below spillway crest level during construction • Construction difficulties: the existing concrete has to be scabbled on the u/s face and cut back at least 12cm on the d/s face so that the new ogee shape can be constructed with a durable thickness and anchored to the existing concrete
4	Raise the spillway 75cm in concrete and raise the dam crest height with 1.5m high parapet wall. Install also 1.0m high panel gates, raise spillway crest 75cm	• provides additional flexibility in that the gates can be lowered in the event of a large flood arriving, thereby reducing the surge, i.e. by allowing discharges of say 40 m3/s to pass earlier on and reducing subsequent peak flows (which could otherwise reach 140 m3/s).	• significantly high construction cost • high operation costs for the gates
5	Raise the spillway 1.5m in concrete and raise the dam crest height with fill on both the u/s and d/s shoulders.	• Provides marginally better stability of dam than parapet wall	• involves a large quantity of fill material to raise the height of the dam and is expensive
6	Raise the spillway 75cm in concrete, install a flap gate and construct an auxiliary spillway on the left bank.	• This is a very neat solution involving installing 2 long fish belly type gates; no intermediate piers are required, installation and operation are	• Gates must be lowered when there is news of an impending flood, so an early warning system is necessary, involving possible increased costs for a SCADA system • Risk of environmental damage from auxiliary spillway

No	Alternative	Advantages	Disadvantages
		easier, compared to the panel gates. • construction should be possible in one dry season	• Operation is still seen as a possible problem; the gates have to be well maintained, there is the need for power supply and with it, the risk of theft of components.
7	Raise the spillway 75cm in concrete, install a flap gate and raise the dam crest with 1.5m high parapet wall.	• Again, a very neat solution involving the fish belly gates; again, no intermediate piers, installation and operation are simple • construction should be possible in one dry season	• Cost for construction and operation is high, operation is still seen as a possible problem, power supply is needed and there will thus be the risk of theft of components.
8	Raise the spillway 1.5m in concrete and raise the height of the dam embankment by fill to crest and downstream shoulder.	• It may be the safest way in terms of achieving dam stability	• The most expensive alternative in terms of construction, because of the method of raising the height of the dam embankment

The selected option is alternative 3 as shown in the table. This option is selected mainly due to its economic advantages of being the second cheapest in terms of construction costs as well as requiring less maintenance and operation costs (since no panel gates will be used). The fact that panel gates will not be used eliminates also the risk of theft of installed components for the gates. The alternative 3 also avoids the operational complications that could have come in if panel gates were used, the gates require more appropriate control methods especially when there is river flooding.

The other technical advantage of alternative 3 is that it does not require two dry seasons for the construction work to be completed as is the case with other alternatives such as alternative 1. The chosen option 3 also has the advantages of environmental protection as outlined in the table 3.1 as well as section 2.6 of this report.

The upgrading of the scheme will result to improved efficiency and performance of the system and reduce the pipe network losses leading to savings on operation and maintenance costs. Savings stemming from procurement costs i.e. associated foreign exchange for purchasing specialty materials and chemicals outside of Malawi. The execution of said project will also lead to increased revenue for the Board, taxes for the government, job and associated business creation ultimately contributing to the improvement of the national economy. Safe water will contribute to the reduction in demand for medical health services and medicine. In addition, the burden on women and school girls, associated with fetching water will be reduced and the women will be able to participate and contribute better to economic

development. School girls will have the opportunity to do better in school and qualify for better jobs. All this will translate to improved economic development of the country.

3.3. OTHER ALTERNATIVES

3.3.1 Option of constructing a new dam

In light of the fact that the water demand for the project area has exceeded the available supply capacity, the stable solution which was determined by the NRWB to the challenge is the construction of an additional new dam. Previous studies conducted by the NRWB identified the Lambilambi River in Chikangawa Forest Reserve in Mzimba District as a potential site for construction of the additional dam. Preliminary designs as well as environmental and social impact assessments for this proposed dam were completed.

The construction of the additional dam has the main advantage of offering a more reliable solution to the problem of water supply Inadequacies to the residents of Mzuzu City and surrounding areas. This option is however costlier to implement as compared to the option of raising the existing Lunyangwa Dam. Currently attempts are still being made to source financing for the construction of the new dam and as a result, detailed designs for the proposed new dam are yet to be concluded.

The option of raising the Lunyangwa Dam stands as a quick intervention to the water supply challenge in the project area. It has the advantage of saving the communities from woes of water shortages while funds for the construction of the dam on Lambilambi River are being identified.

3.3.2 Option of using manual labour against use of construction machinery

Use of manual labour for construction activities such as excavations, compaction, concrete mixing and laying as well as transporting of materials has the advantages of:

- Improving the economic conditions of common people of the project area through offering of employments.
- Increasing the circulation of money and the per capita income of the local people.
- Reducing the cost rates of labour on the project for certain activities on the project i.e. earthworks.
- Removing the possible problems of environmental pollution from toxic fumes, oils and noise which may come from the machinery.

On the other hand, employment of machinery has the advantages over use of manual labour of:

- Hastening the rate of conducting the activities, hence allowing for the construction work to be completed in time.
- Allowing for work to be done in difficult environments such as excavating in soft collapsible soils or hard rocky areas where manual labour could not succeed.
- Allowing for the work to be done at acceptable and good quality levels, which would not be reached with manual labour. Use of concrete mixing machinery results in

production of well mixed concrete which is normally not reduced in strength nor its workability as is common with manually mixed concrete.

- Enhancing safety to workers at construction sites by eliminating the risks associated with many labourers working on sites moving around heavy materials in spaces which are likely to be confined and congested if more manual labourers are used.
- Reducing the levels of fatigue among workers hence minimizing the risk of accidents that may occur at construction sites due to the fatigue.

The project to raise the Lunyangwa Dam is a critical project that is necessary to ensure quick supply of more potable water to the residents of Mzuzu and surrounding areas. The project is to be delivered according to the national and international standards that call for delivering of quality infrastructure and ensuring total safety of workers. Therefore, use of machinery for all the necessary activities is opted for with use of manual/casual labour not being completely eliminated.

CHAPTER 4 PROJECT RELEVANT POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter summarizes the policy, legal and administrative framework within which the ESIA was carried out. It also identifies EIB standards that are relevant to the project.

4.1. ENVIRONMENTAL MANAGEMENT IN MALAWI (1996)

Malawi is a signatory to the 1992 Rio Declaration on Environment and Development. Principle 17 of the declaration commits Malawi to undertake environmental impact assessments (as a national instrument for environment management), subject to a decision of a competent authority, on all proposed activities likely to have significant negative impact on the environment. Following the declaration, several policies and legislations on environmental management have been developed, of which the overarching legislation is the Environment Management Act (EMA) of 1996. From the same, the Malawi Guidelines for Environmental Impact Assessment were developed in 1997 and are under revision.

The Environmental Affairs Department (EAD) in the Ministry of Natural Resources, Energy and Mines (MNREM), is the responsible authority for development and enforcement of environmental policy and legislation. The EAD, with support from the Technical Committee on the Environment (TCE), and in line with the provisions of the EMA as well as the Environmental Impact Assessment Guidelines of 1997, determines whether an ESIA is required or not, for all projects. The TCE reviews environmental and social impact assessment reports for proposed projects and makes recommendations to the Director of Environmental Affairs, who reports to the National Council for the Environment (NCE). The NCE considers the recommendations from the DEA and advises the Minister for approval and issuance of the environmental certificate for the project to proceed.

4.2. POLICY FRAMEWORK

4.2.1. The National Water Policy (2005)

This policy provides an enabling framework for integrated management and utilization of water resources in order to provide water of acceptable quality and sufficient quantities in Malawi. The policy also intends to ensure availability of efficient and effective water and sanitation services that satisfy the basic requirements of every Malawian; and for the enhancement of the country's natural ecosystem. Realising the challenges, threats and opportunities associated with implementation of activities in the water and sanitation sector similar to the proposed project, the GoM through the Ministry of Water Development established the policy tailored at tackling any issues in the sector in an integrated manner, through involvement of all concerned stakeholders, including communities.

In general, the policy advocates for protection of water resources from unsustainable utilization, which may result in its depletion and degradation through pollution. The Northern Region Water board will make sure that its project of raising the Lunyangwa Dam does not degrade the water sources by pollution throughout all the phases of the project.

4.2.2. The National Environmental Policy (NEP, 2004)

The NEP is a central guide for all environmental and natural resources sectoral activities. Hence, the EIA Guideline for Water Sector Projects (GoM, 2006), recognises the National Environmental Policy (NEP) as a key instrument that provides standards or benchmarks for water policies and legislation in Malawi.

The overall goal of the NEP is ***"The promotion of sustainable social and economic development through sound management of the environment in Malawi"*** *and* some of the goals that the NEP seeks to accomplish are:

a) Securing for all person's resident in Malawi now and in future, an environment suitable for their health and well-being;
b) Promoting efficient utilisation and management of the country's natural resources;
c) Facilitating the restoration, maintenance and enhancement of the ecosystems and ecological processes essential for the functioning of the biosphere and prudent use of renewable resources.

In view of the above, the NEP relates significantly and directly to the activities of the proposed raising of the Lunyangwa Dam for improvement of water supply system in Mzuzu City considering that water is a natural resource that must be managed and utilised sustainably for the betterment of both present and future generations. Section 5.5 of the NEP clearly stipulates that a cross-sectoral objective of the water sector is to manage and use water resources efficiently and effectively, so as to promote its conservation and availability in sufficient quantity and acceptable quality.

4.2.3. Guidelines for Environmental Impact Assessment (1997)

The Guidelines for Environmental Impact Assessment (EIA) 1997 outline the process for conducting EIAs and facilitate compliance to the EIA process by developers, as provided for in the Environment Management Act, 1996. They act as a tool for integrating environmental concerns into development plans at all levels. The guidelines also provide a list of prescribed projects for which EIA is mandatory.

According to these guidelines, the proposed project falls in the category of which an ESIA is mandatory (list A) due to the following provisions:

- **A3.4:** Drinking water supply schemes to serve a population of greater than 10000 people, or expansions of existing schemes to serve a population water reticulation networks with more than 10 kilometres of pipeline.
- **A3.6:** Construction or expansion of dams with height of 4.5 metres or higher.

The guidelines act as a tool for integrating environmental concerns into development plans at all levels.

It is a requirement under section 29 of EMA that developers submit EIA Reports to EAD for review and approval for all prescribed projects, hence, the preparation of this report.

4.2.4. EIA Guidelines for Water Sector Projects (2006)

The purpose of these guidelines is to ensure and facilitate compliance with the Environment

Management Act of 1996; by Government agencies, project developers and the general public. The guidelines follow the same principles outlined in the Malawi Guidelines on Environmental Impact Assessment (1997), with the addition of more technical detail applicable specifically to water projects. The guidelines are distributed and administered by the Environmental Affairs Department (EAD) in the Ministry responsible for Environment. This project will be implemented in relation to the EIA guidelines for water sector projects so that negative and positive impacts are mitigated or enhanced respectively.

4.2.5. The Malawi Growth and Development Strategy III (MGDS III 2017-2022)

The Malawi Growth and Development Strategy III recognises that water is an important resource for a health living and agricultural development. On health, the strategy advocates the promotion or adoption of safe water and sanitation practices at individual and household level. The policy also emphasises the need for promotion of community-based management of rural water supply facilities, strengthening of monitoring and evaluation systems for water utilization and management; and the improvement of water supply in rural and urban areas for both agriculture and irrigation.

The proposed project of raising the Lunyangwa Dam with the aim of improving the water supply are in line with the goals of the MGDS III to meet the challenges of water supply, sanitation and hygiene services provision at household level and the whole country

4.2.6. The National HIV and AIDS Policy

The goal of this policy is to prevent HIV infections, to reduce vulnerability to HIV, to improve the provision of treatment, care and support for people living with HIV/AIDS and to mitigate the socio-economic impact of HIV/AIDS on individuals, families, communities and the nation.

The policy recognizes that social, political and economic conditions create and sustain vulnerability to the risk of HIV infection which include unequal position of girls and women in society and the fact that, due to biological, social, cultural and economic factors women are more likely to become infected and can be more adversely affected by HIV/AIDS than men.

In line with this policy, NRWB has HIV and AIDs Policy at an organisation level. During the project implementation period, the developer will conduct civic awareness meetings in the project area that will help in disseminating information to women and girls on STI and AIDs issues. In addition, the developer will also consider employing women that are capable to do the work throughout the project to reduce economic stress which is one of the factors that make most women more likely to become infected and affected by HIV.

4.2.7. Malawi State of Environment and Outlook Report (2010)

The State of the Environment and Outlook Report (NSOER) 2010 recognises that despite efforts made in environment management, degradation of natural resources continues to be a major threat to the social and economic development of Malawi. High population density and dependence on agricultural production have led to alarming rates of environmental degradation. The result has been deforestation; decreasing soil fertility and increasing erosion; water depletion, loss of biodiversity; and increasing pollution.

The State of the Environment and Outlook Report 2010 aims to address these challenges by providing a knowledge resource for researchers and the general public, to serve as the baseline for monitoring trends in environmental change in Malawi, and to inform policy-makers about the challenges facing Malawi. The Malawi State of Environment and Outlook Report provides the status of the environment at national level. The main problems highlighted in the NSOER include:

- High silt loads, during the rainy season, causing sedimentation;
- High water treatment costs and frequent pump wear;
- Soil erosion in catchments caused by deforestation and unsustainable cultivation practices;
- Sediment loading into the rivers due to irrigation farming along the rivers, river banks and river bed;
- Soil erosion and chemical pollution due to intensive cultivation in water catchment areas, without adequate conservation measures;
- Presence and extent of human settlement in catchment areas; and
- Discharge of effluents into the rivers.

The NSOER therefore provides a basis for environmental planning and development of the proposed project.

4.2.8. The Malawi National Land Policy (2002)

The intent of the Malawi National Land Policy (2002) is to provide guidance on the management of land in Malawi, to promote optimal utilisation of the country's land resources for sustainable socio-economic development. With due recognition that land is a basic resource common to all people in Malawi, the Policy provides for procedures aimed at protecting and regulating land tenure rights, land-based investments and developments at all societal levels. Some of the objectives of the policy include: promotion of land tenure practices that guarantee security and fairness in any land related transactions and enhancement of conservation and management of land resources by communities.

The objectives above are aimed to ensure that local communities do not become victims of developments that may target their land and that where their land or themselves are affected adversely by development projects, they shall be compensated through transparent land administration procedures.

This ESIA, therefore, has taken into consideration; any potential land use related conflicts and any affected communities, in an endeavour to provide sustainable solutions for advancement of development, without infringing on rights of the affected communities over land ownership.

4.3. LEGAL FRAMEWORK

4.3.1. Constitution of the Republic of Malawi (1995)

Section 13, part d, accords for managing the environment and sustainable development of natural resources to prevent degradation; provide a healthy living and working environment for the people of Malawi; accord full recognition to the rights of future generations; and to

conserve and enhance the biological diversity of Malawi. Thus, it paves the way for the Environment Management Act. The project developer must comply with the "section" through adhering to the provisions of the Environment Management Act and implementation of the Environmental Management Plan (ESMP) as provided in this ESIA report.

Regarding protection of property rights, the Constitution has three key sections on the subject (Section 28, 24 and 44). Section 28 entrenches the right to property. It provides that "*every person shall be able to acquire property alone or in association with others, and that no person shall be arbitrarily deprived of property.* According to s. 44(2), *"expropriation of property shall be permissible only when done for public utility and only when there has been adequate notification and appropriate compensation, provided that there shall always be a right to appeal to a court of law".* In Malawi, the courts have held that this constitutional protection of property rights avails to customary and registered land alike.

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

The project developer will have to ensure that activities during all phases of the project promote environmental protection and sustainable development of natural resources, including water and biological diversity resources. The project also has to promote gender equality and human rights as stipulated in the constitution of Malawi.

4.3.2. The Water Resources Act (2013)

The Water Resources Act of 2013 supersedes the 1969 Water Resources Act and aims to provide 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 therefore.

Part iv, section 39 (1) stipulates that no person shall abstract and use water unless authorised to do so and (2a) a licence under this Part shall be required for the abstraction, impoundment and use of water from a water resource.

Part viii, section 92 (1) requires that a person request for a discharge permit for projects that discharge effluents in water surfaces.

Northern Region Water Board will require to get licence for water abstraction and an effluent discharge permit from the Malawi National Water Resource Authority and Mzuzu City Council.

4.3.3. The Environment Management Act (EMA, 1996)

The Environment Management Act (EMA), as an overarching legislation for environmental management in Malawi, accords specific responsibilities to various sectoral authorities on matters pertaining to environmental planning and management. The Act requires the

Director for Environmental Affairs to ensure that, prior to implementation, all projects prescribed for environmental impact assessment shall undergo comprehensive assessment in order to enhance positive impacts and mitigate for negative impacts.

In response to section 24 of the EMA, Guidelines for Environmental Impact Assessment (EIA) were published in 1997, as a benchmark for environmental planning and management of any proposed and existing prescribed EIA projects. Hence the preparation of this ESIA before the implementation of the project.

4.3.4. Land Act (2016)

The Land Act of 2016 was enacted to provide for land administration and management in Malawi. The Act groups land into two categories, "private land" and "public land". Public land comprises of Government land and unallocated customary land. The Land Act also makes provisions for land acquisition which includes compensation of people affected by any project.

Section 13 under section (1), (2) and (3), states that;

- "any person who by reason of any acquisition suffers any disturbance 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 such compensation for such disturbance, loss or damage as is reasonable."

The land to be used for this project is private and it belongs to the Northern Region Water Board. However, in case some land is acquire from people, the NRWB will have to pay compensation to the affected people before proceeding with the project.

4.3.5. Water Works Act (1995)

The Water Works Act provides for the establishment of Water Boards and water-areas; and for the administration of such water-areas as well as for the development, operation and maintenance of waterworks and water-borne sewerage sanitation systems in Malawi; and for matters incidental thereto or connected therewith. The Act is thus relevant for the development of the water supply infrastructure including the pipelines, tanks and all other related structures for the project.

Part III, section 11 of the Act gives powers to the Northern Region Water Board to develop, construct and maintain all works as are necessary and convenient for the purpose of creating, maintaining and extending water supply for domestic, public and business purposes. The proposed raising of the Lunyangwa Dam is in line with this act as it aims at extending the water supply in Mzuzu City for domestic and business purposes.

4.3.6. Local Government Act (1998)

The Act mandates all local authorities to regulate planning and development within their jurisdiction and also empowers them to have by-laws that specify how development projects should minimize and avoid environmental degradation. This Act also devolves decision-making authority from central government to local authorities, through the process of decentralization. The Act has concrete provisions for participation of rural communities in development planning, implementation and monitoring.

The proposed project will adhere to the requirements of the Act by fully involving the Mzuzu City council and rural communities and ensuring that any by-laws set by the Council are followed throughout the project cycle.

4.3.7. The Occupational Safety Health and Welfare Act (1997)

The Occupational Safety Health and Welfare Act (OSHW Act) stipulates the provisions for a safe working environment for the people of Malawi. The OSHW Act therefore was established to provide for the regulation of employee safety, health and welfare in the workplace and to provide for enablers for prevention and regulation of accidents in the workplace.

It is envisaged that various occupational safety and health (OSH) issues will be encountered during implementation of the proposed project. Hence, it is imperative for NRWB to ensure that OSHW requirements are adhered to at all times. This ESIA has outlined the interventions that will be required for implementation and monitoring during the lifespan of the project.

4.3.8. Forestry Act (1997)

This Act provides for participatory forestry, forest management and protection and rehabilitation of environmentally fragile areas. The Act, among other things, seeks to: augment, protect and manage trees and forests on customary land, in order to meet basic needs of local communities and for conservation of soil and water; promote community involvement in the conservation of trees and forests in reserves and protected areas; prevent resources degradation to increase socio-economic benefits; promote community involvement in trees and forests conservation; promote optimal land use practices through agro-forestry in small holders farming systems; protect fragile areas such as steep slopes, river banks, water catchment and conserve and enhance biodiversity. Hence, NRWB will ensure that biodiversity and ecosystems are conserved by adhering to the recommendations; and implementing the mitigation measures in this report.

4.3.9. Gender Equality Act (2013)

The Gender Equality Act of 2013 reflects the Government of Malawi's commitment to implementing the Gender Policy and makes provisions for the Human Rights Commission to:

- Monitor and evaluate the state organs, state agencies and public bodies including the private sector to promote gender equality and make recommendations that the Commission deems necessary;
- Carry out investigations and conduct search in relation to any gender issues on receipt of complaints or on its own accord;
- Make recommendations to the Minister on any gender issues;
- Provide information to any party in a gender dispute on rights, remedies or obligations; and
- Perform functions on implementation of the Gender Equality Act.

In line with this act, the project will be implemented in a such a way that women are also given an opportunity in both skilled and unskilled labour. Another way is that different institutions (table 8.1) will monitor the project in different stages to make sure that women are not hindered from benefiting/ participating from the project.

4.4. REGULATORY FRAMEWORK

Table 4.1 summarises all regulatory licences, approvals and standards that have to be obtained or met for the proposed project to ensure that the project activities are in line with sound environmental management practices and comply with the relevant legislation.

Table 4.1: Regulatory licences and approvals relevant for the project

No	Regulations/ Standards/Approvals	Description	Reference	Issuing Institution
1.	Environmental Certificate	The certificate is provided after approval of the ESIA report.	EMA, 1996 and EIA Guidelines 1997	EAD
2.	Water abstraction permit	Allows the abstraction of groundwater or surface water	Water Resources Act (year)	National Water Resource Authority
3.	Approval of the project design	Approval of project design, where applicable, will be required where construction is to take place in planned areas	Mzuzu City Council by-laws; and the Physical Planning Act (2016)	Mzuzu City Council
4.	Planning permit	To ensure that project is implemented within the city council development plans.	Local government	Mzuzu City Council
5.	Workplace Registration Certificate	This regulates workers safety and health	Occupational Safety Health and Welfare Act (1997)	Ministry of Labour Youth Sports Manpower Development

4.5. ENVIRONMENTAL STANDARDS IN MALAWI

During the construction and operation phase, the project will also trigger a number of Environmental Standards set by the Malawi Bureau of Standards as provided in Table 4.2. The NRWB and the contractor must ensure that the standards are met.

Table 4.2: Relevant Environmental Standards

Standard	Title	Year of Implementation
MS 214:2013 (second Revision)	Drinking Water – Specification	2013
MS 714:2005	Occupational Safety and Health Management Systems - Specification	2005
MS 719:2005	Hazardous Waste – Management, Classification and Disposal – Code of Practice	2005

MS 59:2002	Solid waste – handling, transportation and disposal – code of practice	2002
MS 730:2005	Solid waste disposal sites, guidelines for design	2005
MS 539:2013	Industrial effluents- Tolerance limits for discharge into inland surface waters	2013

4.6. Environmental and social management standards for EIB

The EIB is a public institution driven by the policy objectives of the European Union and their principles of sustainable development, public participation, and accountability. It seeks to promote sustainable and inclusive growth while protecting the natural and social environment in a holistic manner, thereby ensuring that requirements relating to the protection of the environment and human well-being are integrated in the definition, preparation and implementation of all operations financed by the EIB. The EIB also recognises the need for a proactive approach to ensure that environmental and social considerations are taken into account during the early stages of strategic decision-making by promoters so as to have a real influence on the choice of alternative developments. Five relevant standards to the project have been reviewed in the report, and they include;

4.6.1. Assessment and management of environmental and social impacts and risks

The overall objective of this Standard is to outline the promoter's responsibilities in the process of assessing, managing and monitoring environmental and social impacts and risks associated with the operations. EIB promotes the application of strategic environmental assessment as a tool for identifying and evaluating potential impacts of plans and programmes as well as the development of adequate management plans and programmes. Hence, the development of this ESIA by NRWB.

The standard also stipulates that "in this respect, all EIB-financed operations shall comply with national legislation and international conventions and agreements ratified by the host Country. The NRWB will comply with all legislative requirements for the Republic of Malawi as outlined above and the EIB standards in all the phases of the project.

4.6.2. **Pollution** prevention and abatement standard

One of the objectives of the pollution prevention and abatement standard is "avoiding of any deterioration in the quality of human health or the environment, and any loss of biodiversity, by avoiding, reducing and, if possible, compensating/remedying significant adverse effects of projects supported by the EIBs. Since the Lunyangwa Dam is near the Kaning'ina Forest, removal of vegetation is anticipated in this project especially during the construction phase as the stores for the building materials will be located near the Lunyangwa Dam and within the forest reserve. Hence, NRWB will ensure that biodiversity loss and deterioration of quality of human health or the environment and loss of biodiversity is avoided by adhering to the recommendations; and implementing the mitigation measures in this report.

4.6.3. Labour standards

The responsibilities of the promoter/employer are defined to ensure that the project embraces the principles of International Labour Standards. The workforce is a valuable asset for any company. Sound management of human resources and of worker relations is key for

sustainable business practices. The development of fair, safe and healthy working conditions based on respect for workers' rights fosters efficiency and productivity. In contrast, the failure to create and maintain sound worker-management relationships can undermine workforce commitment and effective project implementation. The standard also stipulates that good labour practices and the use of appropriate codes of conduct are important to extend and protect the reputation of firms, governments and lenders; whilst labour rights violations can on the contrary damage the promoter's and the EIB's reputation. NRWB will produce a code of conduct for all employees and make sure that all employees are working under a safe and health working conditions throughout its implementation of the project.

4.6.4. occupational and public health, safety and security

Projects often bring employment, economic growth and social improvement opportunities to both workers and communities. Benefits can also result from access to health, education or social protection. Project activities, however, can also increase exposure to hazards, risks and negative impacts in terms of public health and safety. These may arise through or be amplified by project-related occurrences such as increased environmental pollution, elevated noise levels the spread of communicable diseases or disproportionate use of violence by private or public security forces. The NRWB will make sure that its employees are not exposed to hazards, risks and negative impacts by following the measures proposed in this report from the construction to operation phases.

4.6.5. Stakeholder engagement

A meaningful engagement process allows for the efficient implementation of a financed operation and, in particular, the early and effective identification, assessment, and management of any environmental and social risks, impacts, and opportunities. The views, interests, and concerns of project affected communities and other interested stakeholders are heard, understood, and taken into account throughout the project lifecycle. During the preparation of this ESIA different stakeholders were identified and consulted and their views are appended in this report. NRWB will follow the recommendations provided in this report from different stakeholders and allow for efficient implementation of the project.

CHAPTER 5 : DESCRIPTION OF THE PROJECT ENVIRONMENT

5.1. PHYSICAL CHARACTERISTICS OF THE PROJECT AREA

5.1.1. Spatial location

Lunyangwa Dam is located to the East of Mzuzu City between UTM coordinate locations 36L 615990; 8735597 and 614708; 8734679 within the boundaries of the Kaning'ina Forest Reserve. The City of Mzuzu is the largest urban centre of Malawi's Northern Region and is located in Mzimba District at about 117 km north-eastwards of the Mzimba Boma (the District's administrative headquarters). The City of Mzuzu borders to the East with Nkhata Bay District and it is surrounded to the North, West, and South by the Mzimba District. The Centre of Mzuzu City is located on the road junction of M1 road which comes from the south and M5 road which comes from the east.

5.1.2. Climate (rainfall and temperature)

5.1.2.1. Temperatures

The project area experiences cold and warm temperatures with a mean annual temperature of 18°C. Mean minimum temperatures range from 13°C to 14°C and occur between June and July. Mean maximum temperatures range from 19°C to 21°C and are registered between October and November. July is the coldest month. (Mzuzu Urban Profile, 2011). Figure 5.1 represents average monthly temperatures for Mzuzu City.

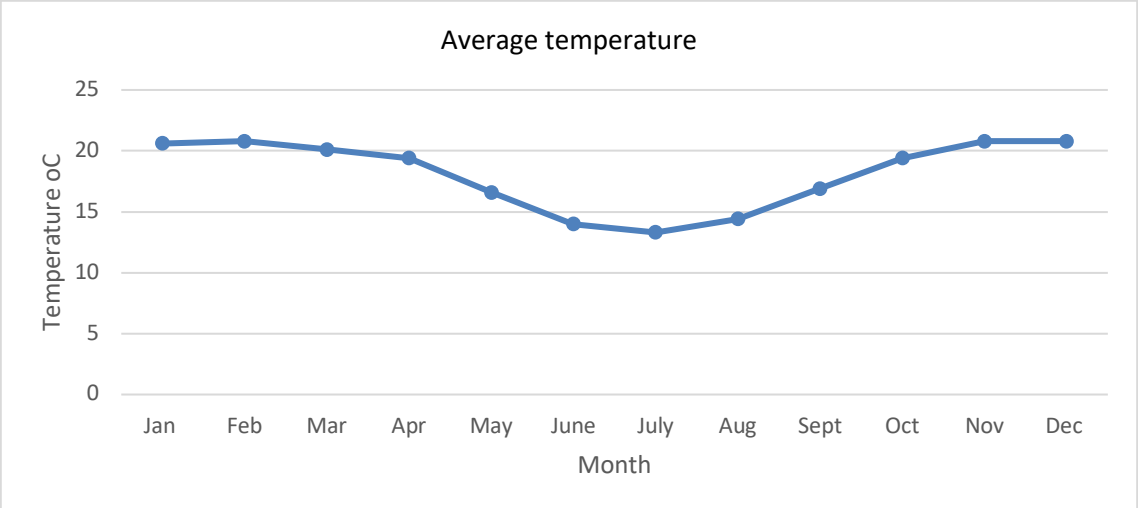

Figure 5.1: Average temperature for the project area

5.1.2.2. Rainfall

Typically, the rainy season in the project area occurs between November and March; however, in previous years, the season has extended into May. The average highest monthly rainfall of 221 mm, is usually observed in the month of March while the lowest monthly average of 10 mm is experienced in September. Rainfall in the project area varies according to topography. The area receives both convectional rainfall and relief rainfall. The main rain bearing system in the area is the Inter Tropical Convergence Zone (ITCZ). Figure 5.2 represents average monthly rainfall for Mzuzu City.

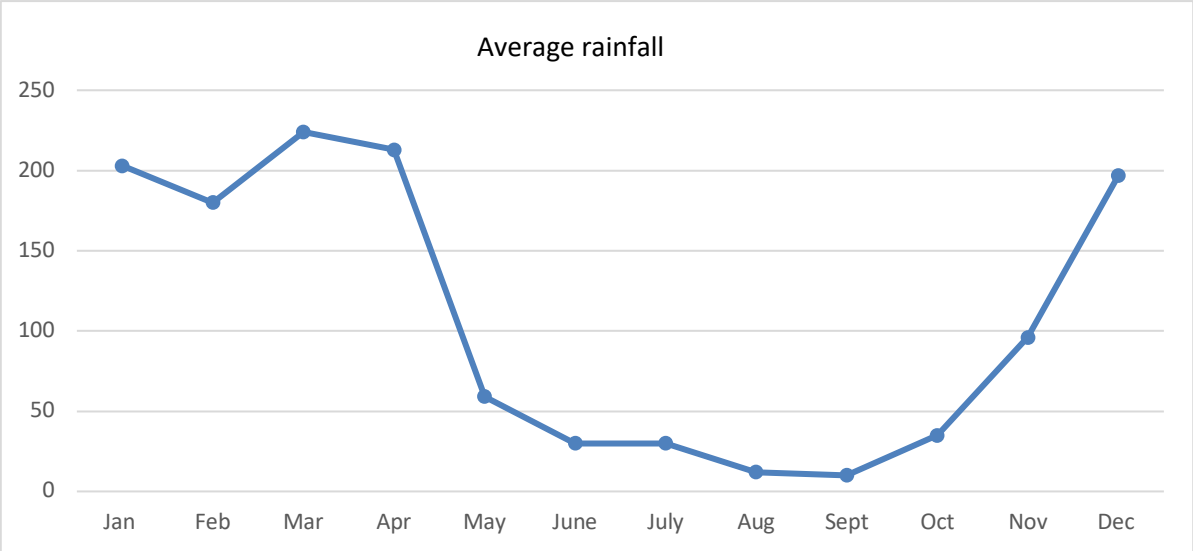

Figure 5.2: Average rainfall for the project area

5.1.3. Topography and soils

The elevation of the project area ranges from 1200m to 1900m especially at Viphya and Kaning'ina mountains. It is predominantly hilly with some rough land forms. Most outstanding landforms can be divided into two zones: a) the eastern half of the city is generally hilly with deep gullies, b) the western half of the city with flat terrain though Lunyangwa wet land takes much of the area.

Due to the many different types of sediments and rocks a wide variety of soils have developed in Mzuzu city that varies from area to area. The soils in the area are classified by the Geological Map of Malawi, 1979, as latosols dominated by leached ferrallitic soils and ferrisols. The Lunyangwa wetland is a low-lying area in the city and is usually prone to flooding hence characterised with fertile alluvial soils especially during dry season.

5.1.4. Land use patterns

The Land Tenure System is comprised of two categories: Public which is comprises of customary and government land) and private land. Mzuzu is a fast growing city and owes its origin to the Commonwealth Development Corporation's Tung Oil Estates established in Mzuzu in 1947. it became a municipality in 1980 and a city in 1985 The 1995 Mzuzu Urban Structure Plan designated land use zones comprising of high density permanent areas (120hectares), Traditional Housing areas (791 hectares), medium density housing areas (51 hectares), low density housing areas (75 hectares), and commercial areas (about 180 hectares). Mzuzu City Council is the main provider of land in the city (Mzuzu Urban Profile, 2011)

5.1.5. Settlement patterns

Majority of settlements in Mzuzu are nucleated and isolated forms of settlement due to its topography. The lack of an up-to-date development plan and a land use plan to guide and prepare for new housing developments has resulted in the growth of uncoordinated, haphazard and substandard housing known as informal settlements, which are mainly inhabited by the poor who cannot afford the high cost of good quality housing. Lack of access to basic urban services such as water and electricity, lack of social infrastructure such as roads

and lack of security of tenure for residents characterize the informal settlements. About 48.3 percent of Mzuzu's population lives in the informal settlements (Mzuzu Urban Profile, 2011)

5.1.6. Geology

Mzuzu city lies within the East African Great Rift Valley System which is characterized by intense faulting. Malawi basement complex and is dominated by the rocks of the amphibolite facies, gneisses of the Pre-Mafingi group. There is also a stretch of sedimentary and volcanic rocks particularly to the north of the city along the Mzuzu – Nkhata bay road. The other types found include nepheline senate, garnet – mica schist phallometers.

5.1.7. Hydrology

Mzuzu city has a network of main rivers with tributaries that form a dendritic drainage pattern. The city has some wetlands that are prone to flooding during rainy season and the drainage system is poor that cause the rivers to within the city to flood. The area has major rivers that include Lunyangwa river that has its source from Lunyangwa mountains. Some of the major rivers present are; Kalumba, Matuli, Kajiti, Thukutu, Chamono, kayuzi, Viyeki, Kaligomba and Ching'ambo as shown in figure 5.3 below (Meteo, Hydro report, 2012).

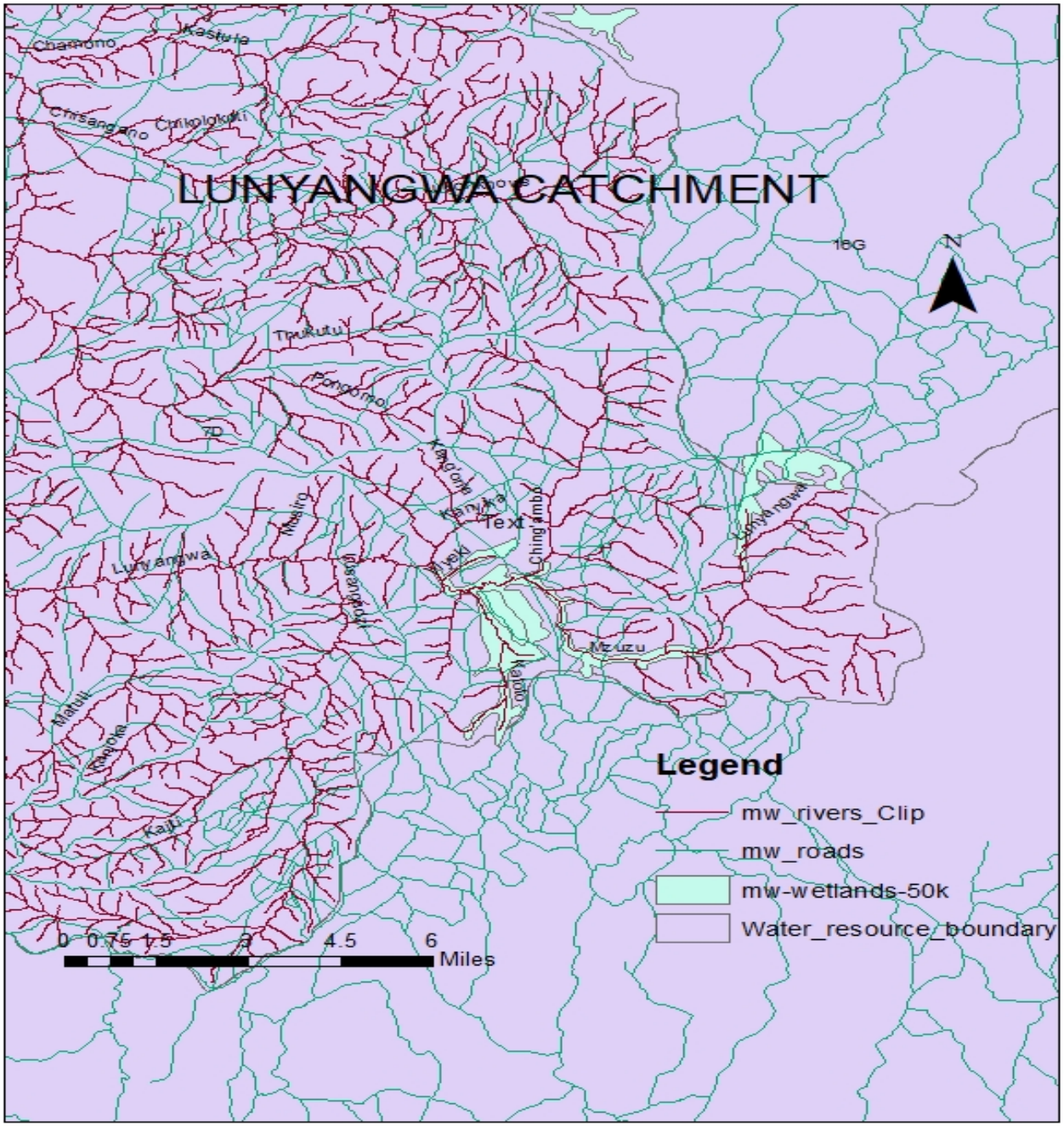

Figure 5.3: Average rainfall for the project area

5.2. BIOLOGICAL CHARACTERISTICS OF THE AREA

5.2.1. Flora for Mzuzu City

The vegetation of Mzuzu is basically closed canopy woodlands dominated by Brachystegia species. These woodlands developed into thick forest popularly known as Miombo woodlands. 'Miombo' Woodlands comprise forestlands in the plateau, hills and escarpments that have medium to high rainfall. The Lunyangwa Dam is located in the Kaning'ina Forest Reserve. Said Reserve hosts a lot of rare species of monocots, dicots and pteridophytes. The main indigenous tree species are Brachystegia wood land, montane grass lands and Pterecarpus angolensis. Major tree species found include: *Jubenardia floribunda, Azadirachta indica*, *Brachystegia boehmii* (Mombo/Miombo),*Brachystegiaspiciformis*

(Tsamba/Muputu),*Brachystegia utilis* (Long-Pod) *Burkeaafricana* (Mufulu) *Erythrina abyssinica* (Chitimbe)*,Parinari curatelliafolia* (Mbula/Muula) *Syzygium gerrardii* (Forest Waterberry), *Syzigium guineense* (Katope/Waterberry),*Syzygum cordatum* (Jambula Tree)*,Uapaca kirkiana* (Masuku)*Bauhinia thonningii* (Kachele)*.* Figure 5.4, shows the main flora for the project area.

Figure 5.4: Flora Captured at the Project Site

5.2.2 Flora of the project area

Through transect walks in the proposed project site (Lunyangwa Dam), all the dominant flora species that were surveyed were identified to species level. Further, the present ecological state of terrestrial and aquatic flora of the project area was thoroughly assessed to determine biodiversity species expected to occur within the ecosystem. It is anticipated that there will be some ecological disturbances/impacts in the project area as a result of the construction works associated with raising the Lunyangwa Dam. With this said, mitigation and avoidance measures must be taken to ensure the level of disturbance is minimal. The survey also aimed at identifying endemic and threatened (Critically Endangered, Endangered & Vulnerable) species according to the national and IUCN (2016) criteria, as well as the presence of Alien Invasive Species (AIS).

5.2.3 Threatened and endemic flora species of the project area

In all, none of the vegetation groups listed are endemic or threatened from a conservation perspective; implementation of said dam raising project will therefore have minimal impacts on flora in the project area. It must however be stressed that due to the prevalence and water retention characteristics of *Syzigum* spp*,* measures should be taken in effort not to disturb said species.

5.2.4 Invasive Alien Species (IAS) of the project area

A total of two IAS were recorded from the project areas during the field survey. These are *Eucalyptus camaldulensis* (blue gum)*,* and *Siphonochilus aethoiopicus* (Wild ginger)*.* These species have potential to suppress the growth and displace indigenous species of flora and

fauna. On the other hand, *Eucalyptus camaldulensis tend* to lower the ground water table through excessive evapo-transpiration while *Siphonochilus aethoiopicus* tends to suppress the undergrowth of and further displace indigenous flora species of the pioneer species. Therefore, these species should not be planted in water catchment areas and wild ginger should be removed in areas with high diversity of indigenous flora and fauna.

5.2.5 Tree density estimates

The density of a species reflected in the project area shows the abundance of a species on an estimated average of 3,100 trees per hectare. The majority of flora species belonged to the *genera Brachystegia, Combretum and Uapacca.*The relative density was obtained from absolute density calculated from the total number of individual of a species present in a plot divided by the total area sampled (0.1 ha) using the following formula.

$$N = \frac{h}{a} \times C$$

Where:

N = estimated number of trees per hectare
h = one hectare
a = area of a plot in a hectare
C = number of trees counted in a plot

5.3. FAUNA

The fauna comprises small mammals, birds, fish, amphibians, reptiles and insects. Common and unique bird species include *Francolinus afer* (Red-necked Francolin), *Streptopelia semitorquata* (Red-eyed Dove), *Myioparus griseigularis* (Grey throated Tit-flycatcher), *Pyconotus barbatus* (Black-eyed Bulbul*)*, *Knysna Turaco Cerylerudis* (Pied kingfisher), *Cinnyris jugularis* (Sunbird), *Megaceryle maxima* (Giant kingfisher) and *Osprey* spp.The district also has a significant number of aquatic species ranging from fish, snails, reptiles and amphibians.The vegetation is dominated by different types of snake species including black mamba, green mamba, which are cold-blooded. There are also a few dragon flies and butterflies that thrive in the area.

5.3.1 Fauna species of the project areas

The fauna species of the project area were surveyed by walking slowly in major vegetation types and recording species that were seen and/or encountered during the field work. Fauna species that occur frequently in the project area are grasshoppersand dragonflies of different species. The data was supplemented by reviewing available literature, and conducting public consultations with relevant stakeholders.

5.3.2 Mammals

No mammal species were recorded during the field survey. However, it was reported during the public consultations that there are some mammal species in the project area. A total of six (6) mammal species were reported to be found in the project areas. This included *Phacochoerus africanus* (Warthog), *Cercopithecus* spp. (Monkeys), *Papio cynocephalus* (baboon), *Lepus microtis* (African common hare), *Mus* spp. (mice), *Silvicapra grimmia* (Common Duiker).

5.3.3 Threatened, endemic and Invasive Alien Species (IAS)in the project area

There are no mammal speciesor animal groups reported to be rare, endemic, or vulnerable or classified as threatened by the IUCN Red List in the project area. No IAS of mammal was recorded from the project area during the field survey and/or reported by stakeholders during the consultations.

5.3.4 Birds

A total of nine (9) species of birds were recorded from the project area during the field survey. Species are *Francolinus afer* (Red-necked Francolin), *Streptopelia semitorquata* (Red-eyed Dove), *Myioparus griseigularis* (Grey throated Tit-flycatcher), *Pyconotus barbatus* (Black-eyed Bulbul*)*, *Knysna Turaco*, *Cerylerudis* (Pied kingfisher), *Cinnyris jugularis* (Sunbird), *Megaceryle maxima* (Giant kingfisher) and *Osprey* spp as shown in figure 5.5.

Figure 5.5: Some bird species observed in the project site.

5.3.5 Threatened, endemic or Invasive Alien Bird Species (IAS) in the project area

None of the species recorded from the project area are threatened, endemic or Invasive Alien Species (IAS). No migratory birds were recorded from the project areas during the field survey.

5.4 Fish

No fish species were sampled during the field survey. However, during the public consultation with relevant stakeholders, the following fish species *Tilapia rendalli* (Matemba)*, Clarias gariepinus* (Bombe)*, Oreochromis karongae, Oreochromis squampinis*, *Clarias gariepinus (Mlamba)* and *Opsaridium macrocephalum, Aulonocara gertrudae*(Chingongu)*Ictalurus punctatus(*Catfish*)* were reported to occur in Lunyangwa Riverof the project areas.

5.5 SOCIO-ECONOMIC SETTING

5.5.1 Population characteristic

According to the National Statistic Survey report 2018 Mzuzu City had a population of 221, 272 people in the year 2018 (NSO Report 2018). The area to be supplied with water had a population of 86,206 in 2008 and was projected at 93,959 people in the year 2018 (Mzuzu WS Project-Design Report for priority works 2016). These are areas in and surrounding different water reservoirs of Lusangazi, Choma, Doroba, Nkhongolo, signal hill and Marymount.

During the household survey, the average household size for the proposed water project areas was 5 people, with most of the households being male headed.

5.5.2 Tribe and Ethnicity

Mzuzu city has a variety of ethnic groups and languages as is the main business hub in the northern region of Malawi. The common ethnic groups in the project area are Tumbuka, Tonga, Chichewa, Nkhonde, Lambya, Yao and Nyakyusa. Tumbuka, Tonga (Mzuzu Urban Profile 2013-2018). Chichewa, Nkhonde, Lambya, Yao and Nyakyusa are the common languages in the area. Additionally, some people speak foreign languages i.e. Swahili, Bemba, Chinese, Indian languages and Shona. This is mainly because Mzuzu city is the base for tourist that come to districts in the northern region.

During the household baseline survey, it was also observed that project area is composed of people different tribes as stated earlier. It was noted that 50.9 percent of the respondents were of Tumbuka tribe, seconded by Ngoni tribe which constituted 13% of the sampled population. The data also shows that there are a number of other ethnicities in the area such as Chewa, Lyambia and Tonga as indicated in figure 5.6.

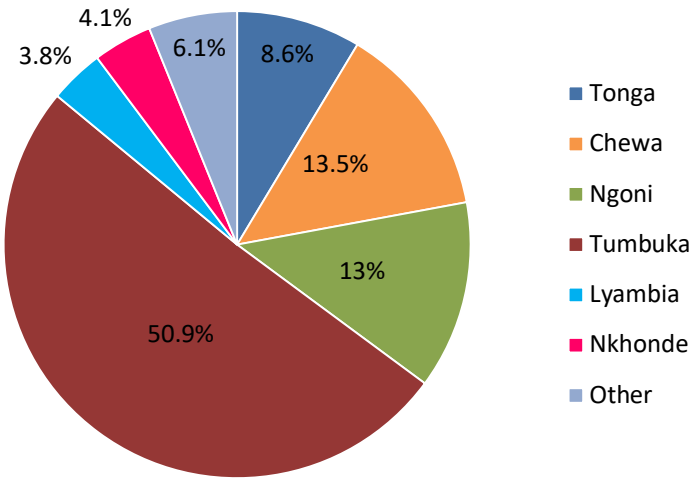

Figure 5.6: Ethnic tribes in the project area (household survey March 2019)

5.5.3 Religion

Mzuzu City is comprised 5 religious beliefs. Christianity comprise of 92%, Islam comprise of 4%, Traditional belief comprise of 0.1 %, 0.3% of the population do not belong to any religious

group and 3.6 belong to other types of religion. According to the baseline household survey that was conducted during the assessment, only 2 religious groups were identified; Christianity comprised of 98.3% and 1.7% were Islam. Figure 5.7 shows the composition of the religions in the proposed project areas.

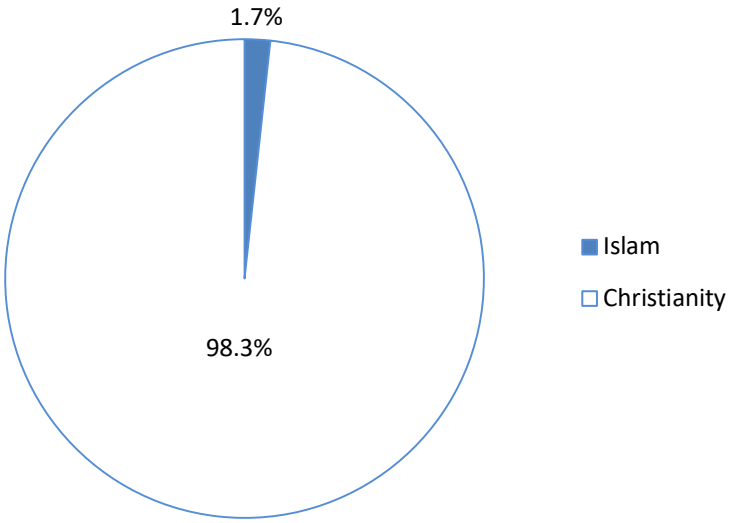

Figure 5.7: Composition of the religions (Household Survey March, 2019).

5.5.4 Livelihood and income

The major sources of employment in the project area are agriculture, enterprise, formal and informal employment (Mzuzu Urban profile 2008). According to the household survey that was conducted, formal employment was identified as a principle source of income with 48.9 percent. This includes employees from the private sector for different organisations and public (government employees). In addition, the people are also involved in Informal employment in form of piece works with 9.8%, commercial agriculture and trading (business-25.3%) for income source and livelihood. Figure 5.8 shows common sources of income in the project area.

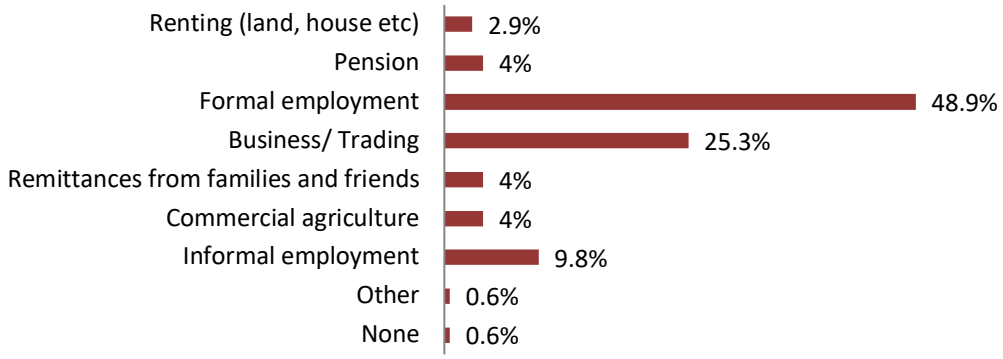

Figure 5.8: Income sources in the project area (HH survey, March 2019)

From both primary and secondary sources of income, it was noted that on average income per month was between MK 50,000 to 100,000 with 31.9% and seconded by MK20,001 to

50,000 with 20.5%. These sources of income also include pensions, remittances and any other. Figure 5.9 shows monthly income levels for the project area.

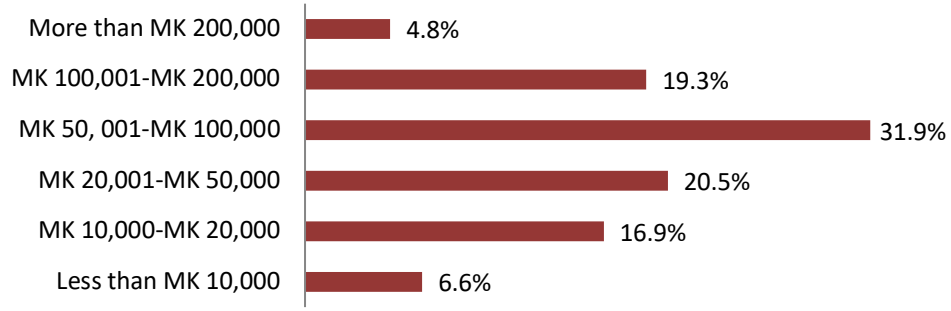

Figure 5.9: **Income per month (Household survey, March 2019).**

5.5.5 Education

There are both public and public schools in Mzuzu City. In total there are 47 primary schools in the city; out of which 40 are public primary schools and 7 are registered private schools. 44 secondary schools exist in the city; 27 are public secondary schools which include 3 conventional secondary schools and 7 community day secondary schools (CDSS), 17 are registered private secondary schools. There is also the Mzuzu University (Mzuni) and Mzuzu Technical College in the city. These provide tertiary education to students from all over the country.

Mzuzu city has a very high literacy rate of 88% which is above the average rate of Malawi (64%). Out of the sampled population 47.7 percent of the respondents attended school up to secondary level. Figure 5.10 shows education levels for respondents that were interviewed in the survey

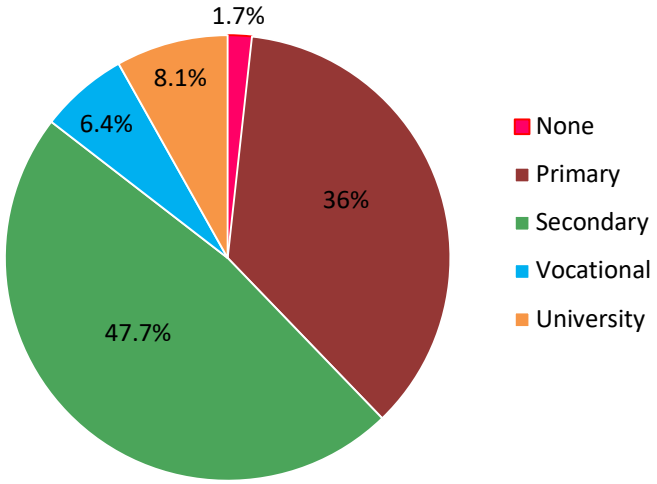

Figure 5.10: Income per month (Household survey, March 2019).

The household survey and stakeholder consultations also investigated literacy rates and challenges in education that lead to school drop-out rate. It was noted during consultations that dropout rates are generally low and pass rate is high in the project area. At the time of investigations there are no organisations focusing on improving education. However, the City faces challenges in providing quality education in the area and these include;

- Lack of enough secondary schools in the City;
- Lack of good learning environment and materials as some schools do not have laboratory facilities;
- Lack of qualified teachers especially in community secondary schools and
- Teacher shortages

According to the household survey, the principle challenge in education for households is the cost of accessing education which includes the cost for tuition fees and cost for buying school materials. In addition, distance to school, illness and early marriages are other challenging factors in accessing and completing education. Figure 5.11, shows some of the challenges that the communities face in accessing education.

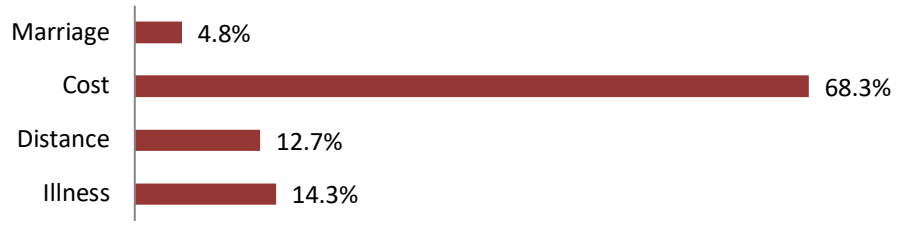

Figure 5.11: **Challenges communities face accessing education**

The water supply project will have an impact in education as some schools will connect to the water supply. In addition, increased water supply will reduce the duration of no water for schools which are already connected. This will later improve sanitation, hygiene and health in schools especially in boarding schools as they require water every day.

5.5.6 Health situation for the project area

The leading causes of morbidity in Mzuzu City are malaria, upper respiratory infections, skin conditions and diarrhoea (Mzuzu Urban Profile 2013-2018). Malaria is the major cause and it contributes up to 30 percent of cause the causes of illness and morbidity in Mzuzu City.

According to the data collected during the household survey, malaria, chronic respiratory infections and water related diseases are the major diseases that affect people in the project area. It was noted from the consultation's that negligence, poverty and lack of safe water are the main causes of these diseases. Figure 5.12 shows major diseases in the project area.

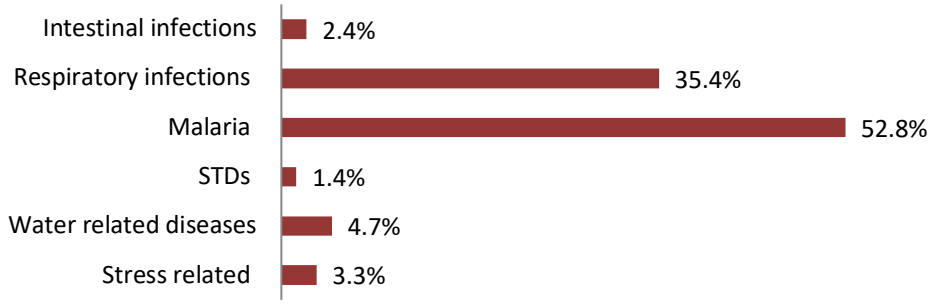

Figure 5.12:**Common diseases (ESIA Household Survey, March 2019)**

During the household survey it was also noted that distance and poor health services are the major health problems in the area in addition. HIV and AIDS is a major public health problem in Mzuzu and the prevalence rate was at 7 % in 2015 which was a bit higher as compared to the district which was at 6% with most affected group of people in the productive age group (15 – 49 years). This resulted to reduced productivity, absenteeism, early terminal benefits, loss of highly qualified and skilled labour, overstretched health service system, increased medical and cost, increase in the number of orphans and growing social economic insecurity. Hence there have been interventions from government and non-governmental organisations to help in working to reduce the speed of the disease.

During the consultations, it was recommended that the project implementers should add sensitization of communities on water management and sanitation and hygiene as part of the project so that the positive impacts are enhanced.

a. Accessibility to health services

There are both private and public health posts for basic services to the public and one referral hospital which people access health care services in the city. There are 5 government health facilities which also includes the Mzuzu Central Hospital which is now extended to increase number of beds at the hospital, 14 Private clinics and 3 Christian Health Association of Malawi (CHAM) health facilities. Table 5.1 represents annual patient numbers for selected health facilities.

Table 5.1: Annual patient numbers for selected health facilities

No	Name of health facility	Annual patient numbers
1.	Mzuzu Central Hospital	152,777
2.	Mzuzu Urban Health Centre	105,308
3.	St John Mission Hospital	19,961
4.	PIO Clinic	12,917
5.	Nkholongo Health Centre	23,960

b. Distance to the health facilities

From the household survey it was noted that over half (52 %) of the sampled population indicated that they spent less than 30 minutes to access health care services. However, others travel a distance of more than 30 minutes because of unequal distribution of health services. Figure 5.13 shows distances taken to reach the health facilities.

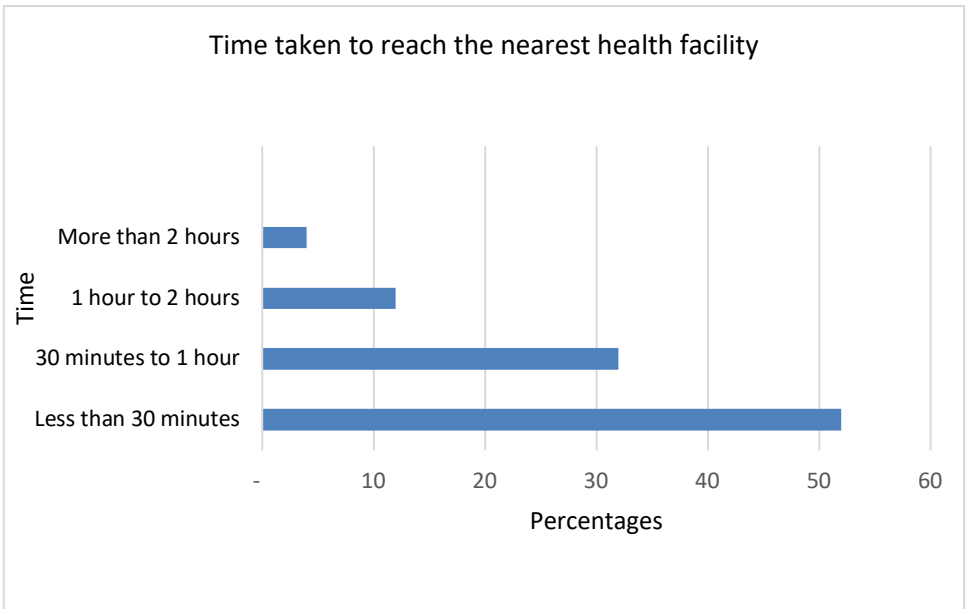

Figure 5.13: **Time taken to reach to the nearest health facility (ESIA Household Survey, March 2019)**

5.5.7 Agricultural production

Agriculture in form of small and medium scale is one of the main sources of income in the area as stated earlier. The main crops that are grown in the project area include Maize, groundnuts, pigeon peas, tobacco, beans and rice. Rice, Pigeon peas and tobacco are mainly grown as cash crop, while the lest are mainly for food. There is also livestock farming in the project area. Cattle, goats, pig and poultry are the common livestock that are reared either for consumption or for sale.

Urban Agriculture, especially in the Western and Northern part of Mzuzu where informal settlements continue to spread is pressured by the growing demand for Housing and other land uses. In addition, the Urban agricultural households receive very limited agricultural extension services which affects urban agricultural productivity.

5.5.8 Tourism

Mzuzu City receives both domestic and international tourists with domestic tourists taking an upper hand. The city is not a major tourist destination; however, there are cultural facilities in the City, like the Regional Museum, National Library Services. In addition, the City is well situated in connection to major tourist destinations like Lake Malawi and the northern wild reserve areas and makes it a base for tourist visiting the northern region. The tourism sector faces challenges of under-developed tourist facilities due to limited access to credit and inadequate publicity.

5.5.9 Trade and commerce

Mzuzu city is the main business hub in the northern region of Malawi and it provides many trade opportunities, which induces demand for goods and services at the at the city and the project area. There are manufacturing companies which include medication, coffee, cosmetics and timber production in Mzuzu city. Mzuzu is an important trading centre especially for imported products from Tanzania port of Dar es Salaam which is one of the

major ports that Malawi uses when transporting goods from different countries because of its positioning.

Development of various forms of trade is visible at the city and surrounding areas, as evidenced by the presence of the following:

a) Banks i.e. Reserve bank of Malawi branch, National Bank, Standard Bank, First Merchant Bank (FMB), New Building Society (NBS) Bank, Malawi Savings Bank and National Bank of Malawi (NBM)
b) Shops for various items including the Toyota Malawi workshop
c) Curios (handcraft materials).

Currently, the Mzuzu City is planning to construct a new stadium, an airport and expand its town. The city for has not yet identified a site for the proposed stadium and the airport. The Council receives a growing number of applications for warehouses, petrol stations, commercial shops, office space and lodges/guesthouses. This is in response to the growing demand for such facilities throughout the City. As the number of businesses and facilitates requiring water are increasing in the city, water demands will also increase to meet the growing population. This expansion of water supply project will therefore have an impact in this area.

5.5.10 Transport, telecommunication and other services

Mzuzu City has a series of roads and footpaths which link various areas such as residential areas, trading centers, institutions and other districts. Different forms of transport are used in the area which includes, minibuses, buses, taxis, wheelbarrows and bicycles. The bicycles are the most popular transport mode in the project area.

There are different road networks in the city which include; Main, Tertiary, District, Secondary, Estate, Feeder and Distributor roads. The Lilongwe - Mzuzu - Karonga (M1) road is the main road that passes through the City to Karonga district and there is also the Nkhata Bay - Mzuzu (M5) road which connects Lilongwe - Mzuzu - Karonga (M1) road at Katoto Freedom Park. It is from these two main roads that roads of various categories emanate into the central business area, institutions and residential areas.

Telecommunication services are available in the project area in form of telephone, cellular phones, telex and internet. Telecommunication networks in the City comprise a landline network and two cellular networks (Airtel and TNM). There are no post offices specifically located in the area of proposed water supply as such people access them in Mzuzu city (Mzuzu Post Office). Services Rendered by these post offices and postal agencies include: Sales of postal stamps stationery, postal orders and money order, payments and Issues of Postal and money orders and acceptance and delivery of postal ordinary letters, parcels, registers, express mail services, bills, and telegrams. Furthermore, other institution providing postal services in the City include; Group Four Security (Pony), DHL, FedEx and Dot Net.

There are also radios and television networks in the city and project area. Additionally, the National Publications Limited (NPL) and the Daily Groups provides daily and weekly newspapers from street sellers as well as at some supermarkets.

5.5.11 Energy

Firewood is the main source of energy for cooking and boiling water in the project area as it was noted during the household survey. However, some households still use electricity and charcoal. Firewood is accessed through buying and collection. However, cost for buying firewood, long distances to access firewood and availability have posed a challenge in accessing firewood. Cost has also been a challenge for people that buy firewood. These challenges are because of increase in population which has resulted in high demand for energy resources like firewood.

There is electricity supplied by ESCOM in the project area and many houses are connected. ESCOM electricity is mainly used for lighting and not cooking as people have perceptions that its costly such that they can afford paying the bills. This puts more pressure on natural resources which has led to deforestation in some area of Mzuzu city. Other sources of energy like solar lamps and solar panels are also used in the area though in smaller amounts. Figure 5.14 shows energy sources that are mainly used for lighting.

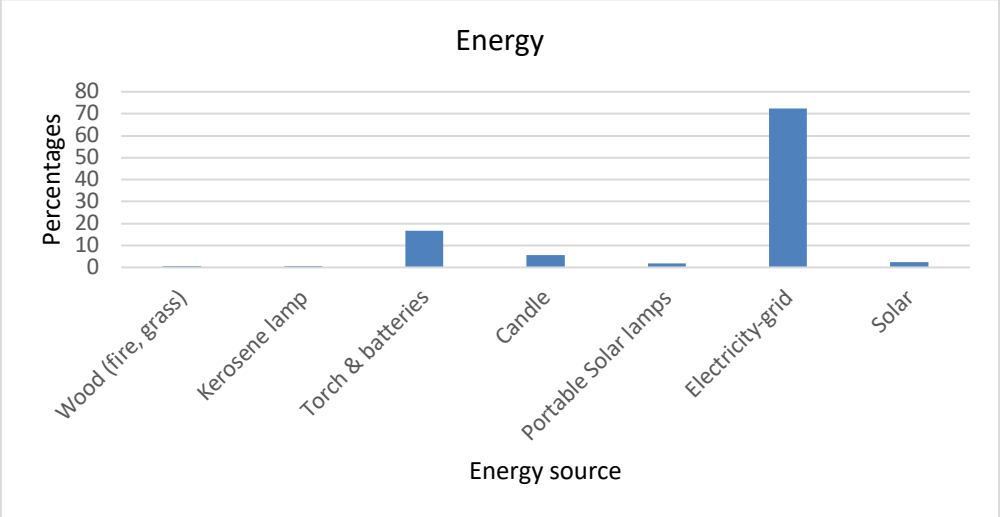

Figure 5.14: Energy sources used for lighting (ESIA Household Survey, March 2019)

5.5.12 Waste management

Indiscriminate disposal of solid waste is a challenge which is more prominent in market places, streets, open space, industrial, high density and traditional residential areas of Mzuzu City. According to the Mzuzu Urban Profile, amounts of solid waste generated in the city are estimated at about 171 kg per person per year. Services for solid waste collection and disposal in Mzuzu are provided by the Mzuzu City Council (MCC) and some private operators (who include Mr clean Malawi). The city council has a skip carrier which is used for collection of solid waste. It also has only one waste compactor. The council mainly collects solid waste from commercial, health institutions, and some industrial areas. Residential areas (particularly homes in high density and traditional housing areas) in the City are mostly not covered by solid waste collection services. The MCC has plans to extend its services for collecting waste to these areas and it is also encouraging more private operators to come in and assist with provision of the service to a growing population in the City.

Collected solid waste from the City is disposed at the Msilo waste management facility (figure 5.15) which is located in Mchengautuwa Township (approximately) 15km northwest from the Mzuzu City Centre. The waste management facility commissioned in 2017, covers a large area of 12ha is designed to serve the city for about 50 years. The facility being the only one of its kind in this country was planned to accommodate various waste management activities including waste sorting, composting (processing organic waste into manure), plastic recycling and biogas generation. The waste management activities at the Msilo facility are however not happening to a satisfactory extent, a thing which is resulting into piling up of garbage and increased breeding of flies at the facility.

Figure 5.15: Piled up garbage at the Msilo Waste Management Facility

The Mzuzu City Council as well as some health institutions such as Mzuzu Central Hospital and St John's Hospital have incinerators which are currently used for burning waste that cannot be disposed of at the waste management facility.

Mzuzu City has no Municipal conventional sewerage system. Only three institutions have localized sewerage systems with oxidation ponds. These are Moyale, SOBO (Castel Malawi Ltd) and Mzuzu Central Hospital. Septic tanks as well as pit latrines in the city are emptied when full using sewage vacuum emptying trucks. Some pit latrines are buried or abandoned when they are full. Services for emptying of septic tanks and pit latrines are currently provided by Moyale Barracks and some private companies (Mr Clean Malawi being majorly the sole private service provider). Mzuzu City Council stopped providing the emptying services after

their only vacuum tanker broke down in 2007. Waste that is emptied from pit latrines and septic tanks is disposed of at the only site for public sewage sludge ponds at Nkhorongo.

5.5.13 Sanitation and hygiene

As Mzuzu City has no Municipal conventional sewerage system, most homes and offices which have water closet toilets rely on use of septic tanks. Use of pit latrines is still largely common in the City particularly among low and some middle income homes. The Mzuzu Urban Profile puts usage of flush toilets in the City as a whole at some 9.9% of the total households. There is a problem of lack of adequate number of pit latrines among High-Density Traditional Housing Areas of the City. Other major sanitary concerns within the Mzuzu City are those of indiscriminate waste disposal and overflowing of waste from latrines and septic tanks, particularly in high density areas.

In the project area, as indicated in Figure 5.16, 58% of the respondents indicated that they use traditional pit latrines; with 20% using improved traditional pit latrines. About 15% of the respondents are using flush toilets connected to septic tanks and some 6.6% are using ventilated improved pit latrines.

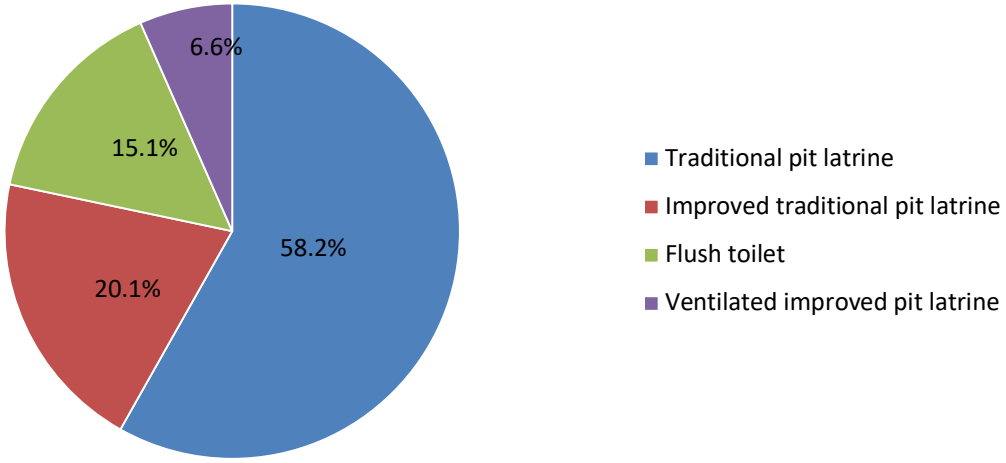

Figure 5.16: Common types of latrines

5.5.14 Emergency responses (disaster preparedness)

Each year Mzuzu faces disasters due to heavy rains and flooding of rivers. Houses are demolished and sometimes agricultural fields are washed away. Therefore, a Disaster Risk Management Committee (CDRMC) was founded in 2009. The Health Department of the City Council operates as the Secretary to the committee with several sectors and NGOs (Red Cross) being members in this committee. The Committee organizes transport for victims of disasters and conducts fundraising campaigns (rallies) to compensate the victims. Furthermore, the Committee enquires business holders to contribute goods (e.g. maize) to distribute among victims and come up with risk assessments. Members of the committee also conduct mass publicity to communities living in disaster prone areas/sites i.e. dambos, landslides areas.

5.3.1. Access to water

In Mzuzu City, potable water is mainly supplied by the Northern Region Water Board which provides the water through piped connections to approximately 82% of households in the City (Mzuzu Urban Profile, 2013-2018). A study of WASH status for the low income areas of the City under the Peri-Urban Hygiene and Sanitation project in 2014 revealed that 79% of homes in the high density areas of the City are using piped water from NRWB with 14% of the homes in the high density areas using NRWB water kiosks as their primary source of potable water. Nevertheless, a remaining larger proportion of about 18% of the total population in the City consumes water from wells, rivers, boreholes, and rainwater harvesting. This remaining proportion not dependent on treated water from NRWB still remains at a high risk of waterborne ailments. In the project area, the majority of households primarily use water supplied by the NRWB through private piped connections.

As indicated in figure 5.17, frequent water shortages, high water charges and poor water quality the major challenges that people in the project area are facing in relation to water supply. Shortages of water in the project area could most likely be attributed to the fact that the current water demand for the Mzuzu water supply system has exceeded the available water supply capacity. The high water demand is contributing water interruptions due to limited availability of water supply particularly during dry periods when less water is available for abstraction.

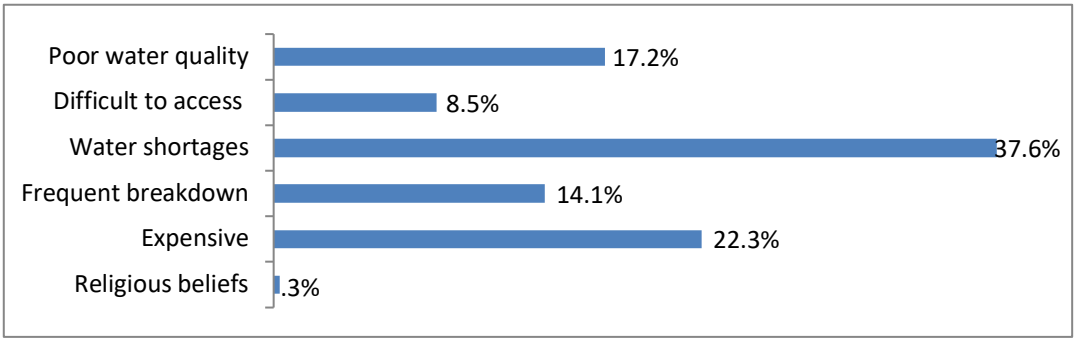

Figure 5.17: Water supply challenges

The government of Malawi recommends a maximum walking distance of 500m and 300m for rural and urban areas respectively and a round-up time of less than 30 minutes to fetch water. Due to the fact that more households in the project area have private piped water connections, the majority of the homes (about 80%) spend round-up walking times of less than 15 minutes to get to the nearest water source. Figure 5.18 presents the times people spend to walk to a water source

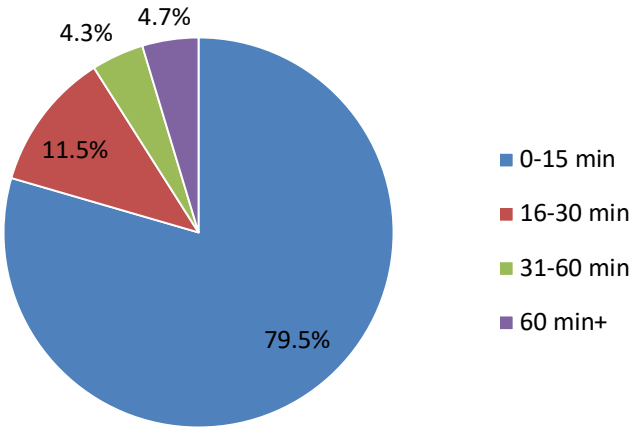

Figure 5.18: Maximum walking time to nearest water point

Again due to the fact that most households in the project area have private piped water connections, it was established from the household survey that most of the homes (about 69%) spend times of less than 5 minutes to draw water from their water points. Figure 5.19 gives details of average waiting times at water points for the communities to draw water in the project area.

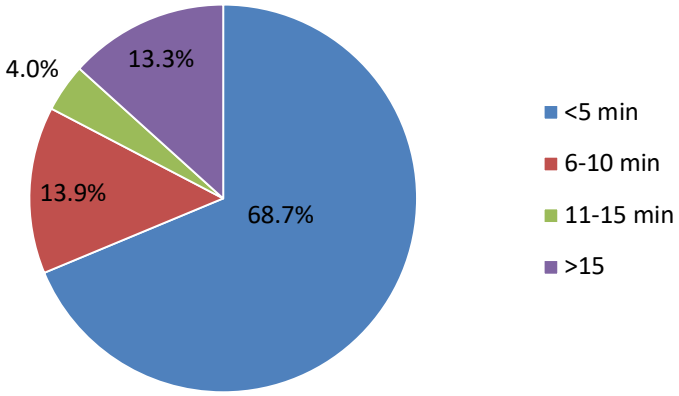

Figure 5.19: Waiting time at the water point

5.5.15 Gender and sustainable development

Communities in project area are deeply patrilineal which directly impacts on gender roles and equality in the area. The household survey assessed women participation in development activities. It was noted that men and women of the project area work together in development activities in areas of education, water, sanitation and hygiene, nutrition and roads maintenance. Women also participate in decision making in the communities and some were seen to be village leaders during the household assessments. Women in the project area are responsible for fetching water and carrying out sanitation and hygiene activities by ensuring that the households and surroundings are clean and that their households are free of lack of good sanitation and hygiene related diseases. These women also travel long distances to fetch water, especially in the dry season when water is scare.

Implementation of the Mzuzu Water Supply Project will significantly reduce the burden of walking long distances to the rivers and wells to fetch water in the project area. Hence, the women will have more productivity time and will be able to contribute more to social and economic development through increased participation.

5.5.16 Degree of gender mainstreaming

Gender mainstreaming refers to promoting gender equality within projects and/or organisations thereby enabling men and women to fully participate within the organisation and enjoy equal opportunities.

The Northern Region Water Board has a specific gender policy in place that was approved in 2016. The gender policy key principles include equal opportunities for both males and females. In addition, the Board considers itself to be an equal opportunity employer and may also resort to affirmative action measures in line with the Malawian constitution in order to balance the female-male ratio in the Board.

5.5.17 Security and fire prevention services

Security in Mzuzu City is provided by Malawi Police Service and other private security services.

Mzuzu City has one Police Station. The Station serves both urban and peripheral rural population. The station is located in Jombo Ward along Orton Chirwa Avenue opposite Regional Information Offices. There are also six Police Listening Units in the City. These are located in Luwinga, Bishop, Chibavi, City centre, Chiputula and Matabwa market.

There are also community policing services in the city with an aim of curbing crime and compliment police efforts, residents of some areas have increased number of their crime prevention committees and such committees include Neighbourhood Watch and Community Policing groups in order to protect themselves and their properties against criminals.

In terms of firefighting, Mzuzu City Council has a Fire brigade located adjacent to the compound of the Department of Parks and Recreation. It is equipped with two fire Engines that have limited capacity. However, the Brigade lacks all modern equipment that is needed for a growing City like Mzuzu. The Vision of the Council is that the Brigade should be equipped to attend to all forms of emergencies happening in the City and adjacent areas. Other firefighting services are at Mzuzu Airport and Moyale Barracks. In addition, the city also faces challenges in carrying out their work properly due to poor road network, inadequate street naming, emergency cases not reported in proper time and shortage of Fire Engines and Hydrants

CHAPTER 6 : ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACT

Environmental and social impacts are defined as the alteration to environmental and socio-economic baseline conditions, or creation of a new set of negative or positive environmental and social consequences, caused by the implementation of project activities. These impacts are classified as negative or positive, direct or indirect, short-term or long-term, reversible or irreversible; and cumulative (e.g. in combination with other projects). This Chapter has identified and assessed the potential environmental and social impacts from implementing the Dam raising Construction works at Lunyangwa.

6.1. METHODS FOR IMPACT IDENTIFICATION

The identification of the impacts of the project will be established by an "environmental matrix" (Table 6.1) opposing, on one hand, the **potential sources of impacts** tied to the water supply system's pre-construction, construction and operation, and, on the other hand, all of the biophysical and socioeconomic components of the project. This will be based on the following information:

- **Environmental and Social Impact Screening** conducted during feasibility studies.
- **Technical aspects of the project:** This enabled the identification of potential sources of impacts, based on the analysis of the technical characteristics of the infrastructures to be built, as well as the construction activities, methods and schedule. The project activities are described in detail in chapter 3.
- **Environmental and socio-economic baseline data (environmental and social components):** This information facilitated understanding of the biophysical, social and economic contexts in which the project will be implemented and identification of issues that should be considered. The environmental and social components are described in chapter 4.
- **Issues and concerns raised by stakeholders and project affected persons:** These issues, from stakeholder consultations, assisted in identification of the main concerns related to the project. Public issues and concerns are discussed in chapter 9.

The **potential sources of impacts** can be defined as all the activities linked to the project likely to have an impact on the biophysical or socioeconomic environment. The sources of impact are grouped by project phase: planning and design, construction, demobilisation, operation and maintenance and decommissioning phases.

It should be noted that impacts resulting from the project's decommissioning phase were neither identified nor assessed in the present report. Indeed, it is anticipated that the water supply system will be continuously maintained and operated for several decades. This very long useable life makes it very difficult and potentially counter-productive to predict, at this stage, the circumstances under which the project's structures might ultimately be decommissioned. However, it is recommended to conduct the full assessment of the decommissioning phase's impacts when enough information becomes available.

Table 6.1: Environmental matrix used in the study

Environmental Components / Potential sources of impacts	Air		Water		Soil	Biological Components					Socio components							
	Ambient air/quality	Noise and vibration	Surface water resources	Surface water quality and sediments	Soils	Flora	Terrestrial Fauna	Aquatic fauna	Biodiversity	Habitats	Land planning	Cultural heritage and sites	Local communities	Livelihoods	Health and safety	Gender	Local economy	Aesthetic and amenity values
Planning and designing phase																		
Land acquisition														X				
Construction phase																		
Presence of workers		X				X							x	x	x	x	x	
Site preparation	X	X	X	X	x	X	x	x	x	x	x		x		x	x	x	
Purchase of materials, goods and services			X										x	x	x	x	x	
Transportation and circulation	X	X	X	X	x		X							x	x		x	x
Construction of facility and associated structures	X	X	X	X	x	x	X	x	x	x			x	x	x	x	x	
Waste management			X	X											x			
Demobilisation phase																		
Removal of temporary structures	X	X	X		x								x	x	x	x		x
Worksites restoration	X	X		X	x	x		x			x		x		x		x	x
Operation phase																		
Presence of water supply system infrastructure																		x

Environmental Components / Potential sources of impacts	Air		Water		Soil	Biological Components					Socio components							
	Ambient air/quality	Noise and vibration	Surface water resources	Surface water quality and sediments	Soils	Flora	Terrestrial Fauna	Aquatic fauna	Biodiversity	Habitats	Land planning	Cultural heritage and sites	Local communities	Livelihoods	Health and safety	Gender	Local economy	Aesthetic and amenity values
Water abstraction, pumping, treatment, reservoir and transmission and distribution			X					x					x	x				
Maintenance and repair	X	X											x	x	x	x	x	
Presence of workers						x	X	x	x	x			x	x	x	x	x	x
Transportation and circulation																		
Purchase of materials, goods and services													X	x	x	x	x	

6.2. ANALYSIS OF POTENTIAL POSITIVE IMPACTS

6.2.1. Positive Impacts During Planning and Design

a. Employment Opportunity for Skilled and unskilled Workers

During the planning phase of the project engineers will be required to visit the proposed site in order to come up with the appropriate design of the dam. Surveyors will also be required to visit the proposed site to gather requisite data for the project, provide data relevant to the shape and contour of the earth's surface for engineering and map making.

Local labourers will be involved during bush clearing to create access road to the proposed site.

Recommended Enhancement Measures

i. The client (NRWB) to provide support for the team involved in the planning and design by;
- Providing primary data;
- Allowing their official to accompany and show them around;
- Introduce the planning team to stakeholders of the project i.e. Community Leaders;
- Help the team to source other important data from the key stakeholders.

ii. The team to be composed of members with the appropriate qualifications and expertise to provide pre-requisite information for the production of accurate designs.

6.2.2. Positive Impacts During Construction Phase

a. Source of employment and business

One of the most direct positive impacts of the Dam raising Construction is the creation of job opportunities that commensurate with the level of skill for the people living in areas surrounding the Lunyangwa Dam. Indirectly, the people involved in small scale business enterprises will also benefit by selling food stuffs to the people working in the construction sites. The projects will present a great opportunity for women and people living with disability to be employed; this will in turn enhance the situation of women and the disabled living in the surrounding areas of the dam.

Recommended Enhancement Measures

i. The contractor should willingly consider giving job opportunities to the people living in the surrounding areas of the Lunyangwa Dam.
ii. The contractor should comply to both the gender policy and the Labour Act
iii. Where possible the contractor should be encouraged to buy the construction materials within the city in order to empower the local business enterprises.
iv. The contractor should only employ workers who present legitimate proof of identification that they are above 18 years of age.
v. The contractor to make sure that employees are treated and paid fairly and that records for proof of payment are available at the site.

vi. The women and people living with a disability should be given tasks that match their physical capability and level of skill. Wages must at the minimum meet the minimum wage standard and overtime must be paid on time.

vii. Workers must be sensitized to save and invest during project implementation. Encourage the workers to participate in Community Services Investment programmes (COMSIP) and Village Saving and Loans groups.

b. Increase in trade opportunities

The project will provide business opportunities to different suppliers including legitimate quarry sites and cement suppliers within the city. Local business enterprise will also be required to provide essential building materials for the project. The quarries suppliers will provide stone aggregates and quarry dust for the concrete works. The usage of quarry dust from the legit quarries will prevent the usage of river sand that is mined from the rivers within the city thereby loosening the banks and encouraging siltation and soil erosion. This will in turn increase government revenue through tax collected from wages and goods.

Recommended Enhancement Measures

i. The contractor to source building materials from the local licenced dealers e.g. quarry dust from the licensed quarries within the city.

ii. Pay the building material suppliers within the agreed time.

iii. Support and promote of entrepreneurship skills amongst communities and business people in the project area by engaging them where appropriate.

iv. Promote village savings and loan (VSL) schemes during project implementation.

c. Training opportunities in vocational skills for youth

The construction works will require unskilled labourers to undertake some tasks and provide support to technicians such as bricklayers. These labourers have the opportunity to learn new skills in construction through exposure and on the job attachment with capable personnel. Such opportunity will provide vocational training for many unskilled labourers. New skills and work experience will help the Un-skilled worker to find formal employment in the later years.

Recommended Enhancement Measures

i. Contractors to consider high potential women for skills training program.

ii. Contractors to consider focused training program to optimize skills transfer to unskilled workers.

d. Improvement of natural resources and wildlife conservation

The Lunyangwa dam is located within the outskirts of Kaning'ina Forest reserve. The contractor will be encouraged to avoid the usage of wood products for construction, but rather opt for materials such as metal shutters and poles; as opposed to the commonly used block boards, timbers and wooden poles. The durability of metal shutters means they can be reused repeatedly for longer periods, leading to conservation of forest products.

Recommended Enhancement Measures

i. Promote and support wildlife conservation programs by engaging the Ministry of natural resources and wildlife and the nearby Mzuzu Government Secondary School wildlife club.
ii. Train the employees to understand the importance of wildlife.
iii. Encourage the employees to use firewood from the artificial trees.
iv. Where possible, construction vehicles and machinery to use the designated access roads to the construction site.
v. The contractor to provide a traffic management plan for the sites
vi. Impose a strict penalty for all employees that will be involved in poaching of wild animals.
vii. Add the contact numbers for the department of wild life on the Emergency contact list so that employees may easily access it whenever they encounter an immediate danger posed by wild animals.
viii. Promote the usage of anti-snake chemicals so that a proper radius is created for the workers.

6.2.3. Positive Impacts During Operation and Maintenance Phase

a. Improved water supply and access to potable water source

The project is expected to result in improved steady supply of potable water in the City of Mzuzu, Ekwendeni Town and the surrounding areas. The availability of portable water will also improve the productivity of women as they will not be spending their time fetching for water when supply is interrupted. Improved water supply will enable more households within Mzuzu City to be connected to the piped water. This is expected to result in easy access to potable water; the improved access to clean water will reduce the hustles involved when certain households do not have the easy access to portable water. It is deeply imbedded in our culture that women and children should bear the responsibility of fetching for water, this easy access to clean water will help children concentrate more on their academic work and this will positively impact school attendance.

Recommended enhancement measures:

i. Ensure water reservoir tanks have adequate water all the time to cover periods of no water pumping
ii. Sustain the desired performance of the water supply system through timely preventive maintenance.
iii. Quickly carryout maintenance works and restore water supply when there are problems.
iv. Adequately treat water at the treatment plant.
v. Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the supply points and implement control measures where results are below safe water standards.
vi. Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules
vii. Sensitize the water users on proper water management practices, water pricing and importance of payments of water bills in time.
viii. Mzuzu City Council (MCC) should provide planned expansion programme

ix. Process water connection applications and provide water to the communities as quickly as possible;
x. Ensure that the recommended maximum distances of 500 metres from houses to a water point is observed when constructing communal water points;
xi. Ensure water is available all the time at the water points;
xii. Encourage communities to form water kiosks committees in order to establish ownerships of the water draw off points.

a) Improved sanitation, hygiene and health

The community that has access to clean water is a healthier community. The Increased availability of treated water will help prevent the community from consuming untreated water that has the potential to spread communicable water borne diseases. Treated water will be available to households, public places and institutions including health centres, markets, trading canters and schools, for use in toilets and washrooms; thereby enhancing sanitation and hygiene. Improved water quality for consumption will also reduce health risks to the people including expecting mothers and infants; and this will translate into financial saving through reduced cost for medical treatment.

Recommended enhancement measures:

i. Sensitize communities on hygienic practices for handling water to avoid secondary contamination;
ii. Encourage the community members to be vigilant in reporting water leakages and broken pipes;
iii. Promote general sanitation practices amongst communities in the project area;
iv. Conduct trainings aimed at building the capacity of water kiosks committee;
v. Monitor the quality of water and promote health and hygiene at water points;
vi. Support initiatives implemented by community-based organizations to promote health, sanitation and hygiene;
vii. Ensure there is adequate drainage within the community water points to avoid accumulation of stagnant waters which lead to rapid mosquito breeding as well as other waterborne parasites.

b) Improved socio-economic situation of the communities

The lost time realized due to employee sickness affects the productivity of an individual and in turn stifles the productivity of the whole company. Hence the improved health of the people will result in increased productivity and consequently poverty reduction. The time saved by women and children in fetching water could be utilized in doing other income earning activities, leading to economic empowerment of the women and their families.

Recommended enhancement measures

i. Provide quality water, with minimal loss of supply, through system monitoring and regular maintenance.
ii. Support women and other vulnerable groups to start and operate businesses through appropriate training and start-up capital.

iii. Make water costs affordable.

c) Enhanced gender and women participation in development

Women form a high percentage of the project areas' population. however, they are inadequately participating in development activities due the burden of fetching water. Increased availability of water (including short distances to fetch water) will relieve them of these burdens, thereby availing them the opportunity to engage in development activities.

Recommended enhancement measures: folk

i. Sensitize recruiting authorities to employ about 40% to 60% women according to the National Gender Policy
ii. Ensure there are also women in important positions.
iii. Promote gender mainstreaming in development activities through sensitization, advocacy and awareness.
iv. Economically empower women within affected communities by linking them with the Community Services Investment Programmes (COMSIP)

d) Education benefits to the girl child

Availability of water will remove the burden of collecting water for the girl child, leading to improved academic pursuits. Improved academic pursuit of the girl child at early stage leads to further education and competitiveness in the job market, which is an exit route from poverty.

Recommended enhancement measures

i. Conduct sensitizations aimed at encouraging girls to enrol in schools;
ii. Provide the necessary support and adequate resources to schools to ensure that they have adequate resources for the provision of quality of education;
iii. Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees;
iv. Provide adequate water and appropriate sanitation facilities in schools to support female students.

e) Employment Opportunities

It is estimated that a good number of people will be employed by the project**.** A majority will be from surrounding communities of the Lunyangwa dam. The income generated by the people will certainly boast household income and food security in the area.

Recommended Enhancement Measures

i. Where feasible, consider providing job opportunities to local qualified people
ii. Adequate occupational health and safety standards should be provided to ensure the work environment is conducive.
iii. Consider employing both qualified female and male workers to enhance income distribution among both men and women.
iv. The women and people living with disability should be given tasks that commensurate with their physical ability and level of skills.

f) Increased development

Availability of potable water improves the economic value of land and property and is one of the development pushers. A lot of investments and businesses are established in areas where there are sufficient and reliable water supply services. This is also expected to occur in the newly developed areas where water distribution will be extended. Water supply by NRWB will also be less costly than when the customers provide own water supply.

To institutions, the project will relieve the burden of providing water to their respective communities when it is not their responsibility and allow them to concentrate on their core business and in the process serve financial resources for their activities.

Recommended enhancement measures

i. New water connection applications must be treated within set time.
ii. Provide adequate potable water supply to the new areas.
iii. Sensitize the communities to report leakages and breakages of pipes.
iv. The Town Council must ensure that development activities are implemented within Council plans and laws

6.3. ANALYSIS OF POTENTIAL NEGATIVE IMPACTS

6.3.1. Negative impacts during construction phase

Degradation of water quality

Construction activities for the dam has potential to affect water quality due to waste mortar and debris falling from the higher levels (new construction) to the spillway of the dam, resulting into water turbidity. These sediments could be pumped together with the water and may clog and damage downstream equipment. Water with high level of turbidity requires more chemicals for treatment. There is a direct correlation between level of water turbidity and the amount of resources used for treatment i.e. more resources are required to treat the water.

Fuel and lubricating oils have the potential to contaminate the water at the two river intakes if they leak during construction work. This may affect the flora and fauna along the river. Construction debris, dirt, silt and soil may run into natural waterways, causing pollution and siltation.

Recommended Mitigation Measures

i. Provide a schedule for excavation works to the treatment plant team so that they plan to pump water in harmony with the works schedule;
ii. Encourage use of mortar and debris traps during construction;
iii. Strategic stakeholder consultations must be done comprehensively to make sure that those who could potentially be affected are aware of the works program.
iv. Mix cement in areas, which are not directly connected to natural drainage systems;
v. Shutters to be properly erected and monitored to check if there are any unallowable spaces in between the joints which may lead to concrete leakages;
vi. Store cement, paints, lubricants and fuels in lined and covered areas;

vii. Provide appropriate spill kits when working near water courses;
viii. Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water;
ix. Site all material storage areas at least 10 m from watercourses;
x. Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses;
xi. Connect the drainage systems to oil interceptors;
xii. Line surfaces where cement, paints and oils will be stored and connecting the drainage systems to oil interceptors;
xiii. Collect and dispose wastes in designated disposal sites as required by the Local Authority;
xiv. Construct pit latrines that are at least 1.5 meters deep, lined at the base and 30 metres from a water body;
xv. The excavated material should be kept far away from the water pumps;
xvi. The other stakeholders should be involved when the excavation works commences.

a) Air Pollution

During the construction phase there will be an increase in road traffic associated with material and equipment haulage. These vehicles and machines will produce combustion gas emissions and nuisance dust. The principal sources of these gases are the exhaust fumes.

The vehicles, electricity generators and other machines, which will be used during construction are expected to result in emission of gas and particulate elements including carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x) and various other hydrocarbons. The carbon containing gases and methane are greenhouse gases and hence responsible for causing global warming and consequently climate change.

Recommended mitigation measures

i. Use new or fairly new machinery that is within the acceptable emission limits.
ii. Erect safety signboards to warn other road users about the volume of traffic.
iii. Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits.
iv. Use the water bowsers to spray water along the access roads used by the haulage trucks.
v. Provide protective gear (dust masks) to workers and ensure that they wear them.
vi. Erect a barrier around the work sites where major construction activities are taking place to break or reduce wind and dust movement.
vii. Store and handle quarry dust and cement properly to limit dust generation.
viii. Optimize transportation management to avoid needless truck drives.
ix. Construct gravel speed bumps to control vehicle speeds.
x. Reduce engine idling time.
xi. Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.

b) Soil contamination and land degradation

Soil contamination and land degradation may result from the following:

- Fuel and oil leaks from construction plant and vehicles, spills from vehicle maintenance operations, and spills from waste oil containers discarded from plant and vehicle maintenance during construction activities;
- Civil works construction wastes such as packaging materials, cement bags, oils and paints;
- Accidental or deliberate disposal of construction waste and chemicals;
- Improper disposal of soils from excavations and stockpiling;
- Unsustainable sand mining and quarrying – this is likely to result in land degradation outside the project site in sand mining and quarrying areas.

Recommended mitigation measures

i. Provide garbage collecting bins at the construction site and monitor its usage so that all the litter at the project site are managed properly.
ii. Contractor to develop the waste management plan in accordance with the Environmental Management Act 1996, and should keep records of the volume of waste generated and disposed.
iii. Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils.
iv. Use containers to collect used oil and then properly discard waste oil containers in approved disposal sites, as recommended by Mzuzu City Council.
v. Segregate waste (e.g. cardboard and paint containers) to encourage reuse.
vi. Provide all structures required for effective water drainage.
vii. Construct waste disposal pits and bury the wastes after the construction period. The pits must not be near to surface water bodies.
viii. Closely supervise the workforce to avoid or limit waste generation.
ix. Store and contain construction materials on lined surfaces and in covered areas.
x. Sensitize construction workers to avoid littering the site.
xi. Use excavated soils for backfilling and site levelling.
xii. Promote the usage of quarry dust and source quarry in approved sites that are run sustainably.
xiii. Enforce the use of licensed construction material suppliers through the construction contract(s).

c) Loss of vegetation cover

An unavoidable part of any development project is the clearing of land and the consequential loss of vegetation cover. This is also anticipated in this project; the area to store the building materials will be located near the Lunyangwa Dam and within the forest reserve. This will also result in loss of vegetation cover which leads to loss of habitat for wildlife species and degradation of soil due to increased soil erosion. Loss of vegetation cover also contributes to climate change; plants absorb carbon dioxide during photosynthesis which slightly offsets the amount of greenhouse gas being released in the atmosphere through the burning of fossil fuels.

Recommended mitigation measures

i. Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation.

ii. Strict control of construction vehicles to ensure that they operate only within the areas to be affected by the construction works or engage only in activities that benefit the project.
iii. Plant appropriate trees and grasses in all disturbed area; Ensure that for every single tree cut down, 10 tree seedlings of a similar species are planted in the adjacent areas.
iv. Cost and appropriately compensate for all the trees to be cut down during construction.
v. Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass immediately after construction works to minimize soil erosion.
vi. Sensitize employees and the community to conserve vegetation.
vii. Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.

d) Accidents and hazards from trenches and burrow pits

The project will require construction materials including earth, sand and quarry stone and dust. Extraction of these materials may lead to creation of holes and burrow pits in the ground. These holes and burrow pits as well as trenches opened for the pipelines will be hazardous to people and animals.

Recommended mitigation measures

i. Use construction material suppliers that are licensed by the Mzuzu city Council.
ii. Avoid making deep pits when extracting construction materials.
iii. Refill all burrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems.
iv. Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them.
v. Inform and sensitize the public about all open pits and trenches.
vi. Supervise adequately the construction activities and follow recommended procedures.

e) Disruption of water supply

Water supply services may be disrupted during construction due to little or no usage of the dam while the works are in progress.

Recommended mitigation measures

i. Give adequate notice of potential water disruption to the water users that could be affected
ii. Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate
iii. The contractor to Provide a works schedule with strategically staggered activities to avoid total flow disruption during construction.

f) Occupational incidents and accidents

Construction workers are likely to have injuries as the construction works unavoidably expose workers to occupational health and safety hazards. One of the major hazard to be considered in this project is the drowning hazard. Working closer to the existing Lunyangwa Dam will

likely pose a major risk to the workers and machinery. The Improper use of various construction equipment, materials and tools may result in accidents, injury or death. According to the Occupational Safety, Health and Welfare Act 1997, employers are supposed to report any incidents and accidents, occurring at their workplace, to the Ministry of Labour. The employers are also supposed to cooperate in any investigations that may follow.

Recommended mitigation measures

i. A competent swimmer to be available all the time when the works are being done.
ii. An emergency vehicle to be available all times when the works are in progress.
iii. Workers to be trained on safe operating procedures.
iv. Induct workers on OSH requirements and repeat reminders on the same.
v. Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of practice for various tasks are followed by workers at all times. i.e.;
   - Issue permits for work at height, hot work, cold work
   - Hazard Identification and risk assessments
vi. Provide appropriate personal protective equipment (PPEs) to construction workers and ensure that it is used at all times.
vii. The contractor to provide a mechanism for reporting of accidents and near misses.
viii. The first aid box to be made available for each team and a trained first aider to be available too.

g) Noise and vibrations

In this project, noise and vibrations are expected from the construction works, use of machinery and movement of materials, the movement of vehicles and rock blasting. Most of the construction machinery that will be used, for example trucks, compactors and concrete mixers, produce noise at levels ranging from 75 – 90 DB. This noise is a health risk only when one is exposed to it over a long time. Blasting activities, which are also likely to be carried out, can produce noise as high as 100 DB. Such noise can result in permanent ear damage.

In addition to being a health risk, noise is generally a nuisance, may disrupt communication and disturb people that want to sleep. As the construction will be closer to the communities, Noise will also affect livestock and wildlife species by masking sounds of predators and prey, causing stress or avoidance reactions. Animal reactions to noise vary from species to species.

Recommended mitigation measures

i. Regularly monitor noise levels for any machine available on site and associated records be made available at the site office.
ii. Use appropriate and well-maintained noise mufflers on vehicles and machinery.
iii. Regularly service and carry maintenance of equipment.
iv. Provide ear muffs for the workers in noisy areas.
v. Use electric motors instead of compressed air driven machinery.
vi. Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and pads on large sheet metal surfaces.
vii. Limit the number of days of operation; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings.
viii. Notify the public of upcoming loud events.

h) The Spread of Communicable Diseases and other Infections

During the construction phase there is a risk of spread of communicable diseases such as tuberculosis and pulmonary infections. Aspects of the physical environment that promote transmission of diseases include; disposal of wastes and ventilation that are likely to occur during the construction phase of the project. With the influx of people during construction, there will be a likelihood of increase in diseases such as malaria, diarrheal diseases, respiratory diseases and dysentery.

Recommended Mitigation Measures

i. Treat the affected local and migrant workers so as to control the movement of disease vectors (through contaminated water and between people);
ii. The contractor to provide sanitary facilities in good condition with adequate water supply;
iii. Train workers on good personal hygiene practices e.g. washing of hands after visiting the toilet, drinking portable/treated water;
iv. Alert the responsible health authority if there is an outbreak of any communicable diseases.

i) Increase in sexual relationships, unplanned pregnancies, breaking up of families

It is anticipated that the local women will have sexual relationships with the men at the construction site, to earn some money. This could lead to breaking up of families, where the women or the men are married. Unprotected sex could also lead to unplanned pregnancies and the transmission of STIs, HIV and AIDS where one of the partners is infected.

The other group of affected persons are teenage school going children. School girls and teenagers are likely to be exposed to sexual abuse in return for money. This may lead to pregnancies and increased school drop outs in the area.

Recommended mitigation measures

i. Provide a reporting mechanism at the site where grievances can be channelled and this mechanism should also be available to the concerned public.
ii. Sensitize communities on the disadvantages of indulging in extra-marital affairs.
iii. Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place.
iv. Sensitize girls from the surrounding areas including the students of Mzuzu Government Secondary School on the dangers of getting involved in pre-marital sex at a tender age.
v. Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities.
vi. Engage stakeholders in encouraging and empowering women to be financially independent.
vii. Provide both male and female condoms to workers for appropriate use.
viii. Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).

ix. Support the District Social Welfare Office and the Community Development Office and Non-Governmental Organizations in the implementation of on-going projects aimed at assisting pupils to go back to school.

x.

j) Incidence of sexual abuse and harassment

Incidence of sexual abuse and harassment are anticipated at the work sites and in the homes. At the worksite, women seeking jobs could voluntarily or involuntarily indulge in sex with the employers in order to get jobs. Men in higher positions will always want to exploit women who are desperate for employment. Some women may also offer sex as the way of gaining favours at the company. Sexual abuse and harassment could also occur during the course of employment, mostly affecting the women due to the perception that women are a weaker gender (gender inequality).

As construction workers will have extra disposable income that may be used for casual sex and some for excessive drinking; disagreements, due to the men's behavioural change, may lead to the harassment and sometimes molestation of the wives in the homes. Likewise, some women working at the project sites may harass their unemployed husbands, due to increased disposable incomes.

Recommended mitigation measures

i. Report any form of physical abuse/harassment to Police, that way workers will understand the seriousness of the offense.
ii. Provide a reporting mechanism for both the public and the workers.
iii. Sensitize workers and surrounding communities to avoid sexual abuse and harassment.
iv. Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment in the homes.
v. Publicize places for reporting gender violence and sexual harassment.
vi. Create a good work environment to allow female workers to report cases of harassment.
vii. Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved sexual abuse and harassment.
viii. Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).
ix. Support the District Gender Welfare Office and Non-Governmental Organizations in the implementation of on-going projects aimed at promoting gender equality and ending sexual harassment.
x. Implement and follow-up on grievance redress mechanisms.
xi. Require the contractor to be responsible and to take necessary measures so his employees do not commit acts of sexual abuse and/or underage sex.

k) The increased pressure on community health services

The influx of immigrant workers and job seekers may result in increases of pressure on community and health services dues to the associated significant health and safety impacts on local communities. First and foremost, interactions between workers and female community members increase the risk of sexually transmitted diseases such as HIV/AIDS and other STDs.

Recommended mitigation measures

i. The contractor to engage a private nurse who will be responsible for his staff.
ii. Conduct public awareness and sensitization on community health, HIV and AIDS.
iii. Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required.
iv. Require the workers, sensitize the communities follow recommended environmental and water management practices.
v. Construct adequate sanitation facilities at the work sites and surrounding area.
vi. Provide both male and female condoms to workers for appropriate use.
vii. Locate worker camps at a minimum distance of 1 km from towns and villages in order to limit worker – community interactions.
viii. Maintain construction camps in clean and healthy condition as prescribed by international worker health standards.
ix. Require all contractors and sub-contractors to comply with relevant health and safety requirements and NRWB corporate policy.
x. Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.).
xi. Involving other stakeholders including NGO's in the promotion of social welfare.
xii. Support and supplement social services including the Health Surveillance Assistants.

l) Unequal employment opportunities

During informal consultations, it was observed that most of the project activities in the construction phase are considered manpower intensive and hence "men's" jobs; for example, digging trenches and laying pipes. As such, the project will tend to employ more men than women. Additionally, according to the culture of the area, usually men take key positions while women take supportive roles. Similarly, at national level, there are more men in the construction industry than women. As such, women may take more supportive roles (for example cooking and ferrying water).

Recommended mitigation measures

i. Encourage the contractor to employ women as well. A clause should be included in the contract specifying that at least 5 – 10 % of the employees should be women. The clause
ii. Conduct gender meetings to sensitize and encourage women and to instil confidence that they can also do the work that men do.
iii. Ensure there are also women in important positions such as foremen and engineers.
iv. Economically empower women within affected communities by linking them with community investment programs (COMSIP).
v. Create a good work environment to allow female workers report any case of harassment.

6.3.3 Negative impacts during demobilisation phase

a) Increased load of solid waste

At the demobilising there will always be increased volume of solid waste generated from the demolished temporary structures and other left over materials left that have no real value for the project. These solid wastes will be of significant quantity and a strategic waste collection plan has to be put in place.

Recommended mitigation measures

i. Separate waste at the source into their appropriate categories for easy disposal at the designated dumpsite.
ii. Protect the waste from the public interference.
iii. Involve the dump truck from the Mzuzu City Council for other wastes that are delicate and produce foul smell.
iv. Provide appropriate personal protective equipment for all the employees that will be involved in managing these wastes.

b) Loss of jobs and businesses

Local labourers will be laid off during the demobilisation phase. This will result in loss of sources of income. Because of job losses, businesses that were thriving or had opened (mainly food and alcohol businesses) because of the project staff will also be affected negatively. This may in turn, also lead to loss of jobs where employees were running the businesses. Some houses that were rented by the contractor's staff will also be vacated too.

Recommended mitigation measures

i. Introduce Money saving programs like Savings and Capital Cooperative (SACCO) for the employees so that they are prepared well for retrenchment.
ii. Provide alternative employment to employees e.g. as maintenance staff.
iii. Provide adequate notice to employees to prepare themselves and secure alternative employment.
iv. Pay severance benefits to leaving workers in line with the labour regulations.
v. Sensitize the workers and the general community to adopt the money saving culture.
vi. Sensitize the business persons to diversify and find alternative markets.

c) Abandonment of used pits

i. burrow pits

There is potential for abandonment of burrow pits after the construction works, in particular sites where construction materials will be sourced. Burrow pits are an issue as they can be a death trap to wildlife and children. In addition, burrow pits create unsightly conditions and they can be breeding grounds for mosquitoes and other aquatic parasites; burrow pits can change the ecosystem.

ii. temporary pit latrines

There is potential for abandonment of pit latrines that were designed to serve the workers during the construction phase. These latrines act as death traps too.

Recommended mitigation measures

i. Fill up and close pits after the construction works.
ii. The contractor should register all burrow pits to the Mzuzu City council.
iii. Authorization Certificates (Signed by Land owners and chiefs) to be obtained before any soil extraction is done and also the Certificate of Rehabilitation to be issued at the end of the construction phase.
iv. Construction materials e.g. sand and clay soils should be sourced from licensed supplier
v. The rehabilitation plan to include reforestation of the area.

6.3.4 Negative impacts during operational phase

a) Increased solid waste generation

During the operation phase, mainly at the treatment plant, offices and staff houses, there will be an increased generation of solid waste (e.g. plastic, wrappings and containers), paper, office wastes including printing cartridges, kitchen (canteen) wastes etc. This waste can be a nuisance if not properly disposed.

Recommended mitigation measures

i. Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale
ii. Provide solid waste storage bins and skips.
iii. Monitor skips so that they do not become overfilled.
iv. Ensure that collected solid waste is disposed of in an approved disposal sites.
v. Implement sensitization campaigns on consequences of indiscriminate waste disposal.

b) Increased pollution from wastewater and sludge

The water treatment activities will generate wastewater and sludge as by-products, which if not properly managed can pollute water and affect people's health, aquatic life and the natural habitat. Wastewater and sludge produce odours, can be breeding grounds for insects; and where they infiltrate into the ground, they can pollute groundwater.

The increase in water consumption (by all types of consumers) due to the expansion of the water supply scheme will result in increased wastewater generation by the consumers. This will lead to surface and groundwater pollution. Increase in wastewater will manifest itself as silage at communal water points, bath shelters and septic tank soak-ways. This wastewater must be properly managed to avoid pollution.

Recommended mitigation measures

i. Enforce proper excreta and wastewater management especially in the town.
ii. Apply lime treatment to dewatered sludge to suppress pathogens and remove odour.
iii. Enforce the use of licensed liquid waste handlers for liquid waste.
iv. Dry sludge on drying beds before disposing off in a dedicated disposal site.

v. Prepare and enforce operational guidelines for sludge treatment and management.
vi. Conduct WASH activities to sensitize people on the benefits (including prevention of cholera) of good the hygiene.

c) Increase in Emergency incidents

The NRWB should be prepared to handle incidents affecting drinking water and water treatment systems. Some of the incidents that are likely to occur include:

- Excessive rains which may wash away the intake weir, channel or pipes;
- Contamination of water at the intake, the treatment plant or the reservoir site;
- Risk of fire from the booster pumps at the treatment plant; and
- Bursting of pipes due to high pressure.

The incidents have the potential to negatively affect the water users and the communities around the water supply infrastructure. For example, contaminated water is a threat to the health of consumers while high-pressure water from busted pipes can wash away people's property.

Recommended Mitigation Measures

i. Design and implement an emergency response plan.
ii. Install fire hydrants within the proposed development.
iii. Use checklists to regularly monitor and maintain the water supply system.
iv. Maintenance of natural drains around the weirs.
v. Install and regularly service fire extinguishers at the plant and carryout periodic fire drills.
vi. Maintain the critical spares lists

d) Potential risks of water leakage and flooding from theft and vandalism

The high unemployment rates because of a rapid population growth and a small economic base have resulted in increased criminal activities in Malawi. As such, cases of vandalism, theft of water supply infrastructure are reported in the project area. This is also anticipated in the operation and maintenance phase of the project, and may result in water leakages and flooding where a big pipe is vandalised. This is a negative impact as the leakages may result in inadequate supplies in the households, hence reduced sanitation, health and hygiene. Flooding on the other hand may damage property and result in accidents. Vandalism and theft also have an impact on the operation cost of water supply system.

Recommended Mitigation Measures

i. NRWB must periodically conduct consultations and sensitizations with villages and group village heads and security personnel.
ii. Provide security at the intake, treatment plant and water reservoir sites.
iii. Support activities of the neighbourhood watch (community policing) e.g. through provision of torches, uniforms and shoes.
iv. Support economic activities in the area as part of corporate social responsibilities.
v. Reward for reports of vandalism and theft that may lead to capture.
vi. Theft and vandalism cases must be reported to the police.
vii. Regularly monitor the pipeline infrastructure.

viii. Inclusion of the local people in the work force.

6.4. SIGNIFICANCE RATING OF THE IMPACTS

The significance of the identified potential environmental and social impacts has been determined by assessing the consequence and the probability of occurrence of the impact as follows:

Significance of the impact = ***consequence x probability***

where:

Consequence = ***severity + reversibility + duration + spatial extent + environmental context***

The factors are defined as follows:

1. **Severity/ Magnitude:** measures the general degree, extensiveness, or scale of impact. It is defined in terms of the observable impact on a resource in the context of the project locality and wider ecosystem or social domain.
2. **Reversibility:** refers to the ability of the site or the impact receptor to recover after an impact has occurred.
3. **Duration:** this is the period of time over which an impact may occur; from a once-off occurrence to continuous, during the life of the Project. This aspect considers the time that is estimated for an affected population or resource to return to "baseline" conditions. Duration is calculated from the time an impact begins to when it ceases. Frequency: considers the number of times an impact is expected to occur over the duration of a proposed project.
4. **Environmental context:** considers the sensitivity of the receptor upon which the impact is occurring.
5. **Areal extent:** refers to the size of the impact area.
6. **The probability:** the likelihood of the impact occurring.

The above factors are ranked using the criteria indicated in Table 6.1 below.

Table 6.2: Criteria for Ranking Factors for Consequences and Probability

Severity/ Magnitude	Reversibility	Duration/ frequency	Areal extent	Environmental context	Probability
5 – Very high/ don't know	5 – Irreversible	5 – Permanent and/or continuous impact	5 - International	5 – highly sensitive or very rare environmental component	5 – Definite / don't know
+-+		4 – Long term (impact ceases after operational life) and/or very	4 – National	4 – sensitive or rare environmental component	4 – High probability

		frequent impact			
3 – Moderate	3 - Recoverable (needs human input)	3 – Medium term (2 – 7 years) and/or frequent impact	3 – Regional	3 – moderately sensitive or uncommon environmental component	3 – Medium probability
2 – Low		2 – Short term (0 – 2 years) and/or infrequent impact	2 – Local	2 – non-sensitive or common environmental component	2 – Low probability
1 – Minor	1 – Reversible (regenerates naturally)	1 – Immediate and/or unique impact	1 – Site only	1 – non-sensitive and widely dispersed environmental component	1 – Improbable
0 – None					0 – None

Expert judgement is used when assigning the values for the factors. The maximum value that can be obtained for the significance of the impact is 125 points. The impacts are rated as of Very High, High, Moderate, Low or Very Low significance as shown in Table 6.3 following.

Table 6.3: Significance Rating of the Impacts

SIGNIFICANCE RATING FOR POSITIVE IMPACTS		
More than 100	Impact is of the highest order possible.	Very High
Between 76 and 100	Impact is substantial.	High
Between 51 and 75	Impact is real but not substantial in relation to other impacts.	Moderate
Between 26 and 50	Impact is of low order.	Low
25 or less	Impact is negligible.	Very Low
SIGNIFICANCE RATING FOR NEGATIVE IMPACTS		
Value	**Description**	**Significance**
More than 100	Impact is of the highest order possible. Mitigation is required to lower impacts to acceptable levels. Potential fatal flaw.	Very High
Between 76 and 100	Impact is substantial. Mitigation is required to lower impacts to acceptable levels.	High
Between 51 and 75	The impact is real but not substantial in relation to other impacts. Mitigation should be implemented to reduce impact.	Moderate

Between 26 and 50	Impact is substantial. Mitigation is required to lower impacts to acceptable level.	Low
25 or less	Impact is negligible. No mitigation is required.	Very Low

6.5. IMPACT SIGNIFICANCE RATING FOR THE IDENTIFIED IMPACTS

The potential environmental and social impacts were assessed and the significance ratings before the mitigation measures are applied are as presented in Table 6.4.

Table 6.4: Impact significance rating before the mitigation measures are applied

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ Enhancement	Significance with mitigation/ Enhancement
1.	POSITIVE IMPACTS									
1.1.	**Planning and Design Phase**									
1.1.1.	Employment Opportunity for Skilled and unskilled Workers	3	3	3	2	4	4	60	Moderate	High
1.2.	**Construction Phase**									
1.1.2.	Source of employment and business	3	3	3	2	4	4	60	Moderate	High
1.1.3.	Increase in trade opportunities	3	3	3	2	3	3	42	Low	High
1.1.4.	Training opportunities of vocational skills for youth	3	3	2	3	3	2	28	LOW	Moderate
1.1.5.	Natural resources and Wildlife conservation	3	3	2	4	3	3	45	Low	Moderate
1.3.	**Operation and Maintenance Phase**									
1.2.1.	Improved reservoir capacity of water supply to Mzuzu City, Ekwendeni and the surrounding areas	5	3	5	2	4	4	76	High	High
1.2.2.	Improved access to potable water source	4	3	5	2	4	4	72	Moderate	High
1.2.3.	Improved sanitation, hygiene and health	4	3	5	2	4	4	72	Moderate	High
1.2.4.	Improved socio-economic situation of the communities	3	3	5	2	4	4	68	Moderate	High
1.2.5.	Enhanced gender and women participation in development	2	3	3	2	5	3	45	Low	High
1.2.6.	Education benefits to girl child	2	3	3	2	5	4	60	Moderate	High
1.2.7.	Employment opportunities	4	3	3	2	4	4	64	Moderate	High

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ Enhancement	Significance with mitigation/ Enhancement
1.2.8.	Increased development	2	3	3	2	3	3	39	Low	High
2.	**NEGATIVEIMPACTS**									
2.1.	**Planning and Design Phase**									
2.1.1	Unrealistic public expectations	4	3	2	2	4	3	45	Low	Low
2.2	**Construction Phase**									
2.2.1.	Poor water quality	4	2	3	4	3	4	64	Moderate	Low
2.2.2.	Air pollution	3	3	2	1	3	3	36	Low	Very low
2.2.3.	Soil Contamination and land degradation	3	3	2	1	3	3	36		
2.2.4.	Loss of vegetation cover	2	3	2	1	3	3	33	Low	Very low
2.2.5.	Accidents and hazards from trenches and burrow pits	2	3	2	1	3	3	33	Low	Very low
2.2.6.	Disruption of water supply	3	3	1	2	3	3	36	Low	Very low
2.2.7.	Water pollution and siltation	2	3	2	2	4	3	39	Low	Very low
2.2.8.	Occupational incidents and accidents	3	3	2	1	4	3	39	Low	Very low
2.2.9.	Noise and vibrations	3	3	2	1	3	3	36	Low	Very low
2.2.10.	Spread of communicable diseases and infections	4	4	5	2	3	3	54	Moderate	Very low
2.2.11.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	4	3	3	2	4	4	64	Moderate	Low
2.2.12.	Incidence of sexual abuse and harassment	4	3	3	2	4	3	48	Low	Very low
2.2.13.	The increased pressure on community health services	3	3	2	2	4	4	56	Moderate	Very low
2.2.14.	Unequal employment opportunities	3	2	3	2	3	4	52	Moderate	Very low
2.3										

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ Enhancement	Significance with mitigation/ Enhancement
	Demobilisation Phase									
2.3.1.	Increased load of solid waste	2	3	2	2	4	3	39	Low	Very low
2.3.2.	Loss of jobs and businesses	3	3	2	2	4	4	56	Moderate	Low
2.3.3.	Abandonment of used burrow pits and temporary pit latrines	2	3	3	1	3	4	48	Low	Very low
2.4	**Operational Phase**									
2.4.1.	Solid waste generation	2	3	3	2	4	3	42	Low	Very low
2.4.2.	Increased pollution from wastewater and sludge	2	3	3	2	3	3	39	Low	Very low
2.4.3.	Increase in Emergency incidents	2	3	3	1	3	3	36	Low	Very low
2.4.4.	Potential risks of water leakage and flooding from theft and vandalism	2	3	4	1	3	3	39	Low	Very low

From the assessment in Table 6.4 overall the anticipated negative impacts are assessed as low and can be mitigated to very low. The most significant impacts are mainly on the socioeconomic environment and these include the following:

- Spread of communicable diseases and infections
- Increase in sexual relationships, unplanned pregnancies, breaking up of families
- The increased pressure on community health services
- Unequal employment opportunities
- Loss of jobs and businesses
- Poor water quality

These impacts are assessed as moderate and can be mitigated to low or very low. Overall the positive impacts are assessed as moderate and can be enhanced to high.

CHAPTER 7 : ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN TABLE

This Environmental and Social Management Plan (ESMP) has been prepared to facilitate the integration of environmental and social management measures, recommended in Chapter 6, in the implementation of the proposed Dam Raising works for Mzuzu City Water Supply Project. The ESMP for this ESIA provides indication of the measures to be taken, to ensure that the identified impacts of the Project activities are mitigated through the following hierarchical order:

a) **Avoiding** activities that could result in negative impacts and avoiding resources or areas considered as sensitive;
b) **Preventing** the occurrence of negative environmental impacts and/or preventing such an occurrence from causing negative environmental impacts;
c) **Preserving** resources by extending the legal protection to selected resources beyond the immediate needs of the project;
d) **Minimizing** the impact by limiting or reducing the degree, extent, magnitude or duration of negative impacts through scaling down, relocating and/or redesigning elements of the project;
e) **Rehabilitating**, repairing or enhancing affected resources, such as natural habitats or water sources, particularly where previous developments have resulted in significant resource degradation;
f) **Restoring** affected resources to an earlier and more stable productive state (background / pristine condition); and/or
g) **Compensation** by provision of the same type or better resource/ property at another suitable and acceptable location, compensating for the lost resources/ property.

The ESMP, presented in Table 7.1 contains the following:

- Potential positive and negative environmental and social impacts of the project
- Enhancement measures for the positive impacts and the mitigation measures for the negative impacts.
- Responsible institutions to implement the mitigation measures.
- Estimated cost for implementing the measures.
- Time frames for implementation of the mitigation measures.

Northern Region Water Board and the Contractor have the responsibility of ensuring that the ESMP is implemented effectively and fully.

Table 7.1: Environmental and Social Management Plan for the Project

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
1.	**ENHANCEMENT MEASURES FOR POSITIVE IMPACTS**				
1.1.	**Planning and Design Phase**				
1.1.1.	Employment opportunities	• Client to provide the necessary support for the team involved in the planning and design • The team to be composed of members with the appropriate qualifications and expertise to provide requisite information for the production of accurate designs.	On as needed basis for planning and design phase	Client, Contractor, Consultants, District Labour Officer, District Community Development Officer	Included in contractor/ Consultant's BoQs
1.2	**The Construction Phase**				
1.2.1.	Source of employment and business	• The contractor should willingly consider giving job opportunities to the people living in the surrounding areas of the Lunyangwa Dam. • The contractor should prescribe to the gender policy and labour Act which stipulates that 5 -10% of the workforce should be women. • Where possible the contractor should be encouraged to buy the construction materials within the city in order to empower the local business enterprises. The contractor to only employ workers possessing legitimate proof of identification that they are above 18 years of age. • The contractor to make sure that employees are treated and paid fairly and that records for proof of payment are available at the site. • The women and people living with a disability should be given tasks that match their physical capability and level of skill.	Continuously throughout construction	Contractor, District Labour Officer, District Community Development Officer	3,500,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Wages must at the minimum meet the minimum wage standard and overtime must be paid on time. • Workers must be sensitized to save and invest during project implementation. • Encourage the workers to participate in Community Services Investment programmes (COMSIP) and Village Saving and Loans groups.			
1.2.2.	Increase in trade opportunities	• The contractor to source building materials from the local licensed dealers e.g. quarry dust from the licensed quarries within the city. • Pay the building material suppliers within the agreed time. • Support and promote of entrepreneurship skills amongst communities and business people in the project area by engaging them where appropriate. • Promote village savings and loan (VSL) schemes during project implementation.	Continuously throughout construction	Contractor, District Community Development Officer	Cost included in 1.1.1
1.2.3.	Training opportunities in vocational skills for youth	• Contractors to consider suitably motivated women on skills training program. • Contractors to consider focused training program to optimize skills transfer to unskilled workers.	Continuously throughout construction		N/A
1.2.4.	Improvement in natural resources and wildlife conservation	• Promote and support wildlife conservation programs • Train the employees to understand the importance of wildlife. • Encourage employees to use firewood from the artificial trees. • Where possible, construction vehicles and machinery to use the designated access roads to the construction site. • The contractor to provide a traffic management plan for the sites	Continuously throughout construction	Client, Contractor, Consultants, District Labour Officer, District Community Development Officer	3,500,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Impose a strict penalty for all employees involved in poaching of wild animals. • Add the contact numbers for the department of wild life on the emergency contact list • Promote the usage of anti-snake chemicals			
1.3.	**OPERATION PHASE**				
1.3.1.	Improved water supply to Mzuzu City and the surrounding areas	• Ensure water reservoir tanks have adequate water all the time • Sustain the desired performance of the water supply system through timely preventive maintenance Quickly carryout maintenance works and restore water supply when there are problems. • Adequately treat water at the treatment plant. • Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the supply points and implement control measures where results are below safe water standards. • Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules • Sensitize the water users on proper water management practices, water pricing and importance of payments of water bills in time.	Continuously throughout the operation period	NRWB, District Water Development Office, NGOs	20,000,000
1.3.2.	Improved access to potable water source	• Process water connection applications and provide water to the communities as quickly as possible. • Ensure that the recommended maximum distances of 500 metres from houses to a water point is observed when constructing communal water points. • Ensure water is available all the time at the water points.	Continuously throughout the operation period	NRWB	Cost included in 1.3.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Encourage communities to establish water kiosks committees in order to establish ownerships of the water draw off points.			
1.3.3.	Improved sanitation, hygiene and health	• Sensitise communities on hygienic practices for handling water to avoid secondary contamination. • Encourage the community members to be vigilant in reporting water leakages and broken pipes. • Promote general sanitation practices amongst communities in the project area. • Conduct trainings aimed at building the capacity of water kiosks committee. • Monitor the quality of water and to promote health and hygiene at water points. • Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene. • Ensure there is adequate drainage within the community water points	Monthly for water quality analysis and quarterly for sensitization and capacity building initiatives	NRWB District water officer NGOs	7,000,000
1.3.4.	Improved socio-economic situation of the communities	• Provide quality water, with minimal loss of supply, through system monitoring and regular maintenance • Support women and other vulnerable groups to start and operate business through appropriate training and start-up capital • Make water costs affordable	Throughout the operation period	Client, District Community and Development Office	Cost included in 1.2.1
1.3.5.	Enhanced gender and women participation in development	• Sensitize recruiting authorities to employ about 40% to 60% women. • Ensure there are also women in important positions • Promote gender mainstreaming in development activities through sensitization, advocacy and awareness.	Throughout the operation period	District social welfare officer, District gender officer	7,300,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Economically empower women within affected communities by linking them with community service Investment programmes (COMSIP).			
1.3.6.	Education benefits to girl child	• Conduct sensitizations aimed at encouraging girls to enrol in schools. • Provide the necessary support and adequate resources to schools to ensure that they have adequate resources for the provision of quality of education. • Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees. • Provide adequate water and appropriate sanitation facilities in schools to support female students.	Throughout the operation period	Client, District Education Office, District Gender Office	Included in 1.3.5
1.3.8	Employment opportunities	• Where feasible, local qualified people will be considered for job opportunities. • Adequate occupational health and safety standards should be provided to ensure the work environment is conducive. • Consider employing both qualified female and male workers to enhance income distribution among both men and women. • The women and people living with disability should be given tasks that commensurate with their physical ability and level of skills.	Throughout operational phase	Client	Included in 1.2.1 and 1.3.5
1.3.7.	Increased development	• New water connection applications must be processed within set time • Provide adequate potable water supply to the new areas • Sensitize the communities to report leakages and breakages of pipes. • The City Council must ensure that development activities are implemented within Council plans and laws	Throughout operation phase	NRWB	Cost included in 1.2.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
2.	**MITIGATION MEASURES FOR NEGATIVEIMPACTS**				
2.1.	**Planning and design phase**				
2.1.1.	Unrealistic public expectations	• Conduct sensitization and awareness on the need for raising the wall of the dam by the height of 1.5m. The design team to incorporate the Environmental expert in the team and take time to sensitize and alert those within project influence areas. • The design team to incorporate the environmental and social expert to facilitate sensitizations and alert those within project influence areas. • The design team to take all the necessary measures to document any concerns and address them on as they occur. • Sensitize the affected people to use the existing Grievance Redress Mechanism	During the planning and design phase	NRWB, District Land Office	3,500,000
2.2.	**Construction Phase**				
2.2.1.	Degradation of water quality	• Provide a schedule for excavation works to the treatment plant team so that they plan to pump water accordingly. • Encourage use of mortar and debris traps during construction. • Strategic stakeholder consultations must be done comprehensively to make sure that those who could potentially be affected are aware of the works program; • Mix cement in areas, which are not directly connected to natural drainage systems. • Shutters to be properly erected and monitored to check if there are any unallowable spaces in between the joints which may lead to concrete leakages. • Store cement, paints, lubricants and fuels in lined and covered areas.	Throughout construction phase	Client, Contractor,	1,000,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Provide appropriate spill kits when working near water courses. • Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water. • Site all material storage areas at least 10 m from watercourses. • Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses. • Connect the drainage systems to oil interceptors. • Line surfaces where cement, paints and oils will be stored and connecting the drainage systems to oil interceptors. • Collect and dispose wastes in designated disposal sites as required by the Local Authority. • Construct pit latrines that are at least 1.5 meters deep, lined at the base and 30 metres from a water body. • The excavated material should be kept far away from the water pumps. • The other stakeholders should be involved when the excavation works commences.			
2.2.2.	Air Pollution	• Use new or fairly new vehicular equipment with exhaust gas emissions above permissible emission limits. • Erect safety signboards to warn other road users about the volume of construction traffic. • Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits. • Use the water bowsers to spray water along the access roads used by the haulage trucks.	Throughout construction	Contractor	5,000,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Provide protective gear (dust masks) to workers and ensure that they wear them. • Erect a barrier around the work sites where major construction activities are taking place to break or reduce wind and dust movement. • Store and handle quarry dust and cement properly to limit dust generation. • Optimize transportation management to avoid needless truck drives. • Construct gravel speed bumps to Control vehicle speeds. • Reduce engine idling time. • Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.			
2.2.3.	Soil contamination and land degradation	• Provide garbage collecting bins at the construction site and monitor its usage • Contractor to develop the waste management plan in accordance with the Environmental Management Act 1996, and should keep records of the volume of waste generated and disposed. • Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils. • Use containers to collect used oil and then properly discard waste oil containers in approved disposal sites, as recommended by Mzuzu City Council. • Segregate waste (e.g. cartons and paint containers) to encourage reuse. • Provide all structures required for effective water drainage.	Throughout construction	Contractor	7,000,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Construct waste disposal pits and bury the wastes after the construction period. • Closely supervise the workforce to avoid or limit waste generation. • Store and contain construction materials on lined surfaces and in covered areas. • Sensitize construction workers to avoid littering the site. • Use excavated soils for backfilling and site levelling. • Promote the usage of quarry dust and source quarry in approved sites that are run sustainably. • Enforce the use of licensed construction material suppliers through the construction contract(s).			
2.2.4.	Loss of vegetation cover	• Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation. • Strict control of construction vehicles to ensure that they operate only within the areas to be affected by the construction works or engage only in activities that benefit the project. • Plant appropriate trees and grasses and grasses in all disturbed area; ensure that for every single tree cut down, 10 tree seedlings of a similar species are planted in the adjacent areas. • Cost and appropriately compensate for all the trees to be cut down during construction. • Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass immediately after construction works to minimise soil erosion.	Throughout construction (but mainly during land preparation)	Contractor, Client	3,000,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Sensitize employees and the community to conserve vegetation. • Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.			
2.2.5.	Accidents and hazards from trenches and burrow pits	• Use construction material suppliers that are licensed by the Mzuzu City Council. • Avoid making deep pits when extracting construction materials. • Refill all burrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems. • Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them. • Inform and sensitize the public about all open pits and trenches. • Supervise adequately the construction activities and follow recommended procedures	Throughout construction	Contractor	1,500,000
2.2.6.	Disruption of water supply	• Give adequate notice of potential water disruption to the water users that could be affected. • Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate • The contractor to Provide a works schedule with strategically staggered activities to avoid total flow disruption during construction.	Throughout construction	Contractor, Client	Cost included in 1.2.1
2.2.7.	Occupational incidents and accidents	• A competent swimmer to be available all the time when the works are being done. • An emergency vehicle to be available all times when the works are in progress. • Workers to be trained on safe operating procedures.	Throughout construction	Contractor	3,700,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Induct workers on OSH requirements and repeat reminders on the same. • Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of practice for various tasks are followed by workers at all times. i.e.; -Issue permits for work at height, hot work, cold work -Hazard Identification and risk assessments • Provide appropriate personal protective equipment (PPEs) to construction workers and ensure that it is used at all times. The contractor to provide life jackets to all workers near the water. • The contractor to provide a mechanism for reporting of accidents and near misses. • The first aid box to be made available for each team and a trained first aider to be available too.			
2.2.8.	Noise and vibrations	• Regularly monitor noise levels for any machine available on site and associated records be made available at the site office. • Use appropriate and well-maintained noise mufflers on vehicles and machinery. • Regularly service and carry maintenance of equipment. • Provide ear muffs for the workers in noisy areas. • Use electric motors instead of compressed air driven machinery. • Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and pads on large sheet metal surfaces. • Limit the number of days of operation; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings.	Throughout the construction period	Contractor	Cost of ear muff included in 2.2.7

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Notify the public of upcoming loud events.			
2.2.9.	Spread of communicable diseases and infections	• Treat the affected local and migrant workers • The contractor to provide sanitary facilities in good condition with adequate water supply. • Train workers on good personal hygiene practices e.g. washing of hands after visiting the toilet, drinking portable/treated water • Alert the responsible health authority if there is an outbreak of any communicable diseases.	Throughout construction	Contractor, District Health Officer	Included in 2.2.10
2.2.10.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	• Provide a reporting mechanism at the site where grievances can be channelled and this mechanism should also be available to the concerned public. • Sensitise communities on the disadvantages of indulging in extra-marital affairs. • Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place. • Sensitise girls on the dangers of getting involved in pre-marital sex at a tender age. • Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities. • Engage stakeholders in encouraging and empowering women to be financially independent. • Provide both male and female condoms to workers for appropriate use. • Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and	Quarterly	Contractor, District HIV/AIDS Coordinator	3,700,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		sexual intercourse with partners younger than 18 years of age (underage sex). • Support the District Social Welfare Office and the Community Development Office and Non-Governmental Organisations in the implementation of on-going projects aimed at assisting pupils to go back to school.			
2.2.11.	Incidence of sexual abuse and harassment	• Report any form of physical abuse/harassment to Police, that way workers will understand the seriousness of the offense. • Provide a reporting mechanism for both the public and the workers. • Sensitise workers and surrounding communities to avoid sexual abuse and harassment • Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment in the homes. • Publicise places for reporting gender violence and sexual harassment. • Create a good work environment to allow female workers to report cases of harassment. • Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved sexual abuse and harassment. • Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex). • Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-	Quarterly	NRWB, Contractor, District HIV/AIDS Coordinator, District Gender Office	Included in 2.2.10

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		going projects aimed at promoting gender equality and ending sexual harassment. • Implement and follow-up on grievance redress mechanisms. • Require the contractor to be responsible and to take necessary measures so his employees do not commit acts of sexual abuse and/or underage sex.			
2.2.12.	The increased pressure on community health services	• The contractor to engage a private nurse who will be responsible for his staff. • Conduct public awareness and sensitization on community health, HIV and AIDS. • Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required. • Require the workers, sensitize the communities follow recommended environmental and water management practices. • Construct adequate sanitation facilities at the work sites and surrounding area. • Provide both male and female condoms to workers for appropriate use. • Locate worker camps at a minimum distance of 1 km from towns and villages in order to limit worker – community interactions. • Maintain construction camps in clean and healthy condition as prescribed by international worker health standards. • Require all contractors and sub-contractors to comply with relevant health and safety requirements and NRWB corporate policy.	Quarterly	Contractor, Client, DHO	Cost included I 2.2.10

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.). • Involving other stakeholders including NGO's in the promotion of social welfare. • Support and supplement social services including the Health Surveillance Assistants.			
2.2.13.	Unequal employment opportunities	• Encourage the contractor to employ women as well. A clause should be included in the contract specifying that at least 5 - 10% of the employees should be women. • Conduct gender meetings to sensitize and encourage women and to instil confidence that they can also do the work that men do. • Ensure there are also women in important positions such as foremen and engineers. • Economically empower women within affected communities by linking them with the District Council's Community Service Investment Programme (COMSIP). • Create a good work environment to allow female workers report any case of harassment.	Quarterly	Contractor District social welfare officer	Included in 1.1.1
2.3.	**DEMOBILISATION PHASE**				
2.3.1.	Increased load of solid waste	• Separate waste at the source into their appropriate categories for easy disposal at the designated dumpsite. • Protect the waste from the public interference. • Involve the dump truck from the Mzuzu City Council for other wastes that are delicate and produce foul smell. • Provide appropriate personal protective equipment for all the employees that will be involved in managing these wastes.	Throughout the operation phase	Contractor, MCC	Cost included in 1.3.5

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
2.3.2.	Loss of jobs and businesses	• Introduce Money saving programs like Savings and Capital Cooperative (SACCO) for the employees so that they are prepared well for retrenchment. • Provide adequate notice to employees to prepare themselves and secure alternative employment. • Sensitize the workers and the general community to be saving. • Sensitize the business persons to diversify and find alternative markets.	Twice during the construction phase	Contractor, District Labour Office, District Community Development Office	Included in 2.2.3
		• Pay severance benefits to leaving workers in line with the labour regulations. • Provide alternative employment to employees where possible e.g. as maintenance staff.	Once during lay offs	Contractor, NRWB	Severance pay to be included in the contractor's bills of quantities
2.3.3.	Abandonment of used burrow pits and temporary pit latrines	• Fill up and close pits after the construction works. • The contractor should register all burrow pits to the Mzuzu City council. • Authorization Certificates (Signed by Land owners and chiefs) to be obtained before any soil extraction is done and also the Certificate of Rehabilitation to be issued at the end of the construction phase. • Construction materials e.g. sand and clay soils should be sourced from licensed supplier • The rehabilitation plan to include reforestation of the area.	Throughout construction	Contractor	1,000,000
2.4.	**OPERATION PHASE**				
2.4.1.	Increased solid waste generation	• Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale • Provide solid waste storage bins and skips. • Monitor skips so that they do not become overfilled.	Throughout the operation period	NRWB	Cost included in 1.3.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Ensure that collected solid waste is disposed of in an approved disposal sites. • Implement sensitization campaigns on consequences of indiscriminate waste disposal.			
2.4.2.	Increased pollution from wastewater and sludge	• Enforce proper excreta and wastewater management especially in the town. • Apply lime treatment to dewatered sludge to suppress pathogens and remove odour. • Enforce the use of licensed liquid waste handlers for liquid waste. • Dry sludge on drying beds before disposing off in a dedicated disposal site. • Prepare and enforce operational guidelines for sludge treatment and management. • Conduct WASH activities to sensitize people on the benefits (including prevention of cholera) of good the hygiene.	Bi Annually	Client, Environmental Health Officer	Cost included in 1.3.1
2.4.3.	Increase in Emergency incidents	• Design and implement an emergency response plan. • Install fire hydrants within the proposed development. • Use checklists to regularly monitor and maintain the water supply system. • Maintenance of natural drains around the weirs. • Install fire extinguishers at the plant and train workers on how to use. • Maintain the critical spares lists.	Monthly	Client	Cost included in 1.3.1
2.4.4.	Potential risks of water leakage and flooding from theft and vandalism	• NRWB must periodically conduct consultations and sensitizations with villages and group village heads and security personnel. • Provide security at the intake, treatment plant and water reservoir sites.	Throughout the operation period	Client	Cost included in 1.3.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Support activities of the neighbourhood watch (community policing) e.g. through provision of torches, uniforms and shoes. • Support economic activities in the area as part of corporate social responsibilities. • Reward for reports of vandalism and theft that may lead to capture. • Theft and vandalism cases must be reported to the police. • Regularly monitor the pipeline infrastructure. • Include the people from the local area in the work force.			

7.2. COST FOR ENVIRONMENTAL AND SOCIAL IMPACTS MANAGEMENT

Table 7.2 presents a summary of costs for implementing the Environmental and Social Management Plan.

The majority of the costs associated with the implementation of mitigation measures and enhancements cannot be specified at this stage of the study. Many of these measures are to be under the responsibility of the contractor(s) who will carry out the project implementation activities. The costs will therefore be integrated with other construction costs. It should be mentioned that the present ESMP imperatively needs to be appended to the construction tender documents to be published in order to ensure that those costs are placed under the responsibility of the project contractor(s).

Table 7.2: Summary of Environmental and Social Management Costs

S/N	Potential Impacts	Implementation cost in MWK/Year
6.	Creation of employment opportunities	3,500,000
7.	Improvement in natural resources and wildlife conservation	3,500,000
8.	Improved water supply to Mzuzu City and the surrounding areas	20,000,000
9.	Improved sanitation, hygiene and health	7,000,000
10.	Enhanced gender and women participation in development	7,300,000
11.	Unrealistic public expectations	3,500,000
12.	Degradation of water quality	1,000,000
13.	Air Pollution	5,000,000
14.	Soil contamination and land degradation	7,000,000
15.	Loss of vegetation cover	3,000,000
16.	Accidents and hazards from trenches and burrow pits	1,500,000
17.	Occupational incidents and accidents	3,700,000
18.	Increase in sexual relationships	3,700,000
19.	Abandonment of used burrow pits and temporary pit latrines	1,000,000
	Total	70,700,000

CHAPTER 8 : ENVIRONMENTAL AND SOCIAL MONITORING PLAN

8.1. ENVIRONMENT AND SOCIAL MONITORING PLAN ACTIVITIES

The Environmental and Social Monitoring Plan, presented in Table 8.1 provides for monitoring to check the implementation of the enhancement and mitigation measures proposed in the Environmental and Social Management Plan (table 7.1).

The monitoring plan identifies the roles and responsibilities of stakeholders to conduct the monitoring and the estimated cost of these monitoring activities. It provides monitoring indicators, means of their verification and the frequency of monitoring.

Implementation of the monitoring programme helps to verify the magnitude, duration and scope of the predicted impacts during and after implementing the enhancement and mitigation measures. It also helps to detect any unforeseen impacts at an early stage so that corrective measures can be taken, before significant damage takes place on the social, economic and biophysical components of the environment.

Table 8.1: Environmental and Social Monitoring Plan

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
20.	**ENHANCEMENT MEASURES FOR POSITIVE IMPACTS**						
1.1.	**PLANNING AND DESIGN**						
1.1.1.	Employment opportunity	Client to provide the necessary support for the team involved in the planning and design	Duration taken for data to be provided from the time requested	Quality of information provided to planning and designing team	Quarterly	Client, Consultant, Contractor	200,000
		The team to be composed of members with the appropriate qualifications and expertise to provide requisite information for the production of accurate designs.	Availability of Client staff when required				
1.2.	**CONSTRUCTION PHASE**						
1.2.1.	Source of employment and business	The contractor should willingly consider giving job opportunities to the people living in the surrounding areas of the Lunyangwa Dam.	Number of locals informed and employed through the council	Review of job applications forms and staff interview	Quarterly	District Labour Officer (DLO), District Social Welfare Officer, District Gender Officer, NRWB's Project Supervisor	300,000
			Percentage of locals employed	Review of employee files			
		The contractor should prescribe to the gender policy and labour Act which stipulates that 5 -10% of the workforce should be women.	Number of women employed against men	Head count, Review of employee files			
		Where possible the contractor should be encouraged to buy the	Number and availability of local materials	Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		construction materials within the city in order to empower the local business enterprises					
		The contractor to only employ workers possessing legitimate proof of identification that they are above 18 years of age.	Age of employees	Inspection, Review of employee files, check IDs			
		The contractor to make sure that employees are treated and paid fairly and that records for proof of payment are available at the site.	Number of cases of unfair treatment	Interviews			
		The women and people living with a disability should be given tasks that match their physical capability and level of skill.	Roles of the vulnerable groups compared against their abilities	Review of job descriptions			
		Wages must be above the minimum wage and overtime must be paid on time	Amount paid as wages including for over time	Interviews, Review of payment records			
		Workers must be sensitized to save and invest during project implementation.	Number of Workers sensitized, number of workers saving	Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Encourage the workers to participate in Community Services Investment programmes (COMSIP) and Village Saving and Loans groups.	Number of workers participating in COMSIP	Interviews, Review of COMSIP reports			
1.2.2.	Increase in trade opportunities	The contractor to source building materials from the local licensed dealers e.g. quarry dust from the licensed quarries within the city.	Percentage of licenced suppliers used	Review of procurement records, Interviews	Quarterly during construction	Director of Planning and Development, District Community Development Office, NRWB's Project Supervisor	Included in 1.1.1
		Pay building material suppliers within the agreed times	Time for paying suppliers				
		Support and promote of entrepreneurship skills amongst communities and business people in the project area by engaging them where appropriate.	Number of people engaged				
		Promote village savings and loan (VSL) schemes during project implementation.	Number of workers participating in VSL				
1.2.3.	Training opportunities in vocational skills for youth	Contractors to consider suitably motivated women on skills training program.	Number of women and youth on training	Employment records, visual inspection	Bi-annually	DLO, NRWB, DCDO	N/A
		Contractors to consider focused training program to	Strategic attachments and rotations of	Number of identified mentors/ mentees			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		optimize skills transfer to unskilled workers.	selected workers to specific sections/ area of specialization				
1.2.4.	Improvement in natural resources and wildlife conservation	Promote and support wildlife conservation programs	Number of natural resources wildlife programs	Attendance records to meetings	Quarterly	Community Development Office, NRWB's Project Supervisor, DFO	300,000
		Train the employees to understand the importance of wildlife.					
		Encourage employees to use firewood from the artificial trees.					
		Construction vehicles and machinery to use the designated access roads to the construction site.					
		contractor to provide a traffic management plan for the sites					
		Impose a strict penalty for all employees involved in poaching of wild animals.					
		Include contact numbers for the department of wild life on the emergency contact list					
		Promote the usage of anti-snake chemicals					
1.3.	**OPERATION PHASE**						

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
1.3.1.	Improved water supply to Mzuzu City and the surrounding areas	Ensure water reservoir tanks have adequate water all the time	Levels of water in reservoir tanks. Number of times water reservoirs have no water	Review records, Interviews	Quarterly	NRWB, District Water Development Officer	900,000
		Sustain the desired performance of the water supply system through timely preventive maintenance	Number of preventive maintenances done	Site visits, Interviews, record review			
		Quickly carryout maintenance works and restore water supply when there are problems.	Duration taken to carry out maintenance works				
		Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the supply points and implement control measures where results are below safe water standards.	Number of water quality analysis done Quality of water				
		Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules	Number of staffs with respect to the required staff; Presence and reports of following the work schedule				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Sensitize the water users on proper water management practices, water pricing and importance of payments of water bills in time.	Number of times sensitizations are conducted, Number of people sensitized,				
1.3.2.	Improved access to potable water source	Process water connection applications and provide water to the communities as quickly as possible.	Duration taken for water applications to be processed	Review of new water connection reports, Interviews	Quarterly	NRWB, District Water Development Officer	Cost included in 1.3.1.
		Ensure that the recommended maximum distances of 500 metres from houses to a water point is observed when constructing communal water points.	Distance between houses and water point	Site visits, Interviews			
		Ensure water is available all the time at the water points.	Percentage time water is available at the water points	Review of employee records, Review of work schedules, Interviews			
		Encourage communities to establish water kiosks committees in order to establish ownerships of the water draw off points.	Number of community kiosks established	Interview, review of records			
1.3.3.	Improved sanitation, hygiene and health	Sensitise communities on hygienic practices for handling water to avoid secondary contamination.	Number of times sensitizations are conducted; Number of	Review of health records from health care services Visual	Quarterly	NRWB, District Health Officer, Environmental Health Office	300,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
			reported secondary contamination	inspections, Review of water quality tests results			
		Encourage the community members to be vigilant in reporting water leakages and broken pipes.	Number of sensitizations conducted; Number of leakage and breakage reports received	Review of sensitization reports, Review of maintenance records			
		Promote general sanitation practices amongst communities in the project area.	Number of sanitation promotion activities conducted				
		Conduct trainings aimed at building the capacity of water kiosks committee.	Number of trainings conducted	Review of training reports, interviews			
		Monitor the quality of water and to promote health and hygiene at water points.	Quality of water	Review of water quality tests results			
		Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene.	Number of initiatives supported	Record review, interviews			
		Ensure there is adequate drainage within the community water points	Presence of adequate drainage structures	Inspection			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
1.3.4.	Improved socio-economic situation of the communities	Provide quality water, with minimal loss of supply, through system monitoring and regular maintenance	Water quality results, Average duration for loss of supply	Review of water supply reports, Review of water quality tests results	Quarterly	NRWB, District Social Welfare Office, District Water Office, District Community Development Office	300,000
		Support women and other vulnerable groups to start and operate business through appropriate training and start-up capital	Number of women and vulnerable groups supported to start businesses	Review of reports for supports with start-up capital			
		Make water costs affordable	Cost of water compared to income levels	Review of water tariffs and social-economic profile			
1.3.5.	Enhanced gender and women participation in development	Sensitize recruiting authorities to employ about 40% to 60% women.	Number of sensitizations, awareness meetings conducted	Review of sensitization reports	Quarterly	District Gender Office, District Community Development Office, NRWB	Included in 1.3.4
		Ensure there are also women in important positions	Number of women in important positions	Review of employee records			
		Promote gender mainstreaming in development activities through sensitization, advocacy and awareness.	Number of women involved in development activities	Review of sensitization records, Review of development activities records			
		Economically empower women within affected communities by linking them with the Community	Number of women linked to economic empowerment programmes	Review of economic empowerment programme reports			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Services Investment Programmes (COMSIP)					
1.3.6.	Education benefits to girl child	Conduct sensitizations aimed at encouraging girls to enrol in schools.	Number of sensitization meetings conducted	Review of sensitization reports	Quarterly	District Monitoring Information and Evaluation Office, District Education Office, District Social Welfare Office	Included in 1.3.4
		Provide the necessary support and adequate resources to schools to ensure that they have adequate resources for the provision of quality of education.	Availability of adequate resources in the schools	Review of education statistics			
		Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees.	Number of deserving girls provided with bursaries and support				
		Provide adequate water and appropriate sanitation facilities in schools to support female students.	Availability of adequate water supply and sanitation in schools				
1.3.7.	Employment opportunities	Where feasible, local qualified people will be considered for job opportunities.	Percentage of locals employed	Review of employee files	Quarterly	District Labour Officer (DLO), District Social Welfare Officer, District Gender Officer, NRWB's	300,000
		Adequate occupational health and safety standards should be provided to	Availability of health and safety	Observations, records review, interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		ensure the work environment is conducive.	standards at the site			Project Supervisor	
		Consider employing both qualified female and male workers to enhance income distribution among both men and women.	Number of female employees against the number of males	Review of employees files			
		The women and people living with disability should be given tasks that commensurate with their physical ability and level of skills.	Roles of the vulnerable groups compared against their abilities	Review of job descriptions			
1.3.8.	Increased development	New water connection applications must be processed within set time	Duration for processing applications	Review of water connection records	Quarterly	NRWB, District Water Development Office, Director of Planning and Development	300,000
		Provide adequate potable water supply to the new areas	Volume of water supplied compared to the demand	Interview, Review of water supply records			
		Sensitize the communities to report leakages and breakages of pipes	Number of sensitizations conducted; Number of leakage and breakage reports received	Review of sensitization reports, Review of maintenance records			
		The City Council must ensure that development activities are implemented within Council plans and laws	Percentage of time water is available and adequacy of sanitation	Review of water supply reports, Interviews, Visual inspection on sanitation			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
2.	**MITIGATION MEASURES FOR ADVERSE IMPACTS**						
2.1.	**PLANNING AND DESIGN PHASE**						
2.1.1.	Unrealistic public expectations	Conduct sensitization and awareness on the need for raising the wall of the dam by the height of 1.5m. The design team to incorporate the Environmental expert in the team and take time to sensitize and alert those within project influence areas.	Number of awareness and sensitization meetings conducted	Review of sensitization reports/records	Monthly before commencement of construction	NRWB, District Lands Office, Director of Planning and Development	300,000
		The design team to incorporate the environmental and social expert to facilitate sensitizations and alert those within project influence areas.	Presence of and environmental and social expert	Record review, inspection and interviews			
		The design team to take all the necessary measures to document any concerns and address them on as they occur.	Inclusion of all the recommended measures in the designs	Review of project designs			
		Sensitize the affected people to use the existing Grievance Redress Mechanism	Number of sensitization meetings done	Record review			
2.2.	**Construction phase**						

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
2.2.1.	Degradation of Water Quality	Provide a schedule for excavation works to the treatment plant team so that they plan to pump water accordingly.	Schedule availability	Visual inspection, interviews, record review	Monthly	Contractor, NRWB, Environmental District Office	900,000
		Encourage use of mortar and debris traps during construction.	Presence of mortar and debris traps				
		Strategic stakeholder consultations must be done comprehensively to make sure that those who could potentially be affected are aware of the works program.	Number of consultations done				
		Mix cement in areas, which are not directly connected to natural drainage systems.	Distance to natural drainage of areas for cement and paint mixing				
		Shutters to be properly erected and monitored to check if there are any unallowable spaces in between the joints which may lead to concrete leakages.	Perimeter with a barrier as compared to the total area that requires a barrier				
		Store cement, paints, lubricants and fuels in lined and covered areas.	Percentage of construction materials stored				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
			and contained on lined surface				
		Provide appropriate spill kits when working near water courses.	Availability of spills kits at the site				
		Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water.	Availability of appropriate waste collection materials				
		Site all material storage areas at least 10 m from watercourses	Distance from water source to the				
		Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses.	Availability of barriers at the worksite				
		Connect the drainage systems to oil interceptors.	Presence of drainage structures				
		Line surfaces where cement, paints and oils will be stored and connecting the drainage systems to oil interceptors.	Percentage of construction material on lined surface				
		Collect and dispose wastes in designated disposal sites as required by the Local Authority	Volume of waste disposed in approved sites				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Construct pit latrines that are at least 1.5 meters deep, lined at the base and 30 metres from a water body.	Distance from to pit latrines and depth of pit latrines				
		The excavated material should be kept far away from the water pumps.	Distance between excavated materials and water pumps				
		The other stakeholders should be involved when the excavation works commences.	Availability/presence of other stakeholder before excavation works				
2.2.2.	Air Pollution	Use new or fairly new vehicular equipment with exhaust gas emissions above permissible emission limits.	Number of years equipment has been in use, Level of emissions from equipment	Review of procurement records, Inspection, Interviews	Monthly	Contractor, NRWB, Environmental District Office	Cost included in 2.2.1
		Erect safety signboards to warn other road users about the volume of construction traffic.	Availability of safety signboards	Site inspection			
		Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits.	Dates for servicing vehicles and equipment in respect to set dates for service	Review of maintenance records			
		Use the water bowsers to spray water along the	Number of times the site is sprayed	Interviews, Visual inspection			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		access roads used by the haulage trucks.	with water to control dust, Dust complaints				
		Provide protective gear (dust masks) to workers and ensure that they wear them.	Reports of use of protective gear during dust generating activities				
		Erect a barrier around the work sites where major construction activities are taking place to break or reduce wind and dust movement.	Perimeter with a barrier as compared to the total area that requires a barrier				
		Store and handle quarry dust and cement properly to limit dust generation.	Reports of proper handling and storage of sand and cement, Presence of dust				
		Optimize transportation management to avoid needless truck drives.	Number or errands for vehicles per day	Review of vehicle logs			
		Construct gravel speed bumps to Control vehicle speeds.	Number of reports of over speeding, Presence of vehicle speed signs	Interviews, Visual inspections			
		Reduce engine idling time.	Time period vehicles remain on idling	Random checks, interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.	Number of times workers go for check-up	Review of human resources records/employee records			
2.2.3.	Soil contamination and land degradation	Provide garbage collecting bins at the construction site and monitor its usage	Presence and number of garbage collection bins available at the site	Site Inspection	Monthly	Contractor, NRWB, Environmental District Office	Included in 2.2.1
		Contractor to develop the waste management plan in accordance with the Environmental Management Act 1996, and should keep records of the volume of waste generated and disposed.	Presence of a waste management plan at the site				
		Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils.	Size of surfaced areas	Visual inspection, Measurements,			
		Use containers to collect used oil and then properly discard waste oil containers in approved disposal sites,	Volume of waste disposed in approved sites	Review of waste management records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		as recommended Mzuzu City Council					
		Segregate waste (e.g. cartons and paint containers) to encourage reuse.					
		Provide all structures required for effective water drainage.	Presence of adequate drainage structures				
		Construct waste disposal pits and bury the wastes after the construction period.	Presence of waste disposal pits and distance to water bodies				
		Closely supervise the workforce to avoid or limit waste generation.	Volume of generated waste				
		Store and contain construction materials on lined surfaces and in covered areas.	Percentage of construction materials stored and contained on lined surface				
		Sensitize construction workers to avoid littering the site.	Number of sensitizations; Presence of littered sites	Review of records			
		Use excavated soils for backfilling and site levelling.	Volume of excavated used for backfilling and levelling	Inspection			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Promote the usage of quarry dust and source quarry in approved sites that are run sustainably.	Presence of quarry dust, sites and methods for quarrying	Inspection, Interviews			
		Enforce the use of licensed construction material suppliers through the construction contract(s).	Clause in contracts, and the types of suppliers that are used	Review of contracts and suppliers used			
2.2.4.	Loss of vegetation cover	Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation.	Size of cleared areas in relation to required space	Inspection, measurement	Monthly	Contractor, NRWB, Environmental District Office	Included in 2.2.1
		Strict control of construction vehicles to ensure that they operate only within the areas to be affected by the construction works or engage only in activities that benefit the project.	Number of trips outside the area affected by construction	Record review			
		Plant appropriate trees and grasses in all disturbed areas; ensure that for every single tree cut down, 10 tree seedlings of a similar species are planted in the adjacent areas.	Size of affected area planted with trees and grass Number of trees planted	Inspection, measurement			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Cost and appropriately compensate for all the trees to be cut down during construction	Percentage of trees compensated for	Review of compensation records			
		Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass immediately after construction works to minimise soil erosion.	Size of rehabilitated sites				
		Sensitize employees and the community to conserve vegetation.	Number of employee and community sensitized	Review of sensitization records			
		Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.	Volume/number of reused plants materials	Interviews, Inspections			
2.2.5.	Accidents and hazards from trenches and burrow pits	Use construction material suppliers that are licensed by the Mzuzu City Council.	Size of rehabilitated sites	Visual inspection, Review of procurement records, Interviews	Once during the demobilisation phase	Contractor, NRWB, Environmental District Officer	300,000
		Avoid making deep pits when extracting construction materials.	Depths of pits				
		Refill all burrow pits to be created during the	Number of barrow pits rehabilitated				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		upgrading, rehabilitation and expansion of the water supply systems.					
		Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them.	Presence of barricades, and appropriate signs, around trenches				
		Inform and sensitize the public about all open pits and trenches.	Number of people sensitized				
		Supervise adequately the construction activities and follow recommended procedures	Number of hours a supervisor is on site				
2.2.6.	Disruption of water supply	Give adequate notice of potential water disruption to the water users that could be affected	Number of times water supply is disrupted without notice	Review of construction reports, Interviews	Monthly	Contractor, NRWB, District Water Office	900,000
		Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate	Availability of alternative means of supplying water				
		The contractor to Provide a works schedule with strategically staggered activities to avoid total flow disruption during construction	Presence of written working schedule				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
2.2.7.	Occupational incidents and accidents	A competent swimmer to be available all the time when the works are being done.	Presence of a competent swimmer	Interviews, record review	Daily	Contractor	Cost included in 2.2.5
		An emergency vehicle to be available all times when the works are in progress.	presence of an emergency vehicle	Inspection, interviews	Quarterly	District Labour Office, NRWB	
		Workers to be trained on safe operating procedures.	Number of trainings conducted	Record review			
		Induct workers on OSH requirements and repeat reminders on the same	Number of workers inducted and reports of reminders	Review of OSH induction records			
		Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of practice for various tasks are followed by workers at all times.	Presence of an OSH expert	Review of human resources records, Inspection			
		Provide appropriate personal protective equipment (PPEs) to construction workers; and to ensure that it is used at all times.	Availability and evidence of use of appropriate PPEs	Inspection, Interview			
		The contractor to provide a mechanism for reporting of accidents and near misses	Number of accidents reported	Record review, interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		The first aid box to be made available for each team and a trained first aider to be available too.	Presence and number of first aid kit/box	Inspection, interviews			
2.2.8.	Noise and vibrations	Regularly monitor noise levels for any machine available on site and associated records be made available at the site office.	Number of times noise is monitored at the site	Record review, interviews	Daily Monthly	Contractor NRWB, Environmental District Office	Included under 2.2.5
		Use appropriate and well-maintained noise mufflers on vehicles and machinery	Types and number of times noise mufflers are used and maintained	Inspections and Interviews			
		Regularly service and carry maintenance of equipment	Number of times the equipment is maintained; Condition of equipment	Inspection, Review of maintenance reports			
		Provide ear muffs for the workers in noisy areas	Number of workers are provided with ear muffs	Inspection, Interviews			
		Use electric motors instead of compressed air driven machinery	Use of electric motors against the use air driven machinery	Inspection			
		Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and pads	Number of complaints during construction	Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		on large sheet metal surfaces.					
		Limit the number of days of operation; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings	Number of days and hours of noise activities	Random interviews, Construction reports			
		Notify the public of upcoming loud events	Number of notices sent, and the time when notices are sent	Inspection of records			
2.2.9.	Spread of communicable diseases and infections	Treat the affected local and migrant workers so as to control the movement of disease vectors	Number of treated affected people	Record review from the contactor and nearby health facilities	Quarterly	Contractor NRWB, Environmental District Office, District Health Officer	300,000
		The contractor to provide sanitary facilities in good condition with adequate water supply.	Presence and number of sanitary facilities	Inspection			
		Train workers on good personal hygiene practices e.g. washing of hands after visiting the toilet, drinking portable/treated water	Number of trainings on personal hygiene	Training record review			
		Alert the responsible health authority if there is an outbreak of any communicable diseases.	Number of alerts	Record review			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
2.2.10.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	Provide a reporting mechanism at the site where grievances can be channelled and this mechanism should also be available to the concerned public.	Number of grievances lodged	Record review	Quarterly	Contractor, NRWB, District Social Welfare Office, District Gender Office	Cost included in 2.2.9
		Sensitise communities on the disadvantages of indulging in extra-marital affairs.	Number of sensitization meetings conducted Number of people sensitized	Review of sensitization records/minutes			
		Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place.					
		Sensitise girls on the dangers of getting involved in pre-marital sex at a tender age.					
		Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities.	Number of workers disciplined for engaging in illicit sex with school going girls	Review of human resources/disciplinary records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Engage stakeholders in encouraging and empowering women to be financially independent.	Number of stakeholders engaged in empowering women	Review of stakeholders (e.g. NGO and CBO) activities records			
		Provide both male and female condoms to workers for appropriate use.	Availability and number of male and female condoms	Inspections, Interviews			
		Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).	Presence and implementation of an STD and HIV/AIDS prevention programme	Interviews, Review of reports of implementation of STDs and HIV/AIDS program			
		Support the District Social Welfare Office and the Community Development Office and Non-Governmental Organisations in the implementation of on-going projects aimed at assisting pupils to go back to school.	Level of support	Interviews, review of reports indicating activities for supporting various District Council Offices and NGO			
2.2.11.	Incidence of sexual abuse and harassment	Report any form of physical abuse/harassment to Police, that way workers	Number of physical abuse/ harassment reported	Review of human resources/ disciplinary records	Quarterly	NRWB, Environmental District Office,	Included in 2.2.9

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		will understand the seriousness of the offense.		Interviews, Review of reports of implementation of STDs and HIV/AIDS program Interviews, Review of support records		District Health Offices, District Gender Office, District Labour Office	
		Provide a reporting mechanism for both the public and the workers					
		Sensitise workers and surrounding communities to avoid sexual abuse and harassment	Number of sensitizations conducted	Review of sensitization records			
		Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment in the homes.	Number of sensitizations conducted; Number of reports received on sexual harassment				
		Publicise places for reporting gender violence and sexual harassment.	Availability of places for reporting gender related and sexual harassment	Inspections, Interviews			
		Create a good work environment to allow female workers to report cases of harassment.	Availability of a good work environment, Number of harassment reports received	Interviews, Review of human resources records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved sexual abuse and harassment.	Number of workers disciplined for being involved in sexual harassment	Review of human resources/ disciplinary records			
		Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).	Presence and implementation of an STD and HIV/AIDS prevention programme	Interviews, Review of reports of implementation of STDs and HIV/AIDS program			
		Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-going projects aimed at promoting gender equality and ending sexual harassment.	Level of support provided	Interviews, Review of support records			
		Implement and follow-up on grievance redress mechanisms.	Number of times the grievance redress mechanism and follow ups	Audit of the grievance redress mechanism, Review of grievance redress records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Require the contractor to be responsible and to take necessary measures so his employees do not commit acts of sexual abuse and/or underage sex.	Availability of a clause in the contract requiring the contractor to take measures for avoiding sexual abuse and underage sex	Review of the contract prevention programme			
2.2.12.	Increased pressure on community health services	The contractor to engage a private nurse who will be responsible for his staff	Presence of the private nurse or health personnel on the site	Inspection, interviews, record review	Bi-annually	NRWB, District Health Offices	300,000
		Conduct public awareness and sensitization on community health, HIV and AIDS.	Number of awareness and sensitizations conducted	Review of sensitization records			
		Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required.	Percentage of potential employees screened	Review of recruitment reports			
		Require the workers, sensitize the communities follow recommended environmental and water management practices.	Percentage of workers and communities following recommended water resources and environment management practices	Inspections, Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Construct adequate sanitation facilities at the work sites and surrounding area.	Number of sanitation facilities constructed, compared to the population to use them	Visual inspections, Counting			
		Provide both male and female condoms to workers for appropriate use.	Presence of both female and male condoms at the site	Inspection			
		Locate worker camps at a minimum distance of 1 km from towns and villages in order to limit worker – community interactions.	Distance between workers camp and community	Inspection, Measurement			
		Maintain construction camps in clean and healthy condition as prescribed by international worker health standards.	Adherence to the international worker health standards	Inspections, Comparisons of the conditions in the camps to the international standards			
		Require all contractors and sub-contractors to comply with relevant health and safety requirements and NRWB corporate policy.	Presence of relevant health and safety requirements and policy	Review of records			
		Develop and implement an H&S management plan to protect every worker involved in construction	Presence and implementation of an H & S management plan	Inspections, Interviews, review of an H & S management plan			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		activities, even temporary workers (e.g. vaccines, etc.).					
		Involving other stakeholders including NGO's in the promotion of social welfare.	Number of stakeholders involved	Review of records, Interviews			
		Support and supplement social services including the Health Surveillance Assistants.	Level of support and supplement to health surveillance system	Interview, Review of support records			
2.2.13.	Unequal employment opportunities	Encourage the contractor to employ women as well. A clause should be included in the contract specifying that at least 5-10% of the employees should be women.	Number of women employed versus the number of men	Head count, Review of employee files, Head count, Review of sensitization records	Quarterly	Contractor, District Labour Office, District Social Welfare Office	300,000
		Conduct gender meetings to encourage women and to instil confidence that they can also do the work that men do	Number of women sensitized, Number of women doing the work said to be for men				
		Ensure there are also women in important positions such as foreman and engineers	Number of women in important positions				
		Economically empower women within affected communities by linking them with the District	Number of women linked to COMSIP	Review of COMSIP records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Council's Community Service Investment Programme (COMSIP)					
		Create a good work environment to allow female workers report any case of harassment.	Number of females being able to report harassment	Interview, Review of harassment records			
2.3.	**DEMOBILISATION PHASE**						
2.3.1.	Increased load of solid waste	Separate waste at the source into their appropriate categories for easy disposal at the designated dumpsite.	Volume of waste disposed in approved sites	Inspections, Interviews	Quarterly	NRWB, Environmental District Office, District Health Office	900,000
		Protect the waste from the public interference.	Presence of barriers separating waste				
		Involve the dump truck from the Mzuzu City Council for other wastes that are delicate and produce foul smell.	Number of times the Mzuzu City Council is involved				
		Provide appropriate personal protective equipment for all the employees that will be involved in managing these wastes.	Availability and evidence of use of appropriate PPEs				
2.3.2.	Loss of jobs due to completion of construction works	Introduce Money saving programs like Savings and Capital Cooperative	Number of money savings program	Interviews, record review	Once during the	Contractor, NRWB, District Labour Officer	100,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		(SACCO) for the employees so that they are prepared well for retrenchment.			demobilisation phase		
		Provide alternative employment to employees e.g. as maintenance staff	Number of employees allowed to continue working	Review of the employee register			
		Provide adequate notice to employees to prepare themselves and secure alternative employment	The notice period before layoffs	Interviews, Review of employee files			
		Sensitize the workers and the general community to be saving	Number of workers saving from their pay; Number of people sensitized	Interviews, review of records of sensitizations			
		Pay severance benefits to leaving workers in line with the labour regulations.	Number of labours to have received the pay	Interviews, Review of severance pay records			
		Sensitize the business persons to diversify and find alternative markets	Reports of business diversification and opening of new markets	Interviews			
2.3.3.	Abandonment of excavated areas for raw materials	Fill up and close pits after the construction works	Presence and number of filled pits after construction works	Visual inspection, Review of procurement records, Interviews	Once during the demobilisation phase	Contractor, NRWB, District Labour Officer	100,000
		The contractor should register all burrow pits to the Mzuzu City council	Number of barrow pits registered	Review of records, interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Authorization Certificates (Signed by Land owners and chiefs) to be obtained before any soil extraction is done and also the Certificate of Rehabilitation to be issued at the end of the construction phase;	Presence of signed certificates	Review of records, interviews			
		Construction materials e.g. sand and clay soils should be sourced from licensed supplier	Number of resources sourced from licensed suppliers	Interviews, inspections			
		The rehabilitation plan to include reforestation of the area.	Presence and number of filled pits after construction works	Visual inspection, Review of procurement records, Interviews			
2.4.	**OPERATION PHASE**						
2.4.1.	Increased solid waste generation	Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale	Volume of wastes sold or reused	Inspections, Interviews	Quarterly	NRWB, Environmental District Office, District Health Office	300,000
		Provide solid waste storage bins and skips.	Presence and number of storage bins and skips				
		Monitor skips so that they do not become overfilled.	Number of times skips are over filled				
		Ensure that collected solid waste is disposed of in an approved disposal sites.	Volume of waste disposed in approved sites				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Implement sensitization campaigns on consequences of indiscriminate waste disposal.	Number of times sensitizations are conducted				
2.4.2.	Increased pollution from wastewater and sludge	Enforce proper excreta and wastewater management especially in the town.	Evidence of proper waste management	Inspections	Quarterly	NRWB, Environmental District Office, District Health Office	900,000
		Apply lime treatment to dewatered sludge to suppress pathogens and remove odour.	Number of times quicklime is used to treat sludge	Interviews			
		Enforce the use of licensed liquid waste handlers for liquid waste.	Number of times licensed liquid waste handlers are used	Review of waste collection records, Interview			
		Dry sludge on drying beds before disposing off in a dedicated disposal site.	Volume of waste dried before disposing				
		Prepare and enforce operational guidelines for sludge treatment and management.	Availability and reports of enforcement of operational guidelines for sludge treatment	Review of the operational guidelines, Interviews, Inspection			
		Conduct WASH activities to sensitize people on the benefits (including prevention of cholera) of good the hygiene.	Number of sensitizations; Number of reported cholera cases	Review of diseases statistics			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
2.4.3.	Increase in Emergency incidents	Design and implement an emergency response plan.	presence of emergency response plan	record review, interviews	Quarterly	NRWB, Environmental District Office, District Health Office	Included in 2.4.1
		Install fire hydrants within the proposed development.	Presence of a written emergency preparedness plan	Inspections, Interviews, record review			
		Use checklists to regularly monitor and maintain the water supply system.	Presence of checklist				
		Maintenance of natural drains around the weirs;	Number and dates of maintenance				
		Install fire extinguishers at the plant and train workers on how to use.	Presence and number of fire extinguishers				
		Maintain the critical spares lists.	Number and dates of maintenance				
2.4.4.	Potential risks of water leakage and flooding from theft and vandalism	NRWB must periodically conduct consultations and sensitizations with villages and group village heads and security personnel.	Number of times consultations and sensitizations are conducted	Review of consultations records	Bi-annually	NRWB, District Water Development Office	Included in 2.4.1
		Provide security at the intake, treatment plant and water reservoir sites.	Presence and number of security personnel	Inspections			
		Support activities of the neighbourhood watch (community policing) e.g. through provision of torches, uniforms and shoes.	Support provided to the neighbourhood watch	Interviews, Review of Cooperate Social Responsibility records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring Indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MWK/Year)
		Support economic activities in the area as part of corporate social responsibilities.	Reports of implementation of cooperate social responsibility programmes				
		Reward for reports of vandalism and theft that may lead to capture.	Reports of rewards for information	Interviews, Review of reports of rewards			
		Theft and vandalism cases must be reported to the police	Number of reported theft cases	Review of theft cases			
		Regularly monitor the pipeline infrastructure	Number of times monitoring is done	Review of monitoring records			
		Include the people from the local area in the work force.	Number of locals in the workforce	Head count, review of employee files			

8.2. SUMMARY OF MONITORING COST

The costs in the Environmental and Social Monitoring Plan have been summarised and presented in Table 8.2. The total cost for monitoring the impacts from the planning and design to the construction phase is established as MWK 7,300,000 per year (Seven Million Kwacha). The Northern Region Water Board and stakeholders must ensure that the funds are available to ensure effective implementation of this monitoring plan.

The cost per year for monitoring activities during the operation and maintenance phase are presented in Table 8.2.

Table 8.2: Cost for monitoring activities

S/N	Potential Impact	Cost in MWK per Year
1.	Creation of employment opportunities	800,000
2.	Natural resources and wildlife conservation	300,000
3.	Improved water supply to Mzuzu City and the surrounding areas	900,000
4.	Improved sanitation, hygiene and health	300,000
5.	Improved socio-economic situation of the communities	300,000
6.	Increased development	300,000
7.	Unrealistic public expectation	300,000
8.	Degradation of water quality	900,000
9.	Accidents and hazards from trenches and burrow pits	300,000
10.	Disruption of water supply, Water pollution and siltation	900,000
11.	Spread communicable diseases and infections	300,000
12.	Increased pressure on community health services	300,000
13.	Unequal employment opportunities	300,000
14.	Increased load of solid waste	900,000
15.	Loss of jobs due to completion construction works	100,000
16.	Abandonment of excavated areas for raw materials	100,000
17.	Solid waste generation	300,000
18.	Increased pollution from wastewater and sludge	900,000
	Total	**8,500,000**

CHAPTER 9 : PUBLIC CONSULTATIONS

Active consultations with relevant regulatory bodies, experts, affected communities and other interested and affected parties is a requirement in conducting environmental and social impact assessment. For this project, consultations have been on-going till the finalization of this ESIA report. This chapter documents the approach to the consultations, objectives and a summary the consultation outcome for preparation of this ESIA.

9.1. OBJECTIVES OF THE PUBLIC CONSULTATIONS

During the ESIA studies, broad consultations involving officials from the Northern Region Water Board, the Regional and District members of staff from the Ministry of Irrigation and Water Development, the District Council Administration and the local leadership were undertaken to ensure that informed decisions are taken regarding the implementation of the water supply project. The meetings also aimed at soliciting information which was used during the environmental and social screening of the project.

During preparation of this ESIA Key objectives of the public consultations were to:

1. Communicate and clarify the objectives and activities for the proposed upgrading and expansion works for Mzuzu water supply systems;
2. Increase public awareness about the proposed project to enhance their understanding;
3. Facilitate and provide a forum for public dialogue and contribution on issues regarding the ESIA for the proposed project;
4. Gather and verify environmental and socio-economic baseline information and constructive ideas to complement the ESIA preparation process for project;
5. Ensure that the ESIA development process helps to consolidate efforts made by NRWB and the local authorities in order to establish lasting relationships with affected communities and other stakeholders; and
6. Ensure compliance with the national and international regulations.

9.2. APPROACH, TARGET GROUPS AND ENGAGEMENT METHODS

The approach to the public consultations process was based on what is outlined in Appendix G of the 1997 Guidelines for EIA for Malawi. Thus, the principal stakeholders (Project Affected Persons) were engaged and more than two methods were used in the engagement process. The consultations were designed to allow for obtaining and cross-checking information obtained at all levels. The consultations included the following:

- Formal meeting and presentations to the District Coordination Team for Mzuzu City Council.
- Direct interviews with stakeholders, and particularly representatives of regional and district level governmental institutions, service providers and NGOs/CSOs; and
- Formal and informal meetings with affected people through focus group discussions and individual interviews through household survey.

9.3. CONSULTATION OUTCOMES

Details of consultation undertaken by WWEC, including the people consulted, dates of consultations and the issues discussed are presented in Appendix 4 and 5. Key issues established from the consultations are as follows:

- The locals anticipate that levels of water related diseases will be reduced. Additionally, they anticipate that the time they spend fetching water will be reduced and thereby increasing their time of productivity.
- The developer should consider having more awareness meetings with the locals to ensure that early marriages and sexually transmitted diseases are avoided to both locals and workers especially during the construction phase of the project.
- The developer should sustain the benefits of employment opportunities and business by encouraging the community to save and engaging them in COMSIP projects. These projects should also involve female headed households as their levels of income are usually low as compared to male headed households.
- Construction works that are to be done within a forest reserve area, the procedure is that a developer has to obtain an approving licence from the forestry department which stipulates the conditions under which the project works are to be done in order to ensure that the forest reserve area is protected
- The developer to prioritise the following mitigation measures to conserve the environment and avoid community disturbances:
    a. Provide an alternative energy source at the campsites to keep workers from cutting down trees for firewood.
    b. Cover all trenches that may be excavated for laying of any new pipes to avoid inconveniencing people that may be using the sites of the trenches as walking pathways.
    c. Inform surrounding communities through sensitizations of any potential disturbances (such as noises) that may come as a result of the project works.
    d. Waste management plans (both construction and domestic wastes) should be generated at construction camp sites and clearly presented in the developer's Environmental management plans.
- Minimise as much as possible, the hiring of migrant workers to avoid cases of influx of more people into the local communities that may cause disturbances into the social/cultural establishments of the locals and possibly lead to increased cases of crimes such as thefts.

CHAPTER 10 : CONCLUSION AND RECOMMENDATIONS

10.1. CONCLUSION

This Environmental and Social Impact Assessment report has identified and assessed significant environmental and social impacts of the proposed rehabilitation, upgrading and expansion works for Mzuzu Water Supply System. The Project is positive as it will help the Northern Region Water Board to address some of the challenges, which it has been facing in its operations because of inadequate water supply and old infrastructure, resulting in failure to meet the increased demand for social and economic development.

However, development of the structures is likely to generate some negative impacts on the biophysical and socio-economic environment. The negative impacts, on overall, are assessed to be medium; mitigation measures have been recommended and are compiled into the Environmental and Social Management Plan (ESMP). A monitoring plan has also been prepared and will assist Northern Region Water Board, the Contractor and other key stakeholders to effectively monitor the implementation of the Environmental and Social Management Plan and ensure that Key Performance Indicators are achieved. Hence, the project should be allowed to proceed.

10.2. RECOMMENDATIONS

To ensure satisfactory achievement of environmental and social sustainability in the implementation of the proposed project, the following recommendations are made:

a) Water abstraction has to be in accordance to the Water Right, which NRWB will be required to obtain before the project can be implemented.
b) The project should be fully supported by all the relevant institutions;
c) Adequate financial support should be allocated to realise the full potential to improve the socio-economic wellbeing of the targeted communities;
d) The environmental and social impacts should be avoided or minimised to the greatest extent possible by fully implementing the enhancement and mitigation measures advanced in this report;
e) The communities have a negative perception of NRWB and how it calculates water tariffs, the NRWB must conduct adequate sensitization on water supply pricing and management.
f) NRWB must allocate additional funds in cooperate social responsibilities to improve its image among the communities,
g) During construction, the contractor should avoid clearing any protected or endangered plant species. Where they are removed, they must be replanted.
h) Adequate and fair compensation must be given to all the affected people before construction activities start;
i) NRWB and the respective key stakeholders should support and facilitate employment of women, the youth and vulnerable groups to eliminate potential gender and social imbalances; where possible and appropriate, employment of local people from the project area must be prioritised to encourage community ownership and sustainability of the project.

CHAPTER 11 REFERENCES

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APPENDICES

APPENDIX 1: TERMS OF REFERENCE

THE REPUBLIC OF MALAWI NORTHERN REGION WATER BOARD MALAWI NRWB WATER EFFICIENCY PROJECT

PROCUREMENT OF CONSULTANCY SERVICES FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND PREPARATION OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR DAM RAISING

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1. Background

Contract No.: NRWB/MZUZU/C03

The Northern Region Water Board was established under the Waterworks Act No. 17 of 1995 as a parastatal organization responsible for the provision of water supply and waterborne sanitation services in the urban centres of the Northern Region of Malawi. The Mzuzu and Ekwendeni water supply systems are two of the ten water supply systems that are managed by the Northern Region Water Board (NRWB).

The sources of water for Mzuzu City, Ekwendeni Town and the surrounding areas have been surpassed by the current water demand. In the long term, the solution to this challenge is construction of an additional dam. However, being a major undertaking, construction of the additional dam and the associated water supply facilities will take several years. Accordingly, there is need for quick interventions which will sustain the water supply to Mzuzu City, Ekwendeni Town and the surrounding areas while funds for construction of the new dam and associated facilities are being sourced and, thereafter, during construction of the dam and these facilities. One of the interventions that has been identified is the raising of Lunyangwa Dam. The raising of Lunyangwa Dam will be done as part of the Malawi NRWB Water Efficiency Project which is financed by the European Investment Bank (EIB).

These terms of reference cover the undertaking of Environmental and Social Impact Assessments (ESIAs) and the preparation of Environmental and Social Management and Monitoring Plans (ESMPs) for the proposed raising of Lunyangwa Dam.

2. Details of proposed dam raising

The principal source of water for Mzuzu is Lunyangwa Dam, which was constructed on the Lunyangwa River in 1994 and sized to cope with the then projected 2005 demand of 18 500 m3/d. The water demand for Mzuzu and the surrounding areas has subsequently outstripped the design capacity of Lunyangwa Dam and it has, therefore, been proposed that the dam be

raised to increase its supply capacity. It is envisaged that the dam will be raised by installing gates on the spillway crest to increase the full supply level by 1.5 m.

3. Objective of the Consultancy Services

The objective of this consultancy is to conduct a detailed environmental and social impact assessment (ESIA) for the proposed dam raising and to develop environmental and social impact mitigation measures commensurate with national and international standards and present them in the form of Environmental and Social Management and Monitoring Plans (ESMPs).

4. Scope of Work

4.1 General

The consultancy will provide useful information to the NRWB on how the project should be planned, designed and constructed to avoid or mitigate negative impacts and to better capture potential environmental and social benefits. As such, the consultant will be required, inter alia, to:

a) Conduct Environmental and Social Impact Assessment studies compliant with the relevant National Environmental and Social Legislation and EIB Safeguard Environmental and Social Policies;

b) Generate baseline data for monitoring and evaluation of how well the mitigation measures will be implemented during the project cycle;

c) Evaluate potential impacts of engineering and design activities during the site preparation, construction and operational phases of the project;

d) Identify the positive and negative impacts of the sub-activities on the physical and socio-economic environments;

e) Make recommendations of environmentally sound, socially acceptable and cost-effective measures to be implemented in the entire course of the proposed project;

f) Prepare Environmental and Social Management and Monitoring Plans (ESMPs) for the project incorporating the findings of the activities described above and recommending appropriate mitigation measures for negative impacts and

enhancement measures for positive impacts. The ESMPs must include an implementation schedule for the recommended environmental and social management and monitoring measures, and a clear explanation of institutional responsibilities, including those pertaining to the NRWB and to other organizations.

4.2 Baseline assessment The baseline assessment shall, inter alia, include:

a) A review of the design that has been prepared for the dam raising;

b) Identification of the areas that will be affected by the proposed dam raising;

c) Preparation of maps showing the areas that will be affected and the affected natural resources and settlements;

d) Collection of information about the environment and communities within the areas that will be affected by the proposed dam raising. This should include:

The Consultant baseline data.

Information about terrestrial plant and animal species known to or expected to occur within the project area, particularly any species of conservation concern (threatened, endemic to a small area, etc.); Information about fish and other aquatic life, including any migratory species which might be affected by the raising of the dam;

Details of any sites of high environmental sensitivity or special legal protection; Information about vegetative cover, including the main vegetation types (natural and altered) present in the project area and the percentage ground cover of the different vegetation types, including any cultivated or degraded lands as well as natural woodlands; and

Information about land tenure i.e. status of land to be affected by the project.

will be free to add other relevant information when compiling the

4.3 Compliance with legal and guideline requirements

The Consultant shall briefly describe the Malawi Government's policies, the Malawi legal framework and the EIB guidelines related to environmental and social issues that apply to the project and also describe how the issues raised in the policies, legal framework and guidelines will be addressed in the project.

4.4 Public consultations

The Consultant shall undertake public consultations to ensure that all interested and affected parties are involved in the Environmental and Social Impact Assessment.

Evidence of consultations shall be provided and the viewpoints of the interested and affected parties shall be included in such evidence.

For purposes of the public consultations, the Consultant shall:

a) Develop and implement a public participation and consultation plan;

b) Identify institutional and community needs as a basis for supervising and monitoring implementation of mitigation measures;

c) Document organizations and interest groups that were invited to participate in public consultation events (names of individual persons are optional), record which ones participated in these events, when and where each public consultation event was held, and what main issues were raised by participants at the consultation events.

4.5 Environmental impact assessments

The environmental impacts to be considered include:

a) Impacts related to the expected water abstraction from the such as changes in water quality, river-edge vegetation or downstream water uses;

b) Impacts due to changes in the magnitude and duration of flood discharges resulting from conversion of the existing un-gated spillway to a gated spillway and from the altered flood routing characteristics of the dam;

c) Impacts on aquatic life;

d) Impacts related to the increase in flooded land area above the dam;

e) Construction-related impacts, including the direct and induced impacts from any access road improvements.

Recommendations shall also be made on measures that might be taken to extend the useful life of the raised dam by, for example, reducing sedimentation, including catchment management measures.

4.6 Social impact assessments

The Consultant shall assess the positive and negative impacts of the proposed project on the communities within the influence of the project area. The study shall, inter alia:

a) Describe and quantify the effects (both positive and negative) of the proposed developments on the human environment;

b) Identify mitigation measures for minimizing, eliminating or off-setting negative effects and enhancing any positive effects;

c) Recommend the most appropriate mitigation measures, including consideration of alternative designs to avoid significant negative impacts and/or enhance environmental/social benefits.

The Environmental and Social Impact Assessments shall, inter alia, be conducted in accordance with the EIB Guidelines as published in the EIB Environmental and Social Handbook and the Malawi Government Guidelines and Procedures on Environment Management and ESIA.

4.7 Cost estimates

The Consultant shall estimate the costs for implementing the recommended mitigation measures. The costs shall be based on those of similar works implemented recently in Malawi.

5. Key staff

The Consultant shall provide a team of experts all of whom shall be adequately qualified and experienced in their respective fields and be eligible for registration with the relevant professional bodies in Malawi or in their country of origin.

The team shall include at least the following experts:

. a) A Team Leader who shall have at least a Bachelors' degree and professional experience in natural resources management, in environmental sciences/engineering, in water resources management or in a similar field. The Team Leader shall have at least ten years' experience in undertaking similar assignments, at least five of which shall have been as a team leader, and shall have a registration certificate issued by the Malawi Government, Environmental Affairs Department.

. b) A Social Scientist with at least a Bachelors' degree in social sciences, developmental studies or similar fields, and at least ten years professional experience in carrying out similar assignments.

6. Time schedule

The indicative input from the Consultancy is 15 person-weeks made up as shown in the table below. A week has been allowed for finalisation of the ESMPs once comments have been received on the draft ESMPs. However, the Consultant shall make his own assessments of the periods required by each of the experts for undertaking the various tasks listed in the table below, or such other tasks as he may deem to be necessary, and of the period required for completing the assignment.

Activity	**Team Leader (person-weeks)**	**Sociologist (person-weeks)**
Baseline Assessments	2	1
Stakeholder consultations	2	2
Review of policies, legal instruments and guidelines	0.5	-
Environmental and social impact assessments including preparation of baseline reports	2	1
Preparation of cost estimates	0.5	-
Preparation of draft ESMPs	2	1
Preparation of final ESMPs	1	
TOTAL	**10**	**5**

The assignment shall commence immediately after signing of the contract.

7. Expected outputs

The deliverables of the consultancy shall be:
a) The baseline environmental and social data for the project;
b) Draft Environmental and Social Management and Monitoring Plans for the project;
c) The Final Environmental and Social Management and Monitoring Plans for the project.
The deliverables shall be in English and all quantities shall be expressed in metric units.

The consultant shall prepare and submit to the NRWB ten hard copies and one electronic copy on CD Rom or flash disk of each of the deliverables listed above. The indicative due dates for the listed deliverables are shown in the table below.

Deliverable N°	**Description**	**Indicative due date (N° of weeks from commencement date)**
1	Baseline environmental and social data	7
2	Draft Environmental and Social Management and Monitoring Plans	9
3	Final Environmental and Social Management and Monitoring Plans	1 week after receiving comments from EAD

The Consultant will be required to seek approval of the ESIA and ESMP from the Department of Environmental Affairs.

8. Valuation of Work

The Consultant's own assessment of the periods required by the experts for completing the assignment (see 6 above) shall be used, in conjunction with rates negotiated between the NRWB and the Consultant for each of the experts, for determining the Consultant's fixed fee for the assignment.

Costs for all equipment required for the assignment e.g. computers, transport, venue hire, office accommodation, support staff, etc. will be deemed to be included in the negotiated rates for the experts and the Consultant will not be entitled to any payments over and above the fee determined as described above.

9. NRWB's personnel and training

The NRWB may, during the assignment, second staff to the Consultant. The Consultant shall provide training to the seconded personnel so that they can gain knowledge and contribute to the completion of the assignment.

Failure of the NRWB to second such staff shall not relieve the Consultant of his responsibility for completing the assignment

10. Reporting

The Consultant will be responsible to the Chief Executive Officer of the NRWB for the successful execution of the assignment. However, for carrying out day-to-day operational activities he shall interact with the Project Implementation Manager and the Director of

Technical Services.

11. Obligations of the Consultant

The Consultant shall be fully self-sufficient in all respects for undertaking the assignment including accommodation, office space, equipment and supplies, communications equipment, and transport. Procurement of equipment will not be allowed on the project.

The Consultant will be responsible for sourcing documents and any information required from the relevant authorities.

12. Obligations of the NRWB

The NRWB will provide:

a) Access to data/information in its custody that is relevant to the assignment;

b) Letters of introduction, where necessary, for the Consultant to contact other institutions and agencies necessary for proper execution of the assignment.

13. Implementation arrangement

The Consultant will be engaged by the Northern Region Water Board and the assignment will be administered through a lump sum contract arrangement.

APPENDIX 2: KEY STAFF FOR THE ASSIGNMENT

Name	Proposed Position and Qualification	Task Assigned
Kent Kafatia, R. Eng	Team Leader and ESIA - Master of Science Degree (MSc.) in Water and Waste Engineering - Bachelor of Science Degree (BSc.) in Chemical Engineering - BSc. Degree in Engineering - Post Graduate Diploma - Advanced Certificate in Water and Environmental Management	• Coordinating the whole assignment • Conducting literature gathering and review • Identification and evaluation of project impacts • Conducting stakeholder consultations • Determination of, and evaluation project impacts, enhancement and mitigation measures • Analysis of proposed project alternatives basing on social impacts • Preparation of Environmental and Social Management and Monitoring Plan • Compilation of the ESIA report • Providing quality assurance
Itayi Nkhono	Sociologist - MSc. Environmental Engineering and Sustainable Infrastructure - BSc Honours Sociology	• Stakeholder mapping and analysis • Designing data collection tools • Conducting stakeholder consultations • Conducting literature gathering and review • Managing the household survey and leading and data analysis • Compiling socioeconomic and baseline information
Vincent Msadala, PhD	Water Resources Expert - Doctor of Philosophy (PhD) in Civil Engineering - MSc in Civil Engineering - BSc in Civil Engineering	• Conducting stakeholder consultations • Conducting a visual and physical surveys of flora, birds, reptiles and amphibians, animal/mammal • Visual observation and physical assessment of the present ecological importance, sensitivity and state of terrestrial and aquatic biodiversity within the proposed project footprint and surrounding environs • Investigating of flora and fauna relationship to project affected persons
Jamestone Kamwendo	Ecologist - MSc. Degree in Conservation Biology - BSc. Degree - in Biology and minor Chemistry	• Visual assessment and determination of impacts of the project on surface water sources and other water users downstream

Name	Proposed Position and Qualification	Task Assigned
		• Recommend mitigation measures to the project impacts • Recommend on project alternatives based on project impacts, water resource assessment. • Assist in the preparation of ESIA

Support Staff

Kent Kafatia, Jr - 7 years ESIA Experience
Precious Chaponda - 4 years ESIA experience
Mazaza Mwafulirwa – 3 years ESIA experience
Prisca Malenga – 1 year ESIA experience

APPENDIX 4: SELECTED CONSULTATION OUTCOMES

Date	2 April 2019
Place	Forestry Department head offices, Lilongwe City Centre
Participants	Interviewee: Mrs Nyuma Mughogho, Deputy Director for the Forestry Department Interviewer: Mr Mazaza Mwafulirwa for WWEC
Discussion	Views from the Department of Forestry (at national level) regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on obtaining input from the headquarters of the Department of Forestry (DoF) regarding how the proposed projects (which will be implemented within and very near to a forest reserve area) should be done to adhere to guidelines for protecting forest reserve areas.

Issues

Key points to note from the interview were as follows:

- The interviewee highlighted that for construction works that are to be done within a forest reserve area, the procedure is that a developer has to obtain an approving licence from the forestry department which stipulates the conditions under which the project works are to be done in order to ensure that the forest reserve area is protected. Among the major issues that are highlighted among the conditions in the licence (according to the interviewee) are the requirement to avoid unnecessary cut-down of trees as well as steps on how to mitigate any damage to forest areas that has come about due to construction works.
- She indicated that, the normal procedure with their department is that when a developer would like to do some construction works within a forest reserve area, they have to first of all make an application to the forestry department (stating that they would like to do some construction works within a forest reserve area), then the department sends some of their staff to look at the proposed project site just to be certain of the possible impacts the proposed project may have on the forest reserve area. Upon looking at the site the forestry staff, write a recommendation letter to the headquarters to issue a licence of approval to the developer to go ahead with the construction works.
- The general expectation of the department is that staff from the Regional Forestry Office (RFO) in Mzuzu will go to visit the sites (within the forest reserve) where the proposed construction is to take place. After the visit then the RFO will produce a letter of recommendation to the headquarters of the DoF who will issue the authorizing licence to NRWB for the project to go on.
- It was also pointed out that as DoF, they do monitoring of compliance with the conditions laid down in the authorizing licence. In case of the proposed NRWB project, they indicated that the department will mostly be using the RFO in Mzuzu to do the monitoring work.
- The department also has authority to stop the contractor doing the construction works if they see that the work is not being done in line with the conditions of the authorizing licence. In such a case a project can remain halted until the identified violation of the conditions is remedied by the contractor.
- It was further highlighted that during their work of monitoring for compliance to the agreed conditions, they normally use the resources from the developer's budgets. However, during times of an emergency (i.e. when they receive an alert that some violation is going on), they do use their own resources as DoF to go and check.

Date	2 April 2019
Place	Environmental Affairs Department (EAD) head offices, Lilongwe City Centre
Participants	Interviewee: Ms Carthy Musa, Environmental Officer at the Environmental Affairs Department Interviewer: Mr Mazaza Mwafulirwa for WWEC
Discussion	Views from the Environmental Affairs Department (at national level) regarding the proposed projects to raise the Lunyangwa Dam and to construct new intake weirs at the Mzuzu and Ekwendeni Treatment Plants. The discussion focused on obtaining advices from the EAD on how the projects should be implemented to adhere to best practices of environmental management and what needs to be stressed out in the ESIA as critical mitigation measures against negative impacts of the proposed projects.

Issues

Key points to note from the interview were that:

- The interviewee advised the developer to prioritise the following mitigation measures to conserve the environment and avoid community disturbances:
    - Provide an alternative energy source at the campsites to keep workers from cutting down trees for firewood.
    - Cover all trenches that may be excavated for laying of any new pipes to avoid inconveniencing people that may be using the sites of the trenches as walking pathways.
    - Inform surrounding communities through sensitizations of any potential disturbances (such as noises) that may come as a result of the project works.
    - Waste management plans (both construction and domestic wastes) should be generated at construction camp sites and clearly presented in the developer's Environmental management plans.
    - Minimise as much as possible, the hiring of migrant workers to avoid cases of influx of more people into the local communities that may cause disturbances into the social/cultural establishments of the locals and possibly lead to increased cases of crimes such as thefts.
- The interviewee recommended that stakeholder consultations done by the consultant at national level should also incorporate views from the department of forestry, since one of the sites where the proposed construction projects are to be implemented is located within their area of jurisdiction (within the Kaning'ina Forest Reserve).
- The interviewee highlighted that as a department, they will also be involved (at both national and district level) to monitor the progress of the construction works to see that the necessary measures for managing the environmental impacts are being adhered to.
- She however pointed out that the main challenge encountered as a department in the work of monitoring the progress of projects (such as the ones being proposed by NRWB) is that of limited funds as mostly they utilise their own resources allocated to them from the government budgets and not necessarily the resources from the budgets of the project developer.

Date	24 March 2019

Place	Mphatso Motel, Mzuzu
Participants	Interviewee: Mrs Charity Kumwenda, Officer in charge for Mzuzu Nature Sanctuary under the Department of national parks and wildlife Interviewer: Mr Mazaza Mwafulirwa for WWEC
Discussion	Views of the Mzuzu Nature Sanctuary regarding the proposed projects to raise the Lunyangwa Dam and to construct a new intake weir at the Mzuzu Treatment Plant. The discussion went as far as talking of possible ways on how the project can be implemented to ensure conservation of the surrounding environment (which includes forests and some animals kept at the Sanctuary).

Issues

Key points to note from the interview were that:

- The Mzuzu Nature Sanctuary has been informed about the project by the NRWB, through a phone call some 3 days ago (from the day on interview).
- Their main worry as Mzuzu Nature Sanctuary is that the project may result into disturbances to the vegetation and animals at/around the sanctuary.
- The sanctuary has a wide variety of trees as well as some animals which mainly include baboons, monkeys, birds, bush pigs, and some common duikers. Of the available animal varieties, baboons and monkeys are the ones which are available in quite large numbers. The animals at the sanctuary are not put in cages; they are allowed to move in free range.
- The Sanctuary which has been in existence since 1985 is mostly used for educational trips, where students from different schools visit the place on their learning tours for free.
- To them the main threat with the proposed projects will be the possible disturbance of the forest area (through removal of vegetation) and the noises that may scare off their animals. The interviewee gave the following measures as recommendations to protect the sanctuary environment during the construction works for the proposed projects:
    - Noise levels should be controlled during the construction works. The contractor should ensure that they avoid very loud noises at the site particularly, they should control the noise levels to ensure a steady/gradual increase in the noise so that the animals can adapt to it and not be suddenly disturbed.
    - They should avoid unnecessary removal of vegetation in the forest areas so that the surrounding natural beauty is conserved.
    - If the contractor happens to find some special (rare/endangered) plant species in the project area that ought to be removed in order to clear the way for construction works, then they should ensure that the plants are safely transferred to some other place first before proceeding with the clearing.
- Nevertheless, as a sanctuary, they are confident that the sanctuary will survive the oncoming construction activities at the intake site as well as at the Lunyangwa Dam in a similar manner as it survived the construction works for the dam back in the early 90's (even though back then the sanctuary was at its infancy stage).
- As part of the department of national parks and wildlife, the Mzuzu Sanctuary is part of the catchment management committee for the Lunyangwa Dam together with the NRWB, Mzuzu City Council, the forest department, Wildlife and Environmental Society of Malawi among others.
- As part of their activities, the catchment management committee for the Lunyangwa Dam organises monthly patrols of the catchment area for the dam using staff from the forest as

well as national parks and wildlife departments. They also organise quarterly (four times a year) joint patrols of the catchment area together with the Malawi Defence Force.

- As part of this catchment management committee, as the Mzuzu Sanctuary, they are certain that they will be involved on the proposed NRWB projects as part of the team to monitor the progress of the construction works to check that they are being done in a manner that is not detrimental to the surrounding natural environment.

Date	5 April 2019
Place	Gender and Social Welfare Departments head offices, Lilongwe Capital Hill
Participants	Interviewee: Mr Misheck Mdambo, Social Welfare Officer for the Ministry of Gender, Children, Disability and Social Welfare Interviewer: Mr Mazaza Mwafulirwa for WWEC
Discussion	Views from the Departments of social welfare and gender (at national level) regarding the proposed NRWB projects to raise the height of the Lunyangwa Dam and to construct new intake weirs in Mzuzu and Ekwendeni. The discussion focused on obtaining input from the headquarters of the departments on how the projects should be implemented to minimise negative impacts on the well-being of societies in the project areas and to enhance positive social impacts.

Issues

Key points to note from the interview were that:

- The interviewee recommended that his department should be stated in the contract between NRWB and a contractor (doing the construction works) in case of any social violations in the project area (For instance, young girls being impregnated, infected with STD's or being sexually harassed by the contractor's employees). In such cases, the contractor (instead of the individual worker who has committed the violation) will be held liable to compensate the victims.
- An example was given by the interviewee of a similar case that occurred last year in the same city of Mzuzu where under a project to construct electrical power lines for the Millennium Challenge Account (MCA) – Malawi; a contractor was made to compensate victims (young girls) who were defiled by his workers because the conditions for the contractor to be liable were already specified in the contracts.
- Apart from this issue of making the contractor responsible for the misconducts of his workers, the interviewee also stated that the department would also wish to see that adequate sensitizations should be done to the workers and communities on the matters of importance of abstaining from unsafe casual sex, sexual exploitation of children, harassments and all kinds of gender based violence.
- On the topic of employment opportunities for the proposed projects, it was said during the interview that the national gender policy encourages that there be a ratio of 40-60% employed female workers against 60-40% employed male workers. However, it was also pointed out that there is no regulation that ensures that this policy guideline concerning employment of male and female workers is adhered to. It was also said that, the main challenge concerning adhering to the requirement of providing balanced work opportunities to males and females on technical construction projects is that there are not as many qualified female workers that can fill up the technical positions.

- The interviewee highlighted that departments of social welfare and gender get involved both from the national level and at the district level in matters of monitoring of compliance to set out measures for managing social impacts emanating from projects. According to him, officers from the headquarters of the department go to initiate the monitoring process and inform the district staff on what issues they are supposed to look at in the monitoring work. The district officers (being those on the ground) then proceed with their work having received the guidance from the headquarters of the departments.
- The interviewee also called for adequate resources to be allocated on the project to support the work of monitoring for compliance to mitigation measures as well as the work of conducting sensitizations and awareness campaigns. According to him, their experience is that the issues of social welfare and gender are considered as trivial matters on many projects and hence they do not have the necessary resource allocation. He feels that if necessary attention is given to these matters then we would avoid the burdens of teenage unplanned pregnancies, spread of sexual infections and defilements of young girls that are normally associated with large scale construction projects.

Date	26th March, 2019
Place	District Social Welfare Office
Participants	Edward Chisanga (District Social welfare Officer) Prisca Malenga (WWEC)
Discussion	Views from the Departments of social welfare and gender (at national level) regarding the proposed NRWB projects to raise the height of the Lunyangwa Dam and to construct new intake weirs in Mzuzu and Ekwendeni. The discussion focused on obtaining input from the headquarters of the departments on how the projects should be implemented to minimise negative impacts on the well-being of societies in the project areas and to enhance positive social impacts.

Issues

Key points to note from the interview were as follows:

- The project should anticipate cases of gender-based violence, child labour, child trafficking and break up of families as it has been seen from previous related projects.
- There is need to have a strategy by which the project should be implemented to prevent the above-mentioned issues. The strategy should include; setting up some grievance committees which will help in conducting sensitizations before the start of the project and also act like a group which abused people can lodge their grievances in the project area.
- The District Social Welfare Officer stressed that the work should be zero tolerance to child and women abuse. As its stipulated in the Gender Act (2013), women should be given equal job opportunities as men as long as they are capable of doing the work. He emphasized that 40 to 60 percent of the employees in each phase should be women
- The social welfare office in Mzuzu area is working in the areas of women empowerment and child protection with a focus on human rights by conducting sensitization meetings on these issues.
- The project should also have a component of reforestation as a corporate social responsibility. This will help in curbing the impacts of climate change in the area which mainly affects vulnerable people's welfare.

• The NRWB should also sensitize its works on gender-based violence and on how they can protect themselves from sexually transmitted diseases before the implementation of the project and should be done with the involvement of the social welfare office of the district. • In addition, women and children should be encouraged to report any criminal cases to the police or the office of social welfare in the district.	
Date	25th March, 2019
Place	District Education Office, Mzuzu
Participants	Interviewee: District Education Officer Interviewer: Prisca Malenga (WWEC)
Discussion	Views from the Education department (at district level) regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on obtaining input from the education sector on how the project can be implemented to enhance its social benefits as regards to the education environment for the impact area.
Issues	
Key points to note from the interview were that: • The District education office welcomed the project, since it is expected to bring water to the area which will help in improving attendance of girls in schools. • Causes of drop outs in the area include; lack of school fees, distances to school, early marriages and pregnancies for girls. These are mostly associated with culture and traditions especially in the local areas. • Dropout rates are low and the passing rate is generally high in the district. Hence, there are no projects on education in the district. • The project developers should conduct sensitization meetings to ensure that children are protected from abuse and that early marriages and pregnancies because of the project are avoided.	

Date	25th March, 2019
Place	Mzuzu Labour offices
Participants	Interviewee: Mr Chidothi Interviewer: Thoko Mtewa for WWEC
Discussion	Views from the department of labour (at departmental level) regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on obtaining input from the department of labour regarding how the project should be done to adhere to guidelines on employees' welfare.
Issues	
Key points to note form the interview were as follows: The interviewee advised that the project should follow labour office requirements as follows: • Have a Contract of employment, which explains on employment conditions including working hours, salaries and wages. ○ Recommended working hours are 8 hours per day, and treat excess hours as overtime. Treat 7th day of working as a day off but if the employees work on this day, pay them a double wage.	

- Minimum monthly salary for unskilled labour is K25,000.12 and wage is K962.00 per day.
- There is ordinary over time and day off over time, where an employee works beyond the working hours and on the days meant for off duties, respectively.
- Formula for calculating payment for ordinary over time:

  Ordinary overtime= (Hour rate x 1.5) x number of excess hours Where;

  Hour rate = Basic salary÷ working days ÷ working hours
- Formula for calculating payment for day off over time:

  Day off overtime= (Hour rate x 2) x number of excess hours

- Have a written statement or contract which contains the following, among others:
  - Names of employee and employer
  - Date of commencement of the contract
  - Rate of enumeration
  - Rate of pay
  - Intervals at which the enumeration is paid
  - Nature of work to be performed
  - Normal hours of work
  - Any provision of termination
- Pension scheme. It is a mandate that all employers place their employees on pension scheme.
- The interviewer recommended that the project should employ people from within the community as it is cost effective for both the project and the employees, but also, do consultations from other companies for example, construction companies on labour costs.

Date	26th March 2019
Place	Mzuzu Regional water office
Participants	Interviewee: Human resources Officer Interviewer: Mrs Thoko Mtewa for WWEC
Discussion	Views from the Department of Forestry (at national level) regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on obtaining input from the Department of Water (at Regional level) regarding ground water abstraction rights and abstraction volumes in Mzuzu city and Mzimba as a district.

Issues

Key points to note from the interview were that:

- Abstraction rights are centralized where one is referred to Lilongwe, now called National water resources authority which was called water resources board in the past.
- The interviewee explained that currently there is chaos on ground water abstraction because people just drill anyhow. He went on to say, in the past you applied for water rights if you wanted to drill a borehole But board took a long time to meet and approve of drilling services whilst on the other hand people needed water. This led to political influx as well as the chaos.
- In terms of the abstracted volumes he said it was difficult to quantify the volumes due to the chaos on the ground.
- He went on to explain that in towns, drilling of boreholes is not allowed unless water board declares to have encountered serious water challenges. Then they give provisional rights

where when the challenges are rectified, the boreholes are supposed to be sealed but people do not seal them. One cannot seal a water source providing them with cheaper or free water and go for paid water.

Date	26th March 2019
Place	Mzuzu Meteorological department
Participants	Interviewee: Mr Theu Interviewer: Mrs Thoko Mtewa for WWEC
Discussion	Views from the Department of Forestry (at national level) regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on obtaining input from the Meteorology Department (at District level) regarding climate change issues that can affect the project and the surrounding communities (after project implementation).

Issues

Key points to note from the interview were that:

- There have been reductions (or variability) in rainfall in the recent years. In the past, Mzuzu received a lot of rains in the month of March, above 250ml but not this year (2019). Temperatures are also rising with a minimum range of 14-16˚C and maximum temperature reaching as high as 29-30˚C, as compared to the past where minimum temperature used to be as a low as 10˚C.
- In his view, the reason for such climatic changes is mainly rampant deforestation where people use the trees for charcoal. The interviewee gave an example of Choma hill which had big natural trees 10 years back, but now there is none. He said, people have reached a point of uprooting even the tree stumps for charcoal production.
- The interviewer said the project and communities will be affected by these climatic changes because through time, the pattern of rainfall will change and therefore water levels will decrease and this will consequently affect the supply of water.
- In his last remarks, he recommended that the project should at least plant trees in the surrounding areas especially the catchment areas of the rivers (Dam intakes), as well as civic educating the surrounding communities on cultivation along river banks and deforestation.

Date	26th March 2019
Place	Mzuzu department of Lands
Participants	Interviewee: Mr Kabambe Interviewer: Mrs Thoko Mtewa for WWEC
Discussion	Views from the Department of Lands (at District level) regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on understanding the guidelines or procedures followed on land registration and certification in the district for proper implementation of the project.

Issues

Key points to note from the interview were that:

- Land certificate depends on location, where some places are just given a deed.
- In town a lease certificate is granted and in rural areas a deed is given. A title deed is granted in towns because it is an adjudicated land which is administered through **Registered Land Act** and a final document is a certificate of ownership. In the rural areas the land is not adjudicated and is governed by Land Act and a **deed document** is the final document.
- The Water board must have been granted a **title deed** (certificate) in the area close to Mzuzu government secondary school because it is located in town. And water board follows procedure; they do not start projects without papers.
- So far there are **no** land issues from the areas where water board facilities are located because the people were already given compensation before the land was acquired.

Date	29th March 2019
Place	Action For Sustainable Development (ASUD)
Participants	Interviewee: Mrs Mzuza (Deputy Director) Interviewer: Mrs Thoko Mtewa for WWEC
Discussion	Views from Action For Sustainable Development (ASUD), a Non-governmental Organization (NGO), regarding the proposed projects to raise the height of the Lunyangwa Dam and to construct a new intake weir at Mzuzu Treatment Plant. The discussion focused on understanding how the project will impact the implementation of ASUD programs from an NGO perspective.

Issues

Key points to note from the interview were that:

- ASUD operates in four districts nationwide namely; Mzimba, Nkhatabay, Rumphi and Thyolo. They have livestock farming (piggery), afforestation, apiculture and fish farming as some of the developmental programs.
- The discussion based on the positive and negative impacts (in the interviewee's point of view).
- The following were the reported positive impacts:
    - This project will enhance the implementation of the piggery Farming program. Clean water is an essential tool for pig production and the project once completed will enable most families involved to have a higher production rate.
    - The organisation will cut the costs on expenses that were allocated to bore hole drilling since most families will have an access to piped water.
    - They also believe that this program will benefit their nutrition program for people living with HIV AND AIDS. In nutrition, hygiene is an essential component and the access to clean water will help the people suffering from this pandemic to avoid some secondary infections that may arise if they use untreated water.
    - They also mentioned that the project will create many job opportunities for the community members.
    - The access to portable water will also improve the health standards of the community and the healthy people will support their programs.
- Negative impacts were reported as follows:
    - The influx of the construction workers into the area will trigger the spread of Sexually Transmitted Infections like HIV/AIDS.

- Increase in greenhouse emissions by the construction machinery. Increase in greenhouse emissions have a direct negative effect on the ozone layer and subsequent enhancement of global warming and weather changes, this may have an environmental health impact for the area.
- Increase in demand of firewood and charcoal making by local people to supply the demand that will be created by people working for the project.

APPENDIX 5: LIST OF PEOPLE CONSULTED

S/N	Full Name	Position	Organization	Phone #	Signature
1	PINNIUS WG WALITA	Plant Supervisor	NRWB	0999201708	
2	Maxon Shaba	Plant operator	NRWB	0888578121	
3	Emmanuel Chilongo	Plant operator	NRWB	0994067037	
4	Aram .A. Mwenibanda	P/OPERATOR	NRWB	099327079	
5	Jester Mlowoka	Plumber	NRWB	0888171187	
6	CHARLES PN. JERE	STA	CHIEF	0995416419	
7.	Kondwani Mbonde	Ag RWB (N)	RWB (N)	[illegible]	
8.	Mwawi Kumwenda	Project Coordinator	NRWB	0999755162	
9	Agnes Nyirenda	DFO (Urban)	DFO	[illegible]	
10	Charity Kumwenda	PWO Parks & wild life officer.	Wildlife	0999205685	
11	KW Mdhlul	DWDO	Water	0885866295	
12	Jim Wotchi	DSWO	Social	0999624871	
13	Russess Mshone	DLO	LABOUR	0999351445	
14	Frank Mfune	MSEO	MDC	0999366496	
15	Esther Chipokosa	TWE	NRWB	0881769130	
16	Topsy Kachere	DCDO	Community Dev	0993591864	
17	Emmanuel C. Mkamwa	PO - MASAF IV	MDC	0888479006	
18	Mabvuto Lupwayi	AHSS	MCC	[illegible]	
19	Augustine Gama	SEHO	MCC	0881235218	
20	Alexander K. Chirambo	APD	MCC	0999748691	
21	FRANCISE KUNYADA	EHO	MOYALE	099101665[illegible]	

APPENDIX 6: LOCAL NAMES FOR FLORA AND FAUNA IN THE PROJECT AREA

FLORA SPECIES

SCIENTIFIC NAME	**LOCAL NAME**
Hyphaene petersian	Chiwale
Pterocarpus angolensis	Mlombwa
Adansonia digitata	Malambe
Albizia spp	Mtangatanga
Azadirachta indica	Neem
Trichilia emetica	Msikidzi
Acacia tortilis	Nchongwe
Prosopis grandilosa	mtcheza
Prosopis cineraria	mtcheza
Albizia lebbeck	Mtangatanga
Azadirachta indica	Nimu or Neem
Acacia seyal	Chisawani
Tecomaria nyassae	Masasa
Colophospermum mopane	Sanya
Brasilettia mollis	Mbumbi
Hardiwickia binata	Mswaswa
Tamarix articulata	Chiombo
Cassia siamea	Kadate
Eucalyptus camandulensis	Bluegum
Eucalyptus hybrid	Bluegum
Leucaena leucocephala	Mtengo wa feteleza
Cenchrus ciliaris	Udzu
Cenchrus setigerus	Udzu
Zizyphus mauritiana	Masawo
Punica granatum	Jamu
Psidium guajava	Gwava
Phoenix dactylifera	Kanjedza
Feronia limonia	Mlunguchulu
Annona squamosa	Mpoza wa chizungu
Tamarindus indica	Bwemba
Salvadoro persica	Mswache
Cordia myxa	Mpefu
Syzygium quineense	Mpeuma
Embelia schimperi	Nakonda
Carissa edulis	Mkangamwazi
Faidherbia albida	Msangu
Ipomeo batatus	Mbatata
Mangifera indica	Mango
Zea mays	Chimanga
Musa paradisiaca	Nthochi

Musa livingstoniana	Nthochi
Carica papaya	Papaya
Manihot esculenta	Chinangwa
Eucalyptust ereticornis	Bluegum
Gmelia arborea	Malayina
Toona ciliata	Sindilera
Bauhinia petersiana	Chitimbe
Senna siamea	Kesha
Senna spectabilis	Kesha
Persea americana	Mapeyala
Citrus limon	Lemon
Citrus sinensis	Orange
Prunus persia	Peach/Pichesi
Pterocarpus angolensis	Mlombwa

FAUNA SPECIES

Haliaeetus vocifer	Fish Eagle
Corythornis cristatus	Malachite kingfisher
Ceryle rudis	Pied kingfisher
Cinnyris jugularis	Sunbird
Bycanistes bucinator	Trumpeter hornbill
Bycanistes brevis	Slivery Cheeked hornbill
Phacochoerus africanus	Warthog
Cercopithecus albogularisnyassae	Blue Monkey
Papio cynocephalus	Baboon
Crocuta crocuta	Spotted Hyena
Geochelone sulcata	African spurred tortoise
Lepus microtis	African common hare
Mus spp	Mice

BIRD SPECIES

Francolinus afer	Red-necked Francolin
Streptopelia semitorquata	Red-eyed Dove
Myioparus griseigularis	Grey throated Tit-flycatcher
Pyconotus barbatus	Black-eyed Bulbul
Tauraco corythaix	Knysna Turaco

FISH SPECIES

Oreochromis karonagae	Chambo
Oreochromis squampinis	Chambo
Opsaridium macrocephalum	Mpasa
Engraulicypris sardella	Usipa
Copadichromis spp	Mbuna
Rhamphocromis spp	Batala

Labeo mesops	Chisawasawa
Tilapia rendalli	Matemba
Clarias gariepinus	Bombe
Bagrus meridionalis	Kampango
Ctenopharynx nitidus	Gundakumwala
Aulonocara gertrudae	Chingongu
Synodontis njassae	Nkholokolo

APPENDIX 5: HOUSEHOLD SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

HOUSEHOLD SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

For:

(i) 2 RIVER INTAKES

(ii) RAISING OF LUNYANGWA DAM WORKS PROJECT

WATER SUPPLY PROJECT

INTRODUCTION:

Hi, my name is _____. I am hired by WWEC, a Malawian consultancy which has been mandated by the Northern Region Water Board to conduct an ESIA on**:**

(i) 2 RIVER INTAKES

(ii) RAISING OF LUNYANGWA DAM WORKS PROJECT

for the proposed upgrading and expansion works for Mzuzu Water Supply Project. As part of the activities for the preparation of the ESIA, we are conducting a socio-economic survey (research).

The purpose of this research is to gather information on water supply issues in this area. The information provided will enable the project to be undertaken in a way that benefits the projects and affected communities. Your household has been selected randomly to participate in this research. The information that you will give us will be confidential and will not be used anywhere apart from for the purposes of this research. We sincerely appreciate the time that you are taking for this survey.

Do you have any questions on this survey or the project before I start?

SECTION 1: INTERVIEW DETAILS

A. INTERVIEWER	
Interview number	
Name of interviewer	
Date of Interview	
Name of Supervisor	

B. Location details	
District	
TA	
GVH	
Village	

C. IDENTIFICATION OF THE HEAD OF HOUSEHOLD/RESPONDENT	
Name (surname):	First name:
cellular phone number: No ph ☐ ***(Tick box as appropriate)***	

Is the respondent the head of household? _____
If not, what is the respondent's name: _____
And what is his status: Spouse o☐ C☐ of HH Other Specify: _____

SECTION 2: DEMOGRAPHIC DETAILS

(*Include all household members starting with the Household head* **(Please Write Name on Identity Card)**

A. Member (Name and surname, start with HoH name)	**B. Gender** 1=F 2=M	**C. Age**	D. **Marital Status** 1=Single 2=Married Monogamous 3=Married Polygamous 4=Separated 5=Widowed 6=Cohabiting 7=Too young	**E. Position within household** 1. HoH 2. Spouse of HoH 3. Child of HoH 4. Grandchild of HoH 5. Parents 6. relatives 7. other, specify	**G. Education** 1. None 2. Primary 3. Secondary 4. Vocational 5. University 6. Too young	**H. Ethnicity** 1. Tonga 2. Chewa 3. Ngoni 4. Tumbuka 5. Lyambia 6. Nkhonde 7. Other (specify	**I. Religion** **1. Islam** **2. Christianity** **3. 0ther**	**J. Disability** 1. Yes 2. No

SECTION 3. INCOME SOURCE	
A. What is the main source of income for this household	1. Formal employment 2. Informal employment (piece work including agriculture day labor) 3. Commercial agriculture 4. Remittances from families and friends 5. Business/ Trading 6. Pension 7. Renting (land, house etc) 8. Fishing 9. Other 10. None
B. What is the secondary source of income for this household	1. Formal employment 2. Informal employment (piece work including agriculture day labor) 3. Commercial agriculture 4. Remittances from families and friends 5. Business/ Trading 6. Pension 7. Renting (land, house etc.) 8. Fishing 9. Other 10. None
C. Income per month (Combined)	1. Less than MK 10,000 2. MK 10,000 – MK 20,000 3. MK 20,001 – MK 50,000 4. MK 50, 001 – MK 100,000 5. MK 100,001 – MK 200,000 6. More than MK 200,000

SECTION 4: HEALTH	
A. What is the nearest health facility in your village/area?	1. Government 2. Private
B. How long does it take you to reach nearest health facility (the nearest)?	1. Less than 30 minutes 2. 30 minutes to 1 hour 3. 1 hour to 2 hours 4. More than 2 hours
C. What are the most common diseases that affect the family? (Multiple response)	1. Malaria 2. Water related diseases (cholera, dysentery, typhoid, diarrhea, eye and skin infections) 3. STDs (Syphilis, HIV, Gonorrhea, Hepatitis B 4. Accidents (Traffic, Domestic)

	5. Stress related (Ulcers, Hypertension) 6. Respiratory infections (Cough, Asthma) 7. Intestinal infections 77 Others specify_____

SECTION 5: EDUCATION	
A. Education of the respondent	1. None 2. Primary 3. Secondary 4. Vocational 5. University 6. Too young
B. What is the name of the nearest school in this area?	Primary= Secondary=
C. How long does it take to get to school? (one way)	1. Less than 15 min 2. 16-30 min 3. 31-60 min 4. 61-90 min 5. 91+ min
	Primary= condary=
D. Are there any factors that limit household members from going to school? (if no, go to section S (health)	1. Yes 2. No (skip to section 6)
E. If yes, what factors limit household members going to school? (multiple response)	1. cost 2. Spend much fetching water 3. Distance 4. Illness 5. Work 6. Marriage 7. cultural/religious 8. lack of transport 77 other (specify)

SECTION 6: WATER	
A. What is the main source of drinking water for this household?	1. Unprotected springs 2. Unprotected wells 3. Protected wells 4. Streams/river/lake

SECTION 6: WATER	
	5. Boreholes 6. Piped water 77 Other
B. What is the main source of water for other uses for this household?	1. Unprotected springs 2. Unprotected wells 3. Protected wells 4. Streams/river/lake 5. Boreholes 6. Piped water 77. Other
C. Approximately what quantity of water is used per day (drinking and home consumption)?	1. <20L, 2. 20-60L 3. 60-80L 4. 80-100L 5. Above 100L
D. How far is the source of drinking water from the dwelling? (to and from)	1. 0-15 min 2. 16-30 min 3. 31-60 min 4. 60 min+
E. When you get to the water sources, how long do you take to get water?	1. <5 min 2. 6-10 min 3. 11-15 min 4. >15
F. Who is providing water services?	1. NGOs 2. Water User Association 3. Northern Region Water Board 4. Government 77. Other
G. Do people pay for the water?	1. Yes 2. No (skip to I)
H. If yes, how is the payment made?	1. Daily 2. Monthly 3. Yearly 4. When need arise
I. How much do people pay for the water?	(TEXT)

SECTION 6: WATER	
J. If water is made available, would you be willing to pay?	1. Yes 2. No (Skip to L)
K. If yes, how much would you be willing to pay?	1. Less than MK 100 2. MK 100 – MK 200 3. MK 201 – MK 500 4. MK 501 – MK 1000 6. More than MK 1000
L. Do you have challenges with your water supply from time to time?	1. YES 2. No (Skip to section 7)
M. If yes, what challenges do you have?	1. Water shortages 2. Expensive 3. Frequent breakdown (boreholes) 4. Religious beliefs 5. Difficult to access (remote access) 6. Poor water quality (i.e. salty water) 77 Other (specify)
N. How is storm water disposed?	1. Planned drains 2. Unplanned drains 3. None

SECTION 7: SANITATION AND HYGIENE	
A. Do you have a toilet/latrine?	1. Yes (skip to D) 2. No
B. If no, what do you use?	1. Bush 2. Water source (lake, river) 3. Neighbors 77 Other (specify)
C. What are the reasons that inhibit you from owning a toilet/latrine?	1. Cost 2. Tradition 3. No reason 4. Poor soil (i.e. sandy soils) 77 Other (specify)
D. What type of toilet facility does your household use	1. Traditional pit latrine 2. Improved traditional pit latrine 3. Flush toilet 4. Ventilated improved pit latrine

SECTION 7: SANITATION AND HYGIENE	
	5. Eco-San toilets
E. Does your toilet have a hand washing facility?	1. Yes 2. No
F. At what times do you usually wash your hands ?	1. After using the toilet 2. Before eating 3. After eating 4. After changing babies nap 5. Before breastfeeding a baby 77 Other, specify
G. What do you use for washing hands	1. Water only 2. Water and soap 3. Water and ash 77 Other, specify
H. How much solid waste do you generate per week? (Enumerator can guide respondent by giving Kg equivalents)	
I. How do you dispose your solid waste?	1. Rubbish pit 2. Burn 3. Designated place (city council) 4. Make manure 5. Indiscriminate disposal 6. Other (specify)
J. How much liquid waste is produced per day?	1. <20L, 2. 20-60L 3. 60-80L 4. 80-100L 5. Above 100L
K. How is liquid waste disposed?	1. Drains 2. Sock pit 3. Indiscriminate disposal

CTION 8: GENDER AND ENVIRONMENTAL SUSTAINABILITY	
A. Do women participate in	1. Yes 2. No

development projects of this area?	
B. Do men and women work together in development activities in this area?	1. Yes 2. No (skip to D)
C. If yes, what development activities do women and men work together? (Text)	1. WASH 2. Education 3. Businesses and loans 4. Agriculture 77 Other(specify)
D. Do women participate in decision making in development activities?	1. Yes 2. No (skip F)
E. If yes, how?	
F. How would you describe the Current Environmental situation?	1. Good 2. Average 3. Poor
G. What is the reason for your rating	Reasons (text)
H. Which components of the environment are polluted or degraded? (Multiple response)	1. Soil 2. Water 3. Trees and vegetation 4. Air 5. General outlook (environmental scenery)
I. What are the main causes of the current environmental situation?	1. Ignorance by individuals 2. Negligence by household or institutions 3. Poor service provision by institutions 4. Poverty 77 Other, Specify
J. What are the likely positive environmental and social impacts which will arise from the implementation of the project?	

K. What are the likely negative environmental and social impacts which will arise from the implementation of the project?	
L. What would be the enhancement measures of the positive impacts	
M. What would be the mitigation measure for the negative impacts	

SECTION 9: ENERGY	
A. What is the main source of lighting for your household?	1. None 2. Wood (fire, grass) 3. Kerosene lamp 4. Torch & batteries 5. Candle 6. Portable Solar lamps 7. Generator 8. Electricity-grid 9. Solar 77 Other
B. What kind of fuel is mostly used for cooking?	1. Gas 2. Biogas 3. Charcoal 4. Kerosene 5. Electricity 6. Saw dust

	7. Firewood 77 Other (specify)
C. If firewood, how do you obtain this? (Multiple response)	1. collect within 1km of village 2. collect over 1km from village 3. buy (skip to E)
D. Who in the household mainly collects firewood?	1. Adult female (>16) 2. Adult male (>16) 4. Children (<15)
E. What challenges do you face in obtaining firewood? (Multiple response)	1. Distance 2. Cost 3. Accessibility 4. Availability 77 Other (specify)
F. Do you have electricity in this household?	1. Yes 2. No
G. If yes, what kind of electricity?	1. ESCOM 2. Solar 3. Generator 77 Other (specify)

Comments and observations

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