



SOUTHERN REGION WATER BOARD

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN PROJECT

Southern Regional Water Board,
Off-Namiwawa Road,
Near Police Training College,
Zomba, Malawi.
Private Bag 72
Zomba,
Malawi.

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EXECUTIVE SUMMARY

The Southern Region Water Board, with support from the European Investment Bank (EIB) intends to upgrade and rehabilitate the Liwonde – Balaka Water Supply System and to extend the Water Supply services.

The project is to be implemented at Liwonde and Balaka towns as well as over the road section which connects the two towns. The existing water supply system for Liwonde was rehabilitated and upgraded in 2002. Its intake is located within a built-up area, approximately 400 m upstream of the Liwonde Barrage. The simple water intake is of a submerged intake pipe in the Shire River, running to the treatment plant located at the river bank. The conventional treatment plant includes coagulation, flocculation, sedimentation, filtration and disinfection. Sudfloc polymer is used as a flocculant and disinfection is done by chlorination. The treatment plant for the system has a capacity of 1,700 m³/d but currently it produces an average of about 1,300 m³/d; its full supply coverage being restricted by a limited distribution and pumping system.

The Balaka water supply system is based on two water sources. One, the water purchased from the Mpira-Balaka water supply system and second, a well field of SRWB to the south of Balaka and a recently commissioned high yielding borhole. For the Mpira – Balaka Water Supply System, SRWB is in a water purchase agreement with government owned Mpira-Balaka water supply system for supply of 23.4 l/s (2,020 m³/d). The supplied water originates from the Mpira dam. It passes through a roughing filter and is then chlorinated. SRWB takes the water over at Sosola, a village located at the western outskirts of Balaka, 3.5 km from the centre. SRWB treats the water in Sosola, as the water quality does not reliably comply with drinking water standards. The water then flows by gravity through a pressure filter, is re-chlorinated and stored at a 1,500 m³ Sosola storage reservoir. From there the water is supplied by gravity to the distribution system of Balaka. The actually supplied amount is often less than the agreed amount due to low pressure in the Mpira-Balaka system.. The Mpira-Balaka system also faces frequent and sometimes long supply interruptions due to the poor condition of the system.

The second water source of Balaka is groundwater from a well-field located south of Balaka, towards the seasonal Rivirivi river. Water from 6 boreholes at the well field is pumped to a collector tank. From there it is pumped by variable speed controlled pumps to the 500 m³ reservoir at Mponda. The yield of the 6 boreholes is a rather small 600 m³/day which equals to 1.7 l/s based on 16 hours of pumping per day. The water from the boreholes has increased mineral content of which consumers complain in cases where it is not diluted with water from the Mpira-Balaka system. Further to that the Board has recently commissioned 10 l/s borehole located North East of Balaka Town. At the moment, the only reliable source for Balaka Town is from the 7 boreholes.

According to the Malawi Environmental and Social Impact Assessment Guidelines of 1996, the proposed project requires an environmental and social impact assessment (ESIA). Hence, this Environmental and Social Impact Assessment report outlines the enhancement and mitigation measures to be implemented by the SRWB and other key stakeholders; during the construction and operation phases of the proposed rehabilitation and upgrading water supply

scheme. The ESIA aims at enhancing the beneficial and mitigating the adverse impacts of the project on the biophysical and socio-economic environment the ESIA has been prepared through: Surveillance visits, Biodiversity appraisal on and around the project area, updating on various literatures, interviews with key informants affected directly or indirectly with the project, interviews with stakeholders and Analysis and updating of the socio-economic and water quality/quantity related data against prevailing national regulations, policies and standards

The ESMP for this ESIA Report has identified two positive impacts: those for the Construction Phase and other for the Operations Phase. Job creation and increase in trade opportunities are positive impacts during Construction Phase. Positive impacts during Construction Phase include Improved water quantity and quality, reduced time to fetch water, improved sanitation, hygiene and health, improved socio-economic welfare in Balaka and Machinga, enhanced gender and women participation in development, education benefits to the girl child, increase in revenue generation, increased development and employment opportunities.

This ESIA has also identified the following adverse impacts at planning and design phase, construction and operational phases. The following are the adverse effects identified at the planning and design phase: Loss or destruction of land and/ or property, high compensation costs and land conflicts

The following adverse impacts were identified for the construction phase: land degradation, change in natural scenery and landscape of the project area, accidents and hazards from trenches and borrow pits, disruption of water supply, air quality degradation and increase respiratory disorders, Loss or destruction of habitats for fauna and aquatic life, loss of vegetation, water pollution and siltation, occupational incidents and accidents, noise pollution, Increase in sexual relationships, unplanned pregnancies, breaking up of families and sexual harassment, increase in teenage pregnancies and school drop outs amongst the youth, increase in prevalence of sexually transmitted infections (STIs), including HIV and AIDS, Unequal employment

- a) The following adverse impacts were identified during operational phase: harassment or intimidation of female workers in a male dominated environment, increase in crime incidents due to loss of employment, increase in solid waste generation, Increased pollution from wastewater and sludge, increased risk of water contamination, increased risk of fire from the electrical systems and from bush fires, increased incidences of pipe bursts in the high-pressure pipes, increased chances of theft and vandalism due to increased size of infrastructure

In view of the negative impacts outlined above, this document has presented an environmental and social management plan (ESMP) in Chapter 7, which outlines mitigation measures that must be undertaken by SRWB and other key stakeholders in order eliminate or decelerate the impacts on the environment. A monitoring plan for implementation of the management plan, which outlines responsibilities to SRWB and other key stakeholders, along with monitoring verifiable indicators for each of the mitigation measures, has also been provided. The costs for management of the impacts have been determined to be **10,069USD per year**; and the costs for monitoring are estimated to be **9,350 USD per year**.

If the proposed mitigation measures are effectively and efficiently implemented, it is expected that the adverse environmental and social impacts will be reduced or eliminated for the sustainability of the project in Liwonde and Balaka. In this respect it is therefore strongly recommended that the project should be implemented without further delay.

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LIST OF ACRONYMS

AIDS	Acquired Immuno-Deficiency Syndrome
BBTV	Banana Bunchy Top Virus
COMSIP	Community Service Investment Programme
DEC	District Executive Committee
DHIS	District Health Information System
DI	Ductile Iron
DLO	District Lands Officer
DPD	Director of Planning and Development
EAD	Environmental Affairs Department
EIA	Environmental Impact Assessment
EMA	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GI	Galvanised Iron
GoM	Government of Malawi
HIV	Human Immune Virus
IAS	Invasive Alien Species
MBS	Malawi Bureau of Standards
MDGS	Malawi Growth and Development Strategy
MDHS	Malawi Demographic Health Survey
MIEO	Monitoring, Information and Evaluation Officer
MPC	Malawi Postal Corporation
mPVC	Modified Polyvinyl chloride
MTL	Malawi Telecommunications Limited
NAPA	National Adaptation Programme of Action
NEAP	National Environmental Action Plan
SRWB	Southern 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 and Welfare
SEP	Social Economic Profile
STIs	Sexually Transmitted Infections
TCE	Technical Committee on the Environment
TNM	Telecommunication Network of Malawi
uPVC	un-plasticised polyvinyl chloride
UTM	Universal Transverse Mercator
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

CHAPTER 1 : BACKGROUND AND INTRODUCTION

1.1 Introduction

The Southern Region Water Board (SRWB) was created in 1996 under the Laws of Malawi Chapter 72:01 to be responsible for the supply of potable water and the disposal of waterborne sanitation in all the urban centers of the Southern Region of Malawi with the exception of City of Blantyre which is under the jurisdiction of Blantyre Water Board. SRWB operates 25 water supply schemes under five management zones for water supply to urban centres. Liwonde and Mangochi Water Supply Systems are within the mandate of the Southern Region Water Board.

1.2 Project Background

1.2.1 Liwonde and Balaka Water Supply Systems

The Liwonde Town System was designed to meet the water demand needs for the 2010 population of the town. The current Liwonde Water Supply System has therefore outlived its design life leading to people in the town facing water shortages.

Balaka Water Supply System is also under the Liwonde Management Zone and supplies water to communities in Balaka Town. The Balaka system draws most of its water (over 85%) from the Mpira Dam in Ntcheu District where SRWB buys the water from the Mpira-Balaka Water Trust, a Malawi government agency which runs the Mpira-Balaka Rural water supply system. The remaining proportion of water for the Balaka system is supplied through motorized boreholes. The total population in the two towns of Balaka and Liwonde is fast growing and is currently estimated to be at around 70,000 and is projected to grow to about 100,000 in the next 10 years. Currently the SRWB is able to supply only about 45% of the total population in both towns with safe drinking water.

The Balaka water supply system is also presently challenged with inadequate water supply source from the Mpira Dam. The Dam is facing a problem of drying up due to climatic change factors, catchment degradation as well as a significant increase in the rural and urban populations it serves. There is therefore a need to identify another more reliable source to supply water to the people of Balaka Town.

Taking into consideration these challenges of high population growths in the towns of Balaka and Liwonde as well as the inadequacies in the water supplied by the two systems, the SRWB plans to implement the upgrading and extension of the Liwonde System to cover supply to Balaka Town. The planned project will see the construction of a new intake at the Shire River, a new water treatment plant, pumping facilities for delivery of the treated water to Liwonde as well as Balaka towns, construction of water storage tanks as well as distribution networks in both towns and provision of materials to house connections and communal water points.

SRWB through the Government of Malawi is presently in the process of identifying financing from European Investment Bank (EIB) to finance the project. The planning and design phase of the project, currently on going, is mostly using the existing SRWB employees; when the construction works are complete, it is estimated that the SRWB will need to employ an additional total of 15 workers for the operation of the new assets. The cost of the project is estimated at €23,700,000.00 or MWK 20,712,615,000.00, 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.

1.3 Existing Systems

1.3.1 Liwonde Water Supply System

The water supply system for Liwonde was rehabilitated and upgraded in 2004. Its intake is located within a built-up area, approximately 400m upstream of the Liwonde barrage. The simple water intake is of a submerged intake pipe in the Shire River, running to the treatment plant located at the river bank. The conventional treatment plant includes coagulation, flocculation, sedimentation, filtration and disinfection. Sudfloc polymer is used as a flocculant and disinfection is done by chlorination. The treatment plant for the system has a capacity of 1,700 m³/d but currently it produces an average of about 1,300 m³/d; its full supply coverage being restricted by a limited distribution system and pumping system Figure 1.1 shows the existing intake and treatment plant for the system.



Figure 1.1: Existing intake (Left) and part of treatment plant (right) for the Liwonde water supply system

1.3.2 Balaka Water Supply System

The Balaka Water Supply system is based on two water sources. One, the water purchased from the Mpira-Balaka water supply system and second, a well field of SRWB to the south of Balaka. SRWB is in a water purchase agreement with the government owned Mpira-Balaka water supply system for supply of 16 l/s (1,382 m³/d). The supplied water originates from the Mpira Dam. It passes through a roughing filter and is then chlorinated. SRWB takes the water over at Sosola, a village located at the western outskirts of Balaka, 3.5 km from the centre. SRWB treats the water in Sosola, as the water quality does not reliably comply with drinking water standards. The water then flows by gravity through a closed rapid sand filter, is re-chlorinated and stored at a 1500 m³ Sosola storage reservoir. From there the water is supplied by gravity to the distribution system of Balaka. The supplied amount is often less than the agreed amount due to low pressure in the Mpira-Balaka system. The Mpira-Balaka system also faces frequent and sometimes long supply interruptions due to the poor condition of the system.

The second water source of Balaka is groundwater from a well-field located south of Balaka, towards the seasonal Rivirivi river. Water from 6 boreholes at the well field is pumped to a collector tank. From there it is pumped by variable speed controlled pumps to the 1,500 m³

reservoir at Sosola. The yield of the 6 boreholes is a rather small 600 m³/day which equals to 1.7 l/s based on 16 hours of pumping per day. The water from the boreholes has increased mineral content of which consumers complain in cases where it is not diluted with water from the Mpira-Balaka system. Considering the fact that the water supply from the Mpira-Balaka System is quite unreliable, the only reliable source at the moment for Balaka Town is that of 600 m³/day coming from the 6 boreholes. Figure 1.2 shows the existing storage reservoir at Sosola as well as a collector tank and pump house at the Well-field for the system.



Figure 1.2: Existing Sosola reservoir (Left) and pump house and collector tank (right) for the Balaka water supply system

1.3.3 Mangochi Water Supply System

1.3.3.1 Water Source

Water for the system is abstracted from Shire River using three submersible pumps (two operating at a time) located on one of the piers of the old Mangochi Bridge, two pumps have a capacity of 200m³/hr head 50m 30kw, and one pump has a capacity of 160m³/hr, head 38m and 22kw. The pumps are run two duty and one standby. The pumps deliver water through two parallel DN200mm pumping mains to the conventional water treatment plant constructed under the NWDP II with a capacity of 8000 cubic metres per day

1.3.3.2 Water Treatment Plant

The treatment plant consists of

- the treatment Flow division
- Coagulant dosing and flash mixing
- Flocculators
- Clarifiers
- Rapid sand filters
- Laboratory facilities to conduct basic water analyses
- Chemical dosing station and chemical storage
- Standby generators for power failure emergency procedures

Water clarification is through alum and soda while HTH is utilized for disinfection.

1.3.3.3 Storage Facilities

2 Sets of pumps of capacity 406m³/hr head 27m pump from wtw plant to Chomba and Kalonga (Each 250 m³ capacity) and 2 sets of pumps of capacity 70m³/hr head 27m pump to (250m³) ntagaluka tank.

1.3.3.4 Distribution System

There are different sizes of distribution and reticulation pipes ranging from DN32mm to DN250mm. The pipes in the system are of a variety of materials including galvanized iron (GI), ductile iron (DI), asbestos cement (AC) and PVC. Distribution along the main road through the town is provided by DN250mm and DN100mm pipes and the pressure is generally adequate. Pipes of size below 32 mm diameter are commonly used for house connections.

1.3.3.5 Water Quality Assessments

The Southern Region Water Board Central Laboratory located at Zomba Water Treatment Works site carries out water quality monitoring tests for the Mangochi System on quarterly basis to assess compliance with national and international water quality standards. However, Mangochi as Zone has the capacity to carry out routine tests on daily basis for parameters like turbidity, PH and residual chlorine.

1.4. Proposed Projects Scope

1.4.1 Overview and Location of Liwonde – Balaka Project

1.4.1.1 Project Overview

In view of the challenges being faced by the two water supply systems, the project to expand the Liwonde Water Supply System is being proposed to remedy the situation. The project seeks to construct a new intake at the Shire River, a new water treatment plant, pumping facilities for delivery of the treated water to Liwonde as well as Balaka towns, water storage tanks as well as distribution networks in both towns. Communal water points are also planned to be installed and materials to necessitate more household connections will be supplied. The project is being designed to have its civil structures capable of supplying the water demands for the next 25 years for both towns of Liwonde and Balaka.

1.4.1.2 Location

The project is to be implemented at Liwonde and Balaka towns as well as over the road section which connects the two towns. Liwonde Town is located in both Machinga and Balaka Districts in the Southern Region of Malawi at approximately 240 km south-east of the capital city of Lilongwe. Balaka Town is the centre of Balaka District; it is located at about 32 km to the north-west of Liwonde, on the motorway M8 and at about 210 km south-east of Lilongwe City.

Figure 1.3 shows the locations of Balaka and Liwonde Towns in Malawi. The proposed area to be covered under the project is shown in the figure 1.4 which also shows the proposed layouts for facilities to be constructed under this project.

Figure 1.3: Map included in appendix

1.4.2 Overview and Location of Liwonde - Balaka Project

1.4.2.1 Project Overview

The proposed project to upgrade and extend the Mangochi Water Supply System has a design horizon extending up to the year 2030. Key project components include:

- Extending water supply system from Mpondasi in Mangochi to Namiasi Trading Centre through boosting.
- Construction of an intake structure at the Lake at Nkhudzi Bay with centrifugal pumps.
- Construction of a conventional water treatment plant comprising of clarifiers, pressure filters and chlorine dosing equipment. The treatment plant will have a sump and a pumping station for clear water to the service reservoir.
- Construction of transmission pipelines.
- Construction of distribution pipe network including construction of storage tanks. Distribution pipe network will extend up to Ntakataka Turnoff.
- Construction of auxiliary buildings
- Procurement of materials for new water connections
- Procurement of equipment to support day-to-day management of the project.

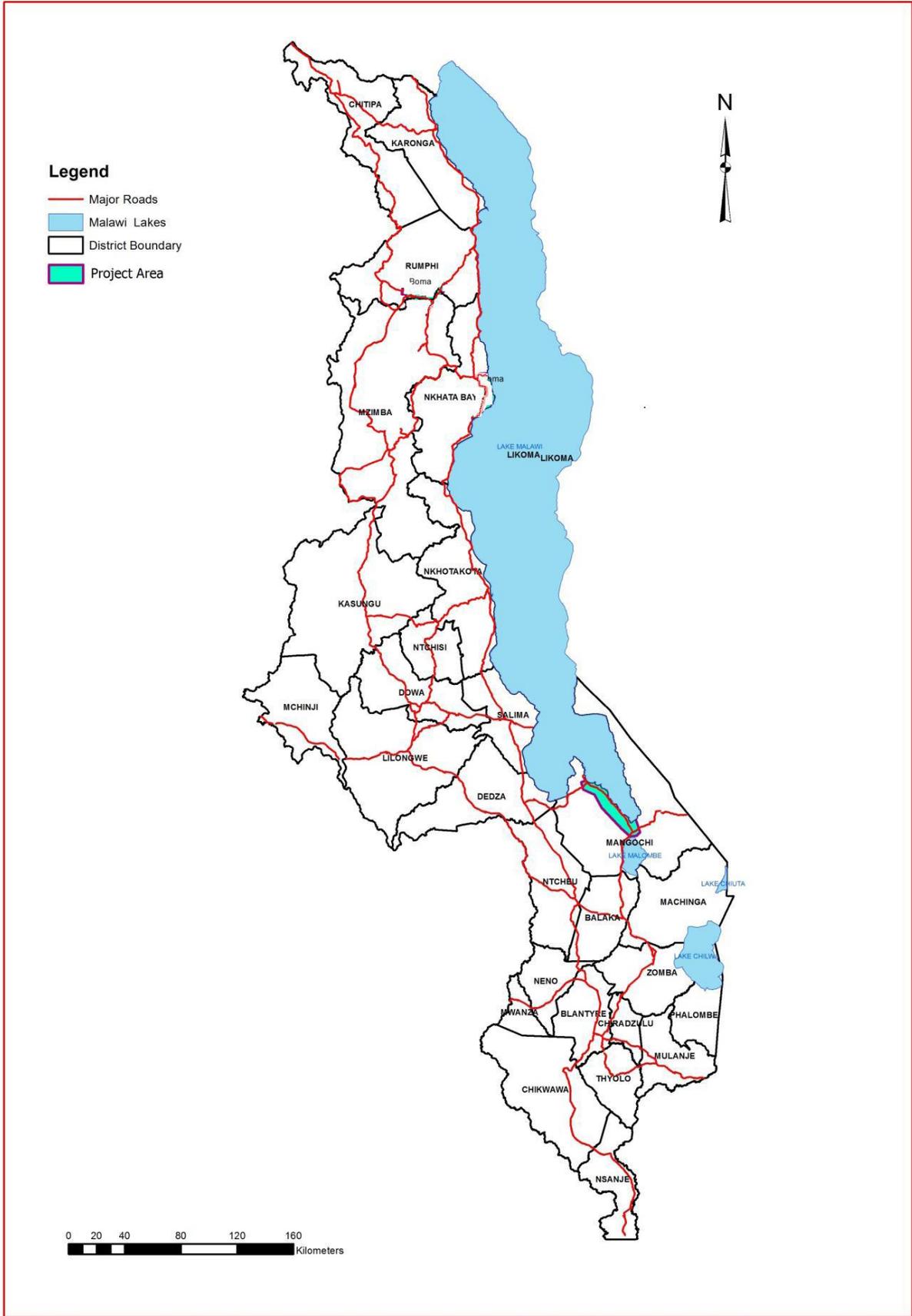


Figure 1.4: Location of project area for Mangochi water supply system extension in Malawi

1.5 Project Proponent

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

Proponent	Southern Region Water Board
Address	Southern Region Water Board Private Bag 72 Zomba Malawi
Telephone	01525311
Fax	01525054

CHAPTER 2 : DETAILED DESCRIPTION OF THE PROPOSED PROJECT

The proposed project to upgrade the Liwonde water supply system is developed in accordance with the requirements of the National Water Policy (2005) and United Nations' the Sustainable Development Goals (SDGs) , and to supply the people of Liwonde and Balaka with safe and reliable water. The Project Development Objective (PDO), is to establish a reliable drinking water supply to the two towns of Liwonde and Balaka, taking into consideration the fast growing population of the two towns. In addition to the residents of the two towns, the project is also expected to benefit the growing numbers of public and commercial water consumers in the two towns.

The design and construction works associated with the proposed project is planned to be implemented within a period of 4 years over. Works to be carried out are to include detailed designs, ground investigations, tendering, contract award and construction. The proposed project activities are classified in three phases namely: planning and design, construction and implementation.

2.1. PROJECT COMPONENTS/ACTIVITIES FOR THE PROJECT PLANNING AND DESIGN PHASE

Main activities during the planning and design phase include:

- i. **Pre-project assessments:** High level assessments regarding the proposed project to upgrade and expand the Liwonde-Balaka water supply systems have been conducted. The assessments were aimed at developing a project concept among from available alternatives. As a product of these assessments, a project appraisal report was developed in 2017, giving the established and proposed concepts for the project. The high level assessments were conducted from technical, financial and environmental perspectives.
- ii. **Site identification and selection:** Identification and selection of sites to be utilized for access roads to the project sites for construction works is one of the main activities for the planning phase. The selection of the access road sites takes into account the need to minimize negative impacts on the natural environment, as well as the surrounding communities. As part of this planning phase, determination of sites for locating proposed facilities for the upgrading of the water supply systems have been made. Established sites include sites for proposed new water intake structure, new water treatment plant and a new clear water storage reservoir.
- iii. **Technical Design:** The Southern Region Water Board is in the process of preparing detailed designs for the project. Activities being performed during this detailed design phase include surveying, site planning, preparation of maps, technical drawings and bills of quantities.
- iv. **ESIA studies:** WWEC is tasked with preparing the ESIA report. Activities associated with this exercise include conducting baseline and socioeconomic surveys, desk studies, map preparations and public consultations.

The project is currently in the planning and design phase.

2.2. PROJECT COMPONENTS/ACTIVITIES FOR THE PROJECT CONSTRUCTION PHASE

Construction works will commence soon after completion of the detailed design and tendering works, and after all the necessary approvals and certificates have been approved and issued.

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

- i) Establishment of Camp Sites
- ii) Transportation of people and equipment to and from the sites;
- iii) Establishment of on-site access roads;
- iv) Erection of work site signage and temporary fences where appropriate.

In general, the majority construction activities expected for a medium-large scale water supply project shall be included. These include land clearing, excavation of trenches, compaction base of the trenches where the pipes will lay, laying of the pipes, backfilling the trenches for laid pipes and the hauling of construction material etc. All these activities will have significant impact on the surrounding environment. Details concerning construction activities for the main infrastructure are discussed as follows:

2.2.1 Construction works to erect a new water intake and raw water pumping station on Shire River

A new water intake shall be constructed on the Shire River. The intake shall be located upstream of Liwonde Barrage. The intake structure is to be located at a site that is adjacent to Liwonde National Park upstream of the current intake for the Liwonde water supply system. As shown in figure 1.4 in the detailed sketch layout of the proposed project, the intake structure is to be located around UTM coordinate locations 36L 739083E and 8336666N. This proposed new intake location is more reliable as it is situated further upstream (about 2km upstream) to avoid abstracting water which might be contaminated with sewage discharge from Liwonde Town. The plan is to construct an intake tower for the new intake structure. The intake tower will allow for ease of maintenance of the facility considering that the new intake is to abstract approximately 10 times more water than the current submerged intake for the Liwonde water supply system. A new raw water pumping station will also be installed near the intake tower to pump water to the water treatment plant. This raw water pumping station will be furnished with 2 on duty pumps and one standby pump. Each of the pumps will have a power rating of 55KW.

2.2.2 Construction works for the new raw water transmission main

The raw water transmission main is proposed to be constructed over a stretch of 2.5 km. The pipe is to run from the new intake structure to connect with a new water treatment plant which will be constructed next to the existing treatment plant in Liwonde. The existing Liwonde plant is located at the bank of the Shire River just upstream of the Liwonde barrage weed boom in the town. The raw water transmission pipe will be optimised to be in the order of diameter 350mm and will largely be constructed of polyethylene pipe material.

2.2.3 Construction of new water treatment plant

A new conventional surface water treatment plant will be constructed for Liwonde. The plant will have a treatment capacity of 10,000 m³/day and will utilise a complete conventional treatment system comprising of units for coagulation, flocculation, sedimentation, filtration and disinfection. The plant will be built to have two parallel treatment lanes and will also include a clear water reservoir which will serve as a suction tank for high lift clear water pumps. Installations to facilitate necessary connections for power supply to the new treatment plant will also be done during the construction phase of the project. Installations for power supply will include the provision of power generators.

2.2.4 Installation of a pumping station at the new water treatment plant

A pumping station of two separate pumping systems will be constructed at the new water treatment plant. One system will pump water to clear water reservoirs in Liwonde and another system will pump treated water to Balaka. Three motorised pumps (two on duty and one on standby) each with a power rating of 30KW will be installed to pump water to tanks in Liwonde. On the other hand, four pumps (three on duty and one standby) each with a power rating of 55KW will be installed to pump approximately 5,000 m³/day of treated water to Balaka. The pumps to deliver water to Balaka will be provided with soft starters and water hammer equipment to reduce dynamic pressure surges that may arise due to the long pumping distances, and the large ground elevation delta of approximately 270m between Liwonde and Balaka. The two pumping systems to Liwonde and Balaka will have a combined pumping capacity of approximately 6700 m³/day.

2.2.5 Construction of transmission mains to Liwonde and Balaka

Main pipelines to transmit treated water from the treatment plant to Balaka and Liwonde towns will be constructed of ductile iron pipes. The main transmission line to supply parts of Liwonde will span an estimated distance of 3km, and will be of nominal pipe diameter of 300mm. The transmission main to supply parts of Balaka Town will be split into two sections; one spanning 25km, from the new treatment plant to Ng'onga hill along the Liwonde-Balaka M8 motorway, and another spanning 13.7km from the Ng'onga hill to the existing Sosola treatment plant (situated 3.5km west of Balaka Town centre). A storage reservoir will be constructed at Ng'onga hill into which the first section of the Balaka transmission main will terminate. The second section of the Balaka transmission pipe will start from this proposed tank at Ng'onga to the existing 1500m³ clear water reservoir at Sosola.

Both sections of the Balaka transmission main will be of nominal pipe diameter of 350mm. Both transmission mains for Balaka and Liwonde will be provided with air valves at high points and washouts at low points. Isolation valves shall be foreseen at strategic locations as needed.

2.2.6 Construction of reservoirs

The project will also include the construction of storage reservoirs for treated water. A 1000 m³ storage tank will be constructed at Ng'onga hill (UTM coordinate location 36L 718521E; 8337105N) along the Liwonde-Balaka M8 road. Pumped water from Liwonde will be supplied to this tank through the Balaka transmission main and the water will flow by gravity from this tank to the existing reservoir at Sosola.

Three additional storage tanks will be constructed at Liwonde, two of which will have a capacity of 500 m³ and one will have a capacity of 1000 m³. The storage tanks will be constructed of reinforced concrete. A high level balancing tank with a capacity of 50m³ will also be constructed to aid with the operation of the booster pumps in the water supply system.

2.2.7 Construction of distribution pipelines to areas of Liwonde and Balaka towns

The project will construct additional distribution pipelines to expand the current water supply networks in the two towns of Balaka and Liwonde. Detailed designs for the expansions of the networks shall be made by the SRWB in close consultation with the administrative councils for the two towns. The designs will take into account the future developments of the two towns. The current plan is to extend the distribution networks by approximately 10km in each of the two towns. The distribution pipelines for the extension will comprise of pipes ranging from 50mm to 250mm in diameter.

2.2.8 Construction works for service outlet points

Under this project, an estimated 100 communal water points will be constructed in selected areas of Balaka and Liwonde towns. Along with the installation of the public water points, a targeted 5,000 individual water connections are expected to be made in the two towns. The service connections are planned to be made concurrently with the expansion of the distribution networks. Construction works for the connections will include construction of manholes and connector pipes. The project will also procure necessary equipment such as water meters to facilitate the connections.

2.2.9 Construction of Auxilliary Buildings

Construction of auxilliary buildings under the project will mainly include pump houses, guard houses, office blocks, staff houses, at sites proposed for reservoirs, and at the new treatment plant.

2.2.10 Rehabilitation works at existing Liwonde and Balaka treatment plant

The project will also include rehabilitation works to the units at the current Liwonde and Balaka water treatment plant. In particular, electro - mechanical equipment such as pumps will be upgraded.

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

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

During the operation phase, the activities performed will include water abstraction, transmission, treatment, storage and distribution to consumers. It is expected that individual service connections for the water supply systems will carry over to the project operation

phase. Other activities performed during this phase include maintenance of the equipment and infrastructure for efficient delivery of the water supply services to the consumers. Pumping of the water will primarily utilize electricity from the Electricity Supply Corporation of Malawi (ESCOM). However, back-up power generators will be installed under this project.

2.4. LABOUR AND MATERIAL REQUIREMENTS FOR PROJECT ACTIVITIES

Excavation of trenches will be achieved using excavators and soil compaction will be done using trench compactors. Excavator and compactor operators and assistants, including labourers and plumbers will be employed by the project contractor. Employment opportunities will consider, where possible, the recommendation of the Malawi gender policy to ensure that a ratio limit of 40-60 (Women-Men)% is achieved. Out of the project workers employed during the construction phase, approximately 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 tanks will require machinery such as crawler dozers for clearing the project sites and excavators for digging foundations. Concrete mixers and vibrator pokers will be required for the concrete works. In addition, labourers will be required to perform functions including shaping the foundations and concrete works. It is estimated that 30 people will be employed for these activities. Tippers will be used for movement of materials such as quarry stones, gravel and sand.

In general, the proposed Balaka-Liwonde water supply systems expansion project is expected to generate an estimated 13,000 person-years of direct temporary employment during the construction phase (SRWB Liwonde-Balaka project appraisal report, 2017).

At operation phase, it has been estimated that SRWB will employ an additional 15 people to operate the new assets that will be installed under the project.

Table 2.1 presents some of the major plant, equipment and materials that will be required for the construction works to upgrade the Liwonde and Balaka water supply systems. 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 pollution
2.	Excavator	Excavation of trenches	To be provided by the contractor	Compacted trenches, firm foundation bases/ dust and noise pollution
3.	Trench compactor	Compaction of trenches	To be provided by the contractor	Compacted beds for pipes and foundations/ noise pollution
4.	Concrete mixer	Mixing concrete	To be provided by the contractor	Well mixed concrete/ noise, air pollution
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 pollution
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.	Plumbing and brick laying tools	For plumbing and brick laying works during construction	To be provided by the contractor	Laid pipes and supporting brick/masonry structures
9.	Fine and course aggregate	For concrete formulation	To be sourced locally. Course aggregate could be sourced from nearby quarries	Completed structures
10.	River sand and gravel	For concrete formulation and other construction works including use in filters for treatment of water	To be procured from suppliers	Completed structures including filters for water treatment,

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
11.	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/brick structures
12.	Water	For concrete formulation and other construction works	To be sourced from approved suppliers	Potable water/ Polluted water
13.	Reinforcement metal bars	For concrete reinforcement	To be sourced locally	Reinforced concrete water tanks and structures
14.	Cement bricks	For various construction structures	To be made locally	Brick structures
15.	Pipes and fittings	For water pipelines	To be sourced locally or internationally depending on quality specifications and cost	Pipelines for water delivery
16.	Hypochlorite solution	For water treatment	Local shops and imports	Treated, potable water

The activities listed above and all the other activities related to the implementation of the project may cause positive and negative environmental impacts for which the enhancement and mitigation measures are discussed in this 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 similar projects recently completed. Table 2.2 provides a summary of the estimated costs for the components of the proposed project to upgrade the Liwonde and Balaka water supply systems.

Table 2.2: Cost estimate for the proposed project

No	ITEM	COST (€)	COST (MWK)
1	New intake and raw water pumps	300,000.00	262,185,000.00
2	Raw water transmission main connecting intake – new Liwonde WTP	640,000.00	559,328,000.00
3	New water treatment plant of 10,000 m ³ /d capacity at Liwonde	3,970,000.00	3,469,581,500.00
4	Rehabilitation of existing Liwonde WTP	200,000.00	174,790,000.00
5	Pumping station at new WTP	930,000.00	812,773,500.00

No	ITEM	COST (€)	COST (MWK)
6	Clear water transmission mains to Liwonde and Balaka	7,100,750.00	6,205,700,462.50
7	New reservoirs	1,412,000.00	1,234,017,400.00
8	Distribution systems expansion and service outlet connections for Liwonde and Balaka	3,420,000.00	2,988,909,000.00
9	Contingencies	3,594,550.00	3,141,456,972.50
	Sub-total for construction costs	21,567,300.00	18,848,741,835.00
	Cost for design and supervision	2,156,730.00	1,884,874,183.50
	GRAND TOTAL	23,724,030.00	20,733,616,018.50

The total estimated cost is €23,724,030.00 or MWK 20,733,616,018.50, 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 implementing the project were assessed. The outcome of the assessment led to the recommendation of constructing a new water intake on the Shire River, a water treatment plant, pumping stations, reservoirs and main water supply piping to supply more water to Liwonde and Balaka Towns through pumping and gravity. The following environmental considerations were taken into account when coming up with the recommended project scope:

- a) The Shire River is a vast water resource with consistently reliable flow and it's use as an abstraction point relieves the pressure that is currently being faced by the Mpira Dam in Ntcheu District. The Mpira Dam has recently been experiencing perilously low water levels due to climate change factors and increased water supply demand from its supply catchment area. A significant portion of water from the dam (about 23.4 l/s) is currently purchased by SRWB to supply water to Balaka Town. The development of this proposed project to abstract water from Shire River to supply the town of Balaka will imply that the SRWB will stop depending on the dam for water supply from this dam. This will in turn save the Mpira Dam from the increased demand which was mostly from the growing urban population of Balaka; thus contributing to the restoration of an important water resource.
- b) The option of the Shire River for abstraction also spares other limited water resources that are located near Balaka Town which might have been considered i.e. the Rivirivi River which passes west-east at the south of Balaka.
- c) The combination of both pumping and gravity for water supply to Balaka significantly reduces the demand for energy/power that would have otherwise been much higher if the only option considered was direct pumping of water to Balaka. An increased power demand which would have come from implementing the latter option would have been a substantial contributing factor to an already inadequate power supply system for the country to the country. The option to reduce demand for power

therefore saves the resource and indirectly also protects the country's trees to which people normally turn to for firewood/charcoal during power shortages.

2.7. WASTE MANAGEMENT

Table 2.3 details how various kinds of waste generated due to the proposed project will be managed:

Table 2.3: Management of waste generated from the proposed project

Type of Waste	Management
Concrete	<ul style="list-style-type: none"> ✓ Concrete waste will be restricted from entering storm drains or any nearby watercourses. ✓ Concrete trucks and other concrete-coated equipment will be washed at the project sites. ✓ Concrete waste 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 waste will also be used to backfill borrow pits.
Oils	<ul style="list-style-type: none"> ✓ Used oil will be kept for oiling shutters during other construction activities.
Steel	<ul style="list-style-type: none"> ✓ All steel offcuts will be stockpiled in a designated protected area. ✓ The steel offcuts will later be sold to recycling companies.
Tyres	<ul style="list-style-type: none"> ✓ Worn 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	<ul style="list-style-type: none"> ✓ Saw dust will be used as an absorber in areas prone to oil leaks to avoid soil contamination. ✓ Other saw dust will be thrown into waste collection bins and arrangements will be made to responsibly disposed of the waste at dedicated waste disposal sites for the Balaka and Liwonde Town Councils.
Plastic Papers and other plastics	<ul style="list-style-type: none"> ✓ These will be recycled where possible. Otherwise they will be placed in bins then thrown into waste collection skips and arrangements will be made to responsibly disposed of the waste at dedicated waste disposal sites for the Balaka and Liwonde Town Councils. Use of thin plastic papers will not be allowed at all project sites to adhere to the ban by the Malawi Government on the production, distribution and use of thin plastics of thickness less than 60 microns.
Office Papers	<ul style="list-style-type: none"> ✓ These will be recycled where possible. Otherwise they will be placed in bins then thrown into waste collection skips and arrangements will be made to responsibly disposed of the waste at dedicated waste disposal sites for the Balaka and Liwonde Town Councils.
Foods	<ul style="list-style-type: none"> ✓ All food waste 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.

Type of Waste	Management
Human waste	✓ Pit latrines will be constructed at construction sites to allow for proper disposal of human waste.
Exhaust Fumes	✓ 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 towns of Balaka and Liwonde, 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 systems will not only have the capacity to supply safe water to the people residing in the two towns presently, but also to amply supply those that will be residing in the towns and their immediate surrounding communities in the future.

With this said, the socio-environmental consequences of a “no action” option are that:

- a) People of Liwonde and Balaka towns 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 children and the elderly, would be exposed to water related ailments stemming from the use of unsafe water.
- e) The national economy would miss out on the possible benefits of increased revenue generation from the customers of the SRWB, more taxes for the government as well as job and associated business creation opportunities that would come due to the proposed project.

On the other hand, the “no action” option would mean that the project-associated negative 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

Various alternatives were analysed regarding the implementation of the proposed project from both technical and economical outlooks. The options mainly were about the possible water source for the proposed project, the water pumping regime for delivery of water to Balaka as well as the location of new water intake structure and treatment plant. Details concerning the alternatives are as presented as follows:

a. ALTERNATIVES ON POSSIBLE WATER SOURCE

- *Increased/improved supply from Mpira Dam:* This option involves the supply of water to Balaka by increasing of the current amount of 23.4l/s of water which SRWB is able to purchase from the Mpira-Balaka Water User Association. The main drawback of this option is that the capacity of the Mpira Dam has significantly reduced since its construction. Due to a number of factors including poor maintenance of the Mpira-Balaka supply system, the supply from the dam has become very unreliable. SRWB is not able to secure a larger amount of water from this system and the unreliability of

the supply is not acceptable for a water service provider. SRWB cannot rely on this source in the medium to long term.

- *Exploring of more groundwater sources:* This option involves the supply of water to Balaka by drilling more boreholes to add to the current well field supplying Balaka Town. The challenge with this option is that the area surrounding Balaka Town does not have reasonable groundwater resources. Most of the boreholes drilled in the area including those from the well field are low yielding. The other problem with the groundwater in the area is that it mostly contains an increased mineral content, a thing which results in complaints from customers. Consequently even if a good groundwater resource was to be found, the groundwater could require also costly treatment processes to deal with the high mineral content.
- *Building a dam on the Rivirivi River:* This option involves the supply of water to Balaka by constructing a dam on the Rivirivi River which passes west-east at south of Balaka Town near the current SRWB well-field. This option has two main drawbacks which are to do with the flat topography of the area which would limit the amount of water to be impounded as well as the fact that farming practices are happening in the catchment area of the river which would lead in increased sedimentation of the dam. The other main drawback is that the Rivirivi River is also currently no more a perennial stream as it presently mostly dries up in the dry season.
- *Constructing an intake structure on the Shire River:* This is the selected option which involves the supply of water to Balaka as well as Liwonde towns by constructing an intake facility to abstract water from the Shire River. This option has the disadvantage of incurring high costs for pumping water over a long distance (of more than 20km) from Liwonde to Balaka against a head of about 270m. Despite of this disadvantage, this is the only viable option for a water source to supply the requirements of the proposed project. This is because the Shire River is a vast reliable source with a strong permanent flow. Due to its vastness, the water at the intake site will not necessarily require building of a dam.

b. ALTERNATIVES ON PUMPING REGIMES TO DELIVER WATER TO BALAKA TOWN

Options assessed in this regard include the following:

- i. Direct pumping from Liwonde to clear water storage reservoir at Sosola treatment plant
- ii. Pumping from Liwonde to a high point "Hill" and gravity supply from this high point to Sosola reservoir
- iii. Either of the options i and ii, but providing an (online) booster pumping station at a strategic location between Liwonde and Balaka or the high point "Hill".
- iv. Either of the options i, ii and iii, but supplying directly into Balaka Town instead of supplying to tank at Sosola.

The alternative ii is opted for over which the water is to be pumped to a high point tank to be constructed at Ng'onga hill, then gravity supply is carried out to the reservoir at Sosola

treatment plant. This option is selected mainly because it cuts down on the costs for pumping the water with the incorporation of gravity flow. This option also provides room for possibilities of effectively supplying the water to trading centres such as Chiendausiku that are located between Liwonde and Balaka Towns.

c. ALTERNATIVES ON LOCATIONS OF NEW INTAKE AND TREATMENT PLANT

The current intake structure for the Liwonde water supply system on the Shire River is determined to not be adequate to serve the proposed water supply system which will deliver water all the way to Balaka Town. Therefore possible locations were analysed for a new intake structure.

In the analysis, two alternatives were mainly looked at, these being locating the intake downstream of the Liwonde Barrage or locating it further upstream. The location downstream of the barrage is not considered suitable for this proposed large water supply scheme mainly because its location downstream of the barrage would cause slightly higher pumping costs. The location would also be too close to the town developments particularly lodges along the Shire River which increases the risk of abstracting water which might be contaminated from sewage discharges. The location upstream of the barrage at almost 3km upstream of the barrage is therefore opted for the placing of the new intake. The new intake will be located just next to the border of the Liwonde National Park to ensure that no human settlement can take place in the vicinity upstream of the intake.

On locating the new treatment plant, the options were either to locate it next to the existing treatment plant for Liwonde or near the proposed new intake site. The selected option is to place it next to the existing Liwonde treatment plant, at an unoccupied space located just downstream of the plant. This option spares the vegetation areas located near the proposed new intake site close to the Liwonde National Park in that they will not have to be significantly cleared during construction works, which would have been the case if the plant was to be placed next to the new intake.

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 relevant international environmental/social agreements that may be related to the project.

4.1. ENVIRONMENTAL MANAGEMENT IN MALAWI

Malawi is a signatory to the 1992 Rio Declaration on Environment and Development. Principle 17 of the declaration commits Malawi to undertaking 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 adverse 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 Mining (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 EAD and advises the Minister for approval and issuance of the environmental certificate for the project to proceed.

4.2. ZAMBEZI WATERCOURSE COMMISSION (ZAMCOM) PRINCIPLES

The ZAMCOM agreement aims at promoting equitable and reasonable utilization of the water resource of the Zambezi Watercourse as well the efficient management and sustainable thereof. Article 14 (1) of the agreement states that member state planning any programme, project or activity with regards to the Zambezi Watercourse or which may adversely affect the watercourse or any other member state shall forthwith notify the secretariat therefore and provide the commission with all available data and information with regards to the project.

Article 12 of the agreement lists principles that are to be followed in order to achieve the agreement's aim. These principles include; principle of sustainable development; principle of sustainable utilization; principle of prevention of harm; principle of precaution; principle of inter-generational equity; principle of assess of trans-frontier impacts; principle of cooperation and principle of equitable and reasoning utilization. The proposed Liwonde-Balaka water supply project is expected to be carried out according to the ZAMCOM agreement by following the agreement's principles throughout the project cycle.

4.3. 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 Agriculture, Irrigation and 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 Southern Region Water Board will make sure that its project 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 upgrade of the Liwonde water supply including Balaka town project 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.

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 adverse and positive impacts are mitigated and enhanced respectively.

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

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 emphasizes 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 has the aim of improving the water supply and is 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 Gender Policy (2005)

The National Gender Policy was developed and adopted to address persistent gender inequalities, under representation of women in decision-making positions at all levels and other related issues. The policy provides guidelines for mainstreaming gender issues in various sectors of the economy to reduce gender inequalities and enhance participation of women, men and the youth for sustainable and equitable development, as well as poverty eradication in the country.

In line with the Gender Policy, gender should be mainstreamed in all stages of the proposed project. Some of the measures that will be taken to ensure that there is gender mainstreaming in this project include involving women in the consultations, awareness and sensitization process, natural resources management, providing equal employment opportunities to women and men and close monitoring of gender related impacts.

4.2.7. 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, SRWB has an 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.

4.2.8. Malawi National State of Environment and Outlook Report (2010)

The National 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 NSOER 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 NSOER 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.

4.2.9. 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.

4.4. 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 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 beneficial impacts and mitigate for adverse 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.

4.3.3. 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 mostly private and it belongs to the Southern Region Water Board. However, there are some few cases where land has yet to be acquired and the Board is finalizing the acquisition process. The SRWB will have to pay compensation to the affected people before proceeding with the project.

4.3.4. 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 Southern 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 upgrading and extension of Liwonde water supply including Balaka town project is in line with this act as it aims at extending water supply for domestic and business purposes.

4.3.5. 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 Liwonde and Balaka District Councils and rural communities and ensuring that any by-laws set by the Council are followed throughout the project cycle.

4.3.6. 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 SRWB 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.

4.3.7. 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, SRWB will ensure that biodiversity and ecosystems are conserved by adhering to the recommendations; and implementing the mitigation measures in this report.

4.3.8. 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.

4.5. 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.	Permit on Water Rights	Allows the abstraction of groundwater or surface water	Water Resources Act (2013)	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	Machinga and Balaka by-laws; and the Physical Planning Act (2016)	Machinga and Balaka
4.	Planning permit	To ensure that project is implemented within the district council development plans.	Local government	Machinga and Balaka District 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

4.6. 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 SRWB 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

CHAPTER 5 : DESCRIPTION OF THE PROJECT ENVIRONMENT

5.1. PHYSICAL CHARACTERISTICS OF THE PROJECT AREA

5.1.1. Spatial location

Liwonde Town is in Machinga District which is located in the Eastern Region of Malawi. The district borders with Mangochi District in the North, Zomba District in the South, Balaka District in the West and the Republic of Mozambique in the East.. Liwonde Town is approximately 101km from Blantyre and 258km from Lilongwe District. Liwonde is located between latitudes 9.9'S and 33°97'S; and longitudes 34°17'E and 34° 18'E.

On the other hand, Balaka Town is located in Balaka District in the Southern Region of the Republic of Malawi. The district is bordered by Machinga to the East, Ntcheu to the North-West, Zomba to the South East, Mangochi to the North, Machinga to the East, Neno to the South West, Blantyre to the South. The district is 201km from Lilongwe, the capital city of Malawi, and about 127km from Blantyre district. The district is located between latitude 14° 58' 0"S and longitude 35° 30' 0"E and covers an area of 2193 km²

5.1.2. Climate (Rainfall and Temperature)

5.1.2.1. Temperature

Machinga district experiences 2 seasons; summer and the rainy season. The summer is between May to October, and the rainy season is between October and March. Minimum temperatures range from 14°C to 22°C in June and July, while the maximum temperatures range from 22°C to 33°C between October and November.

Climate in Balaka district is tropical. The district experiences two seasons; summer which is between June to August and a rainy season which is between October and April. May and September are transitional months. The lowest temperatures range from 15.5°C to 22.7°C between June and July, while the highest temperatures range from 24.4°C to 31.6°C between October and November.

5.1.2.2. Rainfall

Precipitation in Machinga district is affected by topography. Rainfall is both conventional and orographic in nature. Liwonde town being a low-lying area, experiences low and unreliable rainfall due to it being mostly convective. Liwonde Town experiences average rainfall of 750mm per year.

The average annual rainfall for Balaka district is 750mm. The onset of rains is usually the end of October with majority of the rains occurring in the months between December and February.

5.1.3. Topography and Soils

Machinga district has a topography ranging from an elevation of 482 to 794 metres above sea level. The district has a generally flat terrain around Liwonde, which spreads to mountainous and hilly zones of Malosa-Liwonde forest reserve, Ntaja Escarpment and Lungwe Hills in TA Nyambi. The area around Liwonde town has ferruginous, calcimorphic and lithosols type of

soils. Calcimorphic soils are found in the form of mopansols and alluvial soils which are usually very fertile. Eutric soils are also common in the area. These soils have coarse grains and are light in texture with good air circulation.

Balaka District has a topography ranging from an elevation of about 350 to 800 metres above sea level. The topographical features in the district comprise of ridges and natural drainage systems. The district is dominated by plateaus with isolated hills found around the district. Alluvial soils, often calcimorphic, lithosols, mopansols, gleys and ferruginous, are the common types of soils in the district.

Types of soils in both districts determine land use and types of crops planted in the different area.

5.1.4. Land use patterns

Land tenure systems in Machinga and Balaka districts are in two categories namely; public land, which comprises of government, customary and private land, and are either leased or freehold.

Machinga district has a total of 3,711km² (equivalent to 371,169 hectares). Fifty-seven percent (57%) of the total land is slated for agricultural activities, 11% is for forest reserves and protected areas, 0.3% is occupied by water resources i.e. Lakes Chiuta, Chilwa and Malombe, 29% is government land and the rest is utilized by the government.

Balaka district has a total of 2,117km² (equivalent to 211,716 hectares). From the total land size, 15% is occupied by wetlands, 5% is for public use, 57% for farming, 7% for settlements, 5% for estates and 11% is agricultural forest.

From the household assessment, it was noted that land in the project area is mainly public and customary in nature. Land is mainly used for agricultural and residential purposes. However, there is a small percentage of people with unused land especially in Balaka town.

5.1.5. Settlement Patterns

The settlement in Machinga district is in both nuclear and linear patterns. This is dependent on whether it is an urban or rural setting. The settlement in the rural setting is nuclear, as the other side of land is reserved for agricultural purposes. Linear pattern is mainly in the urban areas especially in trading centres. People settle in linear pattern close to the main roads so that they can take advantage of the business opportunities in the trading centres. Liwonde town has been growing rapidly in recent years. This is attributed to developments that take place in the town and the tourism industry.

There are both formal and informal settlements in Balaka town. The formal housing is categorized into low, medium, high and traditional housing areas. Clustered patterns are mainly in trading centres and Balaka township.

5.1.6. Geology

The Machinga area is underlain by rocks of the Malawi basement complex. In some cases blanketed by drift and colluvium. Various rock types are found in Machinga district, some of

which are biotite-bearing felsic gneisses, gneisses containing pyroxene, hornblende, biotite, and garnets dominate the area. Different geographic features have different rock types; Lake Chiuta plain is mostly covered by thick superficial soil and weathered pelitic, semi-pelitic, quartzo-feldspathic, and calc silicate rocks, while the distinctive hill group of Nabwasi, Nafisi, and Nsili represents eroded remnants of perthite-syenite and granitic intrusions among others. In the lowlands, rock outcrops are very rare due to thick and widespread soil. There are many evident morphological breakups that may be referred to as faults. The drainage pattern of the district also indicates some preferential trends that could be related to hidden structures.

The most conspicuous and dominant physical feature of Balaka district are the plateaus with isolated hills found around the district. Majority of the water bodies (rivers/streams) are seasonal. These natural drainage channels are narrow with steep slopes.

5.1.7. Hydrology

There are both underground and surface water sources in Machinga district. Underground water sources include; aquifers, boreholes and shallow wells while surface water sources include; rivers, streams and lakes. Flow direction of groundwater is influenced by the geomorphology of the area. Generally, water flows perpendicular to equipotential planes, flowing from places with higher heads to places with low heads. Hence, the groundwater flow direction is predominantly to the South-East and partially to the East into the Shire River. However, metamorphic rock aquifers cause convergences and divergences in the flow which develops local weathered zones and local aquifers, which are recharged and establish regional continuity during the wet season as the water level rises.

Water resources in Balaka District exist in two major categories; surface and ground water. Surface water consists of rivers and streams while ground water sources consist of springs, boreholes, and shallow wells. Poor land husbandry practices including cultivating along river banks and increase in population, have degraded catchment areas and marginal lands and has accelerated soil erosion, resulting in sedimentation of rivers. Hence the presence of dry spells and floods in most areas of Balaka district. Inadequate sanitary facilities, agrochemical run-off, and lack of proper waste disposal facilities have also contributed to the deterioration of the quality of water resources.

5.2. BIOLOGICAL CHARACTERISTICS OF THE AREA

5.2.1. Study Area

5.2.3.1. General

The project study areas are Liwonde and Balaka. The specific areas are the water intake on the Shire River, a new water treatment plant area at Liwonde town, pumping facilities at Liwonde for delivery of the treated water to Liwonde and Balaka towns, water storage tanks at Liwonde and Balaka towns, areas with water distribution networks in both towns, material for house connections and communal water points, including surrounding environs (Figure 5.1). This is the project study area for the proposed development for the upgrading and extension of potable water supply schemes for Liwonde and Balaka towns (Southern Region Water Board, 2017). Liwonde town lies between latitude 15° 06' 95'' S latitude and longitude 35° 23' 13'' E while Balaka District lies between latitude 15° 05' 07'' S and longitude 35° 08' 29'' E. Liwonde town is located at an altitude of 655 m above the sea level (Malawi Government, 2013).

The study area has three types of vegetation namely closed canopy woodland, mixed savannah woodland and mopane woodland. Other minor vegetation types are perennial wetland grassland and open canopy woodland of hills and scarps. It is reported that the most common plant genera that occur in the study area are *Brachystegia-Julbernardia-Combretum-Uapaca* and *Colophospermum mopane* plant species among others (Malawi Government, 2013).

There are avifaunal species that are found in the study area and the most common ones are *Agapornis lilianae* (Lilian's Lovebird), *Bubulcus ibis* (Cattle Egret) and *Egretta alba* (Great Egret and other various species of birds) (Malawi Government, 2013).

Fish species that are found in the Shire River and other rivers in Balaka District include *Oreochromis lidole* (Chambo), *O. karonge* (Chambo), *Bagrus meridiondis* (Kampango), *Tilapia shirensis* (Makumba), *Haprochronis* (Kambuzi), *Labeo mesops* (Ntchira), *Opsaridium microcephalus* (Mpassa), *O. Microlepis* (Sanjika), *Hippopotamyrus discorhynchus* (Mphuta), *Barbus paludinosus* (Matemba), *Engraulicypris sardella* (Usipa) and *Claris liocephalus* (Mulamba) (Malawi Government, 2013).

There are also mammal species that occur in Balaka district. However, the majority of these mammal species are small mammals such as mice (*Mus spp.*) common hare (*Lepus microtis*) and rodents (*Rodentia spp.*). Large mammals are confined only to protected areas such as Liwonde National Park and the Shire River (Malawi Government, 2013).

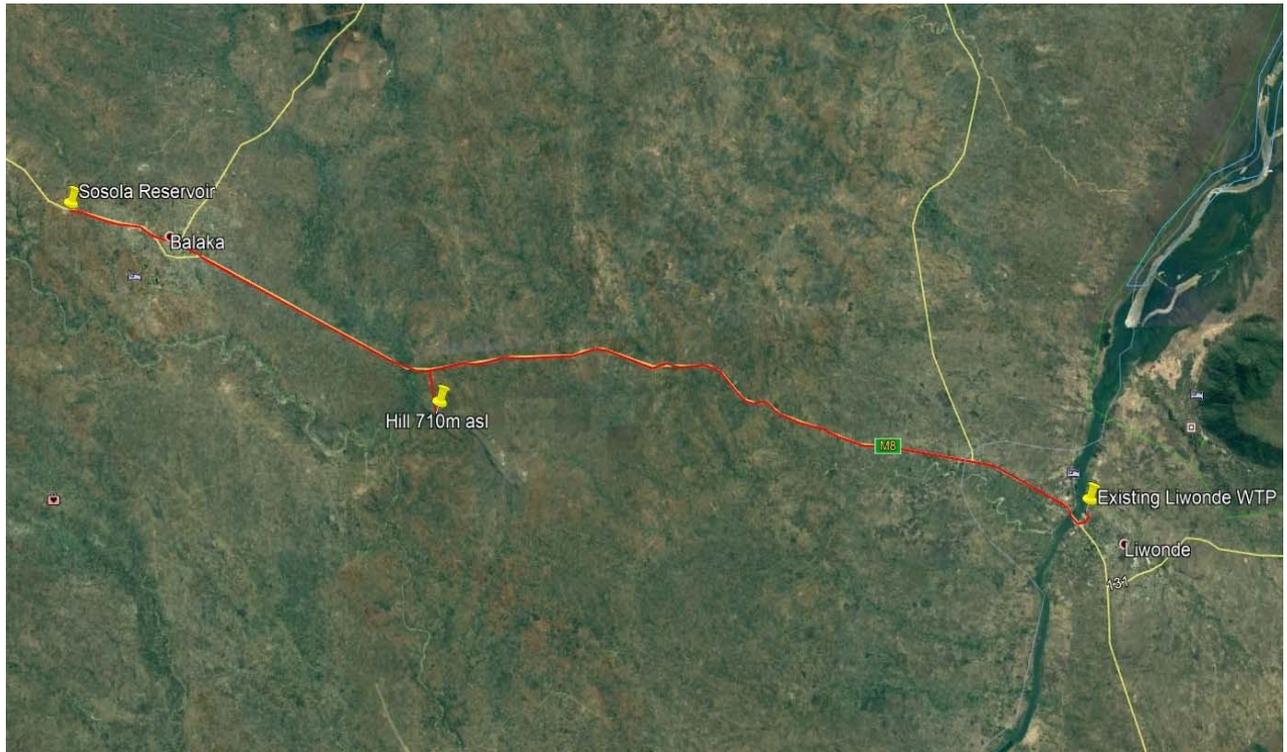


Figure 5.1: Google satellite map of Liwonde – Balaka showing the pipe line route from Shire River to Balaka

One ecologically sensitive area located in the vicinity of the proposed project site is the Shire River: It is the largest river in Malawi. It is home to a number of fish and mammal species, including aquatic flora. It is located on the south-east of Liwonde town in Balaka District.

5.2.3.1.1. Terrestrial Ecoregions

Both Liwonde and Balaka towns fall within a large terrestrial ecoregion known as Central Zambezian Miombo Woodland. This is one of the Africa's largest ecoregions, which stretches across Central Africa below the equator, and includes much of Central and Northern Malawi and some parts of the Southern Malawi. This ecoregion has the highest flora species richness and diversity within the miombo biome and has a higher proportion of miombo trees compared to other woodland types. Soils are highly weathered, well-drained, highly leached and nutrient-poor and tend to be acidic with a low proportion of organic matter. In an undisturbed natural forest, the canopy cover is 10 to 15 m tall and is dominated by broad-leaved species of *Brachystegia*, *Julbernardia* and *Colospermum*. The understory vegetation is lush, comprising grasses, broad leaved shrubs and herbs).

5.2.3.2. Vegetation Types

At a finer scale, the Study Area falls within a transition zone between three vegetation types as described by Wild and Fernandes (1967), and indicated on the Vegetation map of the Flora Zambesiaca Area (Wild and barbosa, 1967):

***Brachystegia floribunda* – *Julbernardia paniculata* Semi-Deciduous Northern Plateau Miombo Woodland**

This vegetation type comprises of tall woodland on variable soils that is widespread in Zambia and occurs also mostly along the western half of Malawi. The trees *Brachystegia floribunda*, *B. longifolia*, *B. boehmii* and *Julbernardia paniculata* are dominant, with locally common evergreen species including *Erythrophloeum africanum* and *Marquesia acuminata* on valleys. *Uapaca kirkiana* and *Combretum molle* are usually prominent below the canopy.

***Brachystegia floribunda* – *Julbernardia globiflora* Tardily Deciduous Northern Plateau Miombo Woodland**

This woodland is characteristic of the broken terrain of the central plateau, as opposed to the above vegetation type. This vegetation type is widespread over northern and north-western Zambia and occurs in southern Malawi as well as along the eastern half of the central plateau. *Julbernardia globiflora* is prominent, while the dominant *Brachystegia* species are *B. floribunda*, *B. longifolia* and *B. manga*.

***Pterocarpus* – *Combretum* – *Pericopsis* Deciduous (Basement Complex) Tree Savannah**

This savannah woodland is largely confined to patches around Kafue flats and near Lusaka in Central Zambia. In Malawi, it occurs mostly between Lilongwe and Dedza on the Central Plateau, including the large parts of the Southern Malawi and areas around north-east of Kasungu. The deciduous trees *Pterocarpus angolensis* and various *Combretum* species are

dominant, while dominant trees in the areas are *Pericopsis angolensis*, *Terminalia sericea*, *Burkea africana*, *Markhamia obtusifolia*, *Lonchocarpus capassa*, *L. bussei*, *Xeroderris stuhlmannii* and *Acacia polyacantha*.

5.2.3.3. Aquatic Ecoregions

The Study Area falls within the Lake Malawi Ecoregion, which comprises Lake Malawi and influent rivers such as the Shire River and streams. More than 200 rivers flow into Lake Malawi and most of these are annual and many flow in the rainy season (FEOW, 2010). The Shire River is a home to several species of fish such as *Oreochromis lidole*, *O. karongae* (Chambo), *Bagrus meridiondis* (Kampango), *Tilapia shirensis* (Makumba), *Haprochronis* (Kambuzi), *Labeo mesops* (Ntchira), *Opsaridium microcephalus* (Mpassa), *O. microlepis* (Sanjika), *Hippopotamyrus discorhynchus* (Mphuta), *Barbus paludinosus* (Matemba), *Engraulicypris sardella* (Usipa) and *Claris liocephalus* (Mulamba). The avifauna that are found in the Shire River wetland include *Agapornis lilianae* (Lilian's Lovebird), *Bubulcus ibis* (Cattle Egret) and *Egretta alba* (Great Egret and other various species (Malawi Government, 2013).

5.2.4.1.1. Flora Species

Assessment of flora species was done using transect walks along the proposed route of the pipelines, at the weir, treatment house and water pumping house, and on areas where water storage tanks will be constructed. All flora species that were seen during the field survey were identified and recorded in a field notebook. Plants that could not be identified onsite were photographed or their specimens were collected for identification at the place of lodging, using the Flora Zambesiaca volumes and various field guides. Particular attention was paid to species of conservation concern (i.e. endemic, protected and endangered species).

5.2.4.1.2. Bird Species

The standardized search method of Watson (2003) was used to survey bird species by walking slowly through various vegetation communities, preferably along paths or tracks and recording the species seen or heard within 20 minute segments in each vegetation community. Six transects of approximately 200 m apart were established on the proposed project site. The bird species were surveyed twice in the morning, twice in midday and twice in the evening. This was done in order to capture all species of birds that reveal themselves at different times of a day. Playback calls were used to encourage cryptic species to reveal themselves. This was done to supplement visual observation data.

5.2.4.1.3. Mammal Species

Mammal species were recorded incidentally while surveying birds. Indirect evidence such as spoor or dung was used to confirm presence of mammal species in the proposed project area, in conjunction with limited visual or audio confirmation. Similarly, mammal species were surveyed twice in the morning, twice in midday and twice in the evening in all the six transects that were established on the proposed project site.

5.2.4.1.4. Fish Species

Fish were surveyed by careful visual observations in water bodies such as rivers and fish ponds present in the Study area. Species of fish that could not be identified on-site were photographed and ultimately compared to photographed fish species available in various fish field guides that were taken so that they could be accurately identified at least to species level.

5.2.4.1.5. Present Ecological State

Assessment of the present ecological state of the proposed project site was done using physical observation, professional judgement and based on subjective assessment of expected and observed abundance and diversity of flora and fauna species, including insects. The results were classified into one of the six categories, ranging from Unimpaired (Category A) to Very Severely Impaired or Modified (Category F) of the ecosystem. The assessment and classification of the present ecological state of the proposed habitat was adopted using Guidelines of IFS PS6 (Table 5-1).

Table 5.1: IFC Guidelines used to assess the Present Ecological State of the Habitat of the Proposed Project Site

Category	Description
A	<p><i>Unmodified</i></p> <ul style="list-style-type: none"> • natural diversity of taxa, and; • numerous sensitive taxa, and • abundance as expected under natural conditions; • no taxa dominating each other, and; • no alien invasive species
B	<p><i>Slightly Modified</i></p> <ul style="list-style-type: none"> • As above, but fewer sensitive taxa and slightly lower taxa, and; • No alien invasive species
C	<p><i>Moderately Modified</i></p> <ul style="list-style-type: none"> • Moderate diversity of taxa relative to diversity expected under natural conditions, and; • moderate numbers of sensitive taxa, or; • moderate reduction in abundance of some or all taxa relative to that expected under natural conditions, and; • alien invasive species may be present.
D	<p><i>Considerably Modified</i></p> <ul style="list-style-type: none"> • low diversity of taxa relative to diversity expected under natural conditions, and; • mostly tolerant taxa, and; • considerable reduction in abundance of some or all taxa relative to the expected under natural conditions, and; • more than one taxa dominating other taxa for extended periods, and; • alien invasive species may be common.
E	<p><i>Severely Modified</i></p> <ul style="list-style-type: none"> • very low diversity of taxa relative to diversity expected under natural conditions, and; • only tolerant taxa present, or; • severe reduction in abundance of some or all taxa relative to that expected under natural conditions, and; • only one taxon dominating other taxa for extended periods, and; • alien invasive species may be abundant.

F**Very Severely Modified**

- as above under Category E, but with Very Severe reduction in taxa diversity and abundance.

5.2.5.1. Flora of Agricultural Mosaic Land

The proposed project site is generally flat land and is predominantly used for subsistence agriculture. A total of 10 cultivated crops were recorded from the project areas of Liwonde and Balaka towns and surrounding areas include *Zea mays* (Chimanga), *Arachis hypogaea* (Mtedza), *Gossypium herbaceum* (Kotoni), *Sorghum bicolor* (Mapira), *Eleusine coracana* (Mayere), *Cucubirta maxima* (Dzungu), *Vigna unguiculata* (Mzama), *Cajanus cajana* (Nandolo) and *Hibiscus cannabinus* (Thereere) among others. Trees that are found in the project areas include natural, planted and fruit trees such as *Eucalyptus camadulensis* (Bluegum) and *Mangifera indica* (Mango) among others, which are harvested for consumption and sale. People living in the project areas also rear livestock such as *Bos taurus* (Ng'ombe) and *Capra aegarus hircus* (Mbuzi).

In addition, a total of 16 indigenous flora species comprising of trees, shrubs and herbs were recorded from the cultivated project areas in both Liwonde and Balaka. These flora species were *Adansonia digitata* (Malambe), *Ocimum americanum* (Nkhundabwi), *Faidherbia albida* (Msangu), *Piliostigma thonningii* (Chitimbe), *Combretum zeyheri* (Kadale), *Sterculia africana* (Msetanyani), *Vangueria infausta* (Mbilima), *Ximenia caffra* (Masau), *Ximenia americana* (Masau), *Ficus thonningii* (Kachere), *Bauhinia petersiana* (Mpandula), *Commelina benghalensis* (Kholavani), *Ageratum conyzoides* (Mtawetawe), *Pennisetum unisetum* (Muzundi), *Trichodesma zeylanicum* (Namasakata), and *Chrysopogon zizanioides* (Vetivar).

The presence of cultivated crops and weed plants such as *Ocimum americana*, *Mangifera indica*, *Ageratum conyzoides*, *Commelina benghalensis*, *Hibiscus cannabinus*, *Trichodesma zeylanicum* and *Chrysopogon zizanioides* in the proposed project sites suggest that the area has been totally transformed from its natural state. This type of habitat can therefore, be classified as Considerably Modified Habitat.

a) Tree Density

The tree density in this habitat was estimated to be about 12 individual trees per ha. and over 4 individual trees of these belong to the genus *Terminalia* and *Brachystegia*.

b) Threatened, Endemic and Protected Species

None of species recorded from the cultivated degraded cultivated mosaic habitat were either threatened or endemic to the study areas. However, *Adansonia digitata* (Baobab tree/Malambe) was the only tree, which was recorded from this habitat of the project areas, which is classified as protected by the Forestry Laws and Regulations (Cap: 63.01 of the Forest Act of 1997) due to its over-exploitation. In this case, the project contractor and the developer should ensure that this tree species is not cut down without permission from the Director of the Forestry Department. Additionally, 5 seedlings of the same species must be planted in the proximity of the foot print of the project areas after a tree is cut down to pave way for the construction or installation of the project infrastructure(s).

c) Present Ecological State of the Habitat

The Present Ecological State of this habitat is classified as *Considerably Modified* even though some natural trees still exist in this type of a habitat. Species composition had been severely transformed as a result of repetitive cultivation of the land for subsistence agriculture and hence, the potential to support biodiversity is moderate.

d) Invasive Alien Species

No invasive alien species was recorded from this habitat of the project areas of Liwonde and Balaka.

5.2.5.2. Flora of Secondary Mixed Woodlands

A total of 27 flora species were recorded from the mixed woodland of the project areas of Liwonde and Balaka which comprises of dry and semi-deciduous trees in the genera *Brachystegia–Julbernardia* and *Colophospermum*. The most common flora species in this vegetation community were *Brachystegia boehmii* (Mombo), *B. longifolia* (Tsamba), *B. floribunda* (Tsamba), *Burkea africana* (Mkalati), *Pterocarpus angolensis* (Mlombwa), *Adansonia digitata* (Malambe), *Bauhinia thonningii* (Chitimbe), *Terminalia sericea* (Naphini), *Pericopsis angolensis* (Muwanga), *Faiherbia albida* (Msangu), *Colophospermum mopane* (Tsanya), *Stecurlia quinqueloba* (Mkweranyani) and *Syzygium cordatum* (Katope) among others.

The presence of natural habitats and indigenous tree species in this habitat can be classified as *Slightly Modified Habitat*. However, this habitat has potential to support biodiversity.

a) Tree Density

The tree density in this habitat was estimated to be about 13 individual trees per ha. and over 4 individual trees of these belong to the genus *Faiherbia* and *Adansonia*.

b) Threatened, Endemic and Protected Species

None of species recorded from the cultivated degraded mosaic habitat were either threatened or endemic to the study area. However, *Adansonia digitata* (Baobab tree) and *Faiherbia albida* (Nsangu) were the only trees recorded from the project areas that are protected by the Forestry Laws and Regulations (Cap: 63.01 of Forest Act 1997) due to its over-exploitation. Therefore, a permission should be sought from the Director of the Department of Forestry if the contractor wants to cut down any of these trees failing which is an offence, which is punishable before the court of law.

c) Present Ecological State of the Habitat

The Present Ecological State of this habitat is Moderately Modified even though some natural trees still exist in this type of a habitat. Species composition had been severely transformed as a result of repetitive cultivation of the land for subsistence agriculture and hence, the potential to support biodiversity is moderate.

d) Invasive Alien Species

No invasive alien species was recorded from this habitat of the project site.

5.2.5.3. Wetland

The most well represented families on the wetland of the Shire River where the intake will be installed were Poaceae, Cyperaceae and Tiliaceae. A total 12 wetland species of *Cyperus papyrus* (Muluru), *Vossia cuspidata* (Duvi), *Phragmites mauritianus* (Bango), *Ipomoea aquatica* (Mbatata ya mmadzi), *Azolla nilotica* (Azola), *Eichhornia crassipes* (Namatsupuni), *Pistia stratiotes* (Mkwakwalazi), *Salvania hastata* (Mpiliri), *Ceratophyllum demersum* (Katsisi), *Eriochloa borumensis* (Kwanjiwangome), *Sporobolus consimilis* (Nseche) and *Sporobolus robustus* (Chese).

a) Threatened, Endemic and Protected Species

None of species recorded from the cultivated degraded mosaic habitat were either threatened or endemic to the study area.

b) Present Ecological State of the Habitat

The Present Ecological State of this habitat is Slightly Modified and this habitat has the great potential to support biodiversity of the project area.

c) Invasive Alien Species

No invasive alien species was recorded from this habitat of the project site.

5.2.5.4. Mammal Species of the Study Areas

a) Species Composition

During the fieldwork, neither large nor small mammals were recorded from the project areas of Liwonde and Balaka. However, it was reported by local communities interviewed living in the project areas that the following mammal species, presented in Table 5-2 are present in the project areas of Liwonde and Balaka.

Table 5.2: Summary of mammal species reported to occur on the project areas

Name	Status	Habitat encountered/Reported
<i>Acomys spinosissimus</i> (Khoswe)	VC	Secondary Mixed Deciduous Woodland, Cultivated land
<i>Lophuromys flavopunctatus</i> (Mbewa)	VC	Secondary Mixed Deciduous Woodland, Cultivated land
<i>Mus triton</i> (Mbewa)	VC	Secondary Mixed Deciduous Woodland, Cultivated land
<i>Mus musculus</i> (Mbewa)	C	Secondary Mixed Deciduous Woodland, Cultivated land
<i>Crocuta crocuta</i> (Fisi)	C	Secondary Mixed Deciduous Woodland, Cultivated land
<i>Lepu saxatilis</i> (Kalulu wa mtchire)	R	Secondary Mixed Deciduous Woodland, Cultivated land
<i>Hystrix africae australis</i> (Chisoni)	R	Secondary Mixed Deciduous Woodland, Cultivated land

Legend: VC = Very common, C = Common, R = Rare

b) Abundance

No trapping took place in this study, so no quantitative statement of mammal species abundance could be made. The most abundant mammals in the project areas as reported by local communities were those associated with cultivation of crops (e.g. *Mus triton* [grey mouse or mbewa], *Mus minutoides* [Brown mouse], *Dendromus melanotis* (black-furred mouse), *Rattus rattus* [Cane mouse] and a few species associated with Secondary Mixed Deciduous Woodland (e.g. *Lepus saxatilis* [Common hare/Kalulu], *Hystrix africae australis* [Porcupine/chisoni]). Other large mammal species that were common near the water intake include close to Liwonde National Park were *Hippopotamus amphibius* [Hippopotamus] and *Crocodylus niloticus* (Nile crocodile).

c) Present Ecological State

The low representation of typical woodland mammals and lack of resident large mammals attributed to hunting and loss of suitable habitats indicate that the Present Ecological State

of the woodland was Considerably Modified due to deforestation for charcoal production, firewood collection and continued subsistence farming.

d) Threatened and Endemic Species

There were neither threatened or endemic species of mammals recorded from and/or reported to occur in the project areas. Nonetheless, lack of primary and thick secondary vegetation communities in the proposed project areas indicates that the project areas are of LOW conservation importance for both large and small mammals.

e) Species of CITES list

No species of mammals that are on CITES list either Appendix I, II or III were recorded from and/or either reported to occur in the project areas.

f) Invasive Alien Mammal Species

Two alien mammal species namely; *Bos taurus* (cattle/Ng'ombe), and *Capra aegagrus hircus* (goat/Mbuzi) were recorded from the project areas during the survey. However, these species are not invasive to the indigenous biodiversity.

5.2.5.5. Bird Species of the Study Areas

a) Species Composition

A total of nine (9) bird species was recorded from the study areas during the field survey presented in Table 5-3.

Table 5.3: Summary of bird species recorded from the proposed project areas

Name of Species	Status	Habitat encountered/Reported
<i>Phyllastrephus placidus</i> (Pumbwa)	C	Secondary mixed deciduous woodland, Cultivated land
<i>Nectarinia olivacea</i> (Phwiti)	VC	Secondary mixed deciduous woodland
<i>Uraeginthus angolensis</i> (Chingolopiyo)	C	Secondary mixed deciduous woodland
<i>Serinus gularis</i> (Nkota)	VC	Secondary mixed deciduous woodland
<i>Anthreptes collaris</i> (Kazaye)	C	Secondary mixed deciduous woodland
<i>Streptopelia capicola</i> (Njiwa)	C	Secondary mixed deciduous woodland
<i>Numida meleagris</i> (Nkhwali)	R	Secondary mixed deciduous woodland, Cultivated land, Seasonal wetland
<i>Quelea quelea</i> (Mpheta)	VC	Secondary mixed deciduous woodland, Cultivated land, Seasonal wetland
<i>Bubo lacteus</i> (Kadzidzi)	C	Secondary mixed deciduous woodland

Legend: VC = Very Common, C = Common, R = Rare

b) Abundance

The most abundant species according to the standardized count data were Yellow-breasted *Nectarinia olivacea* (Phwiti), *Serinus gularis* (Nkota) and *Quelea quelea* (Mpheta) among other (Table 5-3). It is assumed that more intensive sampling around the cultivated land would have resulted in other seed-eating species.

c) Present Ecological State

The strong dominance of generalist woodland species and paucity of closed-canopy Zambezian woodland endemics indicates a *Moderately to Considerably Modified* woodland bird community (Category C and D).

No threatened bird species was recorded from the proposed project areas of Liwonde and Balaka during the field survey.

d) Species of CITES List

No species of birds recorded from the proposed project areas are on CITES list either on Appendix I, II or III (CITES, 2017).

e) Alien Species

No alien bird species was spotted and/or recorded from the project areas during the survey. In addition, no alien bird species had been reported to occur in the Study area by other researchers.

5.2.5.6. Fish Species of the Project Areas

a) Species Composition

During the field survey, a total of 5 fish species namely; *Oreochromis lidole* (Chambo), *Tilapia shirensis* (Makumba), *Haprochronis* sp., (Kambuzi), *Barbus paludinosus* (Matemba) and *Claris liocephalus* (Mulamba) were recorded from the waters of the Shire River near the place where the new weir will be installed.

b) Abundance

The most common fish species were *Oreochromis lidole* (Chambo) and *Claris liocephalus* (Mulamba). These species were seen in almost all the five sampling points that were surveyed during the field work.

c) Present Ecological State

Relatively high species diversity of fish indicates that the Shire River is a Slightly Modified habitat (Category B) and hence has great potential to support more species of fish. It therefore, deserves high protection from water pollution, siltation and cultivation along the riverbanks.

d) Threatened and Endemic Species

No threatened fish species was recorded within the proposed project area according to the National and IUCN Red list.

e) Species of CITES List

No fish species from one of these project areas is on CITES list either on Appendix I, II or III (CITES, 2017).

f) Alien Species

No alien fish species was surveyed or spotted and/or recorded from the project area. In addition, no alien fish species was reported to occur in the project area by other researchers.

5.3 SOCIO-ECONOMIC SETTING

5.3.1 Population Characteristic

According to the National Statistics Survey report, the population of Balaka and Machinga Districts are 438,379 and 1,148,611 respectively (NSO Report 2018). The project area in Balaka is covering TA Nsamala which has population of 80,912 people while in Machinga District, the project is covering TA Sitola with a population of 25,138 people. The project intends to supply water to the fore mentioned areas targeting a population of 98,198 for both Liwonde (49,194) and Balaka (49,004) by the year 2027 (SRWB Investment Profile August, 2017). Specifically, the project will supply water to the following areas in Balaka; Sosola, Mpulula, St. Augustine, Chingeni and Chiyendausiku and Kaudzu village in Machinga

During the household survey, the average household size for Balaka District was 4 people and Machinga was 5 people per household, with most of the households being male headed.

5.3.2 Tribe and Ethnicity

Balaka Town

The Yao, Ngoni, Lomwe, Mang'anja, Chewa, and Sena are the main ethnic groups in Balaka town. The Yao constitute a major ethnic group in the district with 40 % (GoM Balaka SEP 2017-2022). However, results from the baseline household survey shows that the project area is dominated by the Ngoni tribe with 42.6% and is seconded by the Yao with 39%. The data also shows that there are a number of other ethnicities in the area such as Chewa, Tumbuka, Sena and Lomwe as indicated in Figure 5.2.

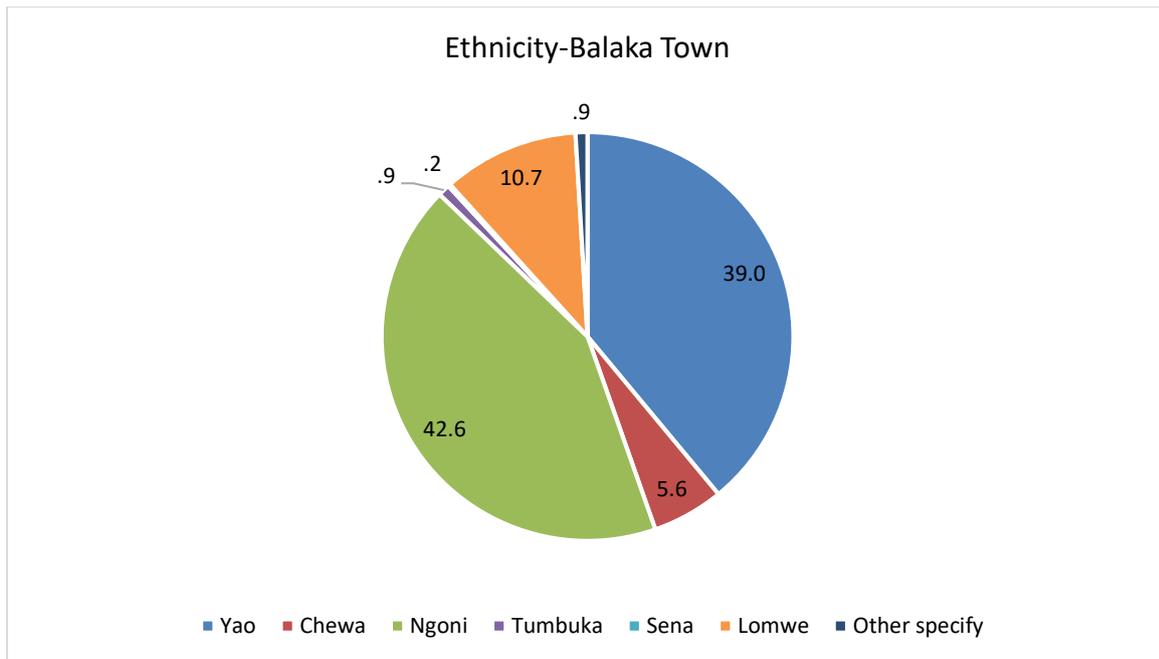


Figure 5.2: Ethnicity-Balaka Town (Household Survey August, 2019).

Machinga (Liwonde)

Yao and Lomwe are the main ethnic groups in Machinga District. The Yao account for 50% of the population in the district seconded by Lomwe at 40%. From the household survey, various ethnic groups were identified in the project area of Liwonde. These include Yao, Sena, Lomwe, Ngoni, Chewa and other ethnicities including the Mang'anjas. The Lomwe account for almost half of the ethnic groups at 44.4% of the population, seconded by Yao with 28.9% of the sampled population as shown in Figure 5.3.

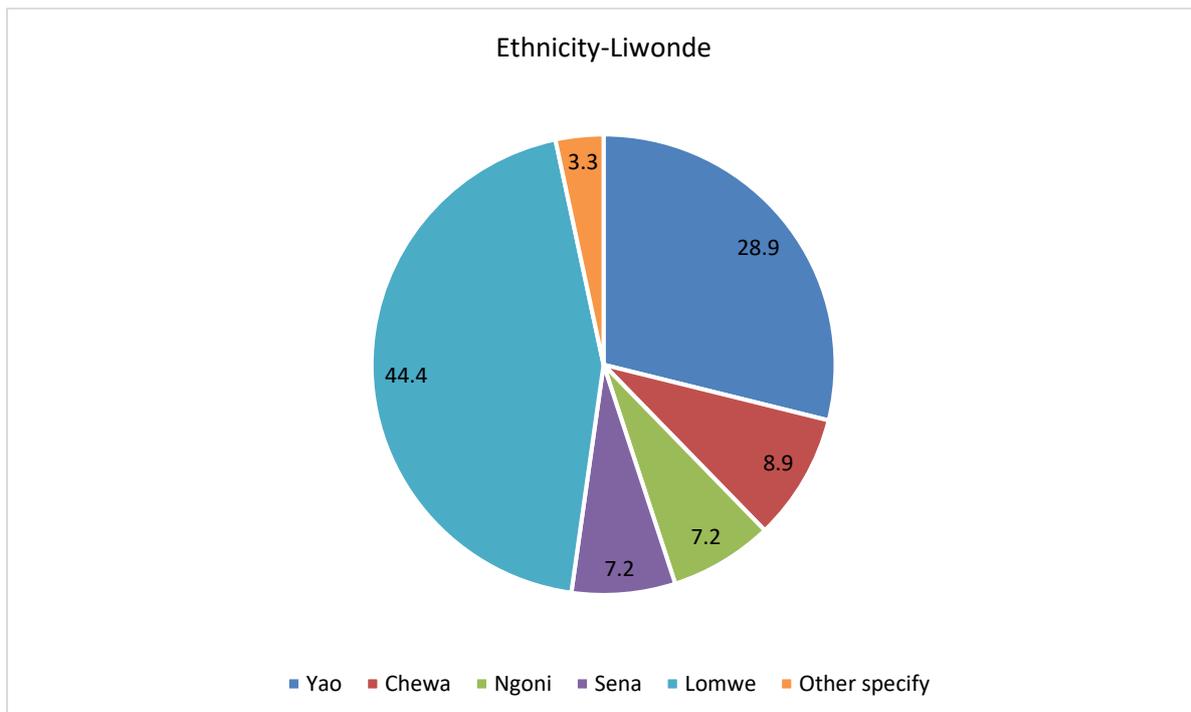


Figure 5.3: Ethnicity-Liwonde (Household Survey August, 2019).

5.3.3 Religion

According to the baseline household survey that was conducted during the field investigations, 3 religious groups were identified in the project area (Balaka Town); Christianity comprising of 56.7%, Islam 42.6% and other religious groups with 0.8%. Figure 5.4 shows the composition of the religions in Balaka Town.

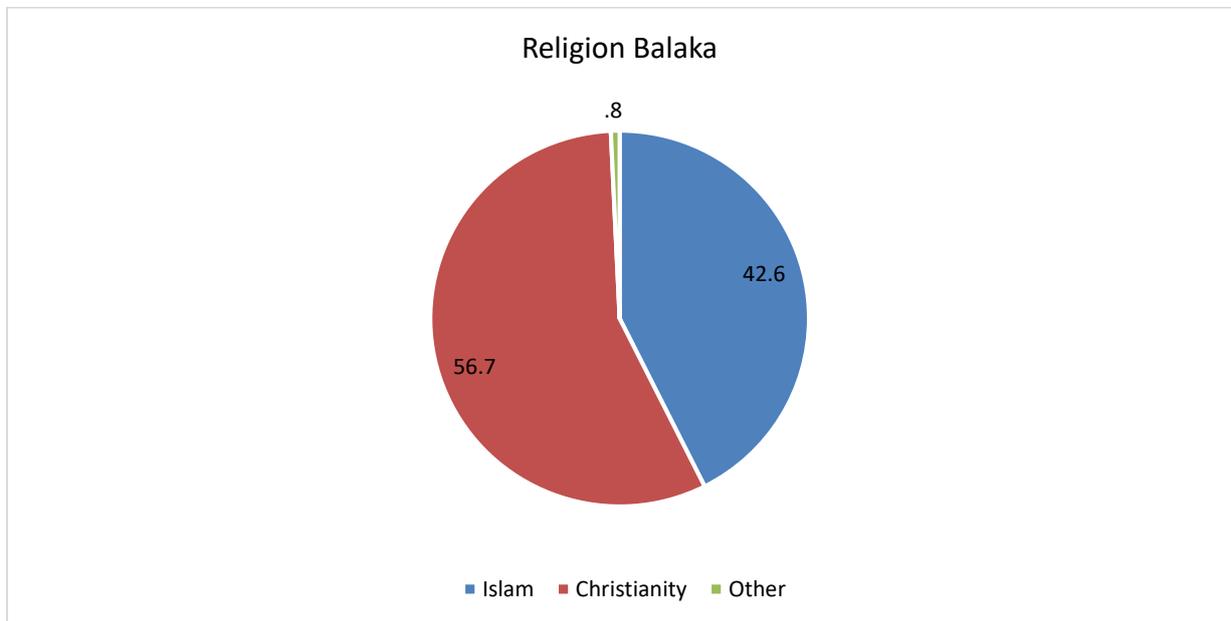


Figure 5.4: Composition of the religions (Household Survey August, 2019).

On the other hand, only 2 religious groups were identified in Liwonde Town. These are Christianity and Islam. Christianity dominates the area with 66.1% of the population despite Machinga District been predominantly Muslim. This could result from Liwonde being a religiously diverse town. Figure 5.5 shows the composition religious groups in Liwonde Town.

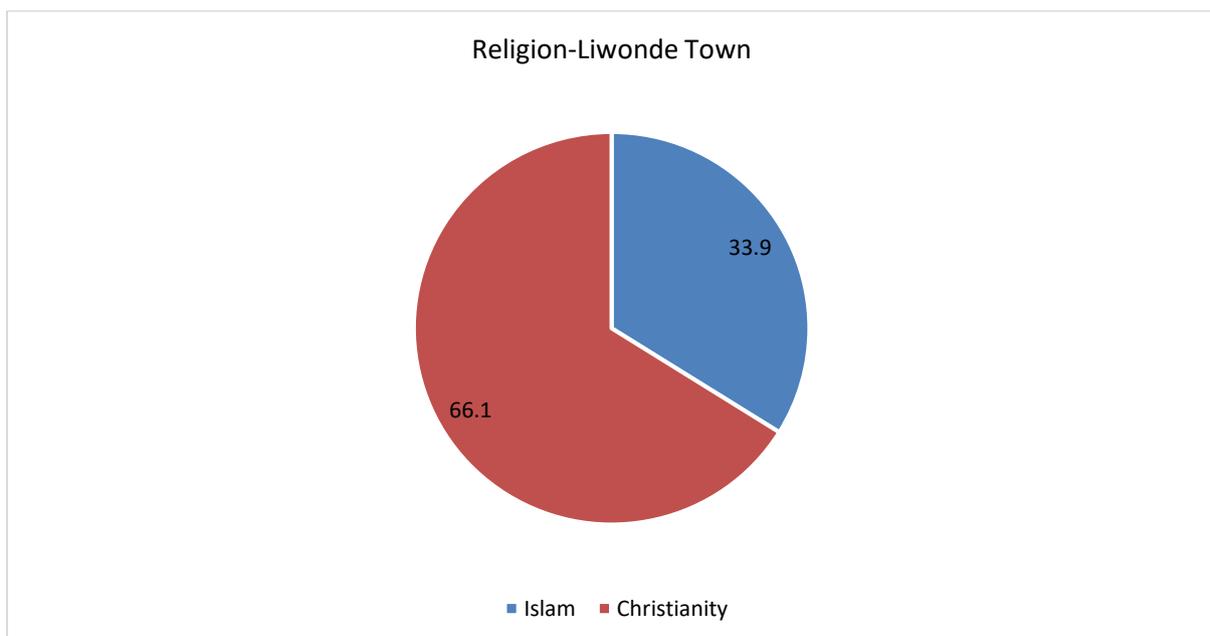


Figure 5.5: Composition of Religions (Household Survey August, 2019).

5.3.4 Livelihood and Income

Sources of income and livelihood in Balaka town includes: agriculture, formal employment, fishing activities, businesses and casual labour (Balaka District SEP 2017-2019). Agriculture being the main source of livelihood and income. However, from the household survey that was conducted during field investigations, business/trading was identified as the major source of income followed by informal employment and agriculture with 36.8%, 29.2% and 24.5% respectively. Figure 5.7 shows income sources in the project area of Balaka Town.

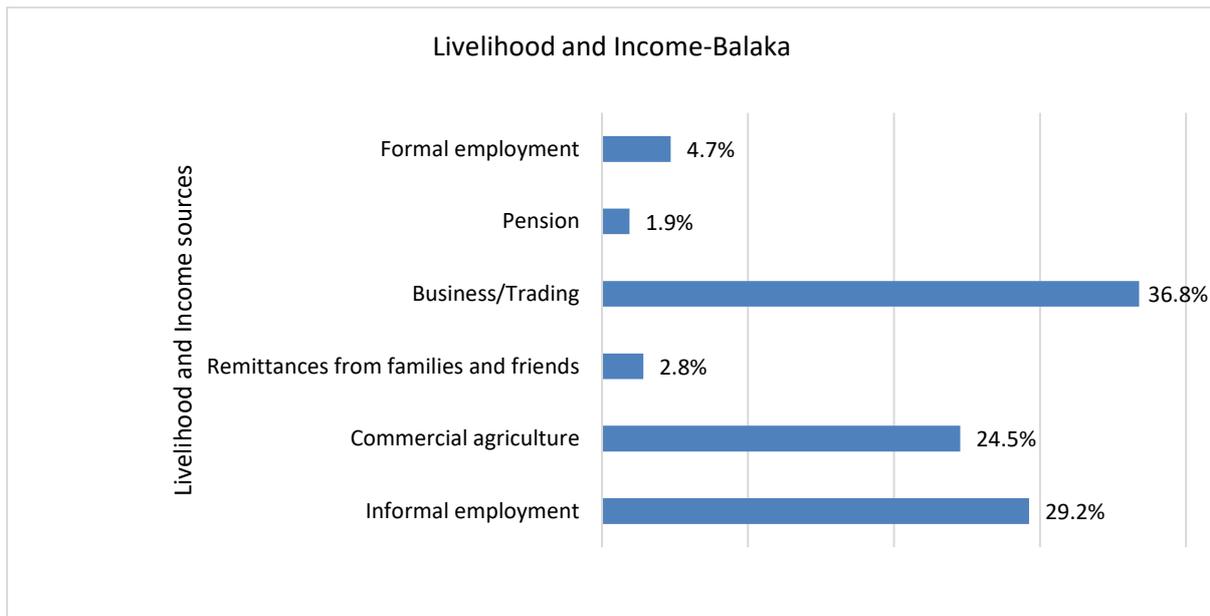


Figure 5.6: Income sources in the project area (HH survey, August 2019)

Livelihood and income sources in Liwonde town include; agriculture, fishing, businesses, casual labour (piece works), formal employment and mining. From the household survey, results show that informal employment is the major source of livelihood and income with 38.1% seconded by businesses and formal employment with 33.3% and 16.7% respectively. Figure 5.8 shows sources of livelihood and income sources for Liwonde project area.

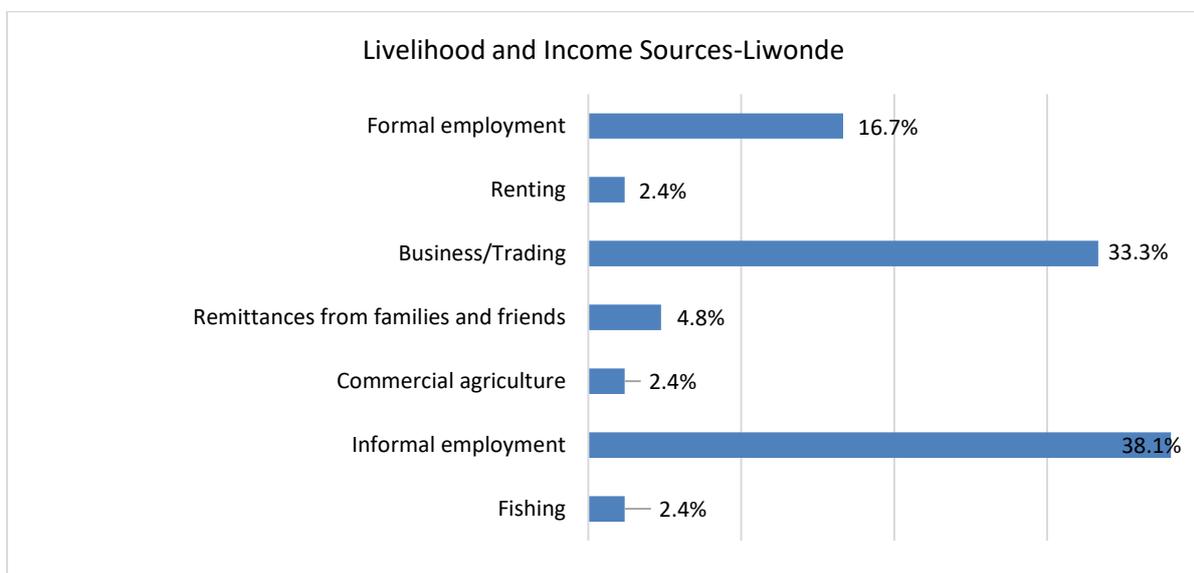


Figure 5.7: Income sources in the project area (HH survey, August 2019)

From both primary and secondary sources of income, it was noted that on average, in Balaka town, income per month was less than MK10,000 for 56.9% of the respondents, seconded by MK10,000-MK25,000 with 23.3%. Figure 5.8 shows monthly income levels for Balaka town.

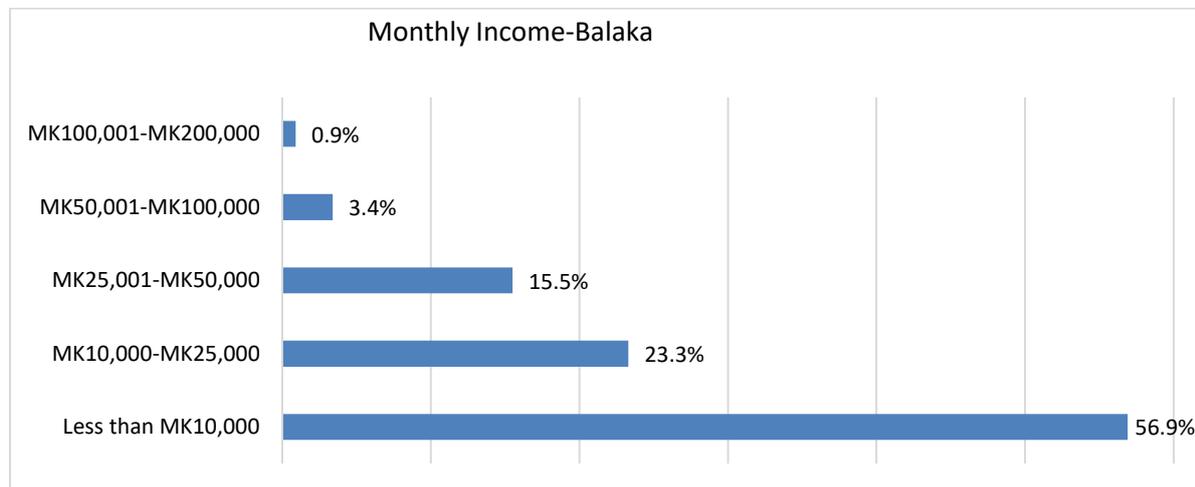


Figure 5.8: Monthly Income-Balaka (Household survey, August 2019).

On the other hand, from both primary and secondary sources of income in Liwonde, it was noted that on average, the monthly income was between MK10,000-MK25,000 for 43.9% of the respondents seconded by less than MK10,000 with 29.3%. Figure 5.9 shows monthly income levels Liwonde town.

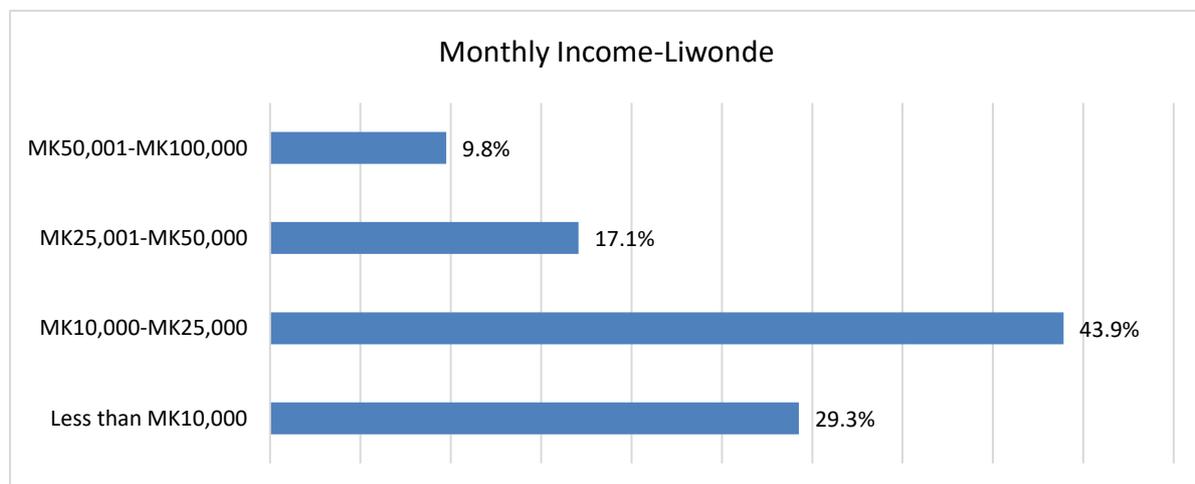


Figure 5.9: Monthly Income-Balaka (Household survey, August 2019).

5.3.5 Education

Education and skills development is key for socio-economic development (MGDS III). Education has a strong impact on decision making in different issues including water, sanitation and hygiene issues as it helps in equipping people with knowledge.

Literature shows that literacy rate for Balaka district has improved from 64% in 2008 to 70% in 2018 (NSO census 2018). Over the years, school enrolment has also increased due to the increase in number of schools in the district. The socio-economic survey assessed education levels of the project area. The results show that 55.5% of the sampled population attended school at primary level and 17.1% never attended school as shown in figure 5.10.

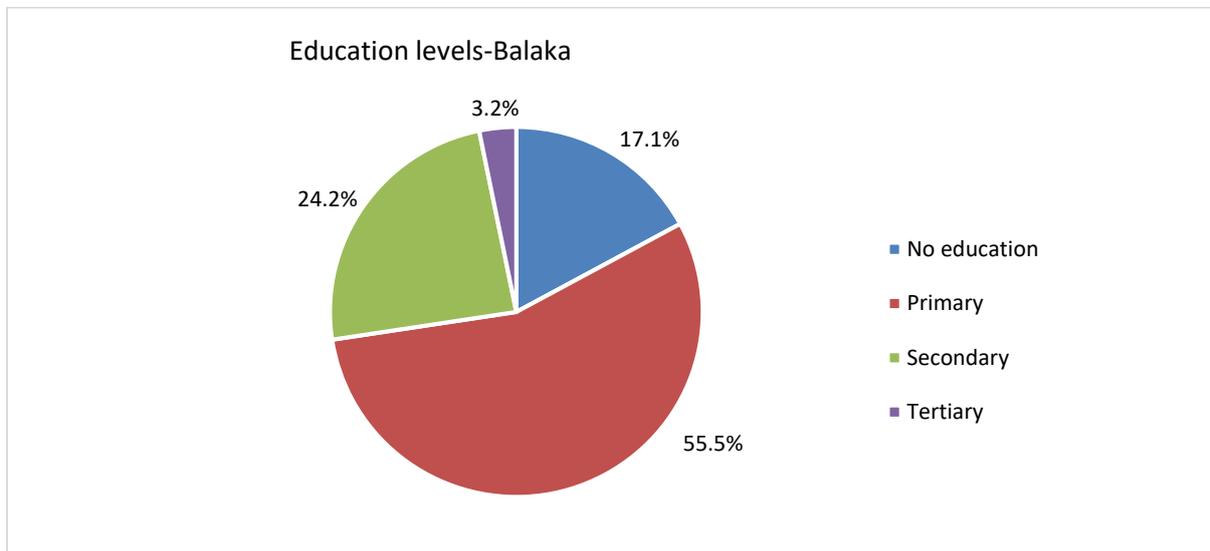


Figure 5.10: Education levels for Balaka Town(Household survey, August 2019).

Literacy rate for Machinga district is at 57% (NSO 2018) from 59.7%. High illiteracy levels in Machinga can be attributed to large number of pupils that drop out of the school system before reaching standard 5. The results from socio-economic survey in Liwonde town shows that 57% of the sampled population indicated that they attended primary level and 14.82% never attended school as shown in figure 5.11

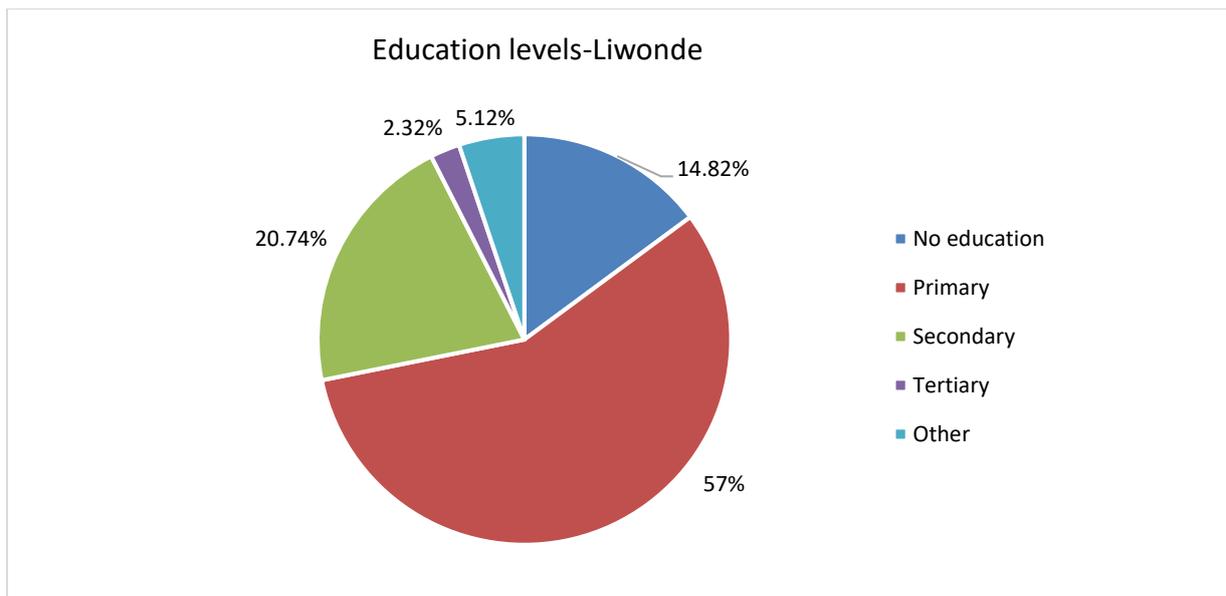


Figure 5.11: Education levels for Liwonde Town (Household survey, August 2019).

According to the household survey, the principle challenge in education for households in both Balaka and Liwonde towns is the cost of accessing education which includes the cost for tuition fees and cost for buying school materials. This can mostly be attributed to high levels of poverty in the districts. In addition, distance travelled by students to access schools and illness are other challenging factors experienced by students in Balaka. Figure 5.12 and 5.13 show some of the challenges that the communities face in accessing education in Balaka and Liwonde towns.

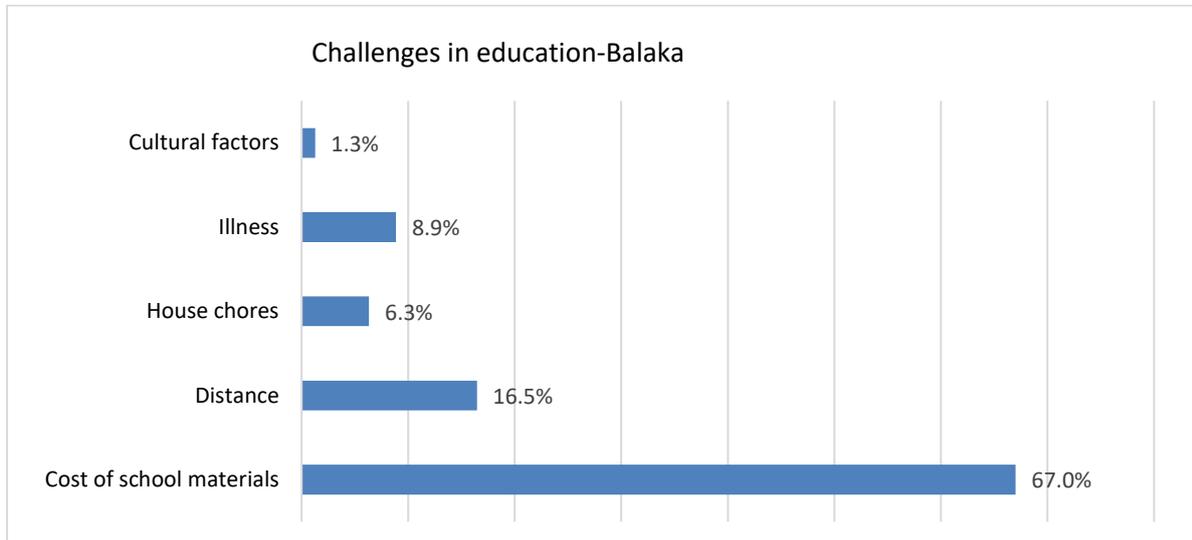


Figure 5.12: Challenges communities face accessing education in Balaka town

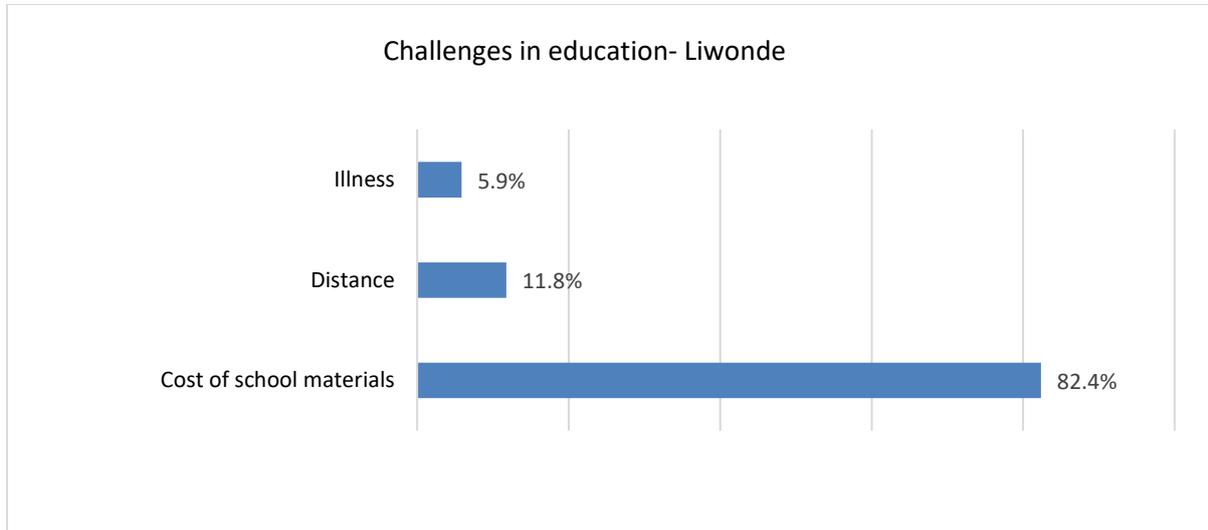


Figure 5.13: Challenges communities face accessing education in Liwonde town

From consultations with the education department in both districts, it was noted that causes of dropouts in school for both boys and girls include; distances to and from school, early pregnancies and marriages for girls and food insecurity in households. The districts also face challenges in providing quality education in the area and these include:

- Lack of sufficient infrastructure and human resource in schools;
- Lack of good learning environment and materials; and

- Lack of qualified teachers.

5.3.6 Health situation for the project area

Malaria is the leading cause of illness and morbidity in both Balaka and Machinga Districts, seconded by respiratory infections mainly in children and lastly diarrhoea (DHIS 2 2015-2016). These diseases are mostly contributed by lack of information on WASH and negligence. Figures 5.14 and 5.15 show common diseases that affect people in Balaka and Liwonde towns.

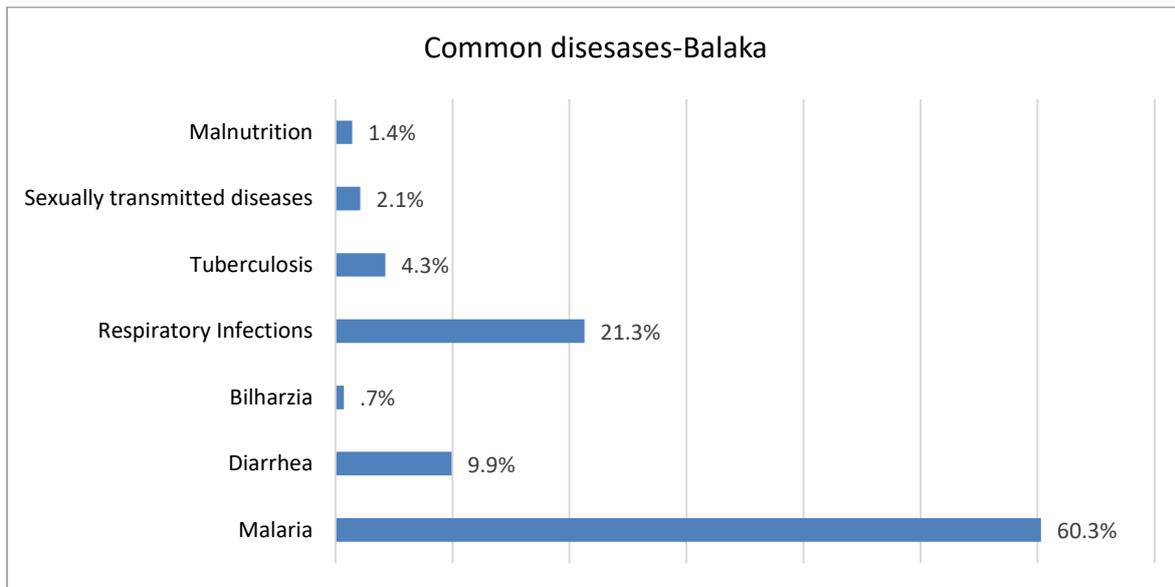


Figure 5.14: Common diseases in Balaka town (Household survey, August 2019).

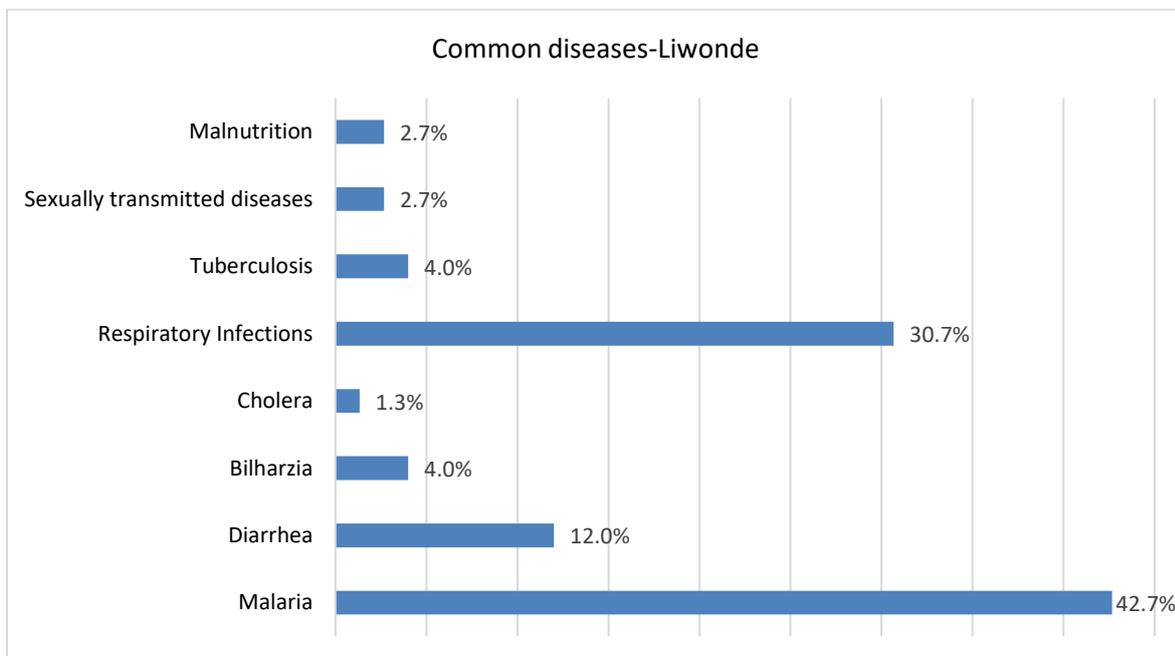


Figure 5.15: Common diseases in Liwonde town (Household survey, August 2019).

Maternal health is also a crucial issue in Machinga district. There are more maternal deaths in Machinga district as compared to other districts mainly because of early pregnancies, high

fertility rates and late referrals due to lack of transport in different health facilities. High fertility rates are mainly because there is a low use of contraceptives in the district by the reproductive age group. Hence, there is a need to increase family planning awareness to those belonging to the reproductive age group, including the youth in the district.

The district councils face the following challenges in delivering quality health services to the people:

- Inadequate number of health personnel;
- Inadequate number of health facilities (health centres);
- Distances travelled to access health centres due an inadequate number of available health facilities;
- Lack of sufficient transportation in terms of ambulances at the hospitals and health centres;
- Lack of WASH awareness and facilities such as incinerators, rubbish pits, latrines etc.

The water supply project will help in reducing some of the water related diseases such as diarrhoea. Hence, the recommendation from the health sector is that the project implementers should sensitize communities on water management, sanitation and hygiene as part of the project to ensure that positive impacts are enhanced.

5.3.7 Waste management

In Balaka and Liwonde Towns, provision of waste removal and disposal services is primarily the responsibility of Balaka and Machinga District Councils respectively. The Balaka District Council runs the Sosola dump site which is located at some 4.5km south of the Balaka Town Centre. The dumpsite covering a total area of about 3ha receives both solid waste (garbage) as well as sewage and latrine sludge emptied from septic tanks and pit latrines from areas around Balaka Town.

The Balaka District Council has two tractors which provide waste collection services to areas within the Balaka Town. Currently one of the two tractors has a fault and is not operating. In full operation, the tractors do collect waste from specific points around the town to dispose at the Sosola dump site. Specific collection points for the waste include the four main markets around the town, the district hospital, the Balaka stadium as well as at business premises like selected lodges and factories. The waste collection frequency for the Balaka District Council is daily with three or four trips carried out by the tractors per day.

To manage sewage, the Balaka District Council hires a tanker from Liwonde for emptying of full septic tanks at a fee of K30,000.00 per trip. The hiring comes in because their own tanker truck developed a mechanical problem and it is being maintained. The hired tanker which is of 1,000 litres capacity also occasionally pumps out sludge from full pit latrines, but customers are instructed to first liquefy their latrine waste with water before the emptying. The sludge removed from the septic tanks as well as latrines is transported to the disposal site at Sosola. The town of Balaka has no offsite treatment systems for sewage. All the residents rely on on-site systems which primarily include septic tanks and pit latrines. The Balaka District Hospital has an incinerator which is used in the management of medical wastes.

Liwonde Township on the other hand has an offsite sewer system, the system however is old and largely broken down. Consequently, it is not satisfying the demand for sewerage services

from the growing population of Liwonde. The township has a disposal site for solid waste which is well known as a dumpsite for a variety of weeds that are harvested from the Shire River at the Kamuzu Barrage. Figures 5.16 and 5.17 show the disposed wastes at the dump sites for Liwonde and Balaka Towns.



Figure 5.16: Piles of harvested weeds from the Shire River disposed at the dumpsite for Liwonde



Figure 5.17: Garbage at the Sosola dumpsite near Balaka Town

From the conducted baseline surveys for the project area of the proposed Liwonde-Balaka water supply project, it is revealed that a majority of homes (70%) have rubbish pits where

they dispose their solid waste. Some 14% of households practice indiscriminate waste disposal. Figure 5.18 summarizes the waste management practices among the households of the project area.

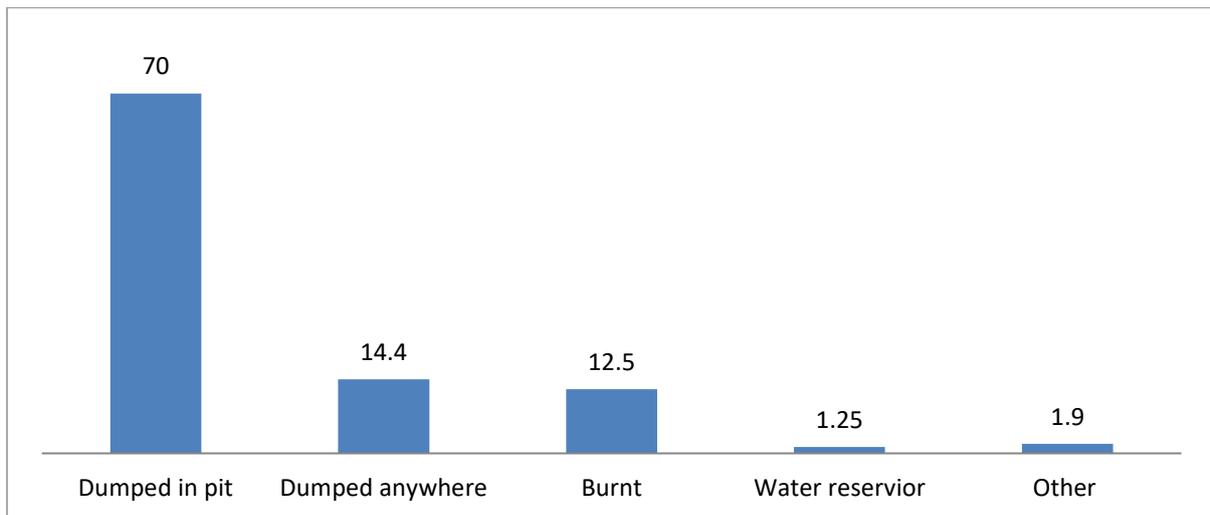


Figure 5.18: Proportion of homes (%) against methods for garbage disposal in the project area

5.3.8 Sanitation and hygiene

In the project area, from the baseline surveys it is indicated that some 91.6% of households have a toilet while 6.6% of homes do not have their own latrine facility but are sharing a latrine with their neighbours. The remaining 1.8% of families is practising open defecation. Poor condition of soils is cited by those families without a toilet as the major contributing factor for them not to dig their own pit latrines. Others indicate that low income and tradition are reasons for them not to build their own toilet.

Usage of basic pit latrines is very common in the project area (for 75.2% of households) with usage of improved toilets including improved pit latrines and flush toilets is at 24.8% of households (figure 5.19).

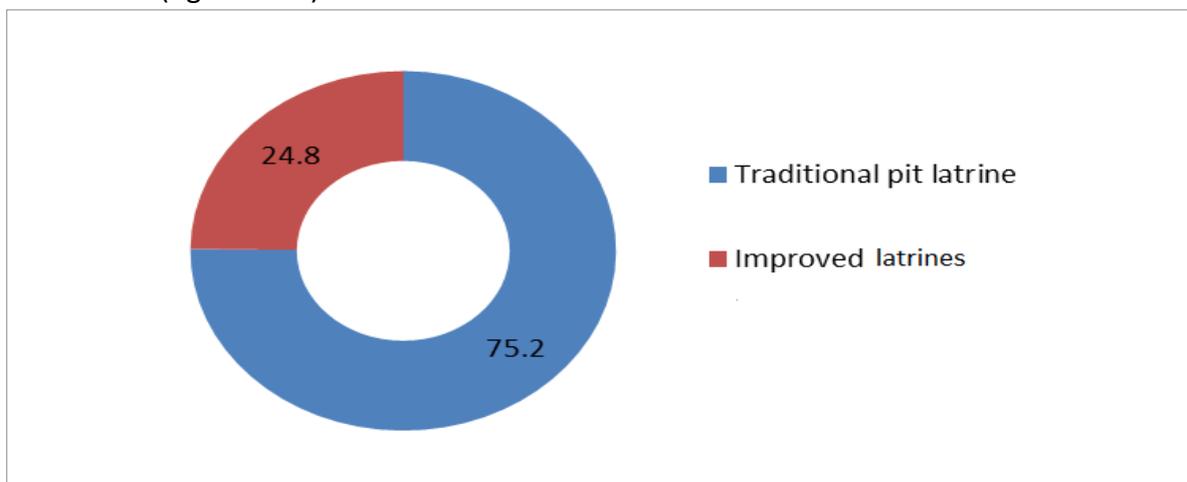


Figure 5.19: Proportion of households (%) against types of latrines used in the project area

Most households (about 59%) in the project area are well-versed with use of soap in hand washing as shown in figure 5.20

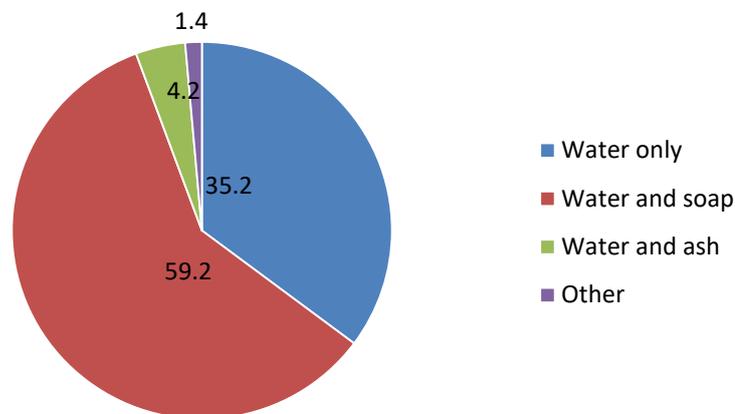


Figure 5.20: Proportion of households (%) against what they use for washing hands in the project area

Use of Rubbish pits, burning, manure making and indiscriminate disposal are ways of solid waste disposal in the project areas. Rubbish pits are very common as they are considered cheap and convenient. Though Balaka has a dedicated solid and liquid waste disposal site at Sosola, near Balaka Town, it is incomplete and not best utilized as liquid waste containment ponds were not well constructed (Figure 5.21) and maintained and as a result have never been used. Also, solid waste is not well managed; is randomly unloaded at the site and is not secured from access to locals. During WWEC’s site visit, children were observed going through the waste, and playing within the site (Figures 5.21).

As for Machinga, there is a dedicated dumping site utilized for water plants that are extracted from the SRWB intake in Liwonde. The water plants are loaded on trucks and offloaded at the site. Locals near the dumping site at times request for some of the water plants to be offloaded on their properties to be used as a manure. (Figures 21 and 22).



Figure 5.21: Incomplete liquid containment ponds and unsecure waste disposal site (Sosola)



Figure 5.22: Dedicated water plant disposal site and water plant used as manure

Liquid waste is mainly disposed of through the use of drains and soak pits, indiscriminately. Most households lack knowledge on proper liquid waste disposal.

Traditional pit latrines are mostly for human waste disposal. From the household survey data, majority of the households use and own toilets. The few households that do not own toilets use their neighbour's toilets. When the latrines are full, most households fill the pits with soil and start using another latrine. Most of the families mentioned using some sort of hand washing practice, especially after using the toilet and prior to eating. Hand washing facilities were observed to be prevalent in the project areas during field investigations.

5.3.9 Access to Water

a. Water sources

Availability of safe water is a key determinant of the socio-economic status of a community. Unsafe water usually causes water borne diseases such as diarrhoea. One determinant of accessibility is the total number of people that are using a particular water point. Water sources in Balaka town include boreholes, taps and shallow wells.

It was observed during the household survey that on average, water is accessible and is of good quality in the project area. The household survey also assessed water sources, time spent at the water source fetching for water and the distance travelled to water points.

The national standard of people accessing a water point is at a ratio of 1:250. Balaka district however, is at a ratio of 1:71, which is lower than that of the national standard. Taps are the main water source for the people in Balaka town seconded by boreholes as shown in Figure 5:23.

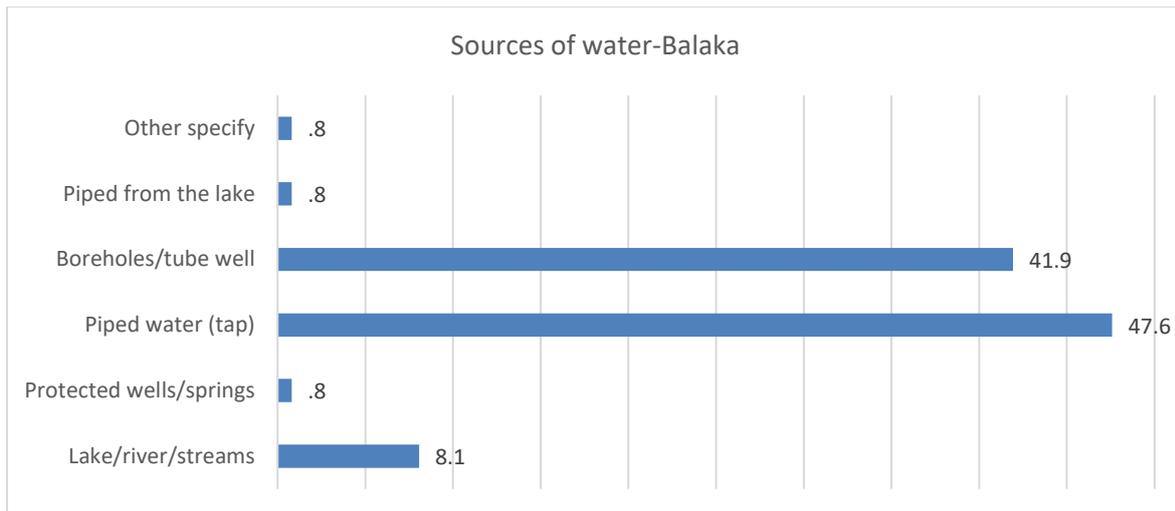


Figure 5.23: Source of water-Balaka town (Household survey, August 2019).

Water taps are the main water source for the people of Liwonde town seconded by boreholes as shown in figure 5:24.

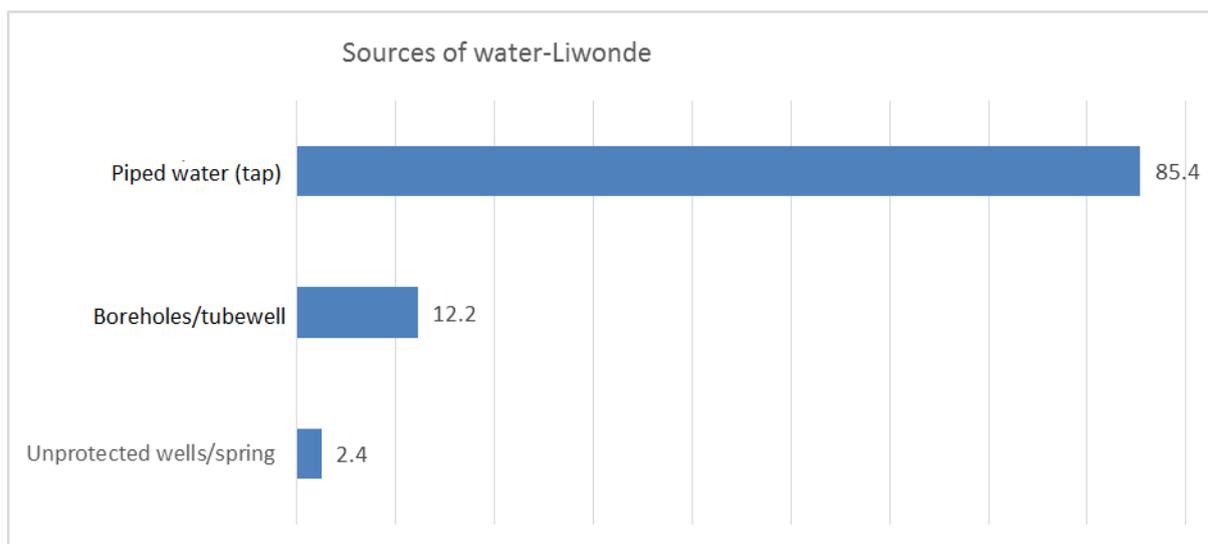


Figure 5.24: Source of water-Liwonde town (Household survey, August 2019).

b. Challenges in accessing water

Water shortage is the major challenge that people in Balaka town face, especially in the dry season as water levels drop. Frequent breakdowns at water facilities and poor water quality due to excess calcium are major problems that people face especially those that use boreholes as a water source. Figure 5.25 shows challenges that people in the project area are facing in relation to water supply.

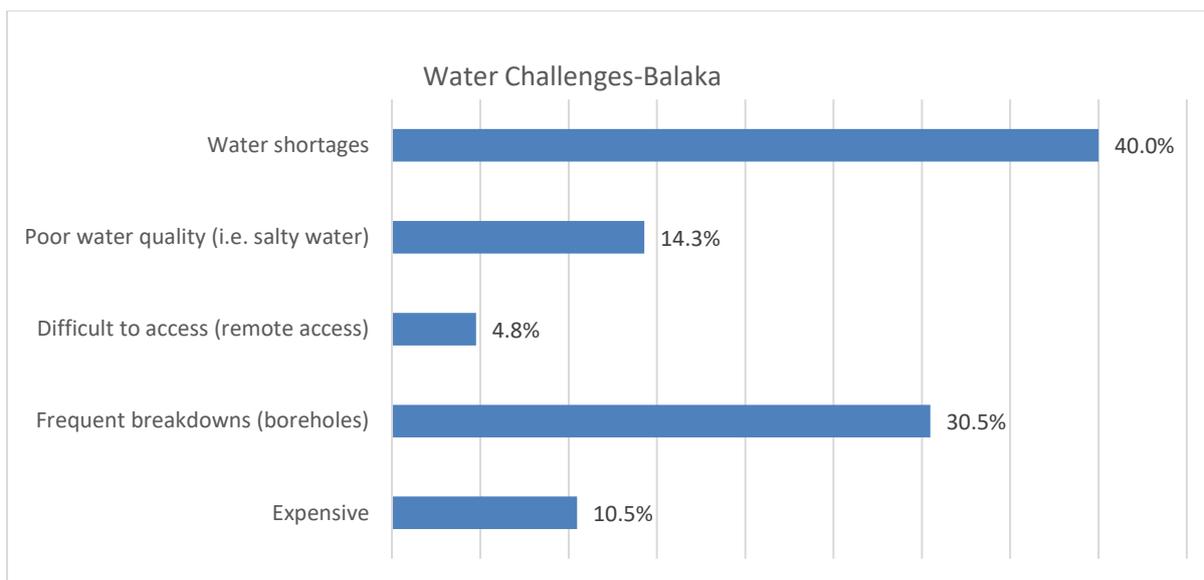


Figure 5.25: Water Supply Challenges-Balaka town

Frequent breakdown of water points (mainly communal water taps) was reported by communities as the major challenge in accessing water in Liwonde town. This is seconded by water shortages, mainly in the dry season and difficult to access water sources due to long distances to water sources as shown in figure 5.26.

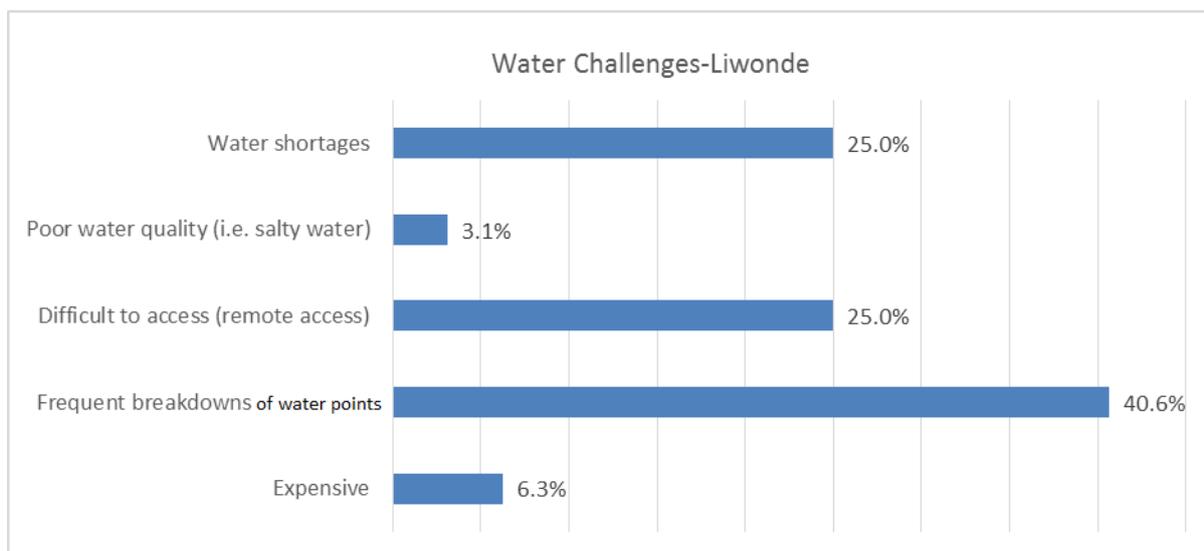


Figure 5.26: Water Supply Challenges-Liwonde town

Invasive species such as *Namasupuni* among others, also have a negative effect on water resources as they reduce the amount and quality of water in reservoirs.

c. Distance and Time taken to Access the nearest Water Source

The government of Malawi recommends a maximum walking distance of 500m and 300m for rural and urban areas respectively. Also, the time taken to go to and from the source to fetch water should not exceed 30 minutes. Since most of the households in the project area have private piped water connections, the majority of the homes (about 66%), spend less than 15

minutes to get to and from the nearest water source. Figure 5.27 presents the times people spend to walk to a water source.

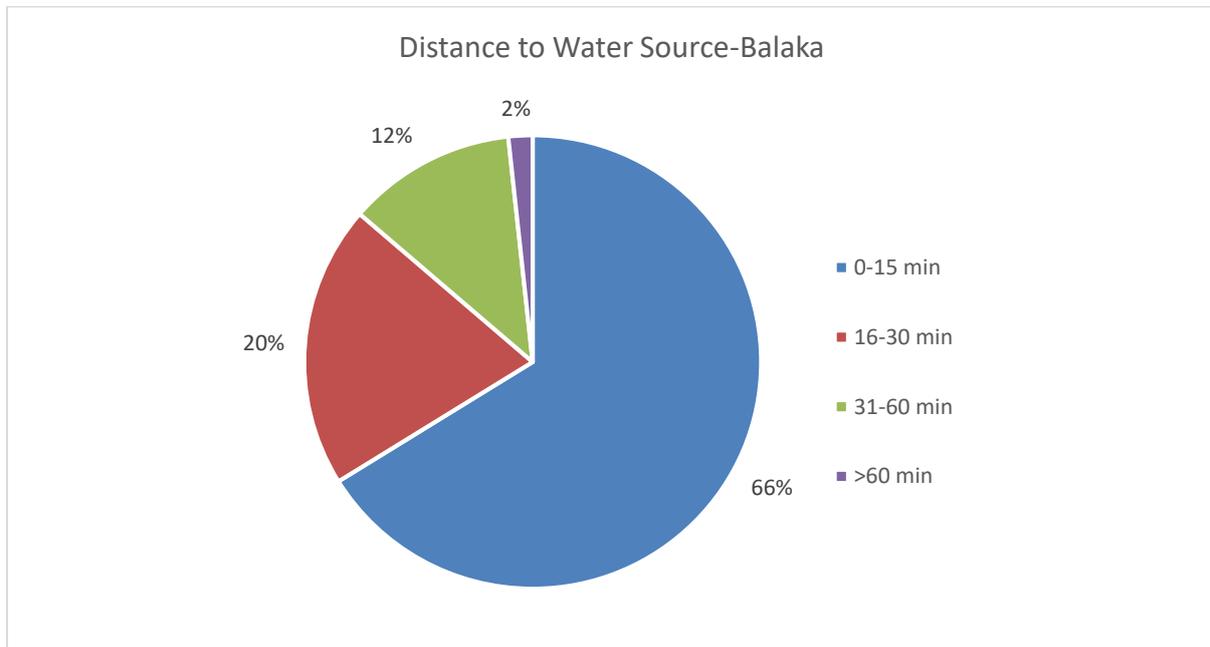


Figure 5.27: Water Source Distance from Dwelling

Although most people in Liwonde access water from boreholes, the walking distance for a round trip is within the recommended time of 30 minutes for over half of the population. Results from the household survey shows that 52% spend less than 30 minutes for a round trip, followed by those that spend more than 30 minutes at 44% as indicated in figure 5.28.

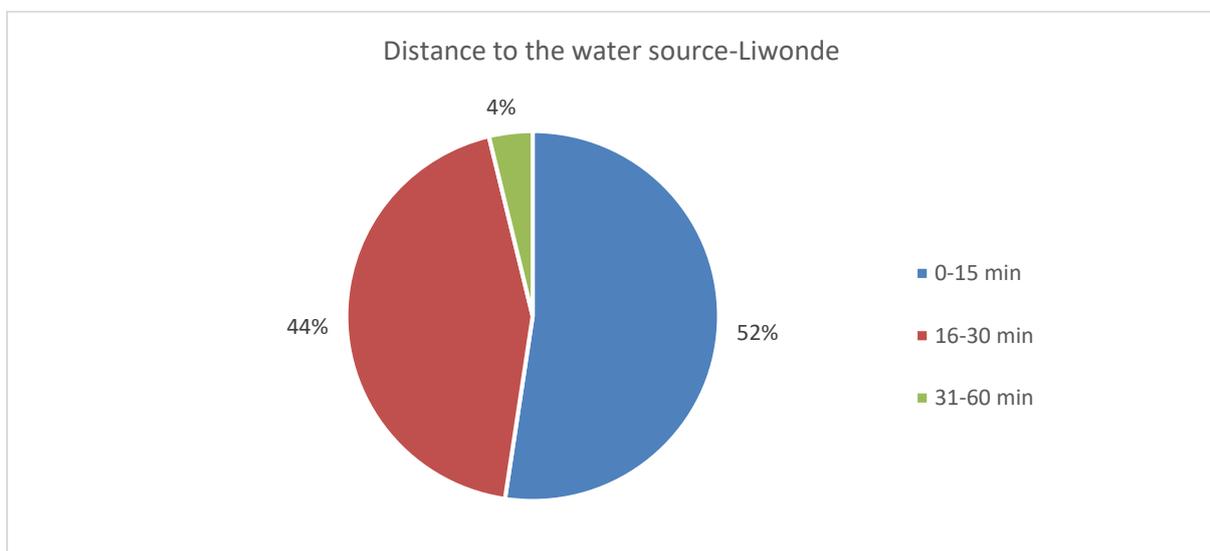


Figure 5.28: Water Source Distance from Dwelling

Since most people have private pipe water, the duration spent at water sources is minimal. From the household survey, 58% of the population spend less than 5 minutes at water sources. However, in the dry season when there is water shortages, the queueing time is prolonged, especially at boreholes as the water table lowers. Figure 5.29 shows the time spent at water sources in Balaka town.

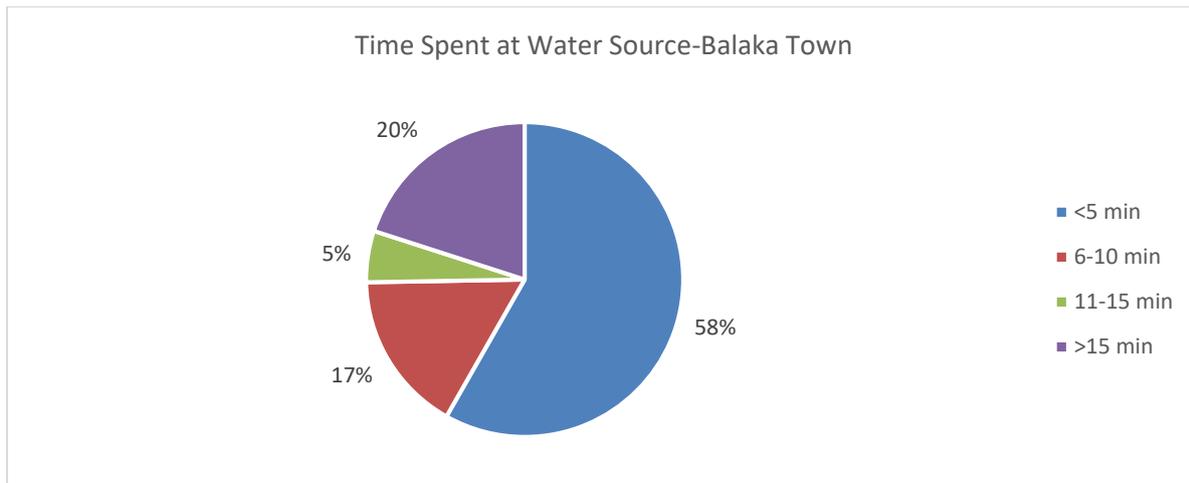


Figure 5.29: Time Spent at Water Source-Balaka Town (Household survey, August 2019).

The waiting time to access water in Liwonde Town is longer in comparison to Balaka Town. This is mainly because boreholes are the main source of water in Liwonde Town while open taps are the main water source for Balaka Town. From the household survey, it was observed that most people (35%) wait in excess of 15 minutes at the borehole and a few (8%) wait for 5 minutes or less to access water as shown in figure 5.30.

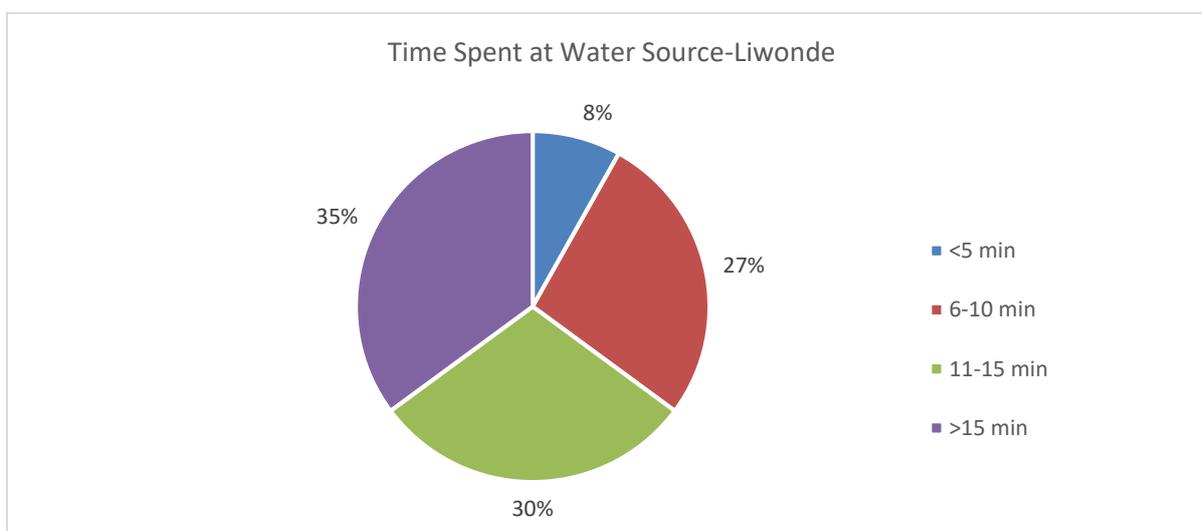


Figure 5.30: Time Spent at Water Source-Liwonde Town (Household survey, August 2019).

d. Water treatment

Water of satisfactory quality is the fundamental indicator of health and well-being and hence crucial for the development of any country. Safety and accessibility of potable water are major concerns throughout the country and the project areas as well. Health risks are more prominent in areas where people consume unsafe water. Diarrhoea is one of the diseases that cause mortality in the project areas. As a result, there have been interventions in Malawi as a country including Balaka and Machinga districts to help in reducing water related diseases. In addition, the health sector has been taking a responsibility in making sure that people are aware of impacts of consuming unsafe water. This is done through the use of

Health Surveillance Assistants (HSAs), who help in disseminating information on WASH among others including the use of safe water.

The household survey assessed measures people in the project areas take to ensure that they consume safe water. Boiling, adding chlorine (water guard) and use of covers (lids) are the major ways in which people ensure that they consume safe water as shown in Figure 5.31 and 5.32 in Balaka and Liwonde Towns respectively.

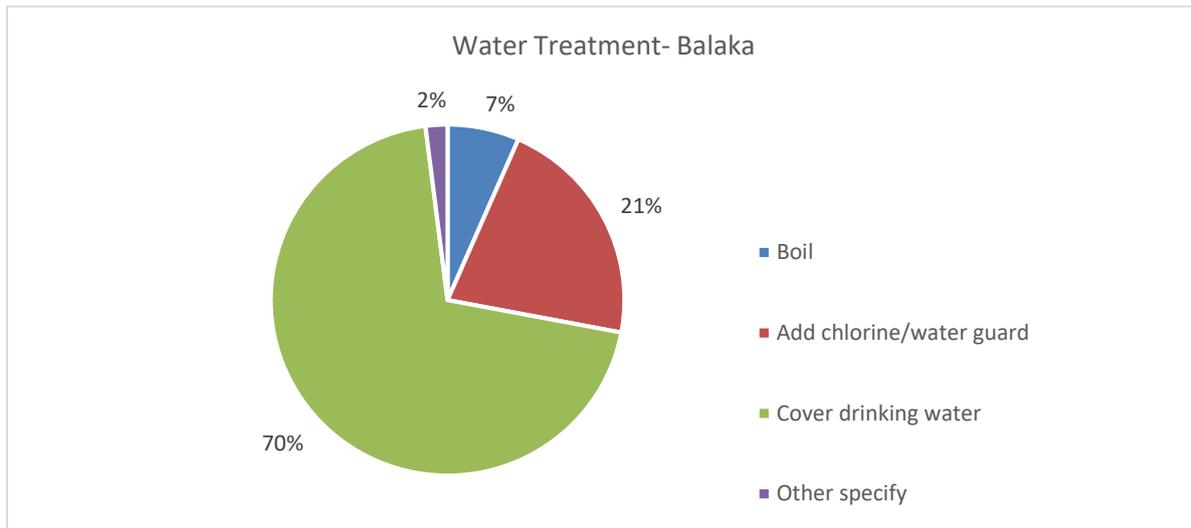


Figure 5.31: Water Treatment-Balaka (Household survey, August 2019).

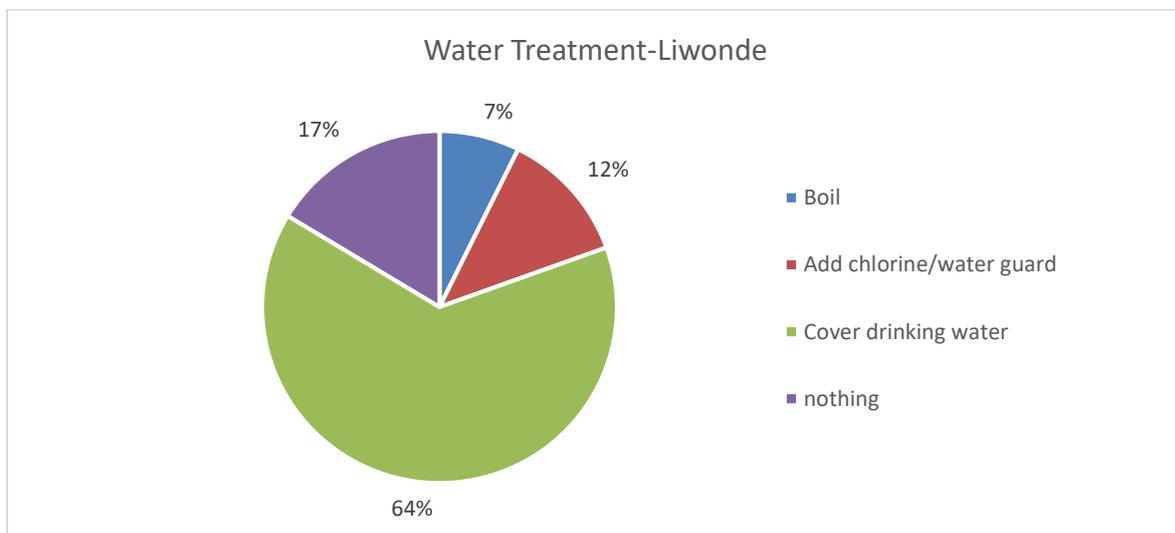


Figure 5.32: Water Treatment- Liwonde (Household survey, August 2019).

e. Willingness to pay

The household survey also assessed the people’s willingness to pay for the water supplied by the SRWB. High water prices was mentioned as one of the main challenges for people that have private taps. Those that do not have private taps were asked how much they would be willing to pay for water supplied by SRWB on a monthly basis. Based on the results in Figures 5.28 and 5.29, majority of the people in both Balaka and Liwonde fall in the range between 1MK to 2000 Mk per month. This translates to 80% of the respondents in Balaka and 67% in Liwonde Town. Minority of the people fall into the category between 8000-16,000 MK with

9% and 5% in Balaka and Liwonde towns respectively. Despite there being a concern among the people consulted regarding water prices, majority of them were in support of the project as they felt it would bring more positive than it would negative impacts.

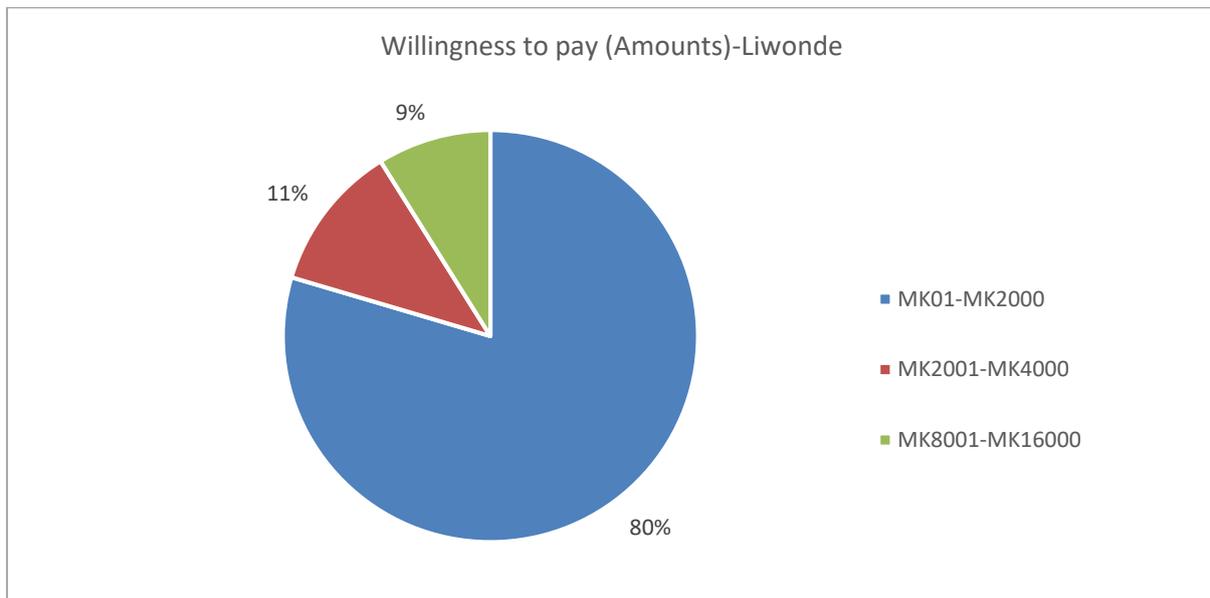


Figure 5.33: Willingness to Pay (Amounts)- Balaka town (Household survey, August 2019).

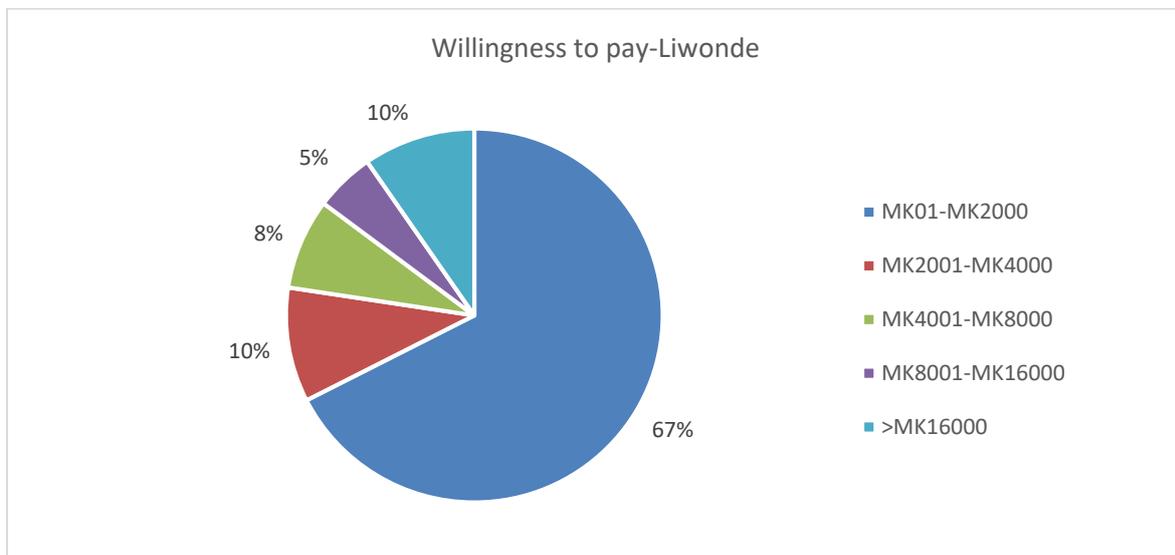


Figure 5.34: Willingness to Pay (Amounts)-Liwonde town (Household survey, August 2019).

5.3.10 Gender and sustainable development

Communities within the project area are mostly matrilineal. This has an impact on resource ownership, control, roles and responsibilities within the household. From consultations, it was observed that women participate in development activities and are able to make decisions on their own. Women also have ownership of land and sometimes have control of the use of the resources that are available at home and in their communities including land. It was also noted that men and women of the project area work together in development

activities (education, water, sanitation and hygiene and nutrition). Women are responsible for household chores including fetching water and carrying out sanitation and hygiene activities in their homes and community. It was also noted during consultations that during the dry season, women spend a significant amount of time searching for water. This mostly stems from long distances travelled.

Implementation of the Balaka-Liwonde Water Supply Project will significantly reduce the burden of people having to walk long distances to fetch for water. It will also reduce the use of unsafe water in the project areas. Consequently, the women will have more productive time and will be able to contribute more to social and economic development through increased participation.

5.3.11 Degree of gender mainstreaming

Gender mainstreaming refers to the promoting of gender equality within projects and/or organisations. This results in the enabling of men and women to fully participate within the organisation and enjoy equal opportunities. The Southern Region Water Board ensures that there is equal opportunity for both men and women, and resort to affirmative action measures in line with the Malawian constitution in order to balance the female-male in the organisation.

CHAPTER 6 : ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

6.1. INTRODUCTION

Environmental and social impacts are alteration to the environmental and socio-economic baseline conditions, or a new set of adverse or beneficial environmental and social consequences, caused by the implementation of project activities. These impacts are classified as beneficial, adverse and irreversible or unavoidable impacts.

Beneficial impacts are the desired attributes of a project, which must be enhanced in order to derive as much value from them as possible. The significance of these impacts varies from one to the other and knowledge of the same is important in decision-making by SRWB and other stakeholders on prioritisation of enhancement measures for the impacts.

Sources of the impacts are all the project activities likely to induce positive or negative changes on the socio-economic environment. These sources were identified from the proposed project activities described in chapter 3.

Mitigation or enhancement measures and complementary Initiatives are measures proposed to enrich the benefits; or prevent, minimize, moderate or compensate for the adverse impacts. The costs of each mitigation and enhancement measure, where applicable, are estimated in the environmental and social management plan (table 6.1).

The following sections present the description of the potential impacts during planning and design, construction and operation phases of the proposed rehabilitation, upgrading and expansion of Balaka - Liwonde Water Supply System.

6.2. Methodology for Impact Identification

An “environmental matrix” was used to identify the potential environmental and social impacts. Potential sources of impacts from the project activities during planning and design, construction and operation were identified with reference to the physical, biological and socio-economic components to be impacted. The impacts presented in sections 6.4 and 6.5 were determined basing on the following information:

- **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.

6.3. ANALYSIS OF POTENTIAL BENEFICIAL IMPACTS

6.3.1. Beneficial impacts during construction phase

- a) **Creation of employment opportunities including women, the vulnerable and the youth in the area:** The project will provide employment to people including women, youth and the vulnerable from the surrounding communities and from other districts and regions of the country. It is estimated that the project will employ a minimum of 150 skilled and unskilled workers among which 30 to 50 percent will be women. It is expected that most of the unskilled labour force, during construction, will be the youth who are energetic. By employing the vulnerable during construction, this project will be of vital importance not only to mitigate the adverse impacts related to the project, but also to enhance employment inequalities. Some of the skill categories that will be required by the project will include: surveying, plumbing, carpentry, bricklaying, steel fixing, plant operation, civil engineering and driving.

Enhancement measures:

- i. Inform local communities of employment opportunities and prioritise employment of local persons that qualify;
 - ii. Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities;
 - iii. Include on-the-job-orientation to unskilled workers;
 - iv. Sensitize workers with HIV and AIDS to go for medical check-ups regularly and receive HIV anti-retroviral treatment as required;
 - v. Provide employment to only people who are above 18 years of age;
 - vi. Workers must be treated and paid fairly for the services rendered;
 - vii. Provide equal employment to women and men;
 - viii. Pay local and imported labour equally for the same job.
 - ix. Wages must be above the minimum wage and overtime must be paid on time.
- b) **Increase in trade opportunities:** The project will provide opportunities for trade due to demand for construction materials and for goods and services by contractors and workers. This will benefit the government as well in that it will increase revenue generated in the form of taxes from wages, goods and taxes.

Enhancement measures:

- i. Pay the building material suppliers within the agreed times;
- ii. Source materials from approved licenced suppliers;
- 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.

6.3.2. Beneficial Impacts during operation phase

- a) **Improved water quantity and quality:** Currently the water supply schemes for Balaka and Liwonde produce inadequate water, such that the communities supplement with

untreated water sourced from boreholes, rivers and the lake. After completion of the project, there will be a significant increase in the quantity of treated water for cooking and domestic purposes. This will improve people's lives as among other benefits.

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 preventative maintenance;
- iii. Quickly carry maintenance works and restore water supply when there are problems;
- iv. Prepare and implement an intake management plan, including protection of lake Malawi, to prevent pollution;
- 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; and
- vii. Sensitize the water users on proper water management practices and payment of water bills in time.

b) Reduced time to fetch water: The project will increase water connections in the town and extend water supply to new areas. This is expected to reduce distances women and vulnerable groups travel to draw water and the drudgery of carrying heavy buckets of water daily. In addition, the queueing time will be reduced, which in turn will lead to increase productivity time for women and girls.

Enhancement measures:

- i. Process water connection applications and provide water to the communities as quickly as possible;
- ii. Ensure that the recommended maximum distances of 500 metres from houses to a water point is observed when constructing communal water points;
- iii. Facilitate and support setting up of water kiosk management committees;
- iv. Ensure water is available all the time at the water points.

c) Improved sanitation, hygiene and health: Increased availability of treated water will result in improved sanitation and hygiene. Treated water will be available to households, public places and institutions including health centres, markets, trading centres 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.

Enhancement measures:

- i. Sustain the desired performance of Balaka and Liwonde Water Supply schemes;

- ii. Conduct water quality tests at the water treatment plant, in the distribution lines and in the supply points;
- iii. Sensitise communities on hygienic practices for handling water to avoid secondary contamination;
- iv. Promote general sanitation practices amongst communities in the project area.
- v. Implement the project within the planned duration

d) Improved socio-economic welfare in Balaka and Liwonde: 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 utilised in doing other income earning activities, leading to economic empowerment of the women and their families. Small-scale businesses (e.g. vegetable and food businesses including restaurants), through improved access to potable water, will be able to provide clean products and hygienic services resulting in increased sales.

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.

e) Enhanced gender and women participation in development: Women form a high percentage of the project areas' population but 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.

Enhancement measures:

- i. Sensitize recruiting authorities to employ about 40% to 60% women.
- ii. Ensure there are also women in important positions.
- iii. Promote the involvement of women in development activities through sensitization, advocacy and awareness.
- iv. Economically empower women within affected communities by linking them with the District Council's Community Service Investment Programme (COMSIP).

f) 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.

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 to 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.

g) Employment opportunities: A significant number of people will be employed to operate and maintain the pumps, water storage and service tanks and pipelines. Increased development as a result of improvement in water supply and quality will also result in increased employment opportunities.

Enhancement measures:

- i. Provide equal employment opportunities to both men and women;
- ii. As much as possible, provide employment opportunities to the local people, particularly women, vulnerable groups and the youth;
- iii. Train unskilled labour and where possible, some should be considered for employment with SRWB, especially in the areas of maintenance;
- iv. Given-on-the-job training and refresher courses to the water supply scheme staff;
- v. Observe payment of overtime to those eligible, protect the welfare of the employees and enforce workers' safety guidelines;
- vi. Promote village savings and loan (VSL) schemes during project implementation, to enable workers from surrounding communities save for establishing income generating activities after the project.

h) Increase in revenue generation: SRWB will generate additional revenue from new water connections to be provided by the project; while the Government will generate additional revenue from various forms of taxes on wages, goods and services.

Enhancement measures:

- i. Sensitize institutions and households to pay bills and on time
- ii. Properly manage revenue from the water supply.
- iii. Engage the community to identify projects which the Water Board can implement as part of cooperate social responsibility.
- iv. Re-invest profits in the improvement and extension of the water supply system.
- v. Regularly review water tariff with consideration of the consumers to avoid overcharging them.
- vi. Properly manage water by replacing old pipes, repairing pipes to prevent leakages and extending intake pipes to avoid abstracting polluted water.

i) Increased development: Availability of running potable water improves the economic value of land and property and is one of the development pushers. Most of the investments and businesses are established in areas where there are sufficient and reliable water supply services. People will therefore settle close to sites, which will be served with piped and treated water from the project. The project will extend water supply to areas which currently do not have water supply resulting in increased business activities within these sites, thereby promoting growth of the town.

Enhancement measures:

- i. Extend water supply to potential areas for development
- ii. Ensure continuous and reliable water supply and adequate sanitation to the supplied areas, to attract more settlers and businesses.
- iii. Plan development areas in consultation with the SRWB and other service providers.

6.4. ANALYSIS OF POTENTIAL ADVERSE IMPACTS

The following is a description of potential adverse impacts that will be associated with the project during the , construction and operational phases.

6.4.1. Adverse impacts during planning and designing phase

- a) **Loss or destruction of land and/ or property:** Land will be required for construction of tanks, movement of vehicles and pipes for water distribution purposes. Some of this land will be acquired from people in the area, hence some will lose agricultural land which they will need to be compensated for. The compensation process already started and now is in progress.

Mitigation measures:

- i. Emphasis should be on minimising and avoiding any potential land acquisition and costs when selecting the sites for the tanks and routes for the pipelines.
 - ii. Where avoidance is not possible, identify affected households and compensate them for loss of land and other property in consultation with the Department of Lands, the local leaders and the District Councils
 - iii. Locate transmission and distribution lines within existing road reserves, as much as possible.
 - iv. Plan and prepare all compensations in coordination with the District Commissioner and the Department of Lands
- b) **Land conflicts:** Construction works for pipelines, pump stations and service tanks may affect people's gardens, crops, trees and buildings and this may result in conflicts. The provision of piped water will also trigger demand for land, for residential and commercial infrastructure which will result in land disputes amongst family or community members.

Mitigation measures:

- i. Give adequate notice (one month as specified in the Water Works Act of 1995) and obtain permission from land owners before commencing the civil works.
- ii. Avoid disturbance of gardens during growing or harvesting seasons where possible. This will require appropriate planning for project implementation to ensure that tasks are not executed when crops are in the fields.

6.4.2. Adverse impacts during construction phase

- a) **Land degradation:** Movement of heavy duty construction machines and equipment will result into soil compaction. Soil compaction leads to soil erosion during the rainy

season and retarded vegetation growth. Cement, paints, lubricants and oils may contaminate the soil causing soil pollution. This may compromise the potential for the soils to sustain life support systems for both flora and fauna.

Mitigation measures:

- i. Ensure that vegetation is cleared and excavations are done as designed to avoid unwarranted clearance of vegetation.
 - ii. Avoid deposits and piling up of loose soils on slopping ground or near drainage channels.
 - iii. Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation.
 - iv. Use excavated soils to rehabilitate eroded areas.
 - v. The routing of pipe layouts and access roads should follow areas with as little vegetation as possible.
 - vi. Minimize the number and length of access roads and use existing roads or tracks as far as possible.
 - vii. Provide all structures required for effective water drainage.
 - viii. If crossing of watercourses cannot be avoided, erect a bridge or a culvert.
- b) **Change in natural scenery and landscape of the project area:** This will result due to stockpiles of solid waste during the construction period.

Mitigation measures:

- i. Confine land clearing and stockpiling to the area for construction of the pipelines, access roads and water storage tanks;
 - ii. Rehabilitate affected areas by planting indigenous trees and backfilling of ruminant excavation works.
 - i. Dispose rubble and all other waste material at licensed sites, in collaboration with the District Council
 - ii. Store and dispose contaminated waste at appropriate designated sites approved by the District Council
 - iii. Recycle or re-use waste materials and containers
 - iv. Level the trench spoil to original land contour.
- c) **Accidents and hazards from trenches and borrow pits:** The project will require construction materials including earth, sand and quarry stone. Extraction of these materials may lead to creation of holes and borrow pits in the ground. These holes and borrow pits as well as trenches opened for the pipelines will be hazardous to people and animals.

Mitigation measures:

- i. Get a permit for mining construction materials from the District Council.
- ii. Refill all borrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems;
- iii. Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them;

- iv. Inform and sensitise the public about all open pits and trenches
- v. Supervise adequately the installation of storage tanks and pipelines and follow recommended procedures

d) Disruption of water supply: Water supply services may be disrupted during construction to facilitate connection of the old water supply equipment and structures to the existing facilities or vice versa.

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
- e) Air quality degradation and increase respiratory disorders:** Dust, gas and particulate matter emission is anticipated during construction. Construction work unavoidably creates dust due to material and vehicle movement; excavation and land clearing; and construction activities. In addition, the vehicles, electricity generators and other machines, which are likely to be used during construction, result in emission of gas and particulate elements including carbon dioxide (CO₂), sulphur dioxide (SO₂), nitrogen oxides (NO₂) and various other hydrocarbons.

Dust and particulates can present respiratory problems as well as potential allergic reactions when inhaled. Project workers, especially those that will be exposed to dust and exhaust gas emissions, may suffer from respiratory disorders. In addition, dust can cause nuisance problems when re-deposited on clothes and surfaces; and can hinder visibility. However, it is considered unlikely that ambient air quality standards will be exceeded.

Mitigation measures:

- i. Use new or fairly new vehicular equipment with exhaust gas emissions above permissible emission limits.
- ii. Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits.
- iii. Apply water sprays when dust is being generated or at times of strong wind.
- iv. Provide protective gear (dust masks) to workers and ensure that they wear them.
- v. Erect a barrier around the work sites where major construction activities are taking place to break or reduce wind and dust movement.
- vi. Store and handle sand and cement properly to limit dust generation.
- vii. Optimize transportation management to avoid needless truck drives.
- viii. Control vehicle speeds.
- ix. Reduce engine idling time.
- x. Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.

- f) **Loss or destruction of habitats for fauna and aquatic life:** Clearing of vegetation for construction of the access and service roads, pipelines and water storage and service tanks is likely to result in destruction of habitats for fauna. Compaction of soils may result in reduced absorption and circulation of water and air in the soil. This may eventually compromise survival of soil-based micro and macro organisms. Increased rates of soil erosion and the consequential water siltation will affect aquatic life due to depletion of oxygen and destruction of aquatic habitats and ecosystems.

Mitigation measures:

- i. Ensure that vegetation is cleared and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation;
- ii. Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees and grass immediately after construction works to ensure restoration of lost flora.
- iii. Ensure that construction vehicles and plant i.e. tippers, excavators, compactors etc. use only designated access roads to avoid soils degradation outside construction areas.

- g) **Loss of vegetation:** Land clearing for the construction of access roads, pipelines and water storage tanks will result in loss of vegetation and reduce biodiversity quality in the area.

Mitigation measures:

- i. Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation.
- ii. Planting appropriate trees and grasses in all disturbed area.
- iii. All the trees to be cut down during construction should be costed and appropriately compensated for.
- iv. Ensure that for every single tree cut down, 10 tree seedlings of a similar species are planted in the adjacent areas.
- v. Use cement bricks/ blocks for construction, where appropriate.
- vi. Train VNRMCs and other committees in catchment management and developing bye-laws and management plan agreements.
- vii. 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.
- viii. Sensitize employees and the community to conserve vegetation.
- ix. Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.

- h) **Water pollution and siltation:** Construction debris, dirt, silt and soil may run into natural waterways, causing pollution and siltation. Oil spillages, from construction machinery and solid waste from construction materials and camp sites will also contribute to water pollution during the rainy season, when the spills and solid waste are washed down to the water courses.

Mitigation measures:

The mitigation measures for soil erosion and soil degradation also apply for this impact. In addition, the following measures are recommended:

- i. Used oils should be sold to Raiply and ESCOM to be used for treating timber.
- ii. Mix cement in areas, which are not directly connected to natural drainage systems.
- iii. Store cement, paints, lubricants and fuels in lined and covered areas.
- iv. Provide appropriate spill kits when working near water courses.
- v. Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water.
- vi. Site all material storage areas at least 10m from watercourses.
- vii. Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses.

- i) **Occupational incidents and accidents:** 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, employers are supposed to report any incidents and accidents, occurring at their workplace, to the OSH directorate. The employers are also supposed to cooperate in any investigations that may follow.

Mitigation measures:

- i. Induct workers on OSH requirements and repeat reminders on the same.
- ii. 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.
- iii. Provide appropriate personal protective equipment (PPEs) to construction workers; and ensure that it is used at all times.

- j) **Noise pollution:** Construction machinery (vehicles, excavators, compactors and concrete mixers) will generate noise that may impair the hearing of workers as well as surrounding community members.

Mitigation measures:

- i. Provide noise ear plugs and tags to workers involved in noisy work environments and ensure that the PPEs are in use at all times.

- k) **Increase in sexual relationships, unplanned pregnancies, breaking up of families and sexual harassment:** 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 behaviour change, may lead to the harassment and sometimes molestation of their wives. Likewise, some women working at the project sites may harass their unemployed husbands, due to increased disposable incomes.

Mitigation measures:

- i. Sensitise communities on the disadvantages of indulging in extra-marital affairs.
- ii. 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.

- iii. Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities.
 - iv. Engage stakeholders in encouraging and empowering women to be financially independent.
 - v. Create a good work environment to allow female workers report any case of harassment.
- l) **Increase in teenage pregnancies and school drop outs amongst the youth:** School girls and teenagers will be exposed to sexual abuse in return for money. This may lead to pregnancies and increased school drop outs in the area.

Mitigation measures:

- i. Sensitise communities and girls in particular on the dangers of getting involved in pre-marital sex at a tender age.
 - ii. Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in illicit sex with school going girls.
 - iii. Engage the district project managed by the social welfare and community development offices to assist pupils going back to school.
- m) **Increase in prevalence of sexually transmitted infections (STIs), including HIV and AIDS** due to extra disposable income to the workers and business persons. This may attract sex workers into the area and may contribute to increased STIs and HIV and AIDS rates;

Mitigation measures:

- i. Sensitise workers and surrounding communities on the dangers of indulging in unprotected sex.
 - ii. Conduct HIV and AIDs sensitization and give lighter tasks to those with the virus or other health problems.
 - iii. Provide both male and female condoms to workers for appropriate use.
- n) **Unequal employment:** During informal consultations, it was observed that most of the project activities in the construction phase are considered to be 'strength-requiring-jobs' and hence "men's" jobs; for example, digging trenches and laying pipes. As such, the project will tend to employ more men than women. In addition, 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).

Mitigation measures:

- i. Encourage the contractor to employ women as well. A clause should be included in the contract specifying that at least 30% of the employees should be women.

- 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 the District Council's Community Service Investment Programme (COMSIP).
- v. Create a good work environment to allow female workers report any case of harassment.

6.4.3. Adverse impacts during demobilization phase

- a) **Loss of jobs and businesses:** Local labourers will be laid off during the demobilization phase. This will result in loss of livelihoods. 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.

Recommended Mitigation Measures

- i. Provide alternative employment to employees e.g. as maintenance staff;
- ii. Provide adequate notice to employees to prepare themselves and secure alternative employment;
- iii. Pay severance benefits to leaving workers in line with the labour regulations;
- iv. Sensitize the workers and the general community to be saving; and
- v. Sensitize the business persons to diversify and find alternative markets.

- b) **Abandonment of excavated areas for raw materials:** There is potential for abandonment of borrow pits after the construction works, in particular at the treatment, water reservoir and on sites where construction materials will be sourced. The impact is not anticipated in the pipeline route, as it will be a requirement to bury the pipe after laying it in the trenches. Borrow pits are an issue as they can be a death trap to wildlife and children. In addition, borrow pits create unsightly conditions and they can be breeding grounds for mosquitoes; borrow pits can change the ecosystem.

Recommended Mitigation Measures

- i. Fill up and close pits after the construction works;
- ii. Rehabilitate all work site;
- iii. Construction materials e.g. sand and clay soils should be sourced from licensed suppliers; and
- iv. Avoid making deep pits during the construction period.

6.4.4. Adverse impacts during operational phase

- a) **Increase in solid waste generation:** During the operation phase, mainly at the treatment plant and offices, 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.

Mitigation measures:

- i. Metal waste should be recycled and/ or sold 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. It was learnt, from the stakeholder consultations that poor sanitation in the project areas is caused largely by lack of civic education about WASH and also due to non-existence of Village Sanitation Committees (VSCs)

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 sullage at communal water points, bath shelters and septic tank soakways. This wastewater must be properly managed to avoid pollution.

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. Use licensed liquid waste handlers.
- 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) Increased risk of water contamination:** Risk of water contamination will increase with the additional water supply infrastructure. Water contamination may occur along the transmission and distribution pipelines especially where pipes have been broken and where they are close to malfunctioning human waste disposal facilities such as excreta disposal pipes, septic tanks and soakway pits; and waste disposal sites producing leachate. Water contamination may also occur as people bathe, defecate and wash their clothes in the lake near the intake

Mitigation measures:

To mitigate the impact, the following measures are recommended:

- i. Mend broken water pipes as quickly as possible

- ii. Follow recommended guidelines for distances that must be maintained between liquid waste disposal facilities and water pipes
- iii. Repair malfunctioning human waste disposal facilities such as excreta disposal pipes, septic tanks and soakway pits as quickly as possible
- iv. Move the water intake pipe as far into the lake as possible.

d) Increased risk of fire from the electrical systems and from bush fires: Additional electrical wiring and pumps at the treatment plant and booster stations may pose additional risks of electrical fires if not well installed and regularly maintained.

Mitigation measures:

- i. Ensure appropriate and approved electrical installations and equipment;
- ii. Design and implement an emergency response plan;
- iii. Train staff in firefighting and regularly conduct fire drills;
- iv. Install fire hydrants within the proposed development;
- v. Regularly monitor and maintain the electrical systems;
- vi. Install a fire extinguisher at the plant and train workers on how use;
- vii. Prohibit smoking in places which can easily catch fire and sensitise people on the dangers of fire incidences;
- viii. Prepare and maintain fire breaks.

e) Increased incidences of pipe bursts in the high-pressure pipes: Increased potential of failure in pipes and water storage tanks may result in flooding of water and damaging people's property or crops.

Mitigation measures:

- i. Use the right sized pipes;
- ii. Replace old pipes with new ones.

f) Increased chances of theft and vandalism due to increased size of infrastructure: The high unemployment rates due to rapid population growth and a small economic base contribute to increased criminal activity in Malawi. Cases of vandalism and theft of water supply equipment are reported in the project area. Vandalism and theft may lead to water leakages and flooding, where a large pipe is vandalised. 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 would have an impact on the revenue and maintenance cost of water supply system.

Mitigation measures:

- i. 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, etc.
- 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. Include the people from the local area in the work force.

6.4.5. Adverse impacts during decommissioning phase

Water supply infrastructure is normally designed for a life span of 50 years and more, and they are rarely decommissioned but rather undergo regular maintenance. However, in the event that decommissioning is to take place, adverse impacts will emanate from the demolition of project structures and related infrastructure which results in large quantities of solid waste. The expected impacts, among others, include the following:

- Noise from demolition activities and machines used
- Generation of waste and associated pollution
- Disruption of water supply

These impacts will not be assessed at this present considering that we cannot correctly predict the existing environmental and social conditions of 50 years from now. This ESIA therefore recommends that a decommissioning plan, including an environmental and social management plan, should be prepared when the time to decommission comes.

6.5. 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 6.1: 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 – High		4 – Long term (impact ceases after operational life) and/or very frequent impact	4 – National	4 – sensitive or rare environmental component	4 – High probability
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 6.2 following.

Table 6.2: 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

6.6. 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 6.3.

Table 6.3: 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.	BENEFICIAL IMPACTS									
1.1.	Construction Phase									
1.1.1.	Creation of employment opportunities including for women, youth and vulnerable people	4	3	2	2	4	4	60	Moderate	Very High
1.1.2.	Increase in trade opportunities	3	3	2	2	4	3	42	Low	High
1.1.3.	Revenue generation for Local Government	3	3	2	2	4	3	42	Low	High
1.2.	Operation and Maintenance Phase									
1.2.1.	Improved water quality and quantity	5	3	4	2	4	5	90	High	Very High
1.2.2.	Reduced distance to draw water	5	5	4	2	4	4	80	High	Very High
1.2.3.	Improved sanitation, hygiene and health	4	3	4	2	4	4	68	Moderate	High
1.2.4.	Improved socio-economic welfare in Liwonde and Balaka	4	3	4	2	4	4	68	Moderate	High
1.2.5.	Enhanced gender and participation in development	4	3	4	2	4	3	51	Moderate	High
1.2.6.	Education benefits to girl child	3	3	4	2	4	3	48	Low	High
1.2.7.	Employment opportunities	2	3	4	2	4	3	45	Low	High
1.2.8.	Increased revenue generation for the water board	3	3	4	2	3	4	60	Moderate	High
1.2.9.	Increased development	4	3	4	2	3	3	48	Low	High
2.	ADVERSE IMPACTS									
2.1.	Planning									
2.1.1.	Loss or destruction of land and/or property	2	3	5	2	3	4	60	Moderate	Low
2.1.2.	Land conflicts	2	3	1	2	4	4	48	Low	Very low
2.2.	Construction Phase									
2.2.1.	Land degradation	4	3	2	1	3	4	52	Moderate	Very low
2.2.2.	Change in natural scenery and landscape of the project area due to stockpiles of solid waste	3	3	2	1	3	3	36	Low	Very low
2.2.3.	Accidents and hazards from trenches and borrow pits	3	3	2	1	4	3	39	Low	Very low
2.2.4.	Disruption of water supply	4	3	1	1	4	4	52	Moderate	Very low
2.2.5.	Water pollution and siltation	2	3	2	2	4	3	39	Low	Very low
2.2.6.	Air quality degradation/ increase respiratory disorders	2	1	1	1	4	3	27	Low	Very low

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/enhancement	Significance with mitigation/enhancement
2.2.7.	Loss or destruction of habitats for fauna and aquatic life	4	1	2	1	3	4	44	Low	Very low
2.2.8.	Loss of vegetation	4	3	2	1	3	4	52	Moderate	Very low
2.2.9.	Occupational incidents and accidents	3	3	1	1	4	3	36	Low	Very low
2.2.10	Noise pollution	3	1	1	1	4	3	30	Low	Very low
2.2.11	Increase in sexual relationships, unplanned pregnancies breaking up of families and sexual harassment	4	3	4	2	4	4	68	Moderate	Very low
2.2.12	Increase in prevalence of sexually transmitted infections (STIs), including HIV/ AIDS	4	5	4	2	4	4	76	High	Low
2.2.13	Unequal employment	3	3	2	2	4	3	42	Low	Very low
2.3.	DemobilisationPhase									
2.3.1	Loss of jobs and businesses	3	5	5	2	3	4	72	Moderate	
2.3.2	Abandonment of borrow pits	3	2	3	2	3	3	39	Low	
2.4.	Operation Phase									
2.4.1.	Increased pollution from wastewater and sludge	3	3	4	1	4	3	45	Low	Very low
2.4.2.	Increased risk of water contamination	2	3	1	1	4	3	33	Low	Very low
2.4.3.	Increased risk of fire from the electrical systems	2	3	1	1	4	3	33	Low	Very low
2.4.4.	Increased incidences of pipe bursts in the high-pressure pipes	3	3	1	1	4	3	36	Low	Very low

From the assessment of the impacts summarized in Table 6.3 above, on overall, the anticipated adverse impacts are assessed as Moderate and can be mitigated to Very Low. The most severe impact of the project is expected to be of “increase in prevalence of sexually transmitted infections (STIs), including HIV/ AIDS”. The SRWB, in collaboration with other stakeholders, must provide regular awareness and community sensitization campaigns on dangers of promiscuous sexual relationships and HIV/AIDS. Overall the project has more beneficial impacts than adverse impacts.

6.1. NOTE ON EXTRACTION VOLUMES FOR Liwonde-Balaka Water Supply Project

The proposed project to construct a new system to supply more water to the Towns of Balaka and Liwonde will see an increased abstraction of some 10,000 cubic meters of water per day. This is an equivalent of 0.116 M³/s of water. The Shire River which is also a major tributary of the Zambezi River has recorded minimum annual flows of between 100-120 M³/s. Therefore it is observed that the amount of water that is to be

abstracted under this proposed Liwonde Balaka water project is only about 0.097-0.116% of the recorded minimum annual flows in the river.

Additionally, flows in the Shire River as well as in the Zambezi River are influenced by water levels in the Lake Malawi which is the main water body draining into the Shire River. Lake Malawi water levels are mainly influenced by evaporation from its vast surface area of 29,600 sq.km. The average evaporation rate from Lake Malawi is 1,500 cubic m per second, this is far greater than the amount of water that is to be extracted from this proposed project. It is thus concluded that water levels in the Shire River will be far more affected by evaporation than by the amount of water by the proposed Liwonde-Balaka Water Supply Project. It is hence very evident that the abstraction amount of 10,000 M³/day has a negligible effect on water levels in the Shire River.

Also in terms of water quality, the total residual chlorine levels of the backwash wastewater from the new treatment plant will not exceed the maximum limit for industrial effluent discharge into surface waters of 1mg per l (the recommended maximum amount to be consumed by humans, MBS-MS 539:2013).

It is therefore concluded that through the Liwonde Balaka Water Supply Project as far as water abstraction is concerned, Malawi will be realising more benefits from the shared watercourse system of Lake Malawi-Shire-Zambezi River, as well as ensuring adequate protection of the watercourse system.

CHAPTER 7 : ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1. Environmental and Social Management Plan

This Environmental and Social Management Plan (ESMP) has been prepared to facilitate the integration of the enhancement and mitigation measures in the implementation of this project. The aim of the ESMP is to ensure that SRWB will prevent, reduce, mitigate, and compensate for the impacts of the proposed project on the biophysical and socio-economic environment. The ESMP, presented in Table 7.1 contains the following:

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

Southern 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 (USD)
1.	ENHANCEMENT MEASURES FOR BENERFICIAL IMPACTS				
1.1.	Construction phase				
	Creation of employment opportunities including women, the vulnerable and the youth in the area	<ul style="list-style-type: none"> • Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities • Include on-the-job-orientation to unskilled workers • Sensitize workers with HIV and AIDS to go for medical check-ups regularly and receive HIV anti-retroviral treatment as required • Provide employment to only people who are above 18 years of age • Workers must be treated and paid fairly for the services rendered • Provide equal employment to women and men • Engage the labour department to enforce the labour laws. (For example, the certificate of completion should compel the contactor to pay all the wages to the labourers on the contract) • Pay local and imported labour equally for the same job 	Continuously throughout construction	Contractor, District Social Welfare Officer, District Labour Officer & Consultants	300 USD for sensitization and enforcement of labour laws.

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> Wages must be above the minimum wage and overtime must be paid on time 			
1.1.1.	Increase in trade opportunities	<ul style="list-style-type: none"> Pay building material suppliers within the agreed times Source materials from approved licenced suppliers Sensitize workers to save and invest Support and promote entrepreneurship skills amongst communities and business people in the project area Promote village savings and loan (VSL) schemes during project implementation. 	Quarterly	District Social Welfare Officer / Contractor	Cost included in 1.1.1
1.2.	OPERATION PHASE				
1.2.1.	Improved water quantity and quality	<ul style="list-style-type: none"> 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 maintenance Quickly carry maintenance works and restore water supply when there are problems Prepare and implement an intake management plan. 	Throughout the operation period	SRWB	To be covered within the operation and maintenance budget for the scheme

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • 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 and payments of water bills in time. 			
1.2.2.	Reduced time to fetch water	<ul style="list-style-type: none"> • 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/kiosk is observed when constructing communal water points • Facilitate and support setting up of water kiosk management committees • Ensure water is available all the time at the water points 	Throughout the operation period	SRWB	N/A (Within the operation and maintenance budget of the board)
1.2.3.	Improved sanitation, hygiene and health	<ul style="list-style-type: none"> • Sustain the desired performance of Balaka - Liwonde Water Supply System 	Monthly for water quality analysis and	SRWB District Water Officer, District	2535 for sensitization of communities

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Conduct water quality tests at the water treatment plant, in the distribution lines and in the supply points • Sensitise communities on hygienic practices for handling water to avoid secondary contamination • Promote general sanitation practices amongst communities in the project area • Implement the project within the planned duration 	quarterly for sensitization	Environmental Health Officer NGOs	
1.2.4.	Improved socio-economic welfare in Balaka and Liwonde	<ul style="list-style-type: none"> • 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	SRWB NGO	N/A (Within the operation and maintenance budget of the board)
1.2.5.	Enhanced gender and women participation in development	<ul style="list-style-type: none"> • Sensitize recruiting authorities to employ about 40% to 60% women. • Ensure there are also women in important positions. • Promote the involvement of women in development activities through sensitization, advocacy and awareness. 	Yearly	District Social Welfare Officer, District Gender Officer	617 for sensitizations

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> Economically empower women within affected communities by linking them with District Councils Community Service Investment Programme (COMSIP) 			
1.2.6.	Education benefits to girl child	<ul style="list-style-type: none"> 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 to ensure the provision of quality of education. Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees. 	Yearly for girl sensitizations	SRWB, District Education Manager.	617 for sensitization
1.2.7.	Employment opportunities	<ul style="list-style-type: none"> Provide equal employment opportunities to both men and women Provide employment opportunities to the local people, particularly women, vulnerable groups and the youth Train unskilled and where possible, some should be considered for employment with SRWB, especially in the areas of maintenance Give-on-the-job training and refresher courses to the water supply scheme staff. 	Continuously throughout operation phase	SRWB	N/A (Within the operation and maintenance budget of the board)

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Observe payment for overtime, protection of the welfare of the employees and workers' safety guidelines • Promote village savings and loan (VSL) schemes during project implementation, to enable workers from surrounding communities save for establishing other income generating activities after the project. 			
1.2.8.	Increased revenue generation for the Water Board	<ul style="list-style-type: none"> • Sensitize institutions and households to pay bills on time • Properly manage revenue from the water supply. • Engage the community to identify projects which the Water Board can implement as part of cooperate social responsibility. • Re-invest profits in the improvement and extension of the water supply system. • Regularly review water supply tariff with consideration of the consumers to avoid overcharging them. • Properly manage water by replacing old pipes, repairing pipes to prevent leakages and extending intake pipes to avoid abstracting polluted water. 	Continuously throughout operation phase	SRWB	N/A (Within the operation and maintenance budget of the board)

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
1.2.9.	Increased development	<ul style="list-style-type: none"> Extend water supply to potential areas for development Ensure continuous and reliable water supply and adequate sanitation to the supplied areas, to attract more settlers and businesses. Plan development areas in consultation with the RWB and other service providers. 	Continuously throughout operation phase	SRWB	N/A (Within the operation and maintenance budget of the board)
2.	MITIGATION MEASURES FOR ADVERSE IMPACTS				
2.1.	Planning and designing phase				
2.1.1.	Loss or destruction of land and/ or property	<ul style="list-style-type: none"> Emphasis should be on minimising and avoiding any potential land acquisition costs when selecting the sites for the tanks and routes for the pipelines Where avoidance is not possible, identify affected households and compensate them for loss of land and other property in consultation with the Department of Lands, the local leaders and the District Council Locate transmission and distribution lines within existing road reserves, as much as possible. Plan and prepare all compensations in coordination with the Balaka and 	Before the construction starts	SRWB, District Lands Officer	TBD for land compensations

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		Machinga District Commissioners and the Department of Lands.			
2.1.2.	Land conflicts	<ul style="list-style-type: none"> • Give adequate notice (one month as specified in the Water Works Act of 1995) and obtain permission from land owners before commencing the civil works. • Where possible, the contractor should avoid disturbance of gardens during growing or harvesting seasons. This will require appropriate planning for project implementation to ensure that tasks are not executed when crops are in the fields. 	Before construction starts	Contractor, SRWB	N/A
2.2.	Construction phase				
2.2.1.	Land degradation	<ul style="list-style-type: none"> • Ensure that vegetation is cleared and excavations are done as designed to avoid unwarranted clearance of vegetation. • Avoid deposits and piling up of loose soils on slopping ground or near drainage channels. • Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation. • Use excavated soils to rehabilitate eroded areas. 	Throughout construction	Contractor	Include in contractor's budget

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • The routing of pipe layouts and access roads should follow areas with as little vegetation as possible. • Minimize the number and length of access roads and use existing roads or tracks as far as possible. • Provide all structures required for effective water drainage. • If crossing of watercourses cannot be avoided, erect a bridge or a culvert 			
2.2.2	Change in natural scenery and landscape of the project area due to stockpiles of solid waste	<ul style="list-style-type: none"> • Confine land clearing and stockpiling to the area for construction of the pipelines, access roads and water storage tanks; • Rehabilitate affected areas by planting indigenous trees and backfilling of ruminant excavation works; • Dispose rubble and all other waste material at licensed sites, in collaboration with Balaka and Machinga District Councils; • Store and dispose contaminated waste at appropriate designated sites approved by Balaka and Machinga District Councils; • Recycle or re-use waste materials and containers 	Throughout construction	SRWB & District Forestry Officer	938 for tree planting and rehabilitation of affected area.

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> Level the trench spoil to original land contour. 			
2.2.3	Accidents and hazards from trenches and borrow pits	<ul style="list-style-type: none"> Use the existing local quarry sites for sourcing quarry stone Get a permit for mining construction materials from Balaka and Machinga District Councils. Refill all borrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems Barricade 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 installation of storage tanks and pipelines and follow recommended procedures. 	Throughout construction	Contractor and Consultants	Cost included in 2.2.2. for refilling borrow pits
2.2.4.	Disruption of water supply	<ul style="list-style-type: none"> 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 	Throughout construction	SRWB	N/A (Within the operation and maintenance budget of the board)

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
2.2.5.	Water pollution and siltation	<ul style="list-style-type: none"> • Obtain licences to abstract water and discharge wastewater from the water authority • Sell used oils to Raiply and ESCOM to be used for treating timber. • Mix cement in areas, which are not directly connected to natural drainage systems. • Store cement, paints, lubricants, and fuels in lined and covered areas. • 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 10m from watercourses. • Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses. 	Throughout construction	Contractor and Consultants	500 for obtaining licence for discharging waste water
i.	Air quality degradation and increase respiratory disorders	<ul style="list-style-type: none"> • Use new or fairly new vehicular equipment with exhaust gas emissions above permissible emission limits. • Timely and effectively maintain vehicles and equipment to prevent 	Throughout construction	Contractor and Consultants	2000 for controlling air pollution

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<p>exhaust gas emissions above permissible emission limits.</p> <ul style="list-style-type: none"> • Apply water sprays when dust is being generated or at times of strong wind. • 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 sand and cement properly to limit dust generation. • Optimize transportation management to avoid needless truck drives. • 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. 			
2.2.7.	Loss or destruction of habitats for fauna and aquatic life	<ul style="list-style-type: none"> • Ensure that vegetation is cleared and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation; 	Throughout construction	Contractor and Consultants	Cost included in 2.2.2

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees and grass immediately after construction works to ensure restoration of lost flora. • Ensure that construction vehicles and plant i.e. tippers, excavators, compactors etc. use only designated access roads to avoid soils degradation outside construction areas. 			
2.2.8	Loss of vegetation	<ul style="list-style-type: none"> • 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 areas. • All the trees to be cut down during construction should be costed and appropriately compensated for. • Ensure that for every single tree to be cut down, 10 tree seedlings of a similar species should be planted in the adjacent areas. • Use cement bricks/ blocks for construction, where appropriate. 	Throughout construction (land preparation)	Contractor SRWB	Cost included in 2.2.2

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Train VNRMCS and other committees in catchment management and developing bye-laws and management plan agreements. • 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. • 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. 			
2.2.8	Occupational incidents and accidents	<ul style="list-style-type: none"> • 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 (PPEs) to construction workers; and ensure that it is used at all times. 	Throughout construction	Contractor and Consultants	Cost included in 2.2.6

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
2.2.9	Noise pollution	<ul style="list-style-type: none"> Provision of noise ear plugs/tags to workers that will be involved in noisy work environments and to ensure that the PPEs are in use at all times. 	Throughout the construction period	Contractor and Consultants	500 for buying ear plugs
2.2.10	Increase in sexual relationships, unplanned pregnancies breaking up of families and sexual harassment.	<ul style="list-style-type: none"> Sensitise communities on the disadvantages of indulging in extra-marital affairs. 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. 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. Create a good work environment to allow female workers report any case of harassment. 	Quarterly	Contractor and Consultants	600 for community sensitization
2.2.11	Increase in teenage pregnancies and school drop outs amongst the youth	<ul style="list-style-type: none"> Sensitise communities and girls in particular on the dangers of getting involved in pre-marital sex at a tender age. 	Quarterly	SRWB Contractor	600 for sensitizations

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in illicit sex with school going girls. Engage the district project managed by the social welfare and community development offices to assist pupils going back to school. 			
2.2.12	Increase in prevalence of sexually transmitted infections (STIs), including HIV/ AIDS	<ul style="list-style-type: none"> Sensitise workers and surrounding communities on the dangers of indulging in unprotected sex. Conduct HIV and AIDs sensitization and give lighter tasks to those with the virus or other health problems. Provide both male and female condoms to workers for appropriate use. 	Quarterly	Contractor SRWB	Cost conducted 2.2.14
2.2.13	Unequal employment	<ul style="list-style-type: none"> Encourage the contractor to employ women as well. A clause should be included in the contract specifying that at least 30% 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. 	Yearly	Contractor District Social Welfare Officer	600 for gender sensitization meetings

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • 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. 			
2.3	DEMOBILISATION PHASE				
2.3.1	Loss of jobs and businesses	<ul style="list-style-type: none"> • Provide alternative employment to employees e.g. as maintenance staff; • Provide adequate notice to employees to prepare themselves and secure alternative employment; • Pay severance benefits to leaving workers in line with the labour regulations; • Sensitize the workers and the general community to be saving; and • Sensitize the business persons to diversify and find alternative markets. 	After construction	Contractor and Consultants	Included in the bills of the contractor
2.3.2	Abandonment of excavated areas for raw materials	<ul style="list-style-type: none"> • Fill up and close pits after the construction works; • Rehabilitate all work site; 	After construction	Contractor and Consultants	Cost included in 2.2.2

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Construction materials e.g. sand and clay soils should be sourced from licensed suppliers; and • Avoid making deep pits during the construction period. 			
2.4	OPERATION PHASE				
2.4.1	Increase in solid waste generation	<ul style="list-style-type: none"> • 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 sites. 	Quarterly	SRWB	100 for buying bins/skips
2.4.2	Increased pollution from wastewater and sludge	<ul style="list-style-type: none"> • Enforce proper excreta and wastewater management especially in the town. • Apply lime treatment to dewatered sludge to suppress pathogens and remove odour. • Use licensed liquid waste handlers • Dry sludge on drying beds before disposing off in a dedicated disposal site. 	Twice a year	SRWB Environmental Health Officer	Cost included in 2.3.3.

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • 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. 			
2.4.3	Increased risk of water contamination	<ul style="list-style-type: none"> • Mend broken water pipes as quickly as possible • Follow recommended guidelines for distances that must be maintained between liquid waste disposal facilities and water pipes • Repair malfunctioning human waste disposal facilities such as excreta disposal pipes, septic tanks and soakaway pits as quickly as possible • Move the water intake pipe as far into the lake as possible. 	Monthly	SRWB	N/A (Within the operation and maintenance budget of the board)
2.4.4	Increased risk of fire from the electrical systems	<ul style="list-style-type: none"> • Ensure appropriate and approved electrical installations and equipment; • Design and implement an emergency response plan. • Train staff in firefighting and regularly conduct fire drills • Install fire hydrants within the proposed development. 	Throughout operation phase	SRWB	200 for buying fire hydrants and extinguishers

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Regularly monitor and maintain the water supply system. • Install a fire extinguisher at the plant and train workers on how use. 			
2.4.5	Increased incidences of pipe bursts in the high-pressure pipes	<ul style="list-style-type: none"> • Use the right sized pipes; • Replace old pipes with new ones. 	Throughout operation phase	SRWB	N/A (Within the operation and maintenance budget of the board)
2.4.6	Increased chances of theft and vandalism due to increased size of infrastructure	<ul style="list-style-type: none"> • 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. • 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. 	Through the operation period	SRWB	Cost included in 2.2.3.

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		<ul style="list-style-type: none"> • Include the people from the local area in the work force. 			

Table 7. 2: Summary of environmental and social management costs

N o.	Activity	Cost (USD)
1	Management of increase in sexual relationship, unplanned pregnancies breaking up of families and sexual harassment	600
2	Management of Increase in teenage pregnancies and school drop outs amongst the youth	600
3	Management of creation of employment opportunities including women, the vulnerable and youth in the area	254
4	Management of improved sanitation, hygiene and health	2535
5	Management of gender and participation in development	617
6	Management of benefits to girl child	625
7	Management of change of scenery and land scape of the project area due to stockpiles of solid waste	938
8	Management of air pollution and increase respiratory disorders	2000
9	Management of increased risk of fire from the electrical systems	200
10	Management of unequal employment	600
11	Management of noise pollution	500
12	Management of increased waste generation	100
13	Management of water pollution and siltation	500
	TOTAL	10,069

7.2. Irreversible or unavoidable impacts

Noise – The introduction of urban uses (e.g. pumps, and other activities) within the Proposed Project site would irreversibly increase the ambient noise environment of the immediate surrounding areas, however, the level of these impacts is less than significant.

Light and Glare – There would some impacts associated with shading or artificial light and glare from roofs etc. However, these will be insignificant irreversible impacts.

Population, Housing and Employment – A local population would be established on the site. Other urban uses providing on-site employment opportunities would also be introduced, irreversibly committing part of the site to urban uses. These impacts will not be very significant. The beneficial impact on jobs/housing balance would be of long-term service to the local distribution of housing and employment uses.

Energy Consumption – The Proposed Project would result in an increase in the amount of energy resources to be committed, which would consist of hydropower electricity from the national grid. While it is anticipated that such energy consumption would not result in a

substantial demand for energy resources relative to available supply, the Proposed Project's use of energy would be essentially irreversible, but not significant over the short term.

Utilities – An essentially permanent, irreversible demand on the water supply system would be created on the site, although reduced by minimised losses through the project design features. This impact, however, would not be significant, given that project-related water use has been accounted for in the water projections.

An irreversible incremental new demand upon the town's wastewater management system would be created. However, the proposed project would not contribute to any municipal wastewater flows to any local wastewater collection and treatment system, since one does not exist at the moment. However, the increase in the amount of sludge to be pumped from septic tanks for new developments would be irreversible.

Visual Qualities – Irreversible changes to the existing aesthetic character of the proposed project site would occur due to conversion of undeveloped land to areas for the water storage tanks and treatment plant. This would result in loss of visual relief in the urban setting, but such impacts, though irreversible, would be insignificant.

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 for the Project

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
1.	ENHANCEMENT MEASURES FOR BENERFICIAL IMPACTS						
1.1.	CONSTRUCTION PHASE						
1.1.1.	Creation of employment opportunities including r women, the vulnerable and the youth in the area	Inform local communities of employment opportunities and prioritise employment of local persons that qualify	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, SRWB’s Project Supervisor	250 for lunch and transport refund for DLO and Social Welfare Officer
		Match responsibilities of the employed women, members of the vulnerable group and youth to their abilities	Roles of the vulnerable groups compared against their abilities	Review of job descriptions			
		Include on-job-orientation and training to unskilled workers	Number of labourers trained	Review of task/job reports			
		Sensitize workers with HIV and AIDS to go for medical check-ups regularly and receive HIV anti-retroviral treatment as required.	Number of times workers go for medical check-ups and receive HIV anti-retroviral treatment	Review of employee files, Interviewing the workers and supervisors, Head count,			
		Provide employment to only people who are above 18 years of age	Age of employees	Inspection, Review of sensitization report ,			
		Workers must be treated and paid fairly for the services rendered	Number of cases of unfair treatment	Inspection of pay roll records			
		Provide equal employment to women and men	Number of women employed against men				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Engage the labour department to enforce the labour laws. (For example, the certificate of completion should compel the contractor to pay all the wages to the labourers on the contract).	Number of violations of labour laws				
		Wages must be above the minimum wage and overtime must be paid on time	Amount paid as wages including for over time				
1.1.2.	Increase in trade opportunities	Pay building material suppliers within the agreed times	Time for paying suppliers	Review of procurement records	Quarterly during construction	District Commissioner, District Labour Officer (DLO), SRWB's Project Supervisor	Included in 1.1.1
		Source materials from approved licenced suppliers	Number of licenced suppliers used				
		Sensitize workers to save and invest	Number of workers sensitized and saving	Staff interviews			
		Support and promote entrepreneurship skills amongst communities and business people in the project area	Number of businesses persons supported and promoted	Interviews, Review of business statistics			
		Promote of Village Savings and Loan (VSL) schemes during project implementation	Number of SMEs joining VSL schemes	Interviews, Review of VSL records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
1.1.3.	Revenue generation for the Local Government	Employ adequate staff to maximise the collection of levies and taxes	Number of staff employed	Review of employment records	Biannually	District Monitoring, Information and Evaluation Officer (MIEO)	N/a
		Reinvest collected revenue in the development of existing facilities	Percent of revenue allocated to improvement of existing facilities	Review of revenue collection records, Interviews			
		Enforce penalties for non-payments of levies	Percentage of businesses penalised				
1.2.	OPERATION PHASE						
1.2.1.	Improved water quality and quantity	Ensure water reservoir tanks have adequate water all the time to cover for periods of no water pumping	Duration and number of times of no water supply to the consumers	Interviews, Review of water supply reports, Review of complaints of loss of water supply	Monthly	SRWB	N/a
		Sustain the desired performance of the water supply system through timely maintenance	Number of times maintenance works are conducted with respect to set dates	Review of maintenance works schedule and reports			
		Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the supply point and implement control measures where	Number of times water quality tests conducted, Reports of appropriate action when there are traces of	Review of water tests results,			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		results are below safe water standards	unwanted elements in the water				
		Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules	Number of staff with respect to the required staff; Presence and reports of following the work schedule	Review of employee records, Review of work schedules, Interviews			
		Sensitize water users on proper water management practices and payment of water bills in time	Number of times sensitizations are conducted, Number of people sensitized, Number of cases of vandalism	Review of sensitization reports, Review of reports on cases of vandalism	Quarterly		
		Prepare and implement an intake management plan	Availability and implementation of an intake management plan Quality of water at the intake	Audit of the implementation of the intake management plan Water quality tests	Quarterly for audit of the implementation of the intake management plan	Malawi Bureau of Standards (MBS), National Water Resources Authority	2,500 for lunch and transport refund and lab tests for MBS or Water Resources Authority staff

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
1.2.2.	Reduced time to fetch water	Process water connection applications and provide water to the communities as quickly as possible	Duration between application for water and the time the connection is done	Review of new water connection reports, Interviews	Quarterly	SRWB	N/a
		Ensure the recommended maximum distances of 500 metres from houses to a water point/kiosk is observed when constructing communal water points	Distance between houses to a kiosk	Site visits, Interviews			
		Facilitate and support setting up of water kiosk management committees	Availability of functional water kiosk management committee	Review of kiosks management reports			
		Ensure water is available all the time at the water points	Number of times maintenance works are conducted with respect to set dates for the works; Duration it takes to address water problems	Review of maintenance reports			
1.2.3.	Improved sanitation, hygiene and health	Sustain the desired performance of Balaka and Liwonde Water Systems;	Number of cases for water related diseases	Review of health records from Balaka and Machinga	Quarterly	SRWB, District Health Officer, Environmental Health Office	1200 for lunch and transport refund
		Conduct water quality tests at the water treatment	Number of times water quality tests	District Hospitals, Visual inspections,			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		plant, in the distribution lines and in the supply points	are conducted, Reports of appropriate action when there are traces of unwanted elements in the water, Review of water tests results	Review of water quality tests results			
		Sensitise communities on hygienic practices for handling water to avoid secondary contamination.	Number of times sensitizations and awareness meetings are conducted,	Review of sensitization reports, Interviews,			
		Promote general sanitation practices amongst communities in the project area.	Number of people sensitised, How the sanitation facilities are used				
1.2.4.	Improved socio-economic welfare in Balaka and Liwonde	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	SRWB, District Social Welfare Office, District Water Office	N/a
		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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Make water costs affordable	Cost of water compared to income levels	Review of water tariffs and social-economic profile			
1.2.5.	Enhanced gender and 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 Social Welfare Office, SRWB	N/a
		Ensure there are also women in important positions	Number of women in important positions	Review of employee records			
		Promote the involvement of women 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 District Councils Community Service Investment Programme (COMSIP)	Number of women linked to economic empowerment programmes	Review of economic empowerment programme reports			
1.2.6.	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	N/a
		Provide the necessary support to schools to ensure	Availability of adequate	Review of education statistics			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		that they have adequate resources to ensure the provision of quality of education	resources in the schools			Office, District Social Welfare Office	
		Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees	Number of deserving girls provided with bursaries				
		Provide adequate water and appropriate sanitation facilities in schools to support female students	Availability of adequate water supply and sanitation in schools				
1.2.7.	Employment opportunities	Provide equal employment opportunities to both men and women	Number of employed women against the number of men	Interview, Review of employee records	Quarterly	SRWB, District Labour Office, Department of Labour, District Social Welfare Office	N/a
		As much as possible, provide employment opportunities to the local people, particularly women, vulnerable groups and the youth.	Percentage of locals in the labour force				
		Train unskilled labour and where possible, some should be considered for employment with SRWB, especially in the areas of maintenance	Percentage of employees trained and allowed to continue to the operation and				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
			maintenance phase				
		Provide the necessary incentives to retain staff	Availability of incentives for retaining staff				
		Given-on-the-job training and refresher courses to the water supply scheme staff.	Number of staff receiving on job training				
		Observe payment for overtime, protection of the welfare of the employees and workers safety guidelines.	Number of complaints for non-payment of dues; Number of safety concerns received	Interview, Review of complaints records			
		Promote village savings and loan (VSL) schemes during project implementation	Presence of VSL groups and number of employees participating	Interview, Review of VSL records			
1.2.8.	Increased revenue generation	Sensitize institutions and households to pay bills and on time	Number of sensitizations, Percentage of paid bills and time for payment	Review of sensitization and engagement reports, Interviews, Audit of revenue collection, expenditures	Quarterly	SRWB, Southern Region Water Board	N/a
		Properly manage revenue from the water supply through good book keeping, transparency and accountability.	Availability of revenue book, Level of transparency and accountability				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Engage the community to identify project which the water board can implement as part of cooperate social responsibility	Number of engagement, Level of engagement				
		Re-invest profits in the improvement and extension of the water supply system	Percentage of profits reinvested in extension of the system				
		Regularly review water supply tariffs with consideration of the consumers to avoid overcharging.	Number of times tariffs are reviewed, Level of prices				
		Properly manage water by replacing old pipes, repairing pipes to prevent leakages and extending intake pipes to avoid abstracting polluted water	Strength of pipes in relation to leakages, Length of intake pipes	Review of maintenance records, Inspections			
1.2.9.	Increased development	Extend water supply to potential areas for development	Level of engagement between the district council and SRWB with respect to development plans and extending water supply	Review of engagement records	Quarterly	SRWB, Balaka and Machinga District Councils	N/a
		Plan development areas in consultation with the SRWB and other service providers					

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Ensure continuous and reliable water supply and adequate sanitation to the supplied areas, to attract more settlers and businesses	Percentage of time water is available and adequacy of sanitation	Review of water supply reports, Interviews, Visual inspection on sanitation			
2.	MITIGATION MEASURES FOR ADVERSE IMPACTS						
2.1.	PLANNING AND DESIGNING PHASE						
2.1.1.	Loss or destruction of land and/ or property	Emphasis should be on minimising and avoiding any potential compensation costs when selecting the sites for the tanks and routes for the pipelines	Number of Project Affected Persons (PAPs) and property in the selected sites	Visual inspection, Review of compensation schedule	Twice before commencement of construction	SRWB's project supervisor, District Commissioner and Lands Officer for Machinga and Balaka, Regional Lands Office - South	500 for lunch and transport refund for Regional Lands Officers, and District Lands Officer
		Where avoidance is not possible, identify affected households and compensate them for loss of land and other property in consultation with the Department of Lands	Signed compensation schedule including list of PAPs, their property and compensation received				
		Locate transmission and distribution lines within existing road reserves, as much as possible	Length of water transmission and distribution pipeline constructed along the road reserve against the total length	Inspection, Measurement	Twice before commencement of construction	SRWB's project supervisor, District Commissioner and Lands Officer for Balaka and Machinga	Included under 2.1.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Plan and prepare all compensations in coordination with the Balaka and Machinga District Councils Commissioners and the Department of Lands	Level of involvement of the District Commissioner in compensations	Interviews, Review of records of the compensation process		Regional Lands Office - South	
2.1.2. L	Land conflicts	Give adequate notice (one month as specified in the Water Works Act 1995) and obtain permission from land owners before commencing the civil works	Length of notice period before commencement of construction	Review of construction reports, Interviews	Once before commencement of construction	SRWB's project supervisor, District Development Planning Office, Environmental District Office	Included in 2.1.1
		Avoid disturbance of gardens during growing or harvesting seasons where possible	Number of gardens disturbed	Visual inspection	Monthly during construction of transmission pipes and tanks		1200 for lunch and transport refund
2.2.	CONSTRUCTION PHASE						
2.2.1. L	Land degradation	Ensure that vegetation is cleared and excavations are done as designed to avoid unwarranted clearance of vegetation	Size of cleared and excavated areas in respect to required space	Interviews, Visual inspections, Review of construction reports	Monthly	Contractor, SRWB, Environmental District Office	1000 for lunch and transport refund
		Avoid deposits/ piling of loose soils on sloppy ground or near drainage channels.	Slope and distance to drainage channels				
		Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation	Size of rehabilitated land in respect to affected land				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Use excavated soils to rehabilitate eroded areas	Volume of excavated soil used to eroded areas				
		Route the pipe and access roads following areas with as little vegetation as possible	Density of vegetation in areas where the pipe is constructed compared with other areas				
		Minimize the number and length of access roads and use existing roads or tracks as far as possible	Length and number of access roads, Number of areas where existing tracks are used				
		Store cement, paints, lubricants, and fuels in lined and covered areas.	Use of lined and covered areas for storage				
		Use new or fairly new construction equipment (tippers, excavators, compactors etc.), that may not easily cause oil spillages.	The number of years the construction equipment has been in use				
		Implement timely preventative maintenance of construction equipment to avoid undue oil spillages	Number of times preventive maintenance is conducted,				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		resulting from breakdown or malfunctioning	Number of breakdowns reported				
		Service construction equipment at designated service areas to effectively manage used oils and any spillages.	Number of times construction vehicles and equipment are serviced				
		Provide appropriate spill kits.	Availability of appropriate spill kits				
		Collect and dispose wastes in designated disposal sites as allocated by Balaka and Machinga District Councils	Volume of wastes are collected and disposed to designated sites in respect to the total volume of wastes				
2.2.2.	Change in natural scenery and landscape of the project area due to stockpiles of solid waste	Confine land clearing and stockpiling to the area for construction of the pipelines, access roads and water storage tanks	Size of cleared and stockpiled areas with respect to required space	Interviews, Visual inspections, Review of construction reports	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1
		Rehabilitate affected areas by planting indigenous trees and backfilling of ruminant excavation works	Size of rehabilitated area				
		Dispose rubble and all other waste material at licensed sites, in collaboration with	Volume of waste disposed at licensed site				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Balaka and Machinga District Councils					
		Store and dispose contaminated waste at appropriate designated sites approved by Balaka and Machinga District Councils					
		Recycle or re-use waste materials and containers	Volume of waste recycled or re-used				
		Level the trench spoil to original land contour	Size of land levelled to original contour				
2.2.3.	Accidents and hazards from trenches and borrow pits	Use the existing local quarry sites	Volume of quarry sourced from local quarry sites against the total volume of quarry	Interviews, Visual inspections, Review of construction reports	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1
		Get a permit for mining construction materials from Balaka and Machinga District Councils.	Presence of a permit for mining construction materials				
		Refill all borrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems	Number of borrow pits rehabilitated				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Barricade 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 installation of storage tanks and pipelines and follow recommended procedures	Number of hours a supervisor is on site				
2.2.4.	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, Interview	Monthly	Contractor, SRWB, District Water Office	1,200 for lunch and transport refund for district water officer
		Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate	Availability of alternative means of supplying water				
2.2.5.	Water pollution and siltation	Obtain licences from the water authority to abstract water and discharge wastewater	Presence of a water and waste water discharge permit	Review of permit	Once	Contractor, SRWB, District Water Office	Included in 2.2.4
		Sell used oils to Raiply and ESCOM to be used for treating timber.	Volume of used oil sold	Review of construction reports	Monthly	Contractor, SRWB,	

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Mix cement in areas, which are not connected to natural drainage systems.	Distance to natural drainage of areas for cement and paint mixing	Visual inspection, Interview, Measurement of distance		Environmental District Office	
Store cement, paints, lubricants, and fuels in lined and covered areas.	Presence and size of cover and surface lining						
Provide appropriate spill kits when working near water courses.	Availability (and number) of spill kit						
Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water.	Availability of facilities used for disposing and collecting of wastes						
Site all material storage areas at least 10m from watercourses.	Distance between storage area and watercourse						
Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses	Presence of and size of barrier separating work site and water resources						
2.2.6.	Air quality degradation/ increase respiratory disorders	Use new or fairly new vehicular equipment with exhaust gas emissions within permissible emission limit	Number of years equipment has been in use, Level of emissions from equipment	Review of procurement records, Inspection, Interviews	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		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			
		Apply water sprays when dust is being generated or at times of strong wind.	Number of times the site is sprayed with water to control dust, Dust complaints	Interviews, Inspection			
		Provide protective gear (dust masks) to workers and ensure that they wear them.	Reports of use of protective gear during dust generating activities	Interviews, Inspections			
		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	Visual inspection			
		Store and handle sand and cement properly to limit dust generation	Reports of proper handling and storage of sand and cement				
		Optimize transportation management to avoid needless truck drives.	Number or errands for vehicles per day	Review of vehicle logs			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Control vehicle speeds	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			
		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			
2.2.7.	Loss or destruction of habitats for fauna and aquatic life	Ensure that vegetation is cleared and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation;	Size of cleared and excavated areas compared to required space	Visual inspection, Measurement	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1
		Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees and grass immediately after construction works to ensure restoration of lost flora.	Size of rehabilitated land				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Ensure that construction vehicles and plant i.e. tippers, excavators, compactors etc. use only designated access roads to avoid soils degradation outside construction areas.	Access roads used by vehicles and plant machinery				
2.2.8.	Loss of vegetation	Limit vegetation clearing and excavations to only those areas specified in the designs	Size of cleared areas in relation to required space	Inspection, measurement	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1
		Plant appropriate trees and grasses in all disturbed areas.	Size of affected area planted with trees and grass				
		All the trees to be cut down during construction should be costed and appropriately compensated for.	Number of workers sensitized, Sites of conserved vegetation	Review of sensitization reports			
		Ensure that for every single tree to be cut down, 10 tree seedlings of a similar species should be planted in the adjacent areas.	Number of seedlings planted in adjacent areas	Inspection, Counting			
		Use cement bricks/ blocks for construction, where appropriate.	Size of area constructed using cement blocks	Inspection, Measurement			
		Train VNRMCs and other committees in catchment management and	Number of people in VNRMC and other committee	Review of training reports, Review of by-laws			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		developing bye-laws and management plan agreements	trained; Presence of by-laws				
		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	Inspection, Measurement			
		Sensitize employees and the community to conserve vegetation	Number of employee and community sensitized	Review of sensitization reports			
		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	Interview			
2.2.9.	Occupational incidents and accidents	Induct workers on OSH requirements and repeat reminders on the same	Number of workers inducted and reports of reminders	Review of OSH induction records	Quarterly	Contractor, District Labour Office, SRWB	Included in 1.1.1
		Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of practice for various tasks are	Presence of an OSH expert	Review of human resources records, Inspection			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		followed by workers at all times.					
		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			
2.2.10.	Noise pollution	Provision of noise ear plugs/tags to workers that will be involved in noisy work environments and to ensure that the PPEs are in use at all times.	Number of workers provided and using appropriate PPEs	Inspection, head count	Quarterly	Contractor, District Labour Office, SRWB	Included in 1.1.1
2.2.11.	Increase in sexual relationships, unplanned pregnancies breaking up of families and sexual harassment	Sensitise communities on the disadvantages of indulging in extra-marital affairs	Number of sensitization meetings conducted	Review of sensitization records/minutes, Review of human resources records	Quarterly	Contractor, SRWB, District Social Welfare Office	1000 for lunch and transport refund
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.		Number of people sensitized, Number of reports of extra marital affairs					
Enforce punitive and disciplinary measures, including dismissal from		Number of workers disciplined for engaging in					

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		employment, on any project workers involved in illicit sex with school going girls.	illicit sex with school going girls				
		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			
		Create a good work environment to allow female workers report any case of harassment	Availability of a good work environment, Number of harassment reports received	Interviews, Review of human resources records			
2.2.12.	Increase in prevalence of sexually transmitted infections (STIs), including HIV/ AIDS	Sensitise workers and surrounding communities on the dangers of indulging in unprotected sex.	Number of times sensitization meetings held	Review of sensitisation minutes	Quarterly	Contractor, SRWB, Environmental District Office, District Health Offices	500 for lunch and transport refund for EDO and DHO
		Conduct HIV and AIDs sensitization and give lighter tasks to those with the virus or other health problems.	Number of HIV/AIDs sensitization campaigns conducted; Tasks assigned compared against their abilities	Review of sensitisation minutes, Review of employee files for job descriptions			
		Provide both male and female condoms to workers for appropriate use	Number of condoms provided, Number of	Interviews, Review of procurement records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
			employees accessing condoms				
2.2.13.	Unequal employment	Encourage the contractor to employ women as well	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	Included in 1.1.1
		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 Council's Community Service Investment Programme (COMSIP)	Number of women linked to COMSIP	Review of COMSIP records			
2.3.	DEMOBILIZATION PHASE						
2.3.1.	Loss of jobs due to completion of construction works	Provide alternative employment to employees e.g. as maintenance staff	Number of employees allowed to continue working	Review of the employee register	Once during the demobilization phase	Contractor, SRWB, District Labour Officer	50 for lunch and transport refund
		Provide adequate notice to employees to prepare	The notice period before layoffs	Interviews, Review of employee files			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		themselves and secure alternative employment					
		Pay severance benefits to leaving workers in line with the labour regulations	Number of labourers to have received severance pay and amounts	Interviews, Review of severance pay records			
		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			
		Sensitize the business persons to diversify and find alternative markets	Reports of business diversification and opening of new markets	Interviews			
2.3.2.	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 demobilization phase	Contractor, SRWB, Environmental District Officer	Included in 2.3.1
		Rehabilitate all work site	Size of area that is rehabilitated after construction				
		Construction materials e.g. sand and clay soils should be sourced from licensed suppliers	Type of suppliers used for construction materials				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Avoid making deep pits during the construction period	Size of pits				
2.4.	OPERATION PHASE						
2.4.1	Increased pollution from wastewater and sludge	Enforce proper excreta and wastewater management	Evidence of proper waste management	Inspections	Quarterly	SRWB, Environmental District Office, District Health Office	N/A (To be done as part of their duties)
		Apply lime treatment to dewatered sludge to suppress pathogens and remove odour	Number of times quicklime is used to treat sludge	Interviews			
		Use licensed liquid waste handlers.	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 (USD)/Year
2.3.3.	Increased risk of water contamination	Mend broken water pipes as quickly as possible	Duration broken pipes are left unrepaired	Review of water supply records	Quarterly	SRWB, Environmental District Office, District Water Office	N/A (To be done as part of their duties)
		Follow recommended guidelines for distances that must be maintained between liquid waste disposal facilities and water pipes	Distance between liquid waste disposal system and water pipes	Visual inspection			
		Repair malfunctioning human waste disposal facilities such as excreta disposal pipes, septic tanks and soakway pits as quickly as possible	Number of repaired human waste disposal facilities	Review of maintenance records			
		Move the water intake pipe as far into the lake as possible.	Length of intake pipes into the lake	Visual inspection	Once after commissioning of the upgraded water supply system	District Water Office	N/A (To be done as part of their duties)
2.3.4.	Increased risk of fire from the electrical systems	Ensure appropriate and approved electrical installations and equipment	Quality of installation and equipment	Inspections, Review of suppliers	Quarterly	SRWB, Environmental District Office, District Labour Office	
		Design and implement an emergency response plan.	Presence of an emergency response plan, Number of staff aware of, and able to use the plan	Review of the emergency response plan			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Install fire hydrants within the proposed development	Presence of a functioning fire hydrants	Inspection			
		Regularly monitor and maintain the water supply system.	Number of times the water supply system is monitored and repair works are conducted	Review of monitoring and maintenance reports			
		Install a fire extinguisher at the plant and train workers on how use.	Presence of a fire extinguisher	Inspection			
2.3.5.	Increased incidences of pipe bursts in the high-pressure pipes	Use the right sized pipes	Size of pipes against the pressure	Visual inspections, Interview	Quarterly	SRWB, Environmental District Office, District Water Office	N/A (To be done as part of their duties)
		Replace old pipes with new ones	Strength of pipes				
2.3.6	Increased chances of theft and vandalism due to increased size of infrastructure	<ul style="list-style-type: none"> 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. Support activities of the neighbourhood watch 	Missing equipment and units	Visual inspections, Interview	Through the operation period	SRWB	N/A (To be done as part of their duties)

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		<p>(community policing) e.g. through provision of torches, uniforms and shoes.</p> <ul style="list-style-type: none"> • 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. <p>Include the people from the local area in the work force.</p>					

8.2. SUMMARY OF COSTS FOR IMPLEMENTING THE MONITORING PLAN

The costs in the Environmental and Social Monitoring Plan have been summarised and presented in Table 8.2. The table has columns for activity, the cost for implementing the activity per year (as indicated in the ESMP and monitoring plan). The total cost is established as 9,350.00 USD per year (Nine thousand three hundred and fifty United States Dollars). The Southern Region Water Board and stakeholders must ensure that the funds are available to ensure effective implementation of this monitoring plan.

Table 8. 2: Summary of the costs for implementing the monitoring plan

No	Activity	Cost in USD per year
1	Monitoring of employment related impacts including occupational health and safety	250
2	Monitoring improved water quality and quantity	2,500.00
3	Monitoring improved sanitation, hygiene and health; Reduction in sanitation related diseases and infant/child mortality rates	1,200.00
4	Monitoring loss or destruction of land and/ or property; High compensation costs	500
5	Monitoring on biophysical components, flora and fauna	1,200.00
6	Monitoring disruption of water supply; Water pollution and siltation;	1,200.00
7	Monitoring increase in sexual relationships, unplanned pregnancies breaking up of families and sexual harassment; Increase in teenage pregnancies and school drop outs amongst the youth	1000
8	Monitoring Land degradation	1000
9	Monitoring increase in prevalence of sexually transmitted infections (STIs), including HIV/AIDS;	500
	TOTAL	9,350.00

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 and will proceed until the finalization of the ESIA report, which will follow the baseline report. This chapter documents the approach to the consultations, objectives and a summary the consultation outcome for preparation of both the baseline report as well as the ESIA

9.1. OBJECTIVES OF THE PUBLIC CONSULTATIONS

During the ESIA studies, broad consultations involving officials from the Southern Region Water Board, the Regional and District members of staff from the Ministry of Agriculture 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 Balaka - Liwonde 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 SRWB 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 Balaka and Machinga District Councils .
- 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 contractor 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 contractor 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 contractor 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 contractor'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 Balaka - Liwonde Water Supply System. The Project is beneficial as it will help the Southern 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 Southern 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 SRWB 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 SRWB and how it calculates water tariffs, the SRWB must conduct adequate sensitization on water supply pricing and management.
- f) SRWB 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) SRWB 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 (excluding juveniles) must be prioritised to encourage community ownership and sustainability of the project.

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APPENDICES

APPENDIX 1: TERMS OF REFERENCE



THE REPUBLIC OF MALAWI

SOUTHERN REGION WATER BOARD

DETAILED TERMS OF REFERENCE

FOR

ENVIRONMENTAL IMPACT ASSESSMENTS: EXTENSION OF MANGOCHI POTABLE WATER SUPPLY PROJECT; AND UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN PROJECT

INTRODUCTION

The Southern Region Water Board (SRWB) was created in 1996 under the Water Works Act (Cap.72:01) of the Laws of Malawi with financing from the World Bank under the National Water Development Project I (NWDP). The Board was created from the District Water Supply Fund which was under the Department of Water Supplies.

The Southern Region Water Board is divided into five management zones which include Zomba Zone covering Zomba, Kuchawe, Domasi, Namadzi, Chiradzulu, Mwanza and Neno; Liwonde Zone that include Machinga, Liwonde and Balaka; Mangochi Zone covering Mangochi, Monkey-Bay and Namwera; Mulanje Zone that include Thyolo, Mulanje, Luchenza, Muloza, Phalombe, MUST and Mikolongwe; and finally Ngabu Zone covering Chikwawa, Nchalo, Ngabu, Bangula and Nsanje.

The then newly created Southern Region Water Board had a lot of deficiencies spanning from poor infrastructure, inadequate operating resources and poorly trained human resource, conditions not conducive for an organisation which was supposed to be financially sustainable and economically viable.

In order to set up the then newly created Water Board into a business environment that would be financially viable, the World Bank, under the National Water Development Project I, financed a lot of investments. These investments included construction works for example:

Zomba Water Supply Project and Rehabilitation of Eight Water Supply Schemes; consultancies aimed at strengthening the capacity of the Board such as Operation Efficiency, Review of Business Plans and Review of Financial Management and Accounting Systems; procurements of goods and equipment such as vehicles and computers that would enable the Board to kick-start its business operations; and trainings for members of staff of the Board.

National Water Development Project II followed. The project apart from International Development Association (IDA) had other development partners like European Investment Bank (EIB), JICA, OPEC Fund, AusAid and ADB.

SRWB implemented a number of projects under NWDP II which included Upgrading of Zomba and Mangochi Water Supply Project, Upgrading and extension of Nsanje Water Supply Project, upgrading of Balaka water supply project, establishment of Neno Water Supply Project; feasibility studies for Mwanza and Chiradzulu Surface Water Sources and sanitation studies for Balaka, Mwanza and Mulanje.

Under Mangochi Project, SRWB constructed a new conventional water treatment plant, increased storage facilities, improved the intake structure and upgraded transmission and distribution networks. The Board had plans to extend to Lakeshore areas up to Ntakataka Turn-Off. The plans failed to materialize due to financial constraints. In order to meet the water supply deficiencies under the NWDP II for Mangochi Town and the Surrounding areas, the Board prepared a proposal for the Extension of Mangochi Potable Water System Project. The objective of the project is to extend to water supply system at Mangochi Town to the Lakeshore areas. Following the preparation of the proposal and its sharing with potential financiers, the Board through Malawi Government has identified Kuwait Fund as a financier for this Project.

Liwonde Town benefited from District Water Supply III Project in year 2000. The project was designed for year 2010. It has since outlived its design life hence the Town is experiencing water shortages due to high population growth rate. Meanwhile, the Board buys over 85 percent of its water at Balaka Town from Mpira-Balaka Trust whose source is Mpira Dam which supplies other rural areas. The remaining 15 percent is complemented by motorized boreholes. The Mpira water source has become so unreliable due to increase in populations being served by it and also climatic change challenges. The Dam has completely dried up by July 2018 with no single drop of water being supplied from the Dam. SRWB through the Government of Malawi is in the process of identifying financing from European Investment Bank (EIB) to finance upgrading and extension of the system at Liwonde to cover supply to Balaka Town..

SRWB is in the process of implementing these projects. As a requirement from the Department responsible for environmental issues, the Board is intending to engage an individual consultant to evaluate both positive and negative environmental and social impacts of these proposed projects.

OBJECTIVE OF THE ASSIGNMENT

The overall objective of the assignment is to carry out an environmental and social impact assessment for both Extension of Mangochi Potable Water and Upgrading of Liwonde Water Supply System to include Balaka projects.

SCOPE OF THE ASSIGNMENT

The Consultant is required to utilize all relevant available information to carry out comprehensive environmental and social impact assessments for the presented projects. Detailed scope has been outlined in this section.

Project Area

Extension of Mangochi Potable Water Supply Project

The area for the project falls within Mangochi District and will extend from Mangochi Town to Ntakataka Turn-Off. It stretches approximately 50km north of Mangochi Town.

Upgrading and Extension of Liwonde Water Supply to Cover Balaka Town Project

The Liwonde Project will cover Liwonde Town and its surrounding area which are under current and future settlement zones and will stretch a distance of about 30km to Balaka Town.

Detailed Tasks

For each of the project, that is, Extension of Mangochi Potable Water Supply Project and the Upgrading and Extension of Liwonde Water Supply to include Balaka Project, the Consultants shall carry out the following activities whose results shall be presented into two separate reports/volumes as outlined in Section 4 below:

Provide a full description of the nature of the project with respect to the name of the proponent, the postal and physical address, the spatial location with respect to natural resources and human settlement of the project site, the estimated project cost, size of land for the project site, resource requirements (raw materials, equipment), the number of people to be employed for all operations (provide a breakdown of males and females, locals and non-locals), number of people to be residing on the project area, waste disposal and access roads.

Provide a site-specific visible map of the area (Scale 1:50,000) showing the proposed sites and (1: 10,000) showing existing establishments in the proposed area and surrounding areas. A site plan for the project should be provided. All maps should be in color to portray the themes clearly.

Describe main activities to be undertaken in implementation of the proposed project at the site covering pre-construction, construction and operation phase. In the description include the type of machinery to be used, nature and quantity of wastes that will be generated, facilities for appropriate waste disposal, and management of waste and estimated costs for the activities.

State the reason for selecting the proposed site of the project as opposed to other sites. Consider alternatives to the project, such as alternative sites and the reason for selecting the preferred option including the 'no project' alternative. The EIA should also consider 'within – project' alternatives e.g. designs, technology etc.

Provide a concise description of the existing biophysical characteristics and the socio-economic environment status of the proposed area by identifying and analyzing:

Physical conditions: soil, geology, site topography, temperature, rainfall patterns and drainage system (water courses);

Biological Resources: scope of vegetative resources of the project area including riparian vegetation, extent of terrestrial and aquatic fauna;

Socio-economic conditions: demographic trend within and around the project area, main land uses, agriculture and marketing, business activities, basic infrastructure and health situation including HIV/AIDS prevalence rates; and

Any changes anticipated during implementation of the project area.

Describe the major activities to be undertaken for the construction and operation of the proposed project. Identify the main construction and operation activities of the project including the construction of the Septic tanks, installation of pipelines, digging of trenches etc. Provide a full description of the nature and quantity of wastes to be generated, the facility for appropriate disposal and management of waste and the equipment to be used. Identify the potential short and long term environmental impacts associated with the proposed project, focusing on both the positive and negative effects as well as the effects to the biophysical, social, economic and cultural components of the environment. The potential impacts must include those related to:

Project location (e.g. loss of forest reserves, loss of agricultural land, impact on flora and fauna, impact on cultural site, impact of water resource abstraction in terms of available quantities of water for other upstream and downstream users and water quality and resettlement of people);

Project construction (e.g. soil erosion, disposal of construction spoils);

Project operation (conflict of use, waste management related to septic tanks, communal water points etc).

Prescribe the measures to eliminate, reduce or mitigate the negative effects identified and the measures to enhance the positive effects.

Propose an Environmental Management Plan by which all of the measures prescribed above, will be carried out. Indicate the budget for the recommended mitigation measures, specifications of who will be responsible for these measures and the schedule when these measures will take place during construction and operation of the project.

Propose an Environmental Management and Monitoring Plan by which all mitigation measures recommended in Environmental Management Plan will be monitored. The plan

should include the activities, frequency of monitoring, the key monitoring indicators, resources required and the authorities responsible for monitoring the exercises. Provide an account of all regulatory licenses and approvals obtained for the proposed project to ensure that they are in line with sound environmental management practices and are in compliance with relevant existing legislation. Describe pertinent legislation and policies pertaining to the project and their implications on the project. Reference should at least be made but not limited to the Environment Management Act, Forestry Act, Water Resources Act, National Water Policy, National Environment Policy, Malawi National Land Policy, Malawi Development and Growth Strategy, Occupational Safety, Health and Welfare Act, Mine Act and other relevant policies and piece of legislation.

Undertake stakeholders' consultations to ensure key interested and affected stakeholders are involved in the Environmental Impact Assessment process. Incorporate their views in the report and indicate a record of consultations in the appendices parts of the report. Only senior officers should be consulted.

The preparation, presentation and structure of the EIA report should follow the format in the Guidelines of Environmental Impact Assessment for Malawi (1997) and the Guidelines for Environmental Impact Assessment (EIA) for projects in Land Developments, Housing and Human Settlement Sector.

Assess Trans-boundary impacts of the projects on downstream countries according to 1991 Espoo Convention on Environmental Impact in a Trans-boundary Context.

Submit 10 hard copies for each project and two soft copies of the EIA report to the Director of Environmental Affairs.

Provide the names of the EIA Team and their respective fields including Environmental and Social Experts.

DELIVERABLES

The consultant shall submit to the Client ten hard copies including a soft copy in a flash disk containing copies of all word, excel, AutoCAD or other similar files used in compiling the report. The expected reports shall be:-

Inception Report for both projects

Draft ESIA report for each project

Final ESIA report for each project

TIME FRAME

This assignment shall be carried out with a maximum duration of 8 weeks.

Inception report second week after contract signing;

ESIA draft report by fifth week after contract signing;

ESIA final report by the seventh week after contracting;

After completion of the review of the draft ESIA, including consultations with communities on the main findings, a final ESIA will be disclosed by the implementing agency. During the review process, the Consultant is expected to make the necessary changes and organize the disclosure and consultation process.

REQUIRED EXPERTISE AND QUALIFICATION

Qualification of Experts

The Consultant shall be an independent, hired on a competitive basis, and will not be connected to the design of the project, or the Contractor, or any other entity assuming a role which might cause a conflict of interest situation. He/she shall have wide experience in the preparation of ESIA for water supply projects

Environmental Expert:

The Environmental Expert shall at least have a Master's Degree in Environmental Management or Environmental Engineering and at least 15 years relevant professional experience in carrying out environmental impact assessment on water supply and sanitation infrastructure projects. Experience in project planning and wastes disposal in the water supply and sanitation sector will be an added advantage. Work experience in the African Region is mandatory.

Socio-Scientist:

The socio scientist shall have at least MSc. in Social Studies, or Rural and Social Development or related discipline with ten [10] years professional experience in conducting ESIA in water supply systems.

Water Supply Engineer:

The water supply engineer shall be a professional water engineer and have at least a MSc in Civil Engineering or Water Supply and ten [10] years professional experience in carrying out similar assignments.

LOGISTICAL ARRANGEMENTS

Consultant's Responsibilities

The consultant shall:

Provide own work space and materials such as vehicles, computers and any other equipment required for the assignment.

Settle own logistical expenses for attending scheduled meetings and/or workshops (daily subsistence allowance, accommodation and transport).

Pay local taxes and duties for all goods and services including levies during execution of the project. The Consultant is therefore expected to liaise with Tax Authorities (Malawi Revenue Authority), NCIC, Town Planning and District Assemblies in this respect.

Source relevant documents and any information required from various authorities. The Client shall make available all relevant reports in its custody.

Client's Responsibilities

The Client shall facilitate the sourcing of relevant documentation and information within key sectors as and when needed by the Consultant in pursuing the tasks under these Terms of Reference.

The Client shall also pay for meetings/workshop expenses including venue, subsistence and transport for participants in accordance with Project Implementation Guidelines.

Reporting Arrangement

The consultant shall prepare and submit progress reports, draft report and a comprehensive EIA report to the Chief Executive Officer through the Director of Operations.

PROPOSAL REQUIREMENTS

Selection Process

Prospective consultants shall be required to undergo a two-stage selection process involving (a) Submission of Expression of Interest (EoI) to conduct the assignment and (b) Submission of Technical and Financial Proposal by successful Consultant.

Proposal Formats

Expression of Interest

The EoI to be submitted by the Consultant shall comprise the following:

A letter of intent to carry out the assignment;

A brief introduction including the consultant’s understanding of the assignment in terms of the objectives, tasks and core responsibilities;

Capability statement elaborating how the consultant meets the selection criteria (requisite qualifications and work experience stated in the ToRs); and

Updated and signed CVs of core Team members.

Technical Proposal

The technical proposal should demonstrate how the applicant meets the selection criteria, the Consultant’s understanding of the assignment, proposed approach/methodology, a detailed tentative time frame for undertaking the assignment and updated and signed CVs of the Team Leader and the other core members of the Team.

Financial Proposal

The financial proposal should contain the total contract sum proposed by Consultant for the services to be rendered in Malawi Kwacha (MK). The budget should be broken down in the three main categories as presented in Table 1.

Table 1. Categories for Budget Breakdown

Category	Brief description of contents
Consultancy Fees	Total fees payable to the Consultant based on the applicable rates for the person-days the Consultant is to work on the assignment.
Living Allowance	Daily subsistence and/or accommodation expenses based on the anticipated number of days or nights to be spent outside normal working location to work on this particular assignment.
Operational Expenses	All other operational expenses including travel, stationery and communication as determined by the Consultant should be clearly stated.

Type of Contract

This shall be a lump sum contract where payments shall be made upon delivery of the expected output and/or deliverables as specified in the ToRs. The following payment schedule shall be used in accordance with timelines for delivery of each of the key deliverables (Table 2).

Table 2. Timeline for key deliverables and payment schedule for key deliverables

No.	Deliverable	Payment (%) upon deliverable
1	Upon approval of inception report	20
2	Upon approval of draft EIA report	30
3	Upon approval of final EIA report	50

SELECTION CRITERIA

In selecting the best candidate for the assignment, the Client shall pay particular attention to the following criteria:

No.	Selection Criteria	Weight Applicable (%)
1	General qualifications	10
2	Adequacy of the Technical Proposal demonstrating Consultant's understanding of the assignment and appropriate methodology	40
3	Experience of work in Africa or Southern Africa	5
4	Key Professional Staff	45
	TOTAL	100

SUBMISSION

Expressions of interest and proposals shall be delivered in a written form to the Chief executive officer (Attention: The Procurement Manager) in person or by post before the set deadlines¹ as follows:

Deadline for submission of EoIs:

Deadline for submission of Full Proposals:

The bid documents must be clearly marked "Expression of Interest/Technical Proposal/Financial Proposal (whichever the case may be) for Environmental and Social Impact Assessment of the Extension of Mangochi Potable Water Supply and Upgrading and Extension of Liwonde Supply System to include Balaka Town.

Physical Address

Southern Regional Water Board,
Off-Namiwawa Road,
Near Police Training College,
Zomba, Malawi.

Postal Address:

Private Bag 72
Zomba,
Malawi.

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 Recommend mitigation measures to the project impacts

Name	Proposed Position and Qualification	Task Assigned
		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

Peter Kafatia – 1 year ESIA experience

APPENDIX 4: SELECTED CONSULTATION OUTCOMES

Date	31 July 2019			
Place	Balaka District Council			
Participants	Interviewee: Karol Nyalugwe, Community Development Officer Interviewer: Peter Kafatia, WWEC			
Discussion	Views from the Department of Community Development, at district level regarding the proposed extension works for Balaka Town Potable Water Supply. The discussion focused on obtaining input from the Community development officer regarding how the proposed project should be conducted such that positive impacts are enhanced and that negative impacts are avoided and mitigated.			
Issues				
<p>Key points to note from the interview are as follows:</p> <p>The officer heard about the project through hearsay, but this is the first time he is officially told about the project.</p> <p>Balaka Town being a very dry area in Malawi, currently relies on potable water supplied from Mpira, Dedza. The source has adequate during the rainy season (late November/December through March), but the area is arid during the dry season (July through November) as the dam levels drop. The surrounding communities, however, do not get adequate water supply all year round. Instead, these communities rely on boreholes for water supply.</p> <p>The officer stated that he/she was not actively involved during planning and design phases of the project, but anticipates involvement in the latter phases of the project.</p> <p>The following is the active/planned project in Balaka District that the interviewee is aware of: Blue water contractor: Project to install pumps in boreholes to supply waterlines from Mpira for the Town of Balaka. Current status of the project unknown, though the water supply is still inadequate to the town and surrounding communities.</p> <p>Improved potable water supply will have a positive impact on the economic growth as the population growth rate in Balaka town is growing rapidly, and is in need of increased and reliable supply of potable water.</p> <p>Below is the status of the listed components per the interviewee:</p>				
<u>COMPONENT</u>		<u>STATUS (IMPROVING/ WORSENING)</u>	<u>CAUSE</u>	<u>SUGGESTION(S) TO TACKLE THE PROBLEM</u>
1.	HIV/AIDS	Improving	Improved communication between communities and District leadership	Continual means to communicate and educate communities
2.	Agriculture	Worsening	Inadequate harvest and political influence	Improved community leadership engagement by the District leadership.

				Communities should be self-reliant and should not rely on the Government and NGO's to always provide aid .
3.	Population	Worsening - Higher birth-rate	Perspective on having larger families; most prefer having larger families even though they are not well equipped or even financially capable of sustaining their families	District leadership should improve civic education on the management of families (family planning)
4.	Agriculture and Marketing	Worsening	Vendors take advantage of desperate farmers and buy their harvest at very low cost and then resell at high prices.	Sensitize community members who rely on farming outputs to earn a living. Local and national government should better regulate markets to ensure that farmers are not taken advantage of and that resell prices by vendors are not cost prohibitive.
5.	Gender issues	Improving	Presence of NGO's focusing their efforts on gender issues.	Increase awareness and continual sharing of knowledge.
6.	Energy	Improving at a slow rate	Use of very inefficient means i.e. make-shift stoves.	Continue to train communities to manufacture more efficient stoves and to use renewable sources of energy.
7.	Water Supply	Worsening	Source is insufficient	Provide water from a more reliable and sufficient source e.g. The Shire river.
8.	Sanitation and Hygiene	Improving	Community sensitization; WASH meetings	Improve water supply
9.	Waste	Improving	Use of waste facility	Improve disposal sites. Segregate liquid from solid

				waste. Also protect sites.
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Below is a table listing the likely negative environmental and social impacts the project might cause:

<u>NEGATIVE IMPACT</u>		<u>SUGGESTED MEASURE TO AVOID IMPACT</u>	<u>SUGGESTED MEASURES TO HELP MITIGATE NEGATIVE IMPACTS</u>
1.	Wasteful/Improper use of water	Ensure sensitization and education of community members on the conservation of water is performed prior to the completion of the project	Sensitize and educate community members on the conservation of water
2.	Spread of HIV and AIDS	Sensitize and educate locals, the project team and travelling workers prior to the start of the project	Provide protective measures such as condoms and contraceptives to communities.

The interviewee anticipates that young girls and women are most likely to be negatively impacted as they are prone to be exploited by project workers.

On the contrary, the interviewee anticipates all members of a household to benefit most from the implementation of this project.

Conflicts may arise between the community and the contractor or/SRWB during the implementation of the project. The following are the conflicts and suggestions for solving them.

Employment Opportunities: Not hiring locals will likely lead to conflicts with the project team and client. Therefore, it is important to prioritize local skilled and non-skilled workers before sourcing from elsewhere.

Loss of property: Affected members of communities will need to be adequately compensated or offered other means of restoring and improving their livelihoods. Also, where possible, the project should at all costs avoid affecting the property of locals.

Conflict resolution involvement:

Yes, part of the Grievance Management Committee

Actively involved in the resolution of conflicts and sensitizing communities.

Part of a conflict resolution team (ACB). This team was formed this year.

Have a large stake in Gender-based violence related conflicts in the district.

Date	2 August, 2019
Place	Education Department-Machinga District
Participants	Prisca Malenga (WWEC – Consultant)
Discussion	Issues and concerns on the project; Information on education and how the project will affect the education department

Issues

The project is a good initiative as it will help provide safe water to people and schools will have access to the water supply.

Causes of dropouts in schools include;

Distances to and from school.

Inadequate teachers, learning materials and infrastructure.

Hunger, however, there are school feeding programs in some schools which have resulted in an increase in attendance rate.

Adequate water will be available for most activities that are carried out at the school such as preparing porridge (feeding program). Sometimes water is not available because of frequent breaking down of boreholes. This affects the feeding program which inevitably affects the attendance rate of children.

Improvement in menstrual hygiene was also mentioned as one of the positive impacts of the project. When they have their menses, some girls are absent from school due to the lack of quality menstrual hygiene services including water at different schools.

Date	30 July 2019
Place	Balaka District Council Offices, Balaka Town
Participants	Interviewee: Mr. Alex Makwinja, Assistant District Water Officer Interviewer: Mr. Mazaza Mwafurirwa for WWEC
Discussion	Views from the Department of water supply (at district level) regarding the proposed project to upgrade and expand the Liwonde Water Supply system to supply to some major trading centres in Balaka including Balaka Town itself. The discussion focused on obtaining input from the district water supply development office regarding how the proposed project (which will largely be implemented within Balaka District) should be done to ensure that there is maximum positive impact of the project to the target beneficiaries.
Issues	<p>Key points to note from the interview were as follows:</p> <p>It was the first time that district water development office was officially hearing about this proposed project to expand the Liwonde water supply system to reach all the way to Balaka Town.</p> <p>It was mentioned by the Assistant DWO that as an office, they run the Mpira-Balaka piped water scheme through the Mpira-Balaka Water User Association. This piped water scheme was initially meant to supply the rural areas parts of Ntcheu, Balaka, Neno and Mangochi districts, which has a supply area of about 1,900 km². Nevertheless, due to challenges to access potable water, the scheme is supplying urban areas including Balaka Town. Further, the SRWB is buying water from the Mpira-Balaka WUA and selling it to the people in Balaka Town.</p> <p>According to the Assistant DWO, the Mpira-Balaka piped water scheme is currently failing to effectively supply water to its beneficiaries due to a wide number of factors ranging from encroachment of intake catchment area, friction of policies between authorities in the water, agriculture and forestry sectors as well as political interference, where supply of water has been extended to more people contrary to the capacity of the limited resource.</p>

Furthermore, the Assistant DWO indicated that the current problems with the Mpira-Balaka piped water scheme are evident in the current frequent water supply interruptions to customers; which is the source of the customers' unwillingness to pay for the supplied water. The Assistant DWO noted that the problem with the scheme is retrievable if the source dam for the scheme is rehabilitated and mitigation measures are put in place to restrict the encroachment as well as to reduce soil erosion and dam siltation.

In addition, the Assistant DWO stated that good coordination between the relevant government authorities concerning the management of the Mpira-Balaka piped water scheme, could help effectively implement the mitigation measures and ensure that the scheme is revived.

With regard to the proposed project by the SRWB to supply water to Balaka Town from the Liwonde water supply system, the Assistant DWO is of the view that the project would very helpful because it will supply more potable water to the Balaka Town and will relieve the pressure that is on the Mpira-Balaka Scheme to supply water to both rural and urban areas. The expectation on his part is that once the SRWB project is implemented, it will solve the problems of water shortage the town of Balaka is currently facing. Accordingly, this will stop the feelings of shame felt by the district water office workers within their communities as they are being accused of being responsible for the water woes the town is experiencing. With the coming of this SRWB project, the Assistant DWO's other expectation is that the water from the Mpira-Balaka Scheme will now be freed to supply the rural areas (and not the urban area of Balaka Town) as it was initially intended.

Although, the Assistant DWO expects that more than 75% of the impacts from the proposed SRWB project will be positive, he also foresees some possible negative impacts. Such as probable conflicts on land/property losses, damage to the natural environment as well as spread of sexually transmitted infections from migratory workers. His advice to the developer would be that if there are any issues of compensation for loss of property and livelihoods, these should be well handled prior to commencement of the project.

Date	31 July 2019
Place	Balaka District Council Offices, Balaka Town
Participants	Interviewee: Ms. Violet Kamasumbi, District Lands Officer Interviewer: Mr. Mazaza Mwafulirwa for WWEC
Discussion	Views from the Department of Lands (at district level) regarding the proposed project to upgrade and expand the Liwonde Water Supply system to supply to some major trading centres in Balaka including Balaka Town itself. The discussion focused on obtaining input from the district lands office regarding how the proposed project (which will largely be implemented within Balaka District) should be done to ensure that there is maximum positive impact of the project to the target beneficiaries.
Issues	Key points to note from the interview were as follows: This was the first time that the district lands office officially heard about this proposed SRWB project to expand the Liwonde water supply system to reach all the way to Balaka Town. Nevertheless as a district lands officer, she is aware that in the newly developed district development plan, the district office put forth a request for more initiatives to help solve the

challenge of inadequate potable water. Among those requested initiatives was the idea to tap water from the Shire River at Liwonde and pipe it to the areas of Balaka District. On this proposed SRWB project, the lands officer is advising that issues of community sensitizations and compensations for loss of property (which is likely to occur) should be well prioritized to avoid or minimise possible disturbances to the project. She recommended that the best time to make assessments and recompenses for property to be affected, will be in the dry months of the year, where there are no crops grown by the people. The crops normally tend to make the compensations more expensive for the developer.

She also pointed out that there is a looming project by the National Roads Authority (NRA) in the near future to upgrade the Balaka-Liwonde Road along which the proposed distribution main line by the SRWB project will be made to pass. She indicated that assessments for property to be affected by the project to upgrade the Balaka-Liwonde Road were already done. She also clarified that in a case where the Roads Authority project starts first before the SRWB project, the people will be compensated by the NRA and will not have to be compensated under the SRWB project. This will be the case since the two bodies of NRA and SRWB are both agencies of the Malawi Government and the procedures of the government do not allow for people to be “double recompensed” by the same Malawi Government for the same property lost.

Nevertheless, she pointed out that the compensation/resettlement procedures of the financier of the SRWB project will also have to be followed.

Concerning their work of valuating affected property as district lands office, she pointed out that they work hand in hand with the valuation section from the Southern Region head office for the Ministry of Lands, Housing and Urban Development. In their work as a district office, they mainly valuate trees and crops to be lost, while staff from the Southern Region head office do provide help with valuation of land and structures to be lost.

Another recommendation made by the district lands officer was in regards to the rates of compensations for loss of property, in which she indicated that they ought to be equal to or higher than the standard Malawi Government rates for compensations.

On possibilities of having some vulnerable people that could be affected (through property loss) by the proposed SRWB project; she indicated that it is indeed likely that some vulnerable people will be found in the project area particularly those that would be relying on small grocery shops as their only livelihood source, as well as some female headed and child headed homes. Nevertheless, considering the fact that the most of the construction work under the SRWB project will be along a road reserve area, she indicated that the possible numbers of vulnerable families to be affected may not be as much.

Furthermore, she made mention of the recommendation that adequate community sensitizations would be important for smooth project implementation. She also noted that it would help to minimise conflicts with the people despite the fact that this is a project that is already meant to give the much needed potable water to the communities.

Concerning the matter of community of sensitizations, she made mention that there would be need for the SRWB to hold sensitization meetings with the district council, the district executive committee as well as the local communities in the project area.

She further gave insight picture of the sensitization meetings, stating that:
The sensitization meetings with local communities in the project area would take about 4-5 days.

The district executive committee sensitization meeting (which should come before sensitizing the locals) would involve about 50-60 people who will include district council officers, leaders

from the civil society in the district as well as traditional leaders, including the two T/As of Msamala and Kapalamula.

The district council officers to be involved in sensitizing the local communities would include the district commissioner, director of planning and development, the district commissioner, director of planning and development, as well as officers responsible for water development, HIV/nutrition, Gender, Community development, Land as well as Environment.

With regard to the rates for allowances received for local sensitization meetings, she noted that currently, the officers from the district council are paid allowance rates of K30,000 each per day and TAs get K10,000 each per day while other chiefs such as village heads are given K5,000 each per day.

Key Informant Interviews and Focus Group discussion Balaka District

Date	31 July, 2019
Place	Bola Moyo Lodge, Balaka
Participants	Interviewee: John Mwasama (Lodge Manager) Interviewer: Madalitso Namitembo for WWEC
Discussion	Bola Moyo Lodge understanding of the Southern Region Water Board (SRWB) project is that it intends to extend and rehabilitate its water supply schemes in Balaka. The discussion focused on understanding how the project will impact the operations of the Lodge from a business prospective.

Issues

The discussion was based on the positive and negative impacts (from the interviewee's point of view)

Positive Impacts:

The lodge manager anticipates increased operation of its restaurant facilities with reliable supply of potable water from the Southern Region Water Board. Currently, the restaurant only operates several times a week due to limited supply of potable water.

The project will likely reduce the prevalence of water borne diseases due to improved supply of potable water.

Hygiene will be improved (laundry, garden and other domestic uses) at the lodge facilities due to improved water supply.

Improved water supply will also reduce the occurrence of cancellations of reservations by potential guests due to limited access to potable water.

Negative Impacts:

Per Mr. Mwasama, the Southern Region Water Board currently fails to adequately supply water to its customers. The Lodge can at times experience water outages lasting two or more days.

Failure to implement this project will result in continual loss of business by the lodge.

The current billing system of the Southern Region Water board is not consistent and is not user friendly; customers have difficulty deciphering the content on their bills.

Most people in the community lack water management skills. Therefore, simply increasing water access and end users will only lead to an increase in water mismanagement by the community if there is no sufficient water management education or sensitization.

Date	31 July, 2019
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Place	Chingeni Trading Center, GVH Ndoya, Dinala Village.
Participants	Interviewee: Frank Luka, Frazer kapalamula, Nelson Simango, Neliya Simango, Esther Gunde, Latifa Musa, Eliza Joseph, Dorothy Mulesi, Latifa Musa, Eliza Joseph, Dorothy Muleso, Angella Humba, Felita Chingeni, Isaack manganic, Kondwani Kanje, Elita Guwa Interviewer: Madalitso Namitembo - WVEC
Discussion	Views from Chingeni Community, Dinala village, on the project that the Southern Region Water Board intends to extend and rehabilitate its water supply schemes in Balaka. The discussion focused on understanding how the project will impact the people's lives.

Issues

Chingeni Trading center is located in Balaka District in the Traditional authority Msamala, group village headman Ndoya. The village has 65 households and they all rely on one borehole which is located within the village. When the borehole is broken, people use Kagonde river as a source of domestic water. The river is approximately 5km from the village.

The discussion was based on the positive and negative impacts, from the interviewee's point of view

Positive impacts:

The project will increase access to potable water by the communities.

Currently, women travel over an hour to fetch water at the borehole. The extension of water supply will reduce waiting times at the borehole hence they will have more time to do other household activities like farming.

The community's hygiene will improve, because people will have access to portable water for domestic activities and will be can use the same water to wayer thier gardens.

The interviewees also indicated that number of cases related to water borne diseases will be reduced, because people will have access to clean and portable water.

The interviewees also stated that the project will bring job opportunities for the community members

In the community, the school children are required to fetch their own bathing water to get ready for school. However, with upcoming project, the school children will start going to school on time because the time it takes them to fetch water will be reduced.

The following were reported negative impacts:

Because some men and women will engage in sexual activities with the project workers, there will be unwanted pregnancies, breaking up of families, the spread of sexually transmitted diseases and HIV/AIDS

Also, security will be compromised in the community because different people will be coming in the community.

Date	31 July, 2019
Place	Zembani Lodge

participants	Interviewee: David Mtandama (Lodge Manager) Interviewer: Madalitso Namitembo for WWEC
discussion	Views from Zembani Lodge on the project that the Southern Region Water Board intends to extend and rehabilitate its water supply schemes in Balaka. The discussion focused on understanding how the project will impact the operations of the Lodge on the lodge business prospective.
<p>Issues</p> <p>Zembani Lodge is located in Balaka District in the Traditional authority Mponda and it serves people from all the regions of Malawi namely; Southern region, Central region Eastern region and southern region. The Lodge has been operating without water from Water Board for two years, as such, the Lodge uses water from the borehole to run the lodge.</p> <p>The discussion was based on the positive and negative impacts (on the interviewee's point of view)</p> <p>The following were reported positive impacts:</p> <p>The project will cut some costs on electricity bills for electrical pumps that are used to pump water from the bore hole, since the lodge uses only borehole water.</p> <p>The Lodge manager also stated that the access to portable water for the Lodge will improve. The land scape of the Lodge will improve because they will have enough water to irrigate the flowers of which is impossible now with borehole water.</p> <p>Further, the project will improve the hygiene at the lodge, because there will be adequate water for laundry, lodge garden and bathing.</p> <p>The lodge will not be losing customers, because access to portable water will improve the lodge's standards to meet customer's needs.</p> <p>The following were reported negative impacts:</p> <p>The Lodge has stayed for two years without water from the water board and the Lodge mamanger expressed his concerns that if they extend their water supply the situation will be worse.</p> <p>Billing system of Sothern Region Water board is not consistent and increasing the number of customers will make the situation unbearable for the customers.</p> <p>With that huge investment, the water will be expensive for the consumers, as a result a lot of people will not afford it.</p>	

Date	31 July 2019
Place	Balaka District Council Offices, Balaka Town
Participants	Interviewee: Ms. Ireen Taombe, Environmental Health Officer responsible for sanitation and waste management Interviewer: Mr. Mazaza Mwafulirwa for WWEC
Discussion	The interview was aimed at obtaining an overview of the status of waste management in the project area, more specifically regarding the amount of waste generated, how the waste is managed and what challenges are being faced in the management of waste. This information was obtained with the aim of assessing the waste management capacity of the district council facilities in light of the oncoming SRWB project. Views from the officer on

	<p>the looming project and it's possible impact as well as some recommendations on how best to protect the environment and public health were also obtained.</p>
<p>Issues</p>	
<p>Key points to note from the interview were as follows:</p> <p>Hearing of this proposed project to supply water to the town of Balaka from Liwonde, the Environmental health officer appeared happy stating that it will greatly help solve the water woes that are being faced by the residents of Balaka Town.</p> <p>The Environmental Health Officer related how the piped water shortages became a serious problem especially last year between the months of September and December. The intermittent water supply being primarily caused by the drying up of the source (Mpira Dam) resulted in communities standing in long queues through the night to fetch water from boreholes. The quality of water from the boreholes was too salty as is normally the case with most borehole water in areas around the town.</p> <p>Therefore, the Health Officer generally expects that the project will have a number of positive impacts on the communities, mainly in the provision of the needed potable water and promotion of good hygiene among the people.</p> <p>The only negative impacts she anticipates from this project include possible loss of natural resources like trees, and vegetation as well as possible spread of sexually transmitted diseases and sexual abuse of local women as they may be forced to trade sex for job opportunities on the project.</p> <p>In addition, the Environmental Health Officer provided the following recommendations to consider in order to mitigate possible project negative impacts on the environment and public health safety of the locals:</p> <p>The project should include training of the workers to protect the environment by avoiding unnecessary land clearing etc.</p> <p>The project should ensure that the workers are provided with all the necessary protective equipment during all their construction works.</p> <p>There should be the provision of adequate first aid kits and fire extinguishers at all the project work sites as may be needed.</p> <p>The workers should be trained on prevention of HIV/AIDS spread and they should be supplied with free condoms.</p> <p>At all the project work sites, there should also be provision of adequate sanitation facilities, hand washing facilities as well as safe drinking water. Her recommendation on temporary sanitation facilities at construction sites is that they should be VIP latrines provided with drop-hole covers.</p> <p>Safe drinking water at construction sites should be provided in closed buckets fitted with a tap which can be opened to draw the water.</p> <p>Waste collected at all work sites should be disposed in waste collection bins to be strategically placed and once the bins are full, the waste should be disposed of at the waste disposal site for the council located at Sosola near the Balaka Boma.</p> <p>The Environmental Health Officer also indicated that the Balaka District Council has two tractors which provide waste collection services to areas within the Balaka Town. However, one of the tractors has issues and only one collects waste from specific points around the town to dispose at the Sosola dump site. The waste collection frequency for the council is daily with three to four trips per day.</p>	

Also, the officer pointed out that the Sosola waste disposal site also receives sewage sludge emptied from pit latrines and septic tanks from households and commercial/institutional places from around the town. According to the officer, the Balaka District Council does not currently have their own working tanker for emptying and transporting sewage sludge. At the moment, customers from Balaka Town (who require sludge emptying services) are hiring tankers from private operators as well as the Machinga District Council at Liwonde Town.

Date	31 July 2019
Place	Balaka District Council
Participants	Interviewee: Paul Muhosha (District Forestry Officer) – Tel: 0999381294 Dumisani Moyo (Total Land Care Programmes Officer – Tel: 0992420025 Interviewer: Humphrey Chapama (Biodiversity Expert) , WWEC
Discussion	To get views from the Department of Forestry at district level regarding the proposed upgrading and extension works for Liwonde - Balaka Towns Potable Water Supply Schemes. The discussion focused on obtaining input from the Forestry Officer regarding how the proposed project should be conducted such that positive impacts are enhanced and that negative impacts are avoided and mitigated, including any other issues that the interviewee may feel critical to be included in the project design and implementation.

Issues

Key points to note from the interview were as follows:

The DFO stated that he had already been informed of the proposed project by staff from Southern Region Water Board (SRWB).

However, the Programmes Officer for Total Land Care indicated that his office is not aware of this project.

However, both officers stated that the proposed project was very important to the people of Balaka District as it would greatly help address the shortage of potable water in the district, especially during the dry season.

The project will contribute to the improvement of sanitation in the project area and also contribute to the socio-economic growth both locally and nationally.

Improved potable water supply will have a positive impact on the socio- economic growth of the two towns as the population growth rates in both towns are high and hence, there is great need of increased and reliable supply of potable water in the area.

Below is the status of the listed components per the interviewee:

<u>COMPONENT</u>		<u>STATUS</u> <u>(IMPROVING/ WORSENING)</u>	<u>CAUSE</u>	<u>SUGGESTION(S) TO</u> <u>TACKLE THE</u> <u>PROBLEM</u>
1.	Forests	Worsening	Over-exploitation for charcoal and firewood. Agricultural expansion resulted	Continual means to communicate and educate communities of dangers of deforestation.

			<p>in clearing of forests for prime land</p> <p>Bush fires</p> <p>Political interference</p> <p>High population growth</p>	<p>The project should plant trees where some are disturbed or even cut due to land clearing and other construction activities. A good measure would be to plant 5 seedlings for every tree that is cut. These seedlings should be of the same species and should be planted on the buffer zones and/or in the vicinity areas of the project.</p> <p>The construction team should be prohibited from cutting down trees carelessly in the project area and outside the project areas.</p>
2.	Wildlife	Worsening	<p>Hunting for bush meat</p> <p>Loss of habitats to agricultural expansion</p> <p>Bush fires</p>	<p>Prohibiting illegal poaching</p> <p>Prohibiting deforestation</p> <p>Prohibiting setting of bush fires</p>
3.	Energy	Improving at a slow rate	<p>Over-dependency on fuelwood (firewood, charcoal)</p> <p>Intermittent electricity supply</p>	<p>Train communities on production of more efficient cook-stoves and to use briquettes and gas from wastes</p>
4.	Land	Worsening due to soil erosion and degradation	<p>Poor agricultural practices</p> <p>Soil erosion</p>	<p>Continue sensitizing farmers on good agricultural practices</p> <p>Train more farmers on Climate-smart</p>

				conservation agriculture
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Below is a table listing the likely negative environmental and social impacts the project might cause:

<u>IMPACT</u>		<u>SUGGESTED MEASURE TO AVOID IMPACT</u>	<u>SUGGESTED MEASURE TO MITIGATE IMPACT</u>
1.	Loss of trees from project areas	<p>Avoid planting exotic trees such as Bluegum and pine which may become invasive to the indigenous biodiversity.</p> <p>Sensitize workers not to cut down trees from outside the project footprint areas.</p> <p>The Department of Forestry should also be involved in monitoring of project activities</p> <p>Prohibit construction workers from cutting down trees carelessly in the project area and outside the project areas.</p>	<p>Sensitize and educate the client and contractor, including communities on the conservation of biodiversity</p> <p>Plant trees in all disturbed areas.</p> <p>Plant 5 seedlings for every single tree to be cut down during the project implementation.</p>
2.	Loss of wildlife (fauna)	<p>Prohibit workers from poaching</p> <p>Avoid clearing habitats for wildlife unnecessary</p>	<p>All law breakers must be prosecuted before the court of land</p> <p>Rehabilitate and restore all damaged habitats</p>
3.	Spread of HIV and AIDS	Sensitize and educate locals, the project team and travelling workers prior to the start of the project	Provide protective measures such as condoms and contraceptives to communities.
4.	Loss of land for cultivation	<p>Ensure only project footprint areas are used for this project</p> <p>Campsites and workshops should not</p>	Compensate fairly project affected persons (PAPs) so that they can buy a similar piece of land elsewhere for cultivation

		be constructed on arable land	
5.	Soil erosion	Continue sensitizing farmers on good agricultural practices Train more farmers on Climate-smart conservation agriculture	Plant more trees outside and within the gardens Apply agricultural land compost manure Rehabilitate and restore vegetation in all disturbed areas

The interviewee anticipates that young girls and women are more likely to be negatively impacted as they are prone to be exploited by project workers. Need to develop a code of conduct for the Contractor to ensure s/he signs it so that s/he fully abides by the laws and regulations in it.

Employment Opportunities: Not hiring locals will likely lead to conflicts with the project team and client. Prioritize local skilled and non-skilled workers before sourcing from elsewhere.

Loss of property: Affected members of communities will need to be adequately compensated or offered other means of restoring and improving their livelihoods. Also, where possible, the project should at all costs avoid affecting the property of locals.

Date	1 August 2019
Place	Machinga District Council
Participants	Interviewee: Frank Mbaya (District Forestry Officer) – Tel: 0888444955 and Mrs. Fyness Mkandawire (Assistant Forestry Officer) – Tel: 0995965684 Interviewer: Humphrey Chapama (Biodiversity Expert) , WWEC
Discussion	To get views from the Department of Forestry at district level regarding the proposed upgrading and extension works for Liwonde - Balaka Towns Potable Water Supply Schemes. The discussion focused on obtaining input from the Forestry Officer regarding how the proposed project should be conducted such that positive impacts are enhanced and that negative impacts are avoided and mitigated, including any other issues that the interviewee may feel critical to be included in the project design and implementation.
Issues	
Key points to note from the interview were as follows:	
<ul style="list-style-type: none"> • The DFO indicated that his office had never heard about the proposed project. • However, it was pointed out that the proposed project is vital as it would help solve the water problems that people in the district and other surrounding districts face in regards to potable water. • The DFO and his Assistant also mentioned that the project would positively contribute to the improvement of water sanitation and hygiene in the project areas. • Additionally, it will contribute to the socio-economic growth of the project impact areas and to the nation. 	

- Below is the status of the listed components per the interviewee:

<u>COMPONENT</u>		<u>STATUS</u> <u>(IMPROVING/ WORSENING)</u>	<u>CAUSE</u>	<u>SUGGESTION(S) TO</u> <u>TACKLE THE</u> <u>PROBLEM</u>
1.	Forests	Worsening	Over-exploitation for charcoal and firewood. Agricultural expansion resulted in clearing of forests for prime land Bush fires Political interference	Continual means to communicate and educate communities of dangers of deforestation. The project should plant trees where some are disturbed or even cut due to land clearing and other construction activities. A good measure would be to plant 5 seedlings for every tree that is cut. Said seedlings should be of the same species and should be planted on the buffer zones and/or in the vicinity areas of the project. The construction team should be prohibited from cutting down trees carelessly in the project area and outside the project areas.
2.	Wildlife	Worsening	Hunting for bush meat Loss of habitats to agricultural expansion Bush fires	Prohibiting illegal poaching Prohibiting deforestation Prohibiting setting of bush fires

3.	Energy	Improving though slow	Over-dependency on fuelwood (firewood, charcoal) Intermittent electricity supply	Continue to train communities to produce more efficient cook-stoves and to use briquettes and gas from wastes
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- Below is a table listing the likely negative environmental and social impacts the project might cause:

	<u>IMPACT</u>	<u>SUGGESTED MEASURE TO AVOID IMPACT</u>	<u>SUGGESTED MEASURE TO MITIGATE IMPACT</u>
1.	Loss of trees from project areas	Avoid planting exotic trees such as Bluegum and pine as they cause local disappearance of native plants Sensitize workers not to cut down trees from areas outside the project footprint areas.	Sensitize and educate Client and contractor on the conservation of forests and trees. Plant more trees Plant vetivar grass in all disturbed areas
2.	Loss of wildlife (fauna)	Prohibit workers from poaching Avoid clearing habitats for wildlife unnecessary	All law breakers must be prosecuted before the court of land Rehabilitate and restore all damaged habitats

- The interviewee anticipates that the Department of Forestry will be involved in planting of trees in all damaged and disturbed areas by the project.
- The role of the Department of Forestry in this project will be to assist the Client with the monitoring of project activities and providing necessary guidance to the contractor on construction of trenches and water tanks.
- To be involved in selecting appropriate tree seedlings for planting in all damaged and disturbed areas.

APPENDIX 5: LIST OF PEOPLE CONSULTED



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED EXTENSION WORKS FOR MANGOCHI POTABLE WATER SUPPLY, UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN

PLACE OF THE MEETING: Balaka District Council DATE OF THE MEETING: _____

Name	Position/Occupation	Phone number	Signature
Geoffrey Kumbuso	EDO	0993197706	
Alex J. Makwira	ADWW	0994948648	
VIOTEI KAMASUMBI	LANDS OFFICER	0884601075	
Paul Mulosha	District forestry officer	099381294	
Renzal Ntshigwe	District admin officer	0888862953	
Ireen Tsante	Env Health officer	0888157543	
Samuel Khomani	SLM - MAMAT	0993225563	



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED EXTENSION WORKS FOR MANGOCHI POTABLE WATER SUPPLY, UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN

PLACE OF THE MEETING: Liwonde DATE OF THE MEETING: 02 August 2019

Name	Position/Occupation	Phone number	Signature
KACHINFIKA EILBERT	Sc 50	0884113798	
SHARON CHIRUMO	AYO	0993059280	
Linda Magsombe	DO	0995911135	
MARK D KALIMBA	INTAINEE LANDS	0882540513	
Elliott Lungu	District Fisheries officer	0999438274	
McBan Muzasho	DFO - Intern	0888171979	
Chikwika KESHA	Community Extension officer	0993154501	
Macmillan Magsombe	District Gender officer	0881727068	



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED EXTENSION WORKS FOR MANGOCHI POTABLE WATER SUPPLY, UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN

PLACE OF THE MEETING: Hetrot Balaka DATE OF THE MEETING: 31 August 2019

Name	Position/Occupation	Phone number	Signature
L. Kapalamula	Works Supervisor	0888316509	<i>[Signature]</i>
H. Kapenda	District Gender Officer	0881659270	<i>[Signature]</i>
C. Ndaona	Social Welfare Officer	0884483661	<i>[Signature]</i>
Eliza Pankon	Development Facilitator	0888685501	<i>[Signature]</i>
John Mawayo	Senior Environmental Health Officer	0799486181	<i>[Signature]</i>



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED EXTENSION WORKS FOR MANGOCHI POTABLE WATER SUPPLY, UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN

PLACE OF THE MEETING: MACHINGA Bm Office DATE OF THE MEETING: 2 August 2019

Name	Position/Occupation	Phone number	Signature
Prisca Malenga	consultant	0992125015	<i>[Signature]</i>
Boniface Mwanika	CPEA	0884491651	<i>[Signature]</i>



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED EXTENSION WORKS FOR MANGOCHI POTABLE WATER SUPPLY, UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN

PLACE OF THE MEETING: LIWONDE DATE OF THE MEETING: 01 August 2019

Name	Position/Occupation	Phone number	Signature
Steve Mwa Matthews KALWA	District water Dev. Officer	0999304222	[Signature]
Joreness Bwona	District coordinator	099532293	[Signature]
PLAN	MALAWI	LIWONDE	01.08.19
Trevor Harkin	MERL Contractor	099510548	[Signature]
Charles Gansam	Distribution Officer	0881321104	[Signature]
Laurence Maulik	Project manager	0999505765	[Signature]
Vitumbiko Neka	CAPE officer	0999289071	[Signature]
Dango Nyirado	Team leader	0993255803	[Signature]
Cynthia Muthi	WASH specialist	0999095295	[Signature]

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

FLORA SPECIES**SCIENTIFIC NAME****LOCAL NAME**

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

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

FAUNA SPECIES

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

BIRD SPECIES

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

FISH SPECIES

<i>Oreochromis karonagae</i>	Chambo
<i>Oreochromis squampinis</i>	Chambo
<i>Opsaridium macrocephalum</i>	Mpasa
<i>Engraulicypris sardella</i>	Usipa
<i>Copadichromis spp</i>	Mbuna
<i>Rhamphocromis spp</i>	Batala

Labeo mesops

Tilapia rendalli

Clarias gariepinus

Bagrus meridionalis

Ctenopharynx nitidus

Aulonocara gertrudae

Synodontis njassae

Chisawasawa

Matemba

Bombe

Kampango

Gundakumwala

Chingongu

Nkholokolo

APPENDIX 5: HOUSEHOLD SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

CONDUCTING AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED EXTENSION WORKS FOR MANGOCHI POTABLE WATER SUPPLY ,UPGRADING AND EXTENSION OF LIWONDE WATER SUPPLY INCLUDING BALAKA TOWN PROJECT .**INTRODUCTION:**

Hello, my name is _____. I am employed by Water, Waste and Environment Consultants (WVEC,) a Malawian consultancy based in Lilongwe which has been awarded a contract to conduct an Environmental and Social Impact Assessment (ESIA) for the proposed Extension of Mangochi Potable Water Supply Project, Upgrading and Extension of Liwonde Water Supply including Balaka Town Project by the Southern Region Water Board SRWB). 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 experienced in this area. The information provided will enable the project to be undertaken in a way that benefits immediate and surrounding 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 be strictly used for the purposes of this research. We sincerely appreciate the time that you are taking for this survey.

Do we have your permission to conduct this interview?

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 (Month/Day/Year)	

B. LOCATION DETAILS	
District (codes below)	
Group Village Head (GVH)	
Village	

Mangochi = 1 Liwonde = 2 Balaka = 3

C. IDENTIFICATION OF HEAD OF HOUSEHOLD/RESPONDENT			
Head of household name <i>(only if respondent is not the head of the household)</i>	1a. First name(s):		1b. Surname(s):
Gender	Male <input type="checkbox"/>	Female <input type="checkbox"/>	Identified as other <input type="checkbox"/>
Age (estimate or actual if known): Enter in number format.			
Name of respondent	4a. First name (s):	4b. Surname (s):	

Southern Region Water Board (SRWB)

SECTION 2: DEMOGRAPHIC DETAILS

List down all the members of the household starting with the head of house.

A. Member (name of HH members starting with HoH name)	B. Relationship to the Head of Household 1. Spouse 2. Child of HoH 3. Grand child 4. Spouse of child of HoH 5. Parent of HoH 6. Relative 7. Worker 8. Other	C. Gender 1. Male 2. Female	D. Age: (enter in number format)	E. Marital Status 1. Single 2. Married Monogamous 3. Married Polygamous 4. Separated 5. Widowed 6. Cohabiting 7. Too young	F. Education 1. No education 2. Too young 3. Primary 4. Secondary 5. Tertiary 6. Other (specify)	H. Ethnicity 1. Yao 2. Chewa 3. Ngoni 4. Tumbuka 5. Sena 6. Lomwe 7. Tonga 8. Other (specify)	I. Religion 1. Islam 2. Christianity 3. Other	J. Literacy 1. Can't read and write 2. Read only 3. Write only 4. Can read and write

Southern Region Water Board (SRWB)

To make sure there is a complete listing of members of the household, ask the following questions (M-N).

2M) are there any other people such as small children or infants that we have not listed? If yes add to table. Yes No

2N) Are there any other people who may not be members of your family, such as domestic servants, lodgers, friends who usually live here? If yes add to table. Yes No

SECTION 3 : EDUCATION	
A. Where do children in this household go to school?	<ol style="list-style-type: none"> 1. Within this community 2. Other communities 3. Outside the district 4. Don't go to school 5. Other (specify)
B. How do children of this household go to school?	<ol style="list-style-type: none"> 1. Walking 2. Bicycle / motorbike 3. Public transport e.g. bus 4. Private transport e.g. own car 5. Other (specify)
C. How much time does it take for children of this household to get to school?	<ol style="list-style-type: none"> 1. Less than 30 minutes 2. 31 -60 minutes 3. 61-90 minutes 4. More than 90 minutes
D. Do children of this household meet any challenges in order to access education?	<ol style="list-style-type: none"> 1. Yes 2. No → skip to section 4
E. What kind of challenges do they meet?	<ol style="list-style-type: none"> 1. Cost of school including school materials 2. Distance 3. House chores 4. Illness 5. Cultural factors 6. Other (specify)

SECTION 4. INCOME SOURCE	
A. What are your sources of income for this household	<ol style="list-style-type: none"> 1. Fishing 2. Informal employment (piece work including agricultural day labor) 3. Commercial agriculture 4. Remittances from families and friends 5. Business/ Trading 6. Pension 7. Renting (land, house etc.) 8. Formal employment 9. Other (specify) 10. None
B. Income per month (Combined)	<ol style="list-style-type: none"> 1. Less than MK 10,000 2. MK 10,000 – MK 25,000

	<ol style="list-style-type: none"> 3. MK 25,001 – MK 50,000 4. MK 50, 001 – MK 100,000 5. MK 100,001 – MK 200,000 6. More than MK 200,000
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SECTION 5: HEALTH

A. What is the nearest health facility in your village/area?	<ol style="list-style-type: none"> 1. Government Hospital 2. Private Hospital 3. Mission Hospital
B. How long does it take you to reach nearest health facility (the nearest)?	<ol style="list-style-type: none"> 1. Less than 30 minutes 2. 30 minutes to 1 hour 3. 1 hour to 2 hours 4. More than 2 hours
C. Has anyone from the household suffered from the following?	<ol style="list-style-type: none"> 1. Malaria 2. Diarrhea 3. Bilharzia 4. Cholera 5. Respiratory infections (Cough, cold) 6. Tuberculosis 7. Sexually transmitted diseases 8. Malnutrition 9. Others specify _____
D. How many times has the household visited the health facility in the last 3 months?	<ol style="list-style-type: none"> 1. 1-2 times 2. 3-4 times 3. 5-6 times 4. More than 6 times

SECTION 6: HEALTH (SANITATION AND HYGIENE)

A. Do you have a toilet/latrine?	<ol style="list-style-type: none"> 1. Yes → skip to D 2. No
B. If no, what do you use?	<ol style="list-style-type: none"> 1. Bush 2. Water source (lake, river) 3. Neighbors toilet 4. Other (specify)
C. What are the reasons that inhibit you from owning a toilet/latrine? →Skip to 6F	<ol style="list-style-type: none"> 1. Cost 2. Tradition 3. No reason 4. Poor soil (i.e. sandy soils) 5. Other (specify)

D. What type of toilet facility does your household use?	<ol style="list-style-type: none"> 1. Traditional pit latrine 2. Improved traditional pit latrine 3. Flush toilet 4. Ventilated improved pit latrine 5. Composting toilet
E. Does your toilet have a hand washing facility?	<ol style="list-style-type: none"> 1. Yes 2. No
F. What do you use for washing hands?	<ol style="list-style-type: none"> 1. Water only 2. Water and soap 3. Water and ash 4. Other (specify)
G. How is the household waste disposed?	<ol style="list-style-type: none"> 1. Dumped in pit 2. Dumped anywhere 3. Burnt 4. Water reservoir 5. Other (specify)

SECTION 7: MAIN LAND USE

A. Does any member of this household own any agricultural land?	<ol style="list-style-type: none"> 1. Yes 2. No →skip to section 8
B. Type of claim/ownership	<ol style="list-style-type: none"> 1. Leased / Certificate of ownership 2. Customary 3. Government land 4. Freehold land 5. Other (specify)
C. What are the uses of your land?	<ol style="list-style-type: none"> 1. Residential 2. Commercial (business) 3. Agriculture (crop growing/raising animals) 4. Uncultivated 5. Not used 6. Rent to others 7. Others (specify)
D. What is the size of your land? (Acres) Note: 1 Acre = a football pitch	<ol style="list-style-type: none"> 1. Less than 5 Acres 2. 1 to 10 Acres 3. More than 10 Acres 4. Don't know

SECTION 8: AGRICULTURE AND MARKETING

A. Crops Cultivated	B. Quantity 1. 0-1 bag (50KG) 2. 2-10 bags 3. 11-50 bags 4. 51 -100bags 5. >100 bags
Cassava	
Rice	
Maize	
Beans	
Cotton	
Tobacco	
Coconut	
Sweet potatoes	
Soya beans	
Other(specify)	
C. Use of yield	1. Consumption only 2. Selling only 3. Mainly consumption 4. Mainly selling
D. What percentage of yield is used for selling?	1. 01% - 25% 2. 26% - 50% 3. 51% - 75% 4. >75%
E. Where do you sell the produce?	1. Agricultural Development and Marketing Cooperation(ADMARC) 2. Nearest Market 3. Within the community 4. Companies 5. Other (specify)
F. What is the average income generated from selling yields of last growing season?	1. MK0 – MK 100,000 2. MK101 000- MK500,000 3. MK 501,000- MK 1,000,000 4. >MK1,000,000
G. Do you meet any challenges in farming?	1. Yes 2. No → skip to section 9

H. What kind of farming challenges do you meet?	<ol style="list-style-type: none"> 1. Lack of enough labour 2. Soil degradation 3. Lack of rainfall 4. Pests and diseases 5. Floods 6. Lack of market 7. Lack of agricultural inputs 8. Other (specify)
---	---

SECTION 9: WATER

A. What is the main source of drinking water for members of your household?	<ol style="list-style-type: none"> 1. Lake/river/streams 2. Unprotected wells/spring 3. Protected wells/springs 4. Piped water(tap) 5. Boreholes/tube well 6. Rain water 7. Piped from the lake 8. Other (specify)
B. Where is the water source located?	<ol style="list-style-type: none"> 1. In own dwelling → skip to 9E 2. In own yard/plot →skip to 9E 3. Elsewhere
C. How far is the source of drinking water from the dwelling? (to and from)	<ol style="list-style-type: none"> 1. 0-15 min 2. 16-30 min 3. 31-60 min 4. > 60 min
D. When you get to the water sources, how long do you take to fetch water?	<ol style="list-style-type: none"> 1. <5 min 2. 6-10 min 3. 11-15 min 4. >15 min
E. Do you treat your drinking water?	<ol style="list-style-type: none"> 1. Yes 2. No →Skip to G 3. Don't know →Skip to
F. How do you treat the drinking water?	<ol style="list-style-type: none"> 1. Boil 2. Add chlorine/water guard 3. Strain through a cloth 4. Let stand and settle 5. Cover drinking water 6. Other (specify)
G. Who is providing water services?	<ol style="list-style-type: none"> 1. Non-Governmental Organizations 2. Water User Association 3. Southern Region Water Board 4. Government

SECTION 9: WATER	
	5. Other (specify)
H. Do people pay for the water?	1. Yes 2. No →skip to K
I. If yes, what is the frequency of payment?	1. Daily 2. Monthly 3. Yearly 4. When need arise
J. How much do people pay for water on monthly basis?	1. MK01 – MK 2000 2. MK2001 – MK4000 3. MK4001 – MK8000 4. MK8001 – MK16000 5. >MK16000
K. Are you willing to pay for the water?	1. Yes 2. No →Skip to O
L. How much are you willing to pay per month?	1. MK01 – MK 2000 2. MK2001 – MK4000 3. MK4001 – MK8000 4. MK8001 – MK16000 5. >MK16000
M. Do you have challenges with your water supply from time to time?	1. Yes 2. No →Skip to section 10
N. If yes, what challenges do you have?	3. Water shortages 4. Expensive 5. Frequent breakdown (boreholes) 6. Difficult to access (remote access) 7. Poor water quality (i.e. salty water) 8. Other (specify)
O. In the past two weeks, was the water from this source unavailable for at least one full day?	1. Yes 2. No 3. Don't know

SECTION 10: BASIC INFRASTRUCTURE

A. Observe the main material of the floor of the dwelling.	<ol style="list-style-type: none"> 1. Earth floor 2. Wood planks 3. Cement 4. Ceramic tiles 5. Carpet 6. Other (specify)
B. Observe the main roof of the dwelling	<ol style="list-style-type: none"> 1. No roof 2. Thatch/ Palm leaf 3. Rustic Mat 4. Metal (iron sheets) 5. 77 Other (specify)
C. Observe the main material of the exterior walls of the dwelling.	<ol style="list-style-type: none"> 1. Palm leaf/grass 2. Stone with mud 3. Pole with mud 4. Brick with mud 5. Plywood 6. Stone with cement 7. Bricks with cement 8. Other (Specify)

SECTION 11: ENERGY

A. What is the main source of lighting for your household?	<ol style="list-style-type: none"> 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 10. Other (specify)
B. What kind of fuel is mostly used for cooking?	<ol style="list-style-type: none"> 1. Gas 2. Charcoal 3. Kerosene 4. Electricity 5. Saw dust 6. Firewood 7. Other (specify)
C. If firewood, how do you obtain this? (Multiple response)	<ol style="list-style-type: none"> 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) 3. Children (<15)
E. What challenges do you face in obtaining firewood?	1. Distance 2. Cost 3. Accessibility 4. Availability 5. Other (specify)
F. Do you have electricity in this household?	1. Yes 2. No
G. If yes, what kind of electricity?	1. Supplied by ESCOM 2. Solar Electricity 3. Biogas 4. Generator 5. Other (specify)