SOUTHERN REGION WATER BOARD

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE EXTENSION OF MANGOCHI POTABLE WATER SUPPLY PROJECT

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

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ACKNOWLEDGEMENTS

The Consultant, Water Waste and Environment would like to sincerely thank the Southern Region Water Board (the Client) for the guidance and direction towards the conduct of this study and also for providing critical information for preparation of this ESIA. The Consultant also appreciates the support rendered by the staff of Mangochi District Council.

EXECUTIVE SUMMARY

The SRWB has now, through the Malawi Government identified Kuwait Fund for Arab and Economic Development (KFAED) as a financier for this proposed project to extend the supply system to lakeshore areas. Under this project, SRWB will extend the system to un-served areas along the Lakeshore from Mpondasi to Ntakataka Turn-Off and will cover the trading centres of Namiasi, Maldeco, Makawa, Ntakataka Turn-Off and the holiday resorts along the lake.

The project area falls within Mangochi District and will extend from Mangochi Town which is the administrative centre for Mangochi District Council which is located in the Southern Region of Malawi. Mangochi District boarders the districts of Machinga in the south east, Balaka, Ntcheu and Dedza in the south west, Salima in the north and it shares international boundary with Mozambique in the east and north east. The town of Mangochi is located at some 245km south-east of the capital city of Lilongwe. The Ntakataka Turn-off is a lakeshore area covering a lot of holiday resorts and cottages located at approximately 50km north of Mangochi Town on the Mangochi-Monkeybay road

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.

The proposed extension of the Mangochi Water Supply System is expected to benefit an estimated population of about 78,200 who currently get water from unsafe sources such as hand-pump boreholes, shallow wells, rivers, Lake Malawi etc. The consequence of this is that there is high prevalence rate of waterborne and water-washed diseases.

The project is estimated to cost US$ 11,415,677.48 or MWK 8,362,668,694.75

Zambezi Watercourse Commission (ZAMCOM) Compliance

The proposed extension of Mangochi Water Supply project is inline and in full compliance with the ZAMCOM agreement. The proposed project to expand the Mangochi Water Supply System will see an increased amount of water of 13,542 m^3/day extracted from Lake Malawi. This water volume to be extracted is an equivalent of 0.157 m^3/sec or 0.00491km^3 per year. This means that the amount of water that will be extracted from the lake in the year 2035 will

only be 62.92x10^(-6)% of the total permanent storage capacity of Lake Malawi and that of the annual river inflow which is 7,804km^3 (Department of Water Resources).

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

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 water supply scheme rehabilitation and upgrading. The ESIA aims at enhancing the beneficial and mitigating the adverse impacts of the project on the biophysical and socio-economic environment. It has been prepared through the following methodology and activities:

a) Surveillance visits to Mangochi Water Supply Scheme, the surrounding communities, target supply area to be affected by the pipeline and water storage tanks; in order to establish and update the bio-physical and socio-economic factors related to the project;
b) Biodiversity appraisal on and around the project area, in order to ascertain the extent of flora and fauna present in the area;
c) Updating literature on policies, regulations, standards, administrative records and sustainable management practices related to Drinking Water Supply and Sanitation (DWSS),
d) Interviews with officers from SRWB, Government Departments and Agencies present at Mangochi District Council; whose institutions may have a role, directly or indirectly, in the implementation of the project and this ESIA;
e) Interviews with key informants from the surrounding communities affected directly or indirectly by the project; and
f) Analysis and updating of the socio-economic and water quality/quantity related data against prevailing national regulations, policies and standards.

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

a) **Creation of employment opportunities:** The project will provide employment to people from the surrounding communities and from other districts/regions of the country, during all the stages of the project.
b) **Increase in trade opportunities:** The project will provide opportunities for trade due to demand for construction materials, goods and services by construction workers.

Positive Impacts expected to be generated by the project during the operational phase include:

a) **Improved water quantity and quality:** Presently, the water supply scheme for Mangochi produces 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. This will improve people's lives as among other benefits.

b) **Improved access to portable water source**
The project will increase water connections in the town and extend water supply to new areas. This is expected to result in easy access to portable water; reduced distances to draw water and the associated drudgery of carrying heavy buckets of water. Additionally, the queuing time at water points will be reduced, which in turn will lead to increase productivity time for women and girls; the study established that it is mainly women and girls who draw water for the household.

c) **Improved sanitation, hygiene and health:** Increased availability of treated water will result in improved sanitation and hygiene. Improved water quality for domestic consumption will also reduce health risks to the consumers; and this will translate into financial saving through reduced need for medical treatment.

d) **Improved socio-economic situation of the communities**
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.

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.

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.

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

h) **Improved socio-economic welfare in Mangochi:** Improved health of the people will result in increased productivity and consequently contribute to poverty reduction. The time saved by women and children in fetching drinking water could be utilised in doing other income earning activities, leading to economic empowerment of the women and their families.

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

a) **Losses and compensation for land and assets**
Land will be required for construction of water supply system structures and movement of vehicles. Some of this land will be acquired from people hence some will

lose agricultural land and assets which they will need to be compensated for. The SRWB intends to acquire this land through 'owner offers, SRWB agrees and pay' process, with the involvement of the Mangochi District Lands Office and the Regional Physical Planning Department Office (Sorth) to ensure that the values of land offered are acceptable to both parties

b) Unrealistic expectations with regard to lands/compensation/resettlement negotiations

The land acquisition process has created expectations among the population in and around the project area in terms of monetary benefits from compensations. Some people are offering land at prices that are very high compared to acceptable compensations; while the land in the road reserve will not be compensated for. This may lead to disagreements

Adverse impacts identified for the construction phase:

a) Dust generation, gas and particulate matter emission

Potential significant dust generation will generally occur during the first six months of construction due to site preparation activities and excavations for the construction of treatment plants, pump stations and trenches for transmission and distribution pipes. Dust generation will degrade air quality and may cause respiratory disorders; dust can also cause nuisance problems when re-deposited on clothes and surfaces, and can hinder visibility. The impact will mainly be felt on site; however, fine particles may also be lifted from exposed surfaces by the action of wind.

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

b) Soil contamination and land degradation

Soil contamination and land degradation may result from the following:

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

c) Loss of vegetation cover

An unavoidable part of any development project is the clearing of land and the consequential loss of vegetation cover. This is also anticipated in this project; strip clearing of the route of the pipelines, treatment plants and pump stations is expected to result in loss of vegetation cover although not considered ecologically sensitive.

Loss of vegetation cover also leads to loss of habitat for wildlife species and degradation of soil due to increased soil erosion. Loss of vegetation cover also contributes to climate change.

d) 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.

e) 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.

f) 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.

g) 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.

h) Disturbances and accidental damage to assets

Construction of transmission and distribution pipe lines are accepted to be done near or within communities. Disturbance factors will construction workers working near a house, site of heaps of soil, noise, temporary closure of sections of the road where the pipeline is crossing and many more. Accidental damage to property and land assets may also occur during construction works.

i) Noise and vibrations

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

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

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

k) Incidence of sexual abuse and harassment

Incidence of sexual abuse and harassment are anticipated at the work sites and in the homes. At the worksite, women seeking jobs could voluntarily or involuntarily indulge

in sex with the employers in order to get jobs. It was established during the consultations that this is a common practice in Mangochi. Sexual abuse and harassment could also occur during the course of employment, mostly affecting the women due to the perception that women are a weaker gender (gender inequality).

l) **Diseases and increased pressure on community health services**

The influx of immigrant workers and job seekers may result in increases pressure on community and health services dues to the associated significant health and safety impacts on local communities. First and foremost, interactions between workers and female community members increase the risk of sexually transmitted diseases such as HIV/AIDS and other STDs. The interactions could also lead to the spread of communicable diseases such as coughs and Tuberculosis. Construction activities such as sand and cement mixing activities could also to lead to respiratory diseases among the workers and the community. On the other hand, poor sanitation at work sites and workers camp, potential land and water resources degradation as a result of construction activities could lead to spread of water related diseases such as malaria among the workers and the communities.

m) **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 additional, 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).

Adverse impacts during operational phase:

a) **Solid waste generation**

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

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.

c) **Emergencies**

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

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

The incidents have the potential negatively affecting the water users and the communities around the water supply infrastructure. For example, contaminated

water is a threat to the health of consumers while high-pressure water from busted pipes can wash away people's property.

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

Adverse impacts during operational 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.

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.

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 **61,700 USD per year**; and the costs for monitoring are estimated to be **6,640 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 Mangochi Town. 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
BoQ	Bills Of Quantities
COMSIP	Community Service Investment Programme
DEC	District Executive Committee
DI	Ductile Iron
DLO	District Land Officer
DPD	Director of Planning and Development
EAD	Environmental Affairs Department
EIA	Environmental Impact Assessment
EMA	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Impact Plan
GI	Galvanised Iron
GoM	Government of Malawi
HIV	Human Immune Virus
IAS	Invasive Alien Species
MBS	Malawi Bureau of Standards
MDGS	Malawi Goals 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 Environment
TNM	Telecommunication Network of Malawi
uPVC	un-plasticised polyvinyl chloride
US	United States Dollars
VNRMCs	Village Natural Resource Management Committee
VSCS	Village Sanitation Committee
VSL	Village Savings and loan
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation
WTP	Water Treatment plant

CHAPTER 1 : BACKGROUND AND INTRODUCTION

1.1. PROJECT BACKGROUND

Mangochi Water Supply System under the Mangochi Management Zone is one of the schemes within the mandate of the Southern Region Water Board. The water supply system provides potable water to communities in Mangochi Town and its supply coverage to areas of the town is estimated to be at 81% of the total population of the town.

The areas surrounding Mangochi Town, particularly those around the shores of Lake Malawi are experiencing significant settlement growth and are in critical need of reliable safe water supply. During the implementation of the National Water Development Project II, the SRWB carried out the construction of a conventional water treatment plant, upgrading of the intake structure, construction of storage reservoirs and replacement of major and minor pipelines for the Mangochi Water Supply System. At this time the plan was to extend the system to lakeshore resorts and lakeshore trading centres up to Ntakataka Turn-off to maximize potential of the investments made in Mangochi. However, this proposed extension failed due to financial constraints under the project.

The SRWB has now, through the Malawi Government identified Kuwait Fund for Arab and Economic Development (KFAED) as a financier for this proposed project to extend the supply system to lakeshore areas. Under this project, SRWB will extend the system to un-served areas along the Lakeshore from Mpondasi to Ntakataka Turn-Off and will cover the trading centres of Namiasi, Maldeco, Makawa, Ntakataka Turn-Off and the holiday resorts along the lake.

Mangochi Lakeshore area has high potential for tourism. Presence of reliable water supply system in terms of quality and quantity from a mandated organisation such as the SRWB will promote tourism in the area hence leading to economic empowerment of the locals. Communities along lakeshore areas are settled at the shores of the lake as their livelihood is fishing. These people draw water directly from the lake without treatment and are very much affected with water borne diseases especially among under five children whose mortality rate is estimated at 18%. Implementation of the project will ensure that communities in the project area have access to improved water supply thereby improving their health and productivity as water will be available within a reasonable distance and of required water quality standards.

The proposed extension of the Mangochi Water Supply System is expected to benefit an estimated population of about 78,200 and is estimated at a cost some US$ 11,415,677.48 or MWK 8,362,668,694.75, converted using a rate of US$1= MWK 732.56, quoted on the National Bank of Malawi website on 9 August, 2019. 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 expected that the SRWB will need to employ additional staff for the operation of the new assets which will include a new water treatment plant.

1.1.1 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, each with a capacity of 80m³/hr. 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.

1.1.2 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.

1.1.3 Storage Facilities

Clear water from the treatment plant is pumped into an elevated steel tank located within the treatment plant with a capacity of 250m^3 tank. Water from the 250m^3 tank is further pumped into two satellite tanks located at Chomba and Ntagaluka areas. Water from Chomba gravitates to Kalonga tank. Supply from these satellite tanks is through gravity.

1.1.4 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.

1.1.5 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.

1.1.6 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.

To ensure that the project activities are implemented sustainably, the Southern Region Water Board engaged Water, Waste and Environment Consultants (WWEC) to conduct Environmental and Social Impact Assessments (ESIA) and this serves as an inception report for the same.

1.1.7 Project Location

The project area falls within Mangochi District and will extend from Mangochi Town which is the administrative centre for Mangochi District Council which is located in the Southern Region of Malawi. Mangochi District boarders the districts of Machinga in the south east, Balaka, Ntcheu and Dedza in the south west, Salima in the north and it shares international boundary with Mozambique in the east and north east. The town of Mangochi is located at some 245km south-east of the capital city of Lilongwe. The Ntakataka Turn-off is a lakeshore area covering a lot of holiday resorts and cottages located at approximately 50km north of Mangochi Town on the Mangochi-Monkeybay road.

Figure 1.1 shows the location of the project area for the proposed extension of the Mangochi system in Malawi. The proposed area to be covered under the project is shown in more detail the figure 1.4 which also shows the proposed layouts for facilities to be constructed under this project.

Figure 1.1: Location of project area for Mangochi water supply system extension in Malawi

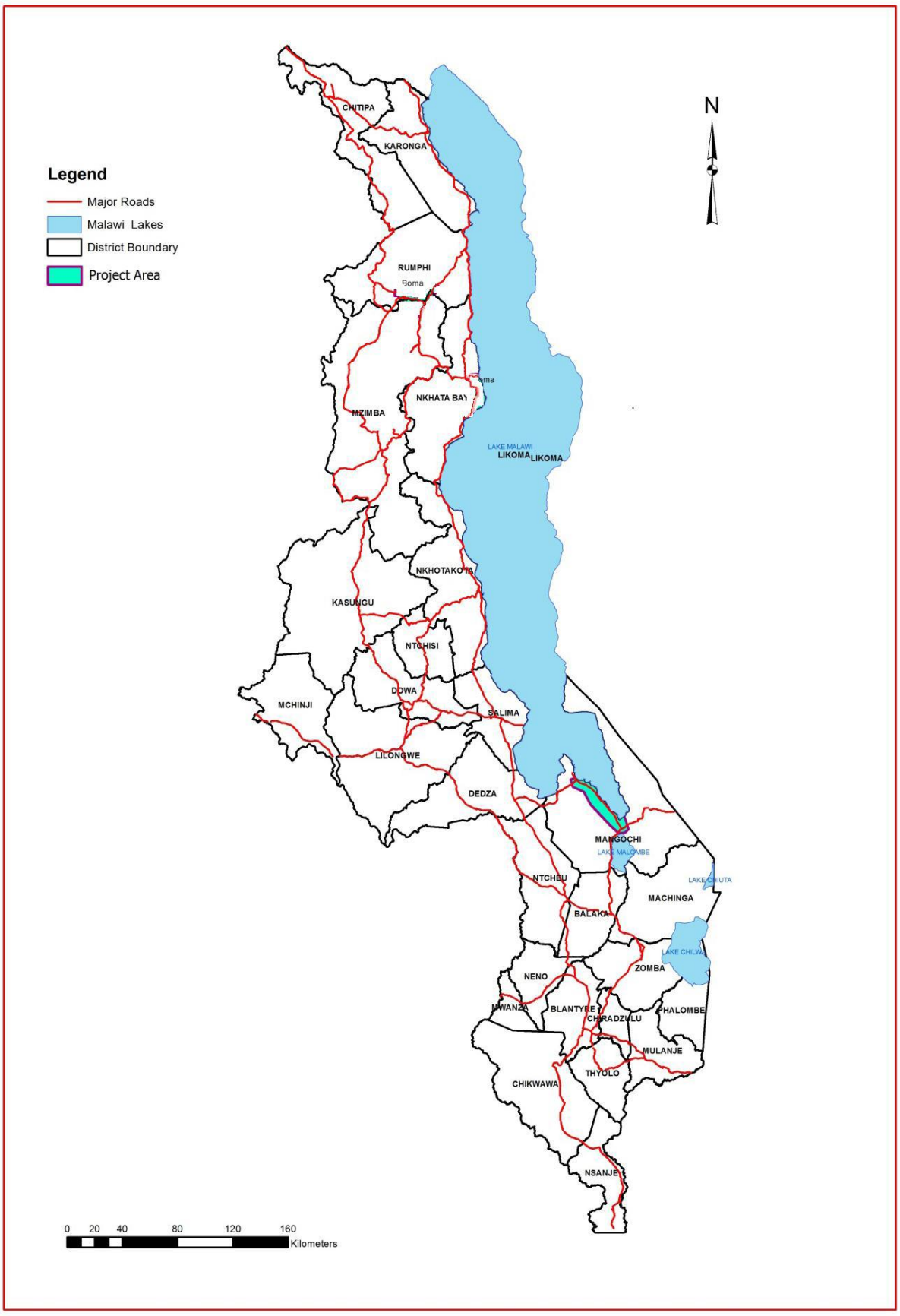

Figure 1.2: Location of project area for Mangochi water supply system extension in Malawi

1.2 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

1.2. PURPOSE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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

1. To identify potential significant environmental and social impacts of the proposed project, due to the construction and operation of the proposed extended MangochI Water Suppy System.
2. To recommend mitigation measures for the identified impacts by preparing Environmental and Social Impact Assessment (ESIA) report that will include Environmental and Social Management Plan and Environmental and Social Monitoring Plan, among others.

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

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

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

1.3. SCOPE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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

i. **Baseline assessment:** To identify the extent of the area (s); which will be affected by the proposed developments and to carry out an analysis of the existing condition of the environment and traditional society in order to compare with the situation after implementation of the project.
ii. **Description of legal requirements:** Outlining the Malawi Government and the financiers' policies and legal instruments related to environmental and social issues that apply to the project at hand. The consultant was also expected to describe how the issues raised in the policies and legal framework shall be addressed in the project.
iii. **Public Consultations**: Undertaking public consultations to ensure that all interested and affected parties are involved in the Environmental and Social Impact Assessment. Views of the stakeholders shall be incorporated and evidence of consultations shall be provided in the reports.
iv. **Social Impact Assessment:** Assessing the positive and negative impacts of the proposed project on the traditional society within the influence of the project area.

v. **Environmental Impact Assessment:** Assessing the impacts of the proposed developments on natural resources including terrestrial wildlife as well as aquatic life within the study area and their consequences on the local as well as on national economy.

vi. **Preparation of Environmental/Social Management Plan and environmental/Social Monitoring Plan** detailing the positive and negative effects of the proposed developments on the environment and traditional society, and shall recommend appropriate solutions to minimize any undesirable effects resulting from the proposed developments.

vii. **Cost Estimates:** determine costs for implementing the recommended mitigation measures. The costs shall be based on similar works implemented recently in Malawi.

1.4. METHODOLOGY FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Consultant reviewed the SRWB Investment Profile and Appraisal documents, which also includes project design and the Environmental and Social Screening information; documents with information and data for the project area including the socio-economic profile for Mangochi District, environmental profiles and maps; and policies and pieces of legislation relevant to the project. The reviewed documents have been included in the reference section.

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

- Biological environment: plant and animal species likely to be affected by the proposed development in the proposed project areas and surroundings;
- Geo-physical environment: geology, topography, soils, vegetation and surface water bodies;
- Socio-economic and cultural environment: cultural issues and economic activities, current land use and future development activities; and
- Existing physical developments: existing projects such as infrastructure and business enterprises.

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

Identification and analysis of potential impacts of the project involved a review of impacts identified during the environmental and social screening, the use of checklists matrices, review of information collected through consultations, and the use of experts' knowledge. Subsequently, for each negative impact, mitigation measures were identified and recommended for implementation as outlined in the Environmental and Social Management

Plan (ESMP) and Monitoring Plan (MP) that have been developed; while positive impacts of the proposed project have been recommended for enhancement.

1.5. STRUCTURE OF THE REPORT

The report has been organised into the following chapters:

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

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

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

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

Chapter 5: Description of the project environment - describes the existing environmental and social conditions including physical, biological and socioeconomic aspects. Physical aspects include spatial location, topography and soils, drainage, climate (rainfall and temperatures), land use patterns, Geo-hydrological aspect. Biological aspects include flora and fauna. Socioeconomic aspects cover population characteristics, health situations in the project area, agriculture, and degree of gender mainstreaming among others.

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

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

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

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

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

CHAPTER 2 : DETAILED DESCRIPTION OF THE PROPOSED PROJECT

The proposed project to extend the Mangochi water supply system to lakeshore areas up to Ntakataka turn-off is developed with the goal of maximizing on the investments made in the project area and to enhance tourism along the lakeshore. The project seeks to also address water related problems existing within the area.

Tourism is identified in the Malawi Growth and Development Strategy II (MGDS II) as one sector that has the potential to significantly contribute towards the country's socio-economic development. The newly adopted MGDS III, 2016-2021, recognizes water development and sanitation as one of the priority areas towards meeting the goals of reducing poverty and achieving sustainable economic growth. Construction and rehabilitation of water facilities is prioritized under the MGDS III. The Mangochi Water Supply Project which will supply potable water to un-serviced lakeshore areas from Mpondasi to Ntakataka Turn off, is definitely in line with the national development agenda. The project will provide much needed safe water to resorts and cottages that are struggling to efficiently treat their water. It will also supply good quality water to communities that periodically experience cholera outbreaks due to the use of unsafe water.

Construction work for the proposed project will commence following the completion of preparatory activities, and will be conducted within an 18 month period. Activities to be carried out before construction include the conducting of an EIA, recruitment of a construction supervision consultant, review of project designs, tendering and award of a construction contract. The proposed project activities are described as follows in the three phases of planning, construction and demobilisation and operation.

2.1. PROJECT COMPONENTS/ACTIVITIES FOR THE PROJECT PLANNING PHASE

Main activities during the planning phase include:

i. **Feasibility studies:** feasibility studies have been made aimed at assessing the feasibility and viability of the proposed project to expand water supply of the Mangochi system to the lakeshore areas. The feasibility assessments were conducted from technical, financial and environmental perspectives. An outcome of the recommendations from the studies is a preliminary design report developed in 2018. The report clarifies the established and proposed concepts of the project.

ii. **Site identification and selection:** Identification and selection of sites for access roads to the project sites for construction activities is also one of the main activities included in the planning phase. The selection of the access road sites takes into consideration the need to minimize negative impacts on the natural environment and the surrounding communities. As part of the planning phase, determinations have also been made of sites to be used for placing proposed facilities for the extension of the water supply system. Established sites include a proposed water intake structure, water treatment plant, water storage reservoirs, main pipelines and auxiliary facilities.

iii. **Technical Design:** Southern Region Water Board has prepared designs for the project. Activities for the preparation of designs included surveying, site planning and

preparation of maps as well as technical drawings and bills of quantities. The SRWB is currently finalising the work on detailed designs for the project internally.

iv. **Engagement of consultant and tendering:** Upon the finalising of the detailed designs, SRWB will go through a 6 month period of recruiting a consultant who will assist with the review of the detailed designs, tendering processes and supervision of the construction contractor. Under the tendering processes, contractors will be selected on the basis of international competitive bidding to carry out the construction works.

v. **ESIA studies:** WWEC is preparing the ESIA report. Scope activities for this current assignment involved conducting baseline and socioeconomic surveys, desk studies, map preparations and public consultations.

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

2.2. PROJECT COMPONENTS/ACTIVITIES FOR THE PROJECT CONSTRUCTION PHASE

2.2.1 Construction works to erect a new water intake structure, raw water submersible pumps and auxiliary facilities

A new intake structure will be constructed on Lake Malawi at Nkhudzi Bay, located approximately 45km North-West of Mangochi Town around UTM coordinate location 36L 716328E and 8431493N. The intake structure shall consist of four main components namely:

a) <u>Raw Water Submersible Pumps</u>

These pumps will be for the abstraction of raw water from the lake. The pumps will be supported by a pier bridge and will be caged. Three pumps will be installed, two for on duty operation and one to operate on standby. The pumps are designed to deliver a flow rate of 80m^3/hour at a delivery head of 30m and will be submerged to a depth of 3m below the lake water level.

b) <u>Pier Bridge</u>

A pier bridge shall be constructed 300m into the Lake. This is to provide access for repair/maintenance and operation needs of the submersible pumps. The bridge shall be constructed of stainless steel. The depth at which the bridge will be constructed will depend on the formation and type of the soil beneath. The bridge will also consist of pump cages and handrails for personnel protection.

c) <u>Suction Pipeline</u>

Each of the three submersible pumps will be fitted with a stainless steel pipe of diameter size 200mm which will be discharging into a 350mm diameter size Ductile Iron (DI) pipe. The DI pipeline will run for a distance of 300m along the pier bridge, and will connect to a 360mm diameter size PVC pipeline which will span a distance of 550m to the treatment plant. The three pipe sections will form the suction pipe which will connect to the treatment plant and is designed to abstract 156.74 litres of water per second. Each inlet pipe will have Stainless steel screens fitted at its bell mouth to prevent the suction of debris.

d) Control Room

A 5m by 8m control room where the submersible pumps will be operated from will be constructed of cement moulded blocks. A back-up electric generator will be installed in the control room in case of power outages. Control panels through which the pumps will be controlled will also be installed in the room.

2.2.2 Construction of new water treatment plant

A new conventional surface water treatment plant will be constructed 1km North-West of Nkhudzi Bay intake around UTM coordinate location 36L 715352E and 8431598N. The treatment plant will be constructed over a flat area overlooking the Nkhudzi hill (Figure 2.1).

Figure 2.2: Proposed site for the construction of the treatment plant near Nkhudzi hill

The plant will consist of the following facilities:

a) A Mixing chamber

The chamber shall be constructed with suitable mixing devices to allow for thorough mixing of the pumped raw water with a coagulant during operation.

b) *2 Clarifiers/sedimentation tanks*

The two clarifiers shall be constructed to have a depth of 5m with a total surface area of 200m2. The clarifiers are designed to provide a retention period of 3 hours with a flow velocity of 0.69m per second shall also be provided with full decanting troughs to collect clear water to the filtration stage of treatment. Sludge collection cones and a sludge drainage system will also be constructed for the collection of sludge to a sludge treatment site. The sludge treatment site shall be built to have a sludge thickener and associated sludge drying ponds.

c) 3 pressure filtration cylinders

3 pressure filters each with a filtration capacity 188m^3 per hour shall be constructed and shall be provided with sand as a filter medium. The filters shall be arranged to filter water from the

clarification stage. A backwashing facility shall be connected to the filters to allow for their washing during operation. Pressure gauges shall also be fitted to the filters for the determination of filter washing times through measurement of head loss across sand media at operation.

d) Laboratory facilities to conduct basic water analyses

A laboratory facility shall be constructed as part of the water treatment plant. The laboratory shall be provided with the necessary equipment to carry out basic water quality monitoring. This will include tests for turbidity, pH, conductivity, hardness, colour, residual chlorine as well as bacteriological analyses for coliforms, and e-coli.

e) A Chemical dosing station and a chemical storage room

A chemical storage room shall be constructed to have two storage areas, one for coagulants and the other for disinfectants. The room shall be fitted with a fume extraction fan, it shall be non-corrosive and provided with a concrete roof.

A chemical dosing station shall be installed and provided with chemical mixers for both coagulants and disinfectants. The mixers shall be made of fibre glass with a capacity of 250 litres with stirring rods that are plastic coated and inert to chemical attack. The dosing station shall also be provided with dosing pumps which will have capacity to vary the dosing rates by adjusting the plunger to the pump diaphragm. The pumping equipment shall have a a pressure of not less than 16 bars during operation.

f) Standby generators for power failure emergency procedures

Generators capable of providing a total power rating of 150 KVA will be installed at the treatment plant to compensate for power failures. The standby power from the generators shall be capable of running the intake raw water pumps, the high lift clear water pumps as well as the backwashing system at the treatment plant.

g) A balancing tank which will also serve as a clear water storage reservoir

A reinforced concrete tank of 600m^3 capacity shall be constructed to serve as a balancing tank for the mixing of disinfectants. The tank shall be built to have baffle walls to mix the water and prevent dead areas. The tank shall have its outlet connecting to the manifold of pumps in the high lift pumping station and shall allow two hour storage of water during operation.

h) A high lift clear water pumping station

A pumping station shall be built to house three pumps (two for on duty operation and one to operate on standby). The three installed clear water pumps shall be capable of delivering a flow of up to 80m3/hr, at a pumping head of 170 m from the clear water balancing tank at the treatment plant to a service reservoir to be placed at Nkhudzi hill.

2.2.3 Construction of water storage/service reservoirs

Two service reservoirs will be constructed; one of reinforced concrete with a capacity of 4,000 m^3 to be built at Nkhudzi Hill (UTM coordinate location 36L 715111E and 8432239N), and

another of 300m^3 capacity which will be an elevated steel tank to be erected on steel columns at Namiasi. The tank at Nkudzi hill will be positioned to receive pumped water from the proposed Nkudzi Bay treatment plant and to allow water supply by gravity to areas towards Ntakataka turn-off and to the Bishops House near Mangochi Town.

The steel tank at Namiasi will be located such that it receives branched off water from Nkudzi Bay during operation, and to pass it on towards the Bishops house. Both proposed service reservoirs are designed to offer 8hr storage requirements at operation.

2.2.4 Construction of pipeline networks

A system will be constructed comprising of primary, secondary and tertiary pipelines which are designed to meet the 2035 demand for the project area. The pipe network will mainly use PVC pipes. Ductile Iron and GI pipes will be used in water, rocky and exposed areas. Main pipelines will be of diameter sizes ranging between 250mm and 360mm. Secondary pipelines will have diameter sizes ranging between 90mm and 160mm and tertiary networks will have pipes of diameter sizes between 40mm and 63mm. Total length of pipeline networks to be constructed from the main lines to the tertiary lines is estimated at 85.3km as shown in table 2.1.

Table 2.1: Pipelines to be laid for distribution systems under the project

ITEM	AREAS/SECTIONS TO BE COVERED BY PIPELINE	PIPELINE LENGTH (m)	PIPE DIAMETER (mm)	PIPE MATERIAL	PIPE PRESSURE CLASS
MAIN LINES					
1	Nkudzi Reservoir to Nkhudzi T/Off	600	360	DI	
		1950	360	PVC	12
2	Nkudzi T/Off to Ntakataka	5500	260	PVC	12
3	Nkudzi to Sun 'n'Sand	16750	315	PVC	12
		200	300	GI	
4	Sun 'n' Sand to Sawa Camp	19850	260	PVC	12
		200	250	GI	
5	Sawa to Bishops House	3250	260	PVC	12
SUBTOTAL LENGTH MAINS		48300			
SECONDARY LINES-BRANCHES					
6	Ntakataka T/O	2200	160	PVC	6
7	Nico Cottage	1850	110	PVC	6
8	Namaso Bay	2500	160	PVC	6
9	Nkope	9000	160	PVC	6
10	Sun 'n' Sand	600	110	PVC	6

ITEM	AREAS/SECTIONS TO BE COVERED BY PIPELINE	PIPELINE LENGTH (m)	PIPE DIAMETER (mm)	PIPE MATERIAL	PIPE PRESSURE CLASS
11	Club Makokola	1550	110	PVC	6
12	Nkopola	1050	110	PVC	6
13	Palm Beach	1850	160	PVC	6
14	Skinny Hippos	1500	110	PVC	6
15	Namiasi Market	750	90	PVC	6
16	Dalitso Cottage	750	90	PVC	6
17	Mulangeni Holiday Resort	650	90	PVC	6
18	Maldeco	700	110	PVC	6
19	Pamadzi Hotel	1500	160	PVC	6
20	Andrews	550	90	PVC	6
SUBTOTAL LENGTH SEC LINES		27000			
TERTIARY LINES					
21	Various targeted areas	5000	63	PVC	6
22	Various targeted areas	5000	40	PVC	6
SUBTOTAL LENGTH TERT LINES		10000			
GRAND TOTAL LENGTH FOR ALL LINES		**85300**			

2.2.5 Construction of communal water points

15 communal water points will be constructed under the project in specific targeted locations. These communal water points will be placed under the mandate of the communities in the target areas for them to manage and operate with the guidance of the SRWB.

2.2.6 Construction of auxiliary buildings

An operator's block will be constructed at the new water treatment plant at Nkudzi Bay. The block will accommodate a laboratory, the chemical dosing/storage rooms and the dosing pumps. Two pump houses will be constructed to house booster pumps. Three staff houses of 3 bedrooms each will also be built at the Nkudzi Bay treatment plant site.

2.2.7 Construction of access roads

This will mainly include the construction of a simple gravel access road at the site of the proposed Nkudzi hill service reservoir. The road is to be 5m wide and will connect the nearby tarmac road to the site of the tank at the top of Nkudzi Hill. The access road will be utilised both at the construction as well as operation phases of the project.

Overall, the majorly expected construction activities for a medium-large scale water supply project are going to be conducted. These include land clearing, placing temporary barricades to work sites, excavation of trenches, compaction of the bottom of the trenches to receive pipes, laying of the pipes, backfilling the trenches for laid pipes as well as hauling of construction material among others. All these activities will have significant impact on the surrounding environment.

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 use. These include temporary fences and barriers, workers' camps, scaffolding material, work site signs posts, steel cuttings and material stockpiles among others. The construction sites will be cleared and the affected areas will be appropriately restored. Negative impacts might arise from the modes of removal of the temporary structures and their disposal upon the completion of the construction works.

During the operation phase of the project, the activities will include water abstraction, water pumping, water treatment, water storage and water distribution to consumers using pumps and pipelines. Community water user associations will be set up and trained to manage the 15 communal water points that will be delivered to the locals. It is also expected that individual/household service connections to the extended water supply system will also be done at the project operation phase. Activities under the operation stage will also 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). Generator sets to be installed under this project will assist with the water pumping when necessary.

2.4. LABOUR AND MATERIAL REQUIREMENTS FOR PROJECT ACTIVITIES

On the project, excavation of trenches will be done using backhoe excavators and compactions will be done using trench compactors. Hence, backhoe excavator and compactor operators and assistants, including labourers to assist the operators, will be employed by the project contractor. Plumbers will also be employed for the laying of pipes. Offering of employment opportunities will consider where possible, the recommendation of the Malawi

gender policy to ensure that a ratio limit of 40-60% employed females against 60-40% employed males is observed. Out of the people to find employment during the project construction phase, 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 a crawler dozer for clearing the sites and excavators for digging the foundations. Concrete mixers and vibrator pokers will be required for the concrete works. In addition, labourers will be required to perform some functions including shaping the foundations and concrete works. It is estimated that 30 people will be employed for these activities. Tippers will be used for movement of materials such as quarry stones, gravel and sand. Crawler dozers will be utilized for clearing construction sites as well as access roadways to construction sites.

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 expand the Mangochi water supply system. The table also gives the project outputs and by-products that are to be expected from use of the equipment and material.

Table 2.2: Major equipment and materials

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
1.	Crawler Dozer	Creation of access roads and clearing construction sites	To be provided by the contractor	Access roads and construction sites dust, noise
2.	Backhoe excavator	Excavation of trenches	To be provided by the contractor	Compacted trenches, firm foundation bases, dust and noise
3.	Trench compactor	Compaction of trenches	To be provided by the contractor	Compacted beds for pipes and foundations, noise
4.	Concrete mixer	Mixing concrete	To be provided by the contractor	Well mixed concrete, noise
5.	Tippers and trucks	Transportation of construction materials such as fine/course aggregate, sand and cement.	To be provided by the contractor	Various construction materials, dust and noise
6.	Vibrating pokers	Concrete compaction	To be provided by the contractor	Well mixed concrete, noise

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
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 bought from suppliers	Completed structures including filters for water treatment,
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 mentioned above and all the other activities related to implementation of the project may cause positive and negative environmental impacts for which the enhancement and mitigation measures 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 extend the Mangochi water supply system.

Table 2.3: Cost estimate for the proposed project

No	ITEM	COST (US$)	COST (MWK)
1	Preliminary and general activities	660,351.00	483,746,728.56
2	Intake works and raw water pipeline construction	221,912.00	162,563,854.72
3	Construction of new water treatment plant at Nkudzi Bay (of capacity 13,452m^3/day)	3,924,258.00	2,874,754,440.48
4	Construction of pump-stations	19,000.00	13,918,640.00
5	Construction of transmission pipelines	720,000.00	527,443,200.00
6	Construction of storage tanks (4,300 m^3 total capacities)	1,494,091.00	1,094,511,302.96
7	Construction of distribution pipelines Including Communal Water Points and provision of 10,000 prepaid meters	5,921,399.00	4,337,780,051.44
8	Sum for power supply facilities	112,500.00	82,413,000.00
9	Construction of access roads	450,686.00	330,154,536.16
10	Supply of materials for service connections	450,000.00	329,652,000.00
11	Construction of auxiliary buildings i.e. pump-houses, operators buildings, staff houses, stores, and office block	195,131.00	142,945,165.36
12	Sum for consultancy services and training	1,300,000.00	952,328,000.00
13	Project operational costs	200,000.00	146,512,000.00
14	Contingency sum	730,672.00	535,261,080.32
	GRAND TOTAL	**16,400,000.00**	**12,013,984,000.00**

The total estimated cost is US$ 16,400,000.00 or MWK 12,013,984,000.00 converted using a rate of US$ 1= MWK 732.56, quoted on the National Bank of Malawi website on 9 August, 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 this option of constructing a new intake on the Lake Malawi at Nkudzi Bay and a new water treatment plant as well as pumping stations, reservoirs and

mains to supply potable water to the lakeshore areas through pumping and gravity flow. The following environmental considerations were taken into account when coming up with the recommended project scope:

a) The Lake Malawi is a vast water resource with a permanent reliable flow and its use as an abstraction point spares other limited water resources located around the project area from pressure of over extraction if they might have been considered. The project area has Koche and Nankundu rivers which could have been opted for as water sources but now are relieved from the undue pressure with the selection of the lake as a source for the proposed project.
b) The combination of both pumping and use of gravity for water supply to the lakeshore areas where gravity flow is majorly utilised reduces significantly the demand for energy/power that would have been higher if the use of gravity was minimised to opt for more pumping. An increased power demand which would have come from increased use of pumping would have been quite an unfair situation on the country's power supply which is currently an already limited resource on the national grid. The option to reduce demand for power by largely using gravity 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

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

Table 2.4: Management of wastes generated from the proposed project

Waste type	Management
Concrete	✓ Concrete waste will not be allowed to enter storm drains or any nearby watercourses. ✓ Concrete trucks and other concrete- coated equipment will be washed onsite. ✓ 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 wastes will also be used to backfill borrow pits.
Oils	✓ Used oil will be kept for oiling shutters during other constructions.
Steel	✓ All steel cutoffs will be stockpiled in a protected area. ✓ The steel cutoffs will be later sold to other companies for use.
Tyres	✓ Defective tyres will be kept for recycling. ✓ If the tyres cannot be recycled, they will be sold off to other potential users (i.e. shoe makers).
Saw Dust	✓ Saw dust will be used as an absorber where leaking oils will be made to fall to avoid soil contamination. ✓ Other saw dust will be thrown into waste collection skips and arrangements will be in place to get the collected waste disposed at waste disposal sites for the Mangochi Town Council.

Waste type	Management
Plastic Papers and other plastics	✓ These will be recycled where possible. Otherwise they will be put in bins then thrown into waste collection skips and arrangements will be in place to get the collected waste disposed at waste disposal sites for the Mangochi Town Council.
Office Papers	✓ Office papers will be recycled where possible. Otherwise, they will be put in bins then thrown into waste collection skips and arrangements will be in place to get the collected waste disposed at waste disposal sites for the Mangochi Town Council.
Foods	✓ 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.
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 areas of Mangochi Town, 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 clean water to the people that are currently being served in the areas near the Mangochi Town Centre, but also those residing in surrounding communities (particularly the critical lakeshore areas) that are to be served once the water supply system is upgraded. Upgrading of the systems is an absolute necessity in light of the growing need for potable water in the project areas.

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

a) People of the lakeshore areas stretching between Mangochi Town and Ntakataka Turn-off would not have access to adequate and efficient potable water supply services. The lodging facilities and hotels existing and being developed in the areas near the Lake Malawi would continue to face challenges to treat the water abstracted from the lake.
b) Those that do not have piped water would continue to utilize unsafe water supply sources (particularly from the Lake Malawi).
c) Many people would be exposed to water related ailments stemming from the use of unsafe water. The cholera outbreaks which mainly hit the lakeshore areas between Mpondasi and Ntakataka Turn-Off during rains will continue to be a problem.
d) The mortality rate for under-five children currently at 18% (for the project area), mostly due to diarrhoeal water-borne diseases would continue to remain high.
e) Communities would still continue to labour spending their time drawing water from the lake and other unsafe water sources. The time which would have been used for other developmental endeavours.

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

3.1 ECONOMICAL ALTERNATIVES

The upgrading of the Mangochi water supply system through extension of the system to the lakeshore areas from Mpondasi and Ntakataka Turn-Off will result to increased amounts of potable water supplied to the service areas. This will lead to increased revenue for the SRWB, taxes for the government, job and associated business creation ultimately contributing to the improvement of the national economy. Those intending to establish more lodging facilities and other tourist destination sites along the lakeshore areas will be attracted by the relief of not having to treat the source water by themselves. This will result in more tourist attraction sites being established, hence boosting the tourism and the national economy in turn.

Safe water will contribute to the reduction in demand for medical health services and medicine. In addition, the burden on women and school girls, associated with fetching water will be reduced and the women will be able to participate and contribute better to economic development. School girls will have the opportunity to do better in school and qualify for better jobs. All this will translate to improved economic development of the country.

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

4.2. POLICY FRAMEWORK

4.2.1. The National Water Policy (2005)

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

In general, the policy advocates for protection of water resources from unsustainable utilization, which may result in its depletion and degradation through pollution. The Southern Region Water board will make sure that its project of extending the Mangochi Water Supply System 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 extension of the Mangochi Water Supply System for improvement of water supply in Mangochi Town 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 provision:

- **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 or enhanced respectively.

4.2.5. The National Water Policy (2005)

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

In general, the policy advocates for protection of water resources from unsustainable utilization, which may result in its depletion and degradation through pollution. Therefore, the project will be implemented in a way that water resources are not degraded by pollution by following all preventative and precaution measures to pollution.

4.2.6. 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 emphasises the need for promotion of community-based management of rural water supply facilities, strengthening of monitoring and evaluation systems for water utilization and management; and the improvement of water supply in rural and urban areas for both agriculture and irrigation.

The proposed project of extending the Mangoch Water Supply system with the aim of improving the water supply are in line with the goals of the MGDS III to meet the challenges of water supply, sanitation and hygiene services provision at household level and the whole country

4.2.7. 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.

4.2.8. 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 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.

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

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

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

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

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

4.2.10. The Malawi National Land Policy (2002)

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

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

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

4.3. LEGAL FRAMEWORK

4.3.1. Constitution of the Republic of Malawi (1966)

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."

Most of the land to be used for this project lies within the road reserve boundary and and can rightfully be used by the Southern Region Water Board for the project. However, in some cases, some land has to be acquired from people and the SRWB is in the process of finalizing the acquisition process with to the affected people. All land issues will be settled 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 extension of the Mangochi Water Supply System is in line with this act.

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 Mangochi District Council 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.

4.4. REGULATORY FRAMEWORK

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

Table 4.1: Regulatory licences and approvals relevant for the project

No	Regulations/ Standards/Approvals	Description	Reference	Issuing Institution
1.	Environmental Certificate	The certificate is provided after approval of the ESIA report.	EMA, 1996 and EIA Guidelines 1997	EAD
2.	Water Abstraction Permit	Allows the abstraction of groundwater or surface water	Water Resources Act (year)	National Water Resource Authority
3.	Approval of the project design	Approval of project design, where applicable, will be required where construction is to take place in planned areas	Mangochi District Council by-laws; and the Physical Planning Act (2016)	Mangochi District Council
4.	Planning permit	To ensure that project is implemented within the District Council development plans.	Local government	Mangochi 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

4.5. ENVIRONMENTAL STANDARDS IN MALAWI

During the construction and operation phase, the project will also trigger a number of Environmental Standards set by the Malawi Bureau of Standards as provided in Table 4.2. The 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

Mangochi District is located in the southern region of Malawi. The district shares boundary with Machinga District to the South-East, Ntcheu, Balaka and Dedza to the South-West, Salima in the North and Mozambique in the East and North-East. The district is approximately 200 kilometres from Blantyre which is the main commercial city in Malawi. Mangochi town is located on latitude $14^0$23'34.66" S and longitude $35^0$20'47.69" E.

5.1.2. Climate (rainfall and temperature)

5.1.2.1. Temperatures

Mangochi town experiences warm tropical climate with mean annual temperatures ranging from 18 to 32 degrees Celsius. The lowest temperatures are experienced in June and July while the hottest temperatures are experienced in October and November (GoM, Mangochi SEP 2017-2022).

5.1.2.2. Rainfall

Mangochi town experiences both wet and dry seasons. Typically, the wet season occurs between November and March and the drier season starts from mid-March to November (GoM, Mangochi SEP 2017-2022). On average; the precipitation for the district is 841mm annually. The district receives the highest amounts of rainfall in the months of January and February (P.K. Mughogho 2014).

5.1.3. Topography and soils

Mangochi district lies between the rift valley of the southern end of Malawi. The topography of Mangochi falls into 2 categories; the rift valley/coastal; plans and hilly-forested areas which arise above plains. The hilly areas run from the North-East running Southwards. It includes the Namizimu Forest reserve and Mangochi hills among others. The hilly areas rise above undulating to flat plains where estates are common. The Western side of the district is dominated by flat plains but punctuated by isolated and a chain of hills.

As mentioned earlier, Mangochi district lies within the rift valley, hence, lithosol soils dominate the district. These soils are shallow and stony. There are also alluvial soils mainly around Lake Malawi and Lake Malombe. The alluvial soils are grey to brown in colour and neutral to weakly alkaline in nature. In addition, dambo soils occur on the stretch between Lake Malawi and Lake Malombe and they are called gleys or hydromorphic soils ((GoM, Mangochi SEP 2017-2022)).

5.1.4. Land use patterns

The Land tenure system of the district is comprised of two categories: Public land (customary and government land) and private land. Commercial, residential, institutional, agricultural and recreational are the major land uses in the district (GoM, Mangochi SEP 2017-2022). Land within Mangochi town is within the planning area as stipulated in the Town and Country Planning Act 2016. Currently, the district is working to develop 2 rural urban centres with the

aim of achieving an integrated and sustainable land and human settlement which is in line with the Malawi Growth and Development Strategy (MGDS III). These are Namwera and Monkey bay urban centres. These trading centres offer more advanced market services like banking which is far beyond TA compass.

5.1.5. Settlement patterns

The settlement in Mangochi district is in both nuclear and scattered patterns (GoM, Mangochi SEP 2017-2022). Most settlements are formed along roads, water bodies and flat lands. There are a total of 1551 villages in the district. 94 percent of the population live in rural areas in either nuclear or scattered patterns. The concentration of people is highest along the lake shore areas where fishing is the major source of income. It was noted during the site visit that areas around trading centres also have a high concentration of people.

5.1.6. Geology

The district is underlined by crystalline rocks of Precambrian to lower Paleozoic which are mainly referred to as Malawi Basement Complex. These rocks are overlain unconformably by sedimentary rocks and subordinate alkaline igneous complexes. Alkaline igneous complex is common in the district as the district lies between the rift valley of the southern end of Malawi and are called Chilwa Alkaline Province. The Chilwa Alkaline has an exceptional range of lithologies, from carbonatite to alkaline granite. The carbonatite includes pyrochlore, bastnaesite, monazite, phosphate, fluorite and carbonate. In addition, tertiary lacustrine deposits occur in a narrow belt parallel to the lakeshore. These range from sandstone, mudstone, gravel and shell limestone among others (JICA *et al*..,2013).

5.1.7. Hydrology

The project area has numerous water bodies including lakes, rivers and streams. There is Lake Malawi in the project area which will be the source of raw water by the SRWB. There are also rivers in the area which include the shire river which is a source of water for domestic purposes in some households within the project area. The lake and rivers have fresh water which is sometimes used for irrigation in the dry season.

5.2. BIOLOGICAL CHARACTERISTICS OF THE AREA

5.2.1. Flora of Mangochi District

The flora of Mangochi District, including 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.

Major tree species found in the district include: *Brachystegia spiciformis* (tsamba), *B. Boehmii* (mombo), B. *longifolia* (mombo), *B. utilis* (Nzale), *Jubenardia floribunda* (mchenga), *J. paniculata* (ntondo), *Acacia polyacantha* (mthethe), *A. abyssinica* (mtsidzi), *Burkea africana* (Mufulu), *Erythrophloeum africanum* (mpapa), *Uapaca kirkiana* (Masuku) and *Bauhinia thonningii* (muuwa) (Mangochi District Socio-economic Profile, 2016).

5.2.2. Flora of the Project Area

Through transect walks in the proposed project areas (Mangochi town, Ntakataka Turn-Off and extending through the Lakeshore resorts of Lake Malawi and Nkhuzi Bay near Monkey Bay), a total of 71 dominant flora species that were surveyed from cultivated mosaic land, secondary mixed savanna woodland and seasonal and permanenet wetland are *Zea mays* (Chimanga), *Oryza sativa* (Mpunga), *Gossypium herbaceum* (Thonje), *Sorghum bicolour* (Mapira), *Eleusine coracana* (Mayere), *Manihot esculanta* (Chinangwa), *Cucubirta maxima* (Dzungu), *Vigna unguiculata* (Mzama), *Cajanus cajana* (Nandolo), *Nicotiana tabacum* (Fodya), *Ipomoea batatas* (Mbatata), *Hibiscus cannabinus* (Therere), *Rawsonia lucida* (Njale), *Oncoba spinosa* (Nchime), *Adansonia digitata* (Malambe), *Ocimum americanum* (Nkhundabwi), *Faidherbia albida* (Msangu), *Piliostigma thonningii* (Chitimbe), *Combretum zeyheri* (Kadale), *Sterculia africana* (Mgozi), *Vangueria infausta* (Mbilima), *Ximenia caffra* (Masau), *Ximenia americana* (Masau), *Calotropis procera* (Litawunde), Ficus *thonningii* (Kachere), *Bauhinia petersiana* (Mpandula), *Commelina benghalensis* (Kholavani), *Ageratum conyzoides* (Mtawetawe), *Pennisetum unisetum* (Muzundi), *Trichilia emetia* (Msikizi), *Trichodesma zeylanicum* (Namasakata), *Eriosema shirense* (Musese), *Sclerocarya birrea* (Mfula), *Dalbergia nitidula* (Mtakanyerere), *Lannea stuhlmanii* (Mpatilamtikho), *Cordyla africana* (Mtondo), *Lannea stuhlmanii* (Mpatilamthiko), *Sclerocarya birrea* (Mfula), *Lonchocarpus bussei* (Nswaswa), *Lonchocarpus capassa* (Mpakasa), *Acacia polyacantha* (Chogondolo), *A. goetzei* (Chitonya), *Acacia karroo* (Mpapa), *A. nigrescens* (Nanyula), *A. abyssinica* (Mtsidzi), *Cordyla africana* (Mtondo), *Brachystegia boehmii* (mombo), *B. longifolia* (mombo), *B. floribunda* (Tsamba), *B. Bussei* (Mseza), *Diplorhynchus condylocarpon* (Thombozi), *Dalbergaia melanoxylon* (Phingo), *Zahna golungensis* (Mchelechele), *Pterocarpus angolensis* (Mlombwa), *Bauhinia thonningii* (Chitimbe), *Tereminalia sericea* (Naphini), *Pericopsis angolensis* (Muwanga), *Colophospermum mopane* (Tsanya), *Syzygium cordatum* (Katope), *Typha latifolia* (Njedza), *Leersia hexandra* (Likakazi), *Cyperus papyrus* (Muluru), *Vossia cuspidata* (Duvi), *Phragmites mauritianus* (Bango), *Ipomoae 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).

5.2.3. Threatened and endemic flora species of the project area

There are two species of trees that were sampled from the project areas that are threatened. These are *Pterocarpus angolensis* (mulombwa) and *Dalbergia melanoxylon* (phingo). Both of these species were recorded from Secondary Mixed Sabannah Woodland. These tree species should not be cut down unless permission is sought from the Director of the Department of Forestry.

5.2.4. Protected tree species

Five (5) protected tree species of Malawi namely; *Adansonia digitata* (Malambe), *Sterculia africana* (Mgoza), *Stecurlia quinqueloba* (Mkweranyani), *Sclerocarya birrea* (Mfula) and *Faihderbia albida* (Msangu) were recorded from the project areas. These tree species are the only tree species that are protected by the National Forest Act (Cap: 63.01) of 1997 and should not be cut down without obtaining permission from the Director of the Department of Forestry.

5.2.5. Invasive Alien Species (IAS) of the project area

Six (6) invasive alien plant species namely; *Azolla nilotica* (Azola), *Eichhornia crassipes* (Namatsupuni), *Pistia stratiotes* (Mkwakwalazi), *Salvania hastata* (Mpiliri), *Calotropis procera* (chinthonje) and *Eucalyptus camaldulensis* (bluegum) were invasive plant species that were recorded from the project areas of Mangochi District, including the Lakeshore areas and resorts. The first four species tend to colonize water bodies while the last two colonize the terrestrial habitats. These species tend to displace indigenous biodiversity species.

5.2.6. Tree Density Estimates

The density of a species reflected in the project area shows the abundance of a species on an estimated average of 23 indivuatural trees per hectare. The majority of flora species belonged to the *genera Brachystegia, Combretum and Uapacca.* The relative density was obtained from absolute density calculated from the total number of individual of a species present in a plot divided by the total area sampled (0.1 ha) using the following formula.

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

Where:

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

5.2.7. Fauna of Mangochi District

The fauna comprises of small mammals, birds and fish. The majority of the mammal species are those that are associated with agricultural activities such as mice (*Mus* spp.), common hare (*Lepus microtis*) and rodents (*Rodentia* spp.). Large mammals are confined to protected areas such as the Lake Malawi National Park, Phirilongwe Forest Reserve, Mangochi Forest Reserve, Namizimu Forest Reserve and the Shire River (Mangochi Socio-economic Profile, 2016).

The common bird species that are found in Mangochi District, including the study areas are *Agapornis lilianae* (Lilian's Lovebird), *Bubulcus ibis* (Cattle Egret) and *Egretta alba* (Great Egret and other various species of birds (Mangochi Socio-economic Profile, 2016).

Fish species that are found in Lake Malawi and the Shire River, including other rivers in Mangochi District are *Oreochromis lidole, O. karonge* (Chambo), *Bagrus meridiondis* (Kampango), *Tilapia shirensis* (Makumba), *Haprochronis* (Kambuzi), *Labeo mesops* (Ntchira), *Opsaridium microcephalus* (Mpasa), *O. Microlepis* (Sanjika), *Hippopotamyrus discorhynchus* (Mphuta), *Barbus paludinosus* (Matemba), *Engraulicypris sardella* (Usipa) and *Claris liocephalus* (Mulamba) (Mangochi Socio-economic Profile, 2016).

5.2.8. Fauna species of the project areas

The fauna species of the project area were surveyed by walking slowly in major vegetation types and recording species that were seen and/or encountered during the field work. Fauna

species that occur frequently in the project area are grasshoppersand dragonflies of different species. The data was supplemented by reviewing available literature, and conducting public consultations with relevant stakeholders.

5.2.9. Mammals

A total of 9 mammal species presented in Table 5-1 were recorded from the project areas and some were reported by local communities living in the project areas.

Table 5-1: Summary of mammal species reported to occur on the project areas

Name	Status	Habitat encountered/Reported
Procavia capensis (Mbila)	C	Secondary Mixed Deciduous Woodland, Rocks
Chlorocebus pygerythrus (Nyani)	C	Secondary Mixed Deciduous Woodland, Cultivated land
Lophuromys flavopunctatus (Mbewa)	VC	Secondary Mixed Deciduous Woodland, Cultivated land
Papio hamadryas Nkhwere)	VC	Secondary Mixed Deciduous Woodland, Cultivated land
Mus triton (Mbewa)	VC	Secondary Mixed Deciduous Woodland, Cultivated land
Mus musculus (Mbewa)	C	Secondary Mixed Deciduous Woodland, Cultivated land
Crocuta crocuta (Fisi)	C	Secondary Mixed Deciduous Woodland, Cultivated land
Lepu saxatilis (Kalulu wa mtchire)	R	Secondary Mixed Deciduous Woodland, Cultivated land
Mellivora capensis (Harney bager)	TR	Secondary Mixed Woodland

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

5.2.10. Threatened and endemic mammal species

There were no either 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.

5.2.11. Alien Species (IAS) in the project areas

Three (3) alien mammal species namely; *Bos taurus* (cattle/Ng'ombe), *Ovis aries* (Sheep/Nkhosa) 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 as they are just alien (non-native but domesticated) species.

5.2.12. Bird species of the project areas

A total of twelve (12) bird species were recorded from the study areas during the field survey presented in Table 5-2.

Table 5-2: Summary of bird species recorded from the proposed project areas

Name of Species	Status	Habitat encountered/Reported
Haliaeetus vocifer (Nkhwazi)	C	Wetland and Secondary mixed woodland
Alcedinidae sp. (Kingfisher)	C	Wetland and Secondary mixed woodland
Phyllastrephus placidus (Pumbwa)	C	Secondary mixed deciduous woodland, Cultivated land
Nectarinia olivacea (Phwiti)	VC	Secondary mixed deciduous woodland
Uraeginthus angolensis (Chingolopiyo)	C	Secondary mixed deciduous woodland
Serinus gularis (Nkota)	VC	Secondary mixed deciduous woodland
Anthreptes collaris (Kazaye)	C	Secondary mixed deciduous woodland
Streptopelia capicola (Njiwa)	C	Secondary mixed deciduous woodland
Numida meleagris (Nkhwali)	R	Secondary mixed deciduous woodland, Cultivated land, Seasonal wetland
Quelea quelea (Mpheta)	VC	Secondary mixed deciduous woodland, Cultivated land, Seasonal wetland
Bubo lacteus (Kadzidzi)	C	Secondary mixed deciduous woodland
Bubulcus ibis (Cattle Egret)	C	Seasonal and permanent wetlands

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

5.2.13. Threatened and endemic bird species recorded from the project areas

No threatened or endemic bird species was recorded from the proposed project areas of Mangochi and the surrounding areas during the field survey. In addition, no any other researcher has ever recorded of any threatened or endemic species from these areas.

Fish were surveyed by careful visual observations in water bodies such as rivers and fish ponds present in the study area. Species that could not be identified on-site were photographed and ultimately compared to photographs of fish species documented in various fish field guides.

5.2.14. Invasive Alien Bird Species (IAS) in the project area

None of the species recorded from the project areas of Mangochi town, including the Lakeshore areas and resorts of Nkhuzi Bay, Bishop's House and Ntakataka are Invasive.

5.2.15. Fish species recorded from the project areas

A total of 7 fish species namely; *Labeo mesops* (Ntchila), *Oreochromis lidole* (Chambo), *O. karongae* (Chambo), *Tilapia shirensis* (Makumba), *Haprochronis* sp., (Kambuzi), *Barbus paludinosus* (Matemba) and *Claris liocephalus* (Mulamba) were recorded from the waters of Nkhudzi Bay where the new weir will be installed. The number of species may be higher than this if more days days were allocated for the field survey.

5.2.16. Threatened and endemic fish species

One fish species *Oreochromis karongae* (chambo) was recorded from the waters of Lake Malawi near Nkhudzi Bay, which is one of the proposed project areas along the Lakeshore resorts of Mangochi District. This species is classified as Critically Endangered (CR) by both National and IUCN Red lists.

5.2.17. Invasive alien fish species

No alien fish species was surveyed or spotted and/or recorded from the project areas. 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

The population of Mangochi district was 1,148,611 in 2018 (National Statistics Survey report 2018). The project covers areas from Mangochi Boma to Ntakataka Turn Off, both of which are part of TA Mponda. According to the 2018 national census, TA Mponda has a population of 167,313 (NSO Report 2018). SRWB plans to supply water within the stretch targeting a population of 70,053 by the year 2025. Specifically, the project will supply water to the following villages: Chidzula,Nakumba, Makawa, Chipala, Mtimbula, Michesi, Ntyala, Chipoka, Ngoyi, Sanimkawa, Mpondasi and Masanga. SRWB also intends to supply water to the following Trading Centres (TC): Maldeco TC, Namiasi TC and Makawa TC.

According to the household survey that was conducted in the area, the average household size is 6 people.

5.3.2 Ethnicity and Language

Out of the ethnic groups present in project area, the Yao is the predominant group. According to the household survey, 45.3% of the sampled population belong to the Yao tribe. Following the Yao are the Chewa (17.2), then the Lomwe (16.3%), and other ethnic groups who are present in smaller numbers as shown in Figure 5.3. In regards to language, it was noted that Yao is the most common language in the project area seconded by Chichewa.

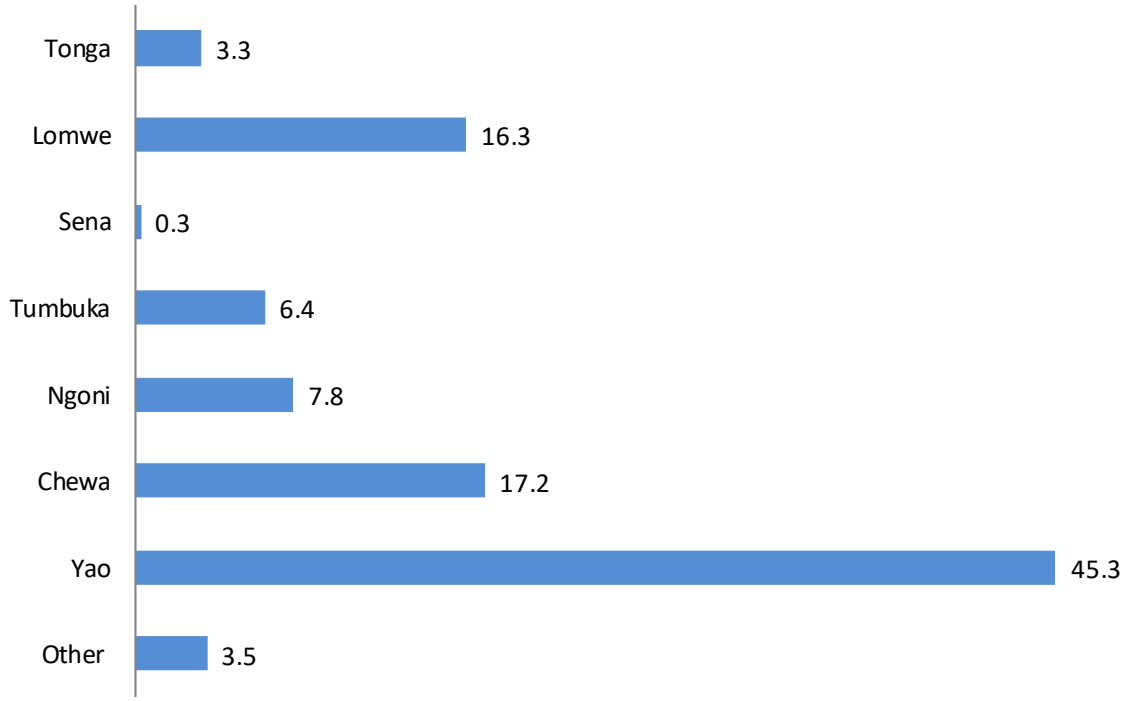

Figure 5.1: Ethnicity (Household Survey August, 2019).

5.3.3 Religion

Christianity and Islam are the predominant religious groups in Mangochi district and the project area. According to the household survey, 53.9% are of Christian faith, seconded by the Islamic faith comprising of 46.0% as shown in Figure 5.4.

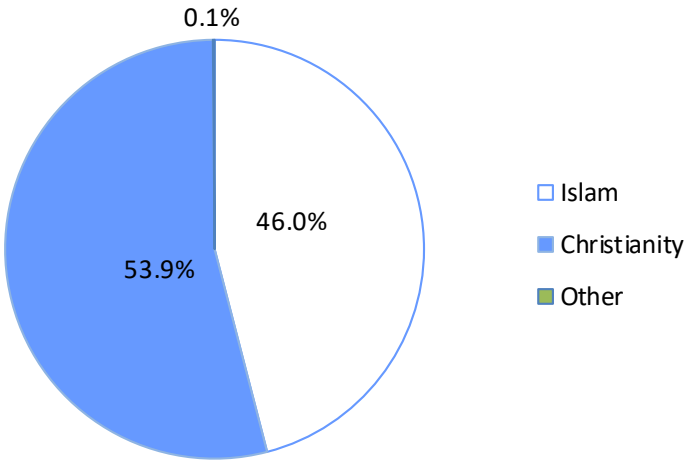

Figure 5.2: Composition of the religions (Household Survey August, 2019).

5.3.4 Livelihood and Income

Agriculture, fishing, trading and formal employment are the major sources of income and livelihood support in the district (Mangochi SEP, 2017-2022). From the household survey, informal employment and businesses (trading), are the major sources of income and livelihood support with 32.2% and 31.5% respectively. 11.4% of the population within the project areas rely on fishing for income. Figure 5.5 shows graphically illustrates the income and livelihood support means in the project area.

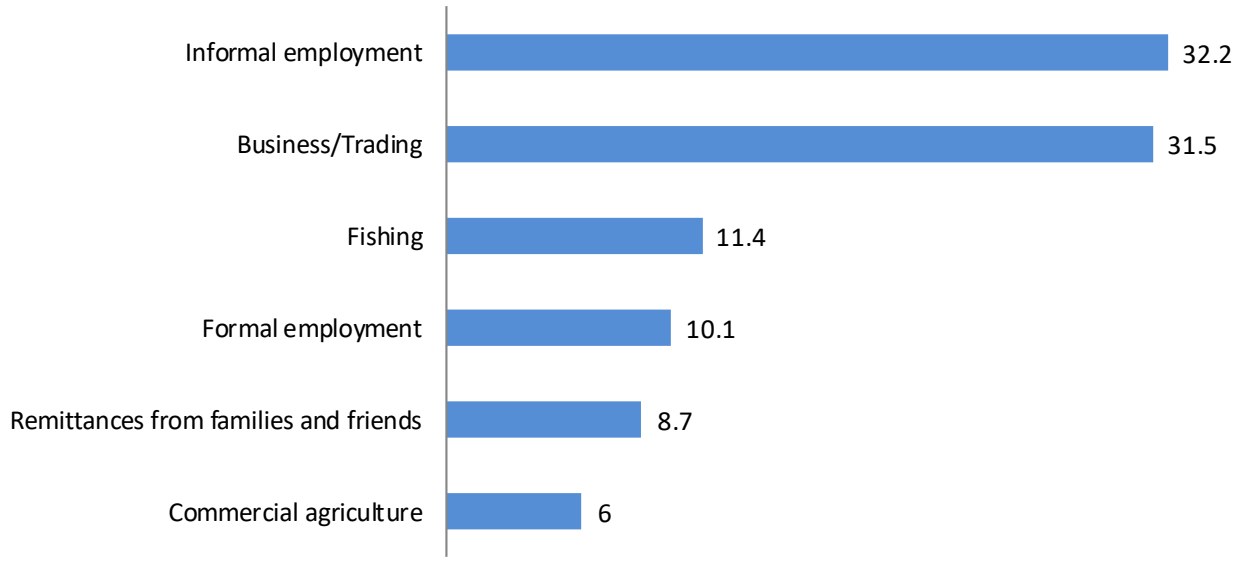

Figure 5.3: Income sources in the project area (HH survey, August 2019)

From both primary and secondary sources of income, it was noted that on average, monthly income is less than MK10,000 for 43.7% of the population and MK10,000 to MK25,000 for 28.9% of the population as shown in Figure 5.6.

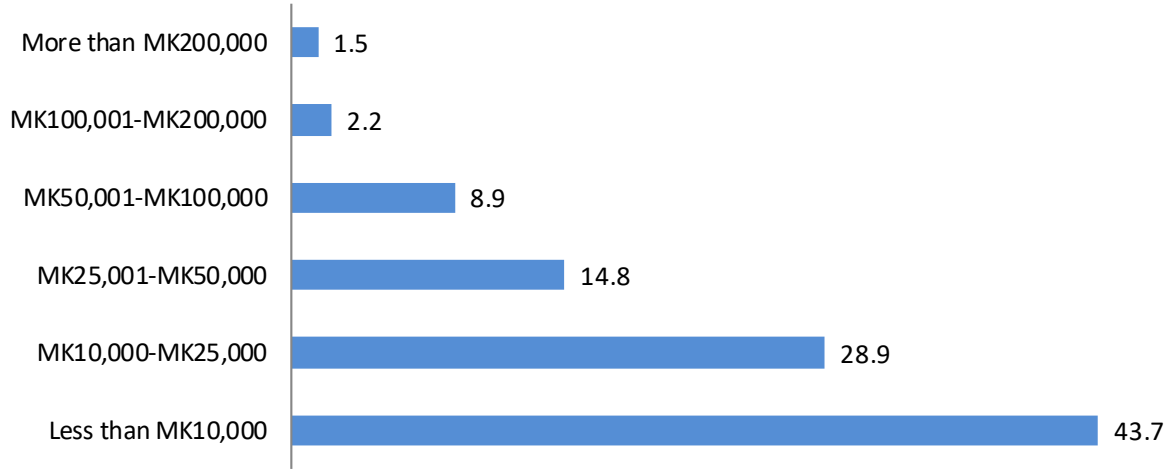

Figure 5.4: Income per month (Household survey, August 2019).

5.3.5 Education

The education sector in Mangochi is divided into primary and secondary education. The sector aims at achieving Malawi Growth and Development Strategy (MGDS III) on education which is to ensure that students are best equipped with knowledge and skills that enable them to function as competent and productive citizens in a free society.

Results from socio-economic survey shows that the highest level of education for majority of the people is primary level at 51%. 15.8% attended school up to secondary level as shown in Figure 5.7. In addition, some people in the area attend other forms of informal education including adult literacy 'sukulu ya kwacha' and MADRAS education as Mangochi District is predominantly an Islamic community.

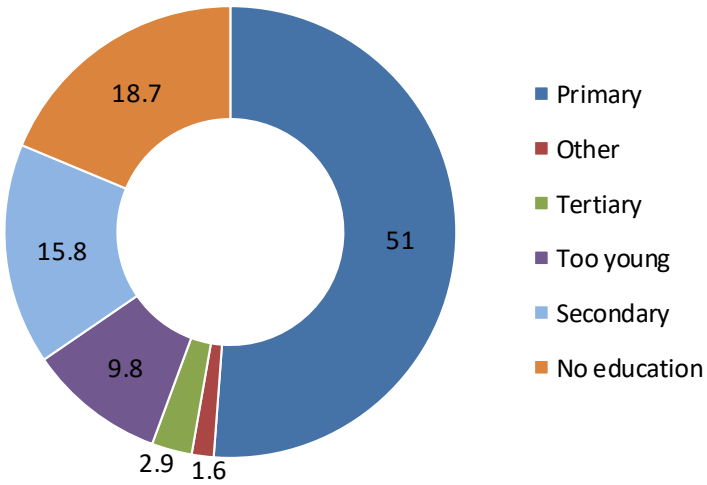

Figure 5.5: Education levels for Balaka Town(Household survey, August 2019).

School enrolment has increased over the past 5 years in the district. This could be attributed to the increase in number of primary schools available. However, from consultations with the education department, dropout rates are still high, especially for girls between standard 5 and 8. It was noted that early pregnancies and marriages, lack of good parental care and technology i.e. increase in video shows in the district are the major causes of increase in dropout rates.

Shortage of learning materials, qualified teachers, lack of sanitation and hygiene facilities including menstrual hygiene produts for girls are the major issues that the district is facing in order to provide quality education to students. It was noted that most girls are absent from school when they are on their menstrual cycle due to the lack of sanitation and hygiene products including water.

The household survey also assessed challenges that communities face in accessing education. Cost (tuition and other fees), materials for learning and distance are some of the challenges that communities face in accessing education. This is shown in Figure 5.8.

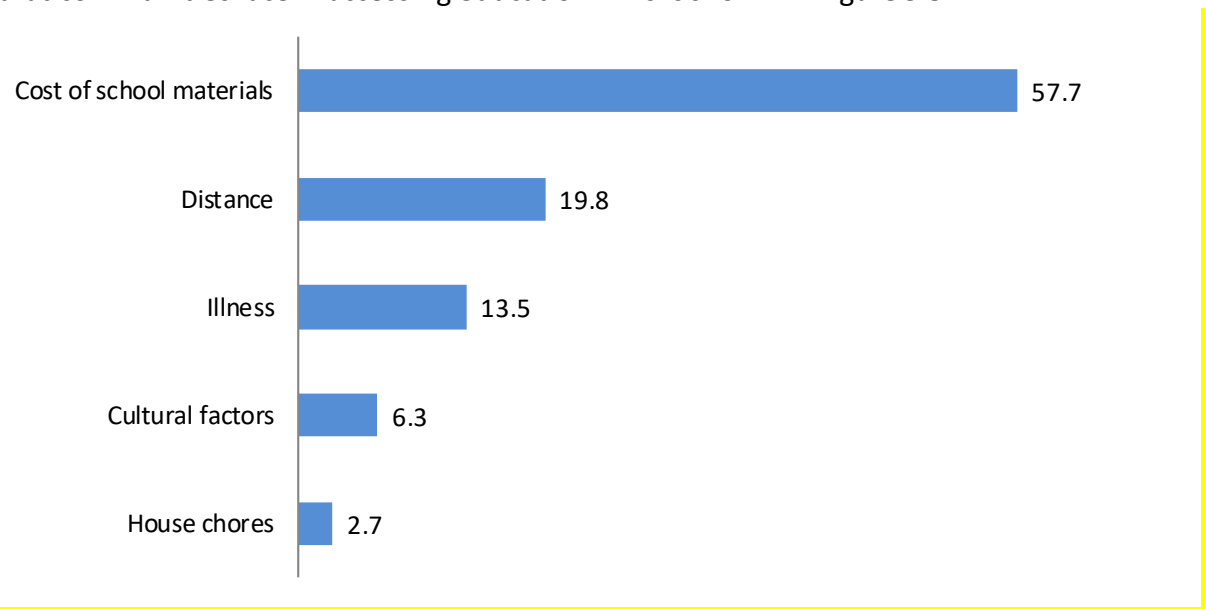

Figure 5.6: Challenges in accessing education.

5.3.6 Health situation for the project area

The leading cause of morbidity in Mangochi district is Malaria, followed by acute respiratory infections (GoM, Mangochi SEP 2017-2022). According to the data gathered during the household survey, malaria, chronic respiratory infections and diarrhoea are the common diseases in the project area as shown in Figure 5.9. Malaria incidents in the district have decreased from 31% In 2016 to 26% in 2017. This was a result of mass distribution of Long Lasting Insecticidal Treatment Nets (LLINs) in the district. However, malaria still remains the cause of high death rate among children under the age of 5 (GoM Mangochi SEP 2017-2022).

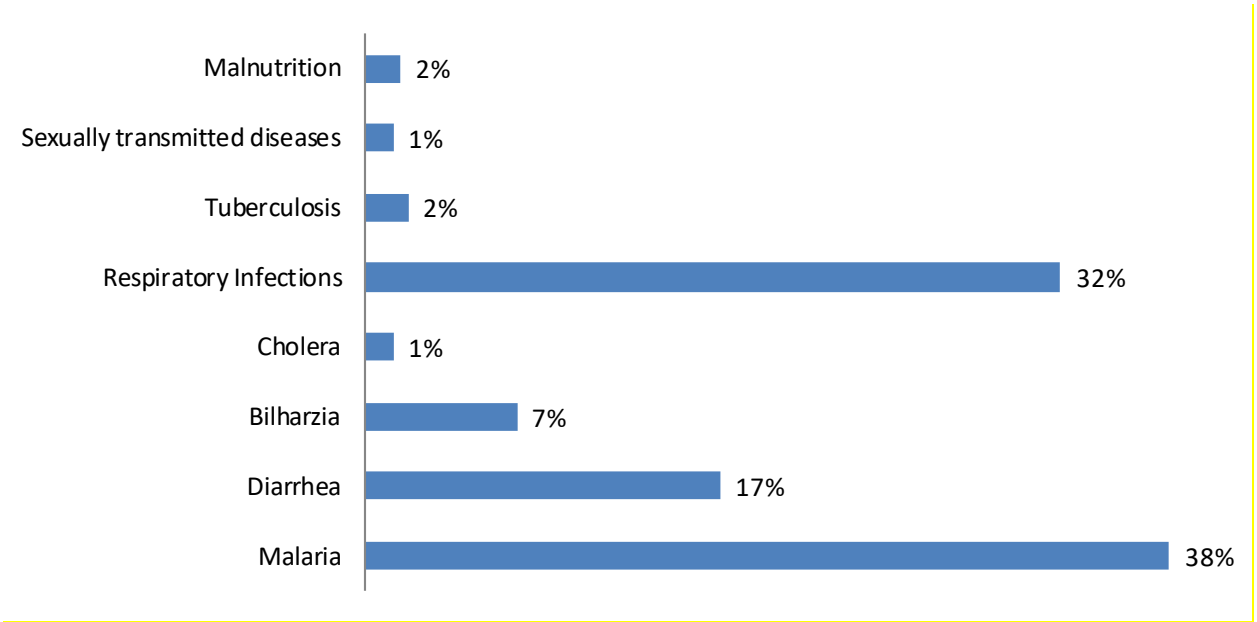

Figure 5.7: Common diseases the project area.

HIV and AIDS is one of the major communicable disease in the district and affects the treatment of both communicable and non-communicable diseases. Apart from the increase in number in HIV, sexually transmitted infections (STIs) are also common in the district. This is because people are reluctant to abstain and the practice of unsafe sex is common. Cholera and diarrhoea also pose major problems in the district. This is mainly attributed to low access to safe water and improved sanitation in the district.

Unavailability of water, sanitation and hygiene facilities, Inadequate number of health personnel, lack of good infrastructure, transportation and finance are the major challenges the district is facing in making sure that people have access to quality health services.

The implementation of this project will have a greater impact on the health sector as it will help reduce incidents of water related diseases. It will also address some of the water-related,sanitation and hygiene challenges faced by the health sector. **Accessibility to health services**

The district has three levels in providing health care services namely:

- Level A (Primary/Community)- This is managed by health surveillance assistants and the treatments are minor through health education, sanitation and hygiene and disease prevention and control.
- Level B (Primary/Health centres)- These are health centres that cover a wider area and focus on providing primary curative and preventive care.
- Level C (Secondary/District hospital)- This provides health care services throughout the entire district.

In addition to the government health care services, there are also private clinics and mission health centres/hospitals in the district. From the household survey/consultations, it was noted that people in the project area access health care services from all the three health care service providers (Government, Mission and Private clinics).

For most residing in the project areas, distance to the nearest health care service is less than 30 minutes (56 %), a few people reported having to walk a distance of more than 2 hours (5%) to access the nearest health care services. Figure 5.10 shows distance to the nearest health care services.

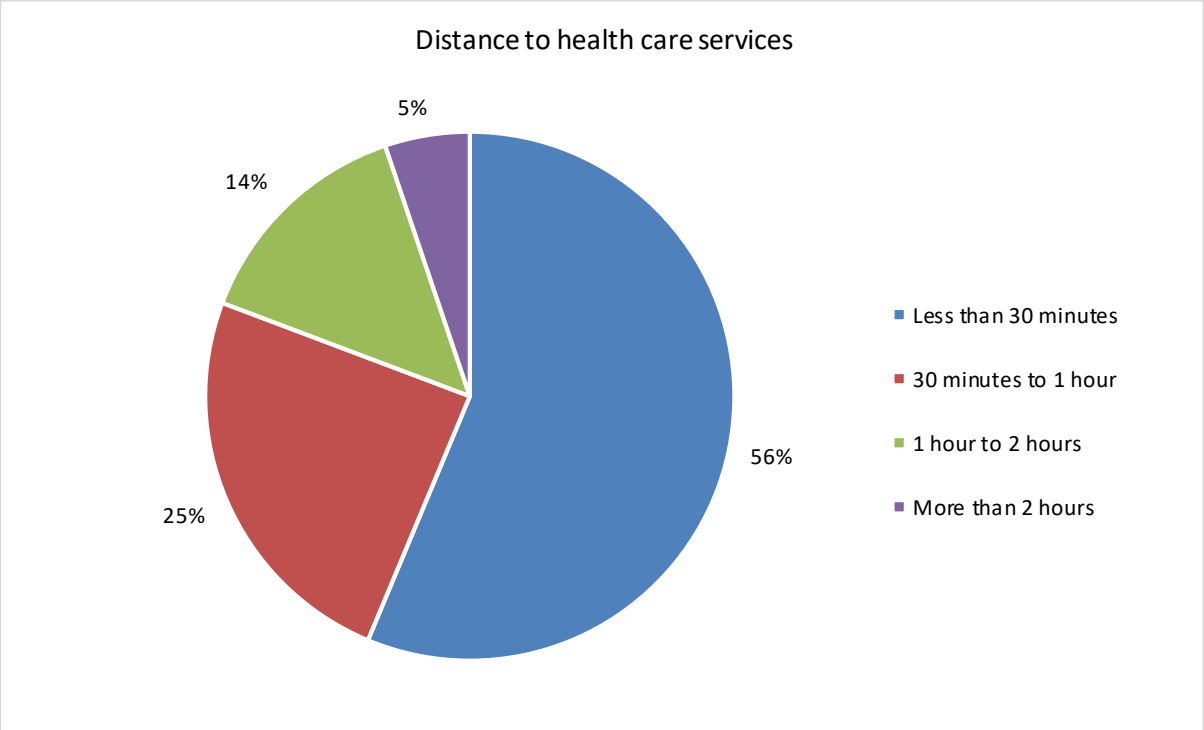

Figure 5.8: distance to health care services

5.3.7 Agriculture

The main crops that are grown in the district include maize, rice, sweet potatoes, cassava, ground nuts, beans, pigeon peas, soya beans, fruits and vegetables, tobacco and cotton. With cotton and tobacco being the major cash crops in the district. According to the household survey, maize, millet, sweet potatoes, and beans are the crops that are grown withinin the project area, with maize being farmed in almost all the households. The household survey assessed agricultural challenges faced by community members in the project areas. Lack of agricultural inputs, insufficient rainfall (drought), pests and diseases and floods are the major agricultural challenges experienced. Figure 5.11 graphically illustrates this.

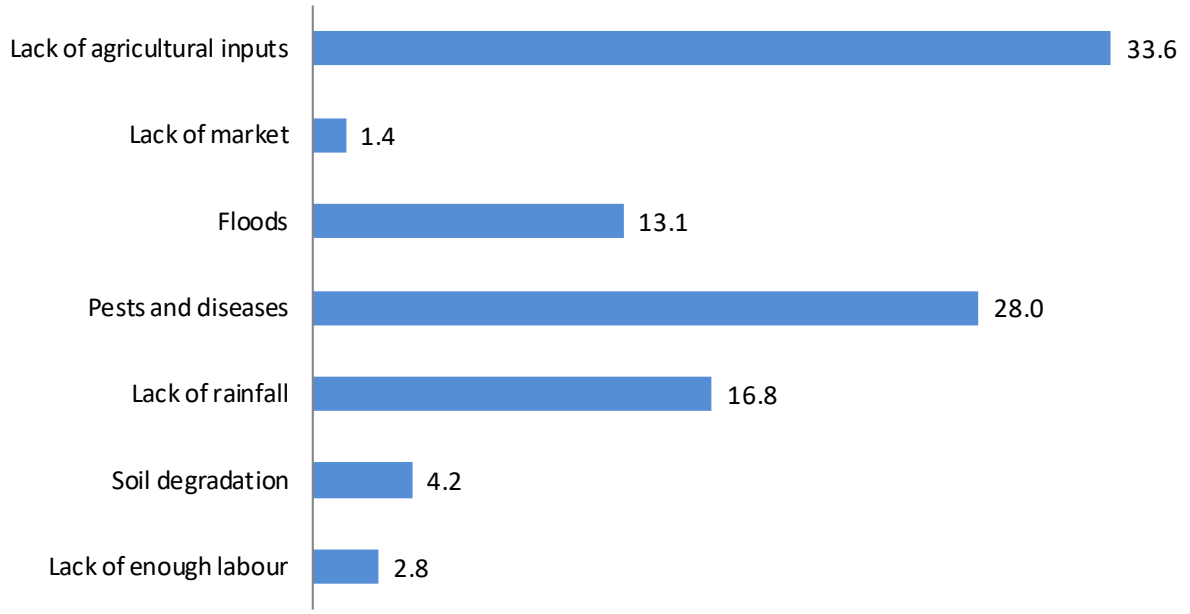

Figure 5.9: Agricultural Challenges

Over the past years, crop production in the district has decreased due to bad weather conditions (drought and floods), low market prices, soil degradation and lack of farm inputs. Because of this, there have been water and soil conservation interventions in the district with the aim of improving soil fertility. These include setting up of physical boundaries, realignment of ridges to follow contours to reduce soil erosion during the rainy season, use of Vetiver grass to reinforce structures which helps in moulding soil and agro-forestry. However, the district still faces challenges in human resources and sourcing funds for provision of extension services. .

Irrigation is also used in the district in effort to increase food production and improve food security. However, due to insufficient water sources, inadquate use of irrigation technologies and frequent failure of irrigation equipment poses a challenge.

5.3.8 Tourism

Mangochi district is rich in natural resources that attract both national and international tourists. Lake Malawi and the Lake Malawi National Park are some of the major tourist attractions. The tourism sector plays a major role in providing income through creation of jobs for local people and helps in boosting the economy for the country through foreign exchange.

5.3.9 Trade and Commerce

Mangochi district is one of the most commercially advanced districts in Malawi. Most commercial and industrial businesses are micro, small and medium scale enterprises. Enterprises taking place in the district include fish processing and trading, tinsmithing, weaving, bakery and making of curios among others. Njereza Cement Company is the only large company in the district. There is also a growing number of people that migrate to South Africa for business opportunities.

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

a) Banks i.e. National Bank, Standard Bank, First Merchant Bank (FMB), New Building Society (NBS) Bank, Malawi Savings Bank and National Bank of Malawi (NBM)
b) Curios (handcraft materials) and handmade boats.

5.3.10 Transport, Telecommunication and other services

Roads in Mangochi district are divided in designated and undesignated roads (Gov Mangochi SEP, 2017-2022). The designated roads comprise of main roads, secondary roads, tertiary roads and district roads. Different modes of transportation are used in the project areas. This includes motorcycles, minibuses, buses, taxis and bicycles. Motorised transport is the most common mode of transport in the project areas due to their close proximity to main roads.

In terms of telecommunication, there are postal services, landlines and cellular phones and radio networks in the district. Specifically, there is one post office in TA Mponda which provides telegraphy services and other mailing services.

5.3.11 Energy

Fuel for cooking

From the household survey, it was noted that the main source of fuel for cooking is firewood (65.2%) seconded by charcoal (34.8%) in the project area as shown in Figure 5.12. Firewood is mainly collected from nearby forests.

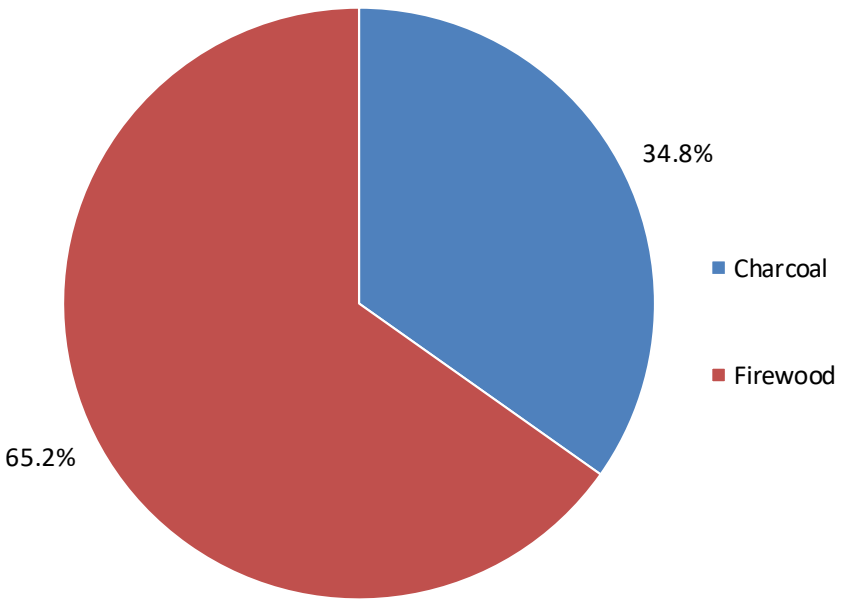

Figure 5.10: Types of fuel used for cooking

Charcoal production and illegal firewood harvesting have resulted in the depletion of forest resources. In an effort to reverse the negative impacts, the district council and other NGOs are working on restoring the depleted forests with the involvement of communities. Afforestation and licensing for charcoal production are some of the interventions that are put in place to help in reducing the rate of deforestation, thereby reversing the negative impacts.

Long distances to access firewood, cost of firewood (for those that buy) and availability of firewood are the main challenges faced in accessing firewood

Fuel for lighting

Battery powered torches are the main source of lighting in the project area. Some people are connected to ESCOM electricity grid especially in areas close to Mangochi town. Other sources of lighting include candles (1.5%), solar (2.2%) and portable solar lamps (0.7%) among other as shown in Figure 5.13.

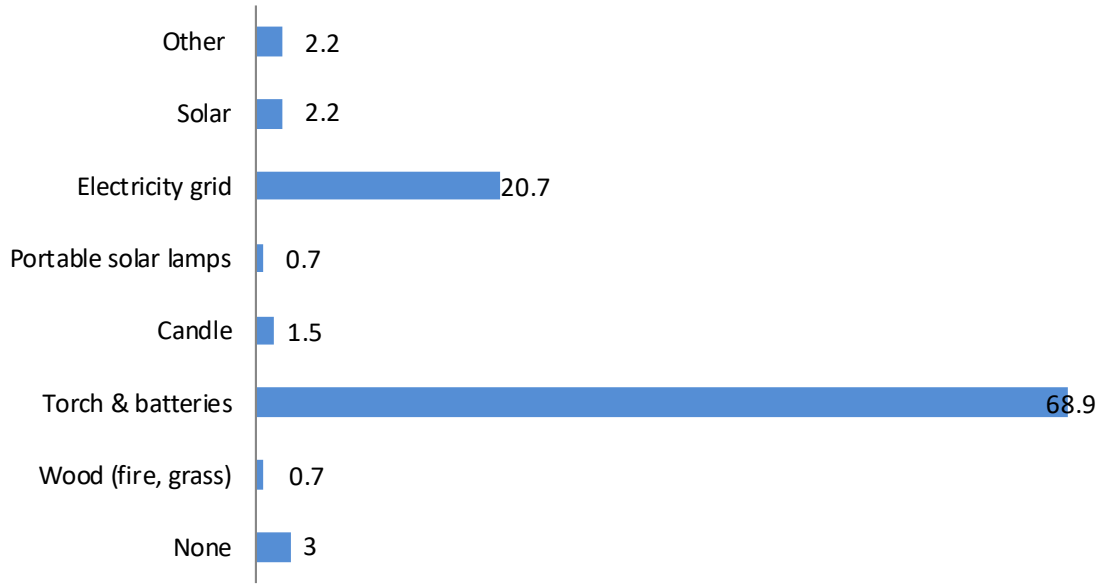

Figure 5.11: Sources of Lighting

5.3.12 Waste Management

Indiscriminate disposal, use of refuse pits and manure making are the most common ways of solid waste disposal. From observation, indiscriminate disposal is very common in both the district and the project areas. Mangochi district does not have a land fill to manage it's solid waste. As a result, waste is disposed of indiscriminately including in a palm forest close to the Shire river.

For liquid waste, use of traditional pit latrines is common in the district and the project area. The household survey showed that 60% of the population use traditional pit latrines and only 1% use flush toilets. Figure 5.14 shows the types of toilets used in the project area.

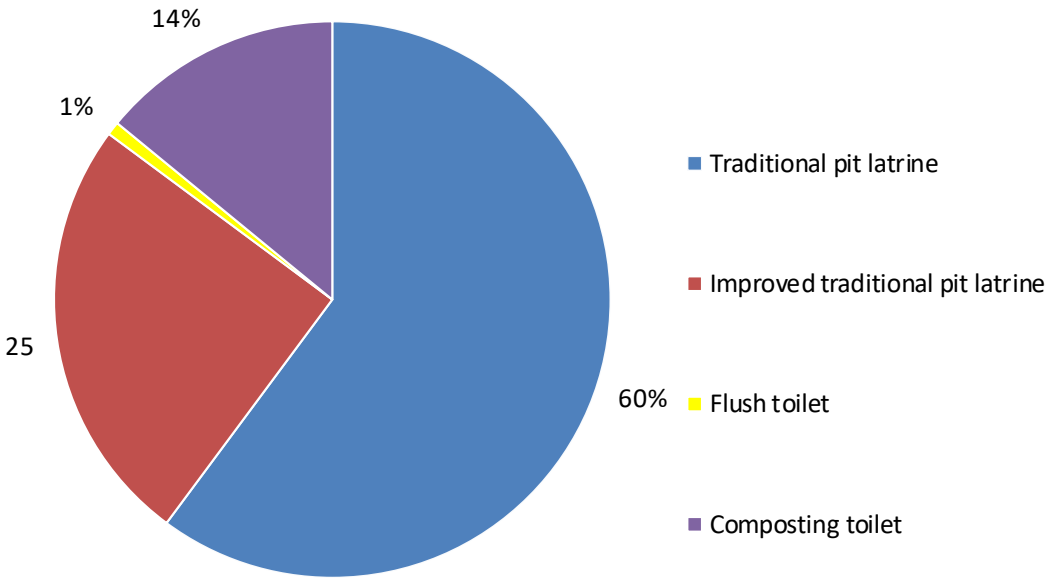

Figure 5.12: Types of toilets in the project area

It was also noted that those people that do not own toilets within their housing compounds use neighbour's toilets, and that none use the bush or nearby water sources. From Focus Group Discussions (FGDs), it was noted that people do not use the water sources to relieve themselves because there are committees put in place to ensure that water sources are protected.

There is no sewer system for liquid waste disposal in the district, hence the use of septic tanks. From consultations with the environmental department, it was noted that when septic tanks are emptied, the waste is disposed of in one of the forests in the district along the Chilipa road.

5.3.13 Access to Water

a. Water Sources

Mangochi district has various water sources; boreholes, wells, taps, lakes, rivers and springs. From the household survey, boreholes are the major source of drinking water in the area at 43.3%. The people also use piped water mainly supplied by Water User Associations (WUA) and water from Lake Malawi and Shire River is also used as shown in Figure 5.15.

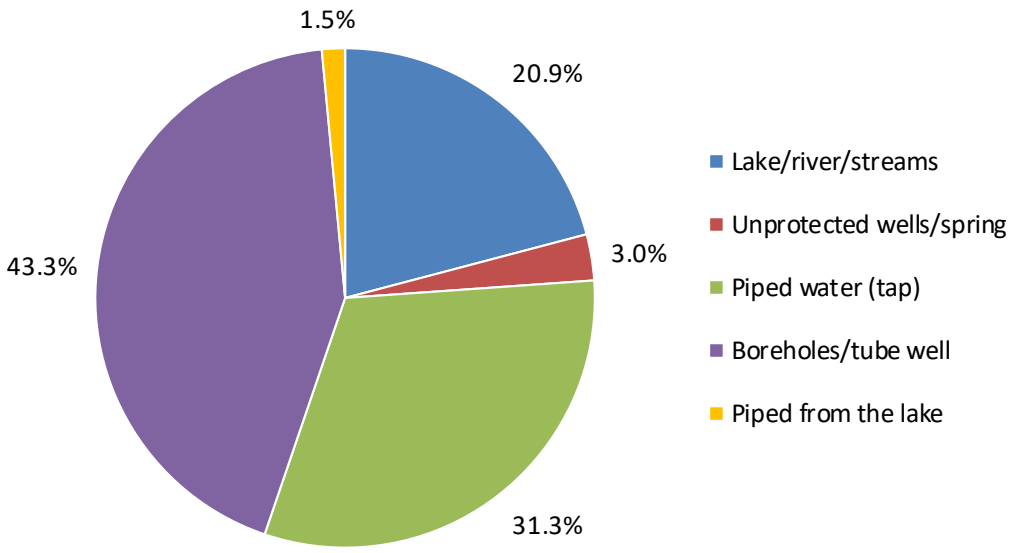

Figure 5.13: Water Sources

b. Challenges Accessing Water

Access to safe water remains a challenge in the district. Poor water quality due to excess calcium is the major problem in the project area, especially for people that access water from boreholes. Water shortages, high cost, difficult to access and frequent breakdowns are other problems in accessing water as shown in Figure 5.16. Water shortages are mainly during the dry season as the water table drops. This forces people to walk long distances in search for water and sometimes use the nearby rivers and lake to access water. On the other hand, people that use tapped water supplied by Koche WUA explained that the water is very expensive which forces them to use unsafe water sources like the river and the lake.

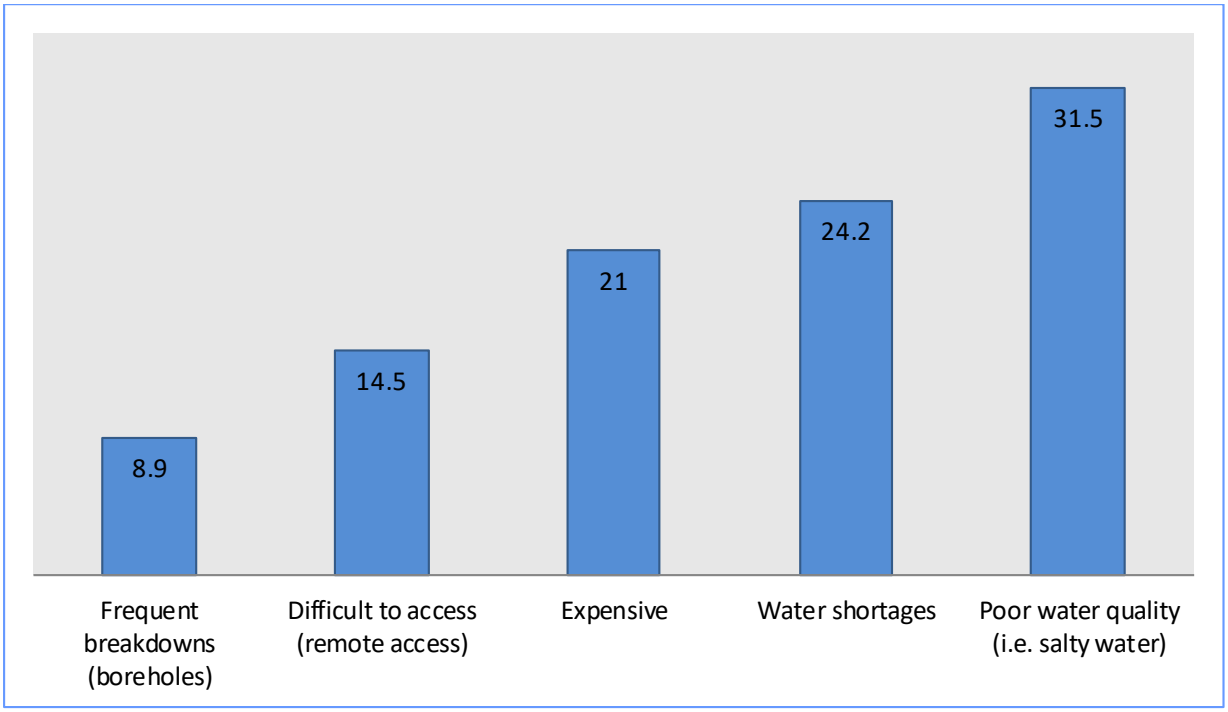

Figure 5.14: Water Supply Challenges-Balaka town

c. Distance to the water source and queueing time

The government of Malawi recommends a maximum walking distance of 500m and 300m for rural and urban areas respectively, and a round trip duration of less than 30 minutes to fetch water. Despite having few boreholes in the area, most people spend less than 15 minutes one way to access water as shown in Figure 5.17. This is because the households in the project villages are not scattered and the unsafe water sources are not far from most households.

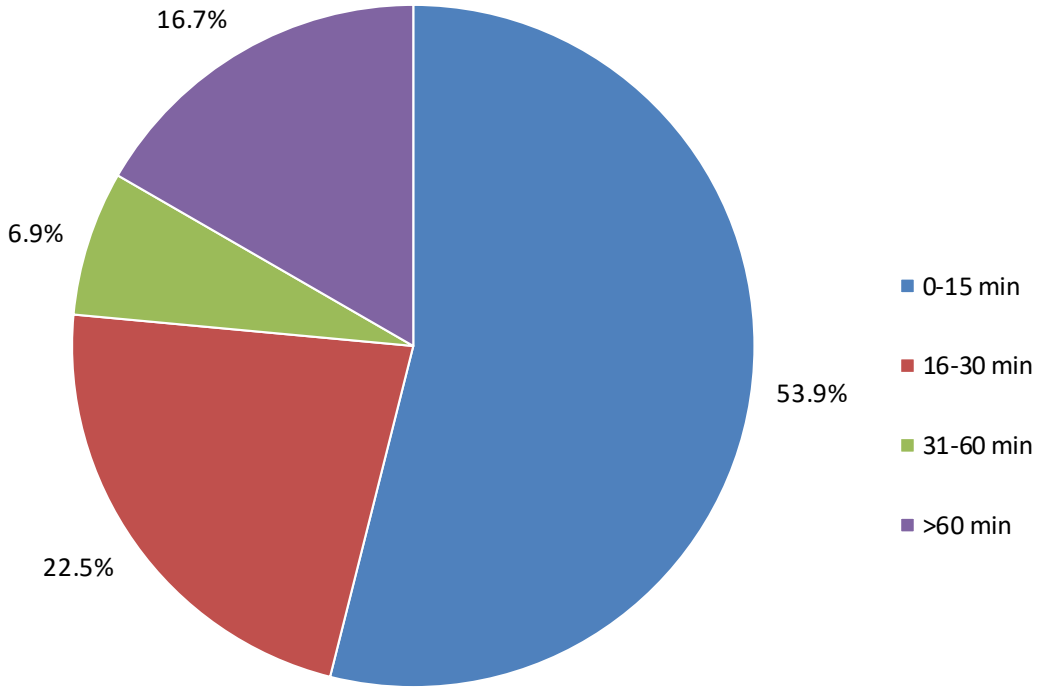

Figure 5.15: distance to water sources

d. Water Treatment

The household survey also assessed the ways in which people treat their water in the project areas. The results from the survey showed that 66 % of the population add chlorine to treat their water. The remaining respondents stated boiling, straining through a cloth,letting the water stand and settle while covered. Figure 5.18 shows Water treatment means.

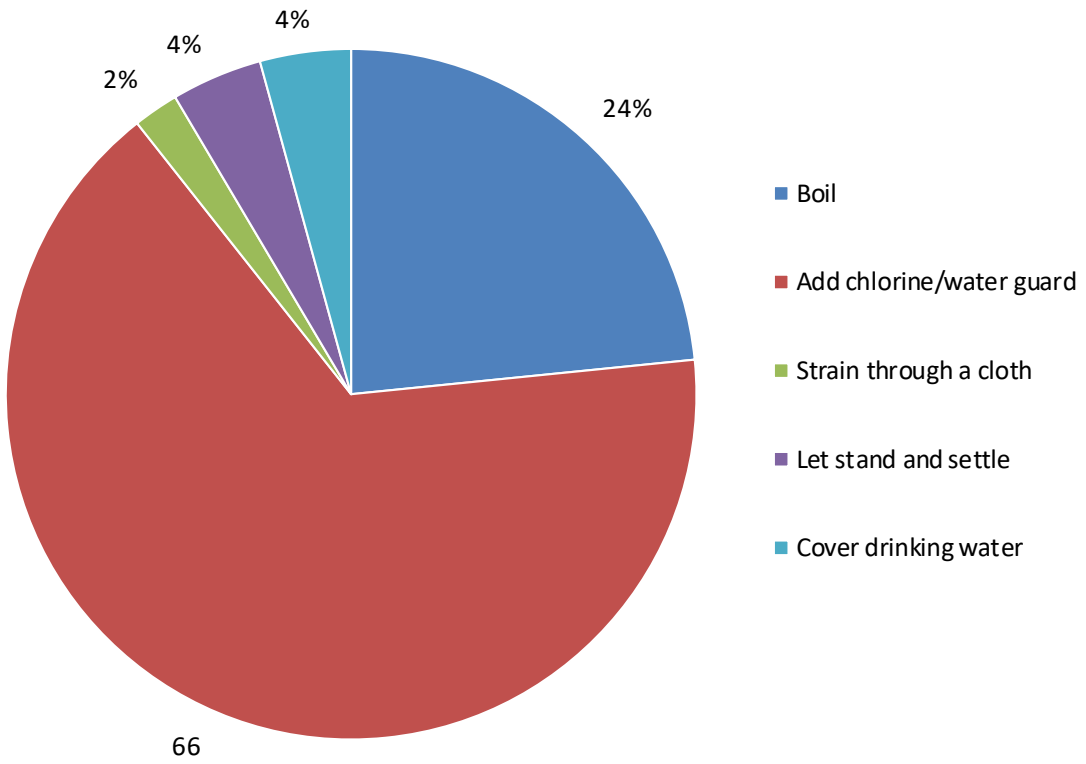

Figure 5.16: Water Treatment-

e. Willingness to pay

From the household survey, most people are willing to pay for water to be supplied by the SRWB. Willingness to pay was assessed on a monthly basis. From the respondents feedback, the majority (70%) are willing to pay between MK 1 to MK 2000. During consultations, participants mentioned that the water to be supplied by the SRWB should not be cost-prohibitive such that they are unable to afford it. The people also recommended the use of prepaid water meters so that consumption is based on the money and water units they have. Figure 5.19 shows the amount of money people are willing to pay for the water on a monthtly basis.

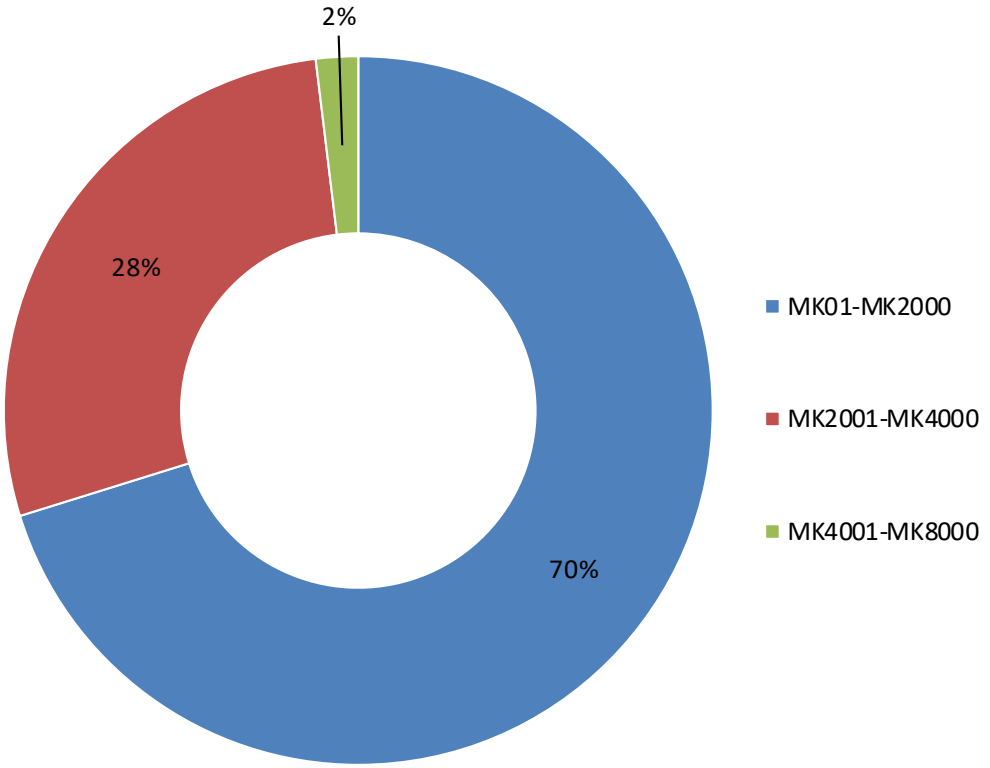

Figure 5.17: Willingness to Pay

5.3.14 Gender and Sustainable Development

Communities in the project area are matrilineal which has an impact on resource ownership and control, roles and responsibilities. Men and women of the project area work together in development activities in areas of education, water, sanitation and hygiene and nutrition. Women are mostly responsible for household chores including fetching water and carrying out sanitation and hygiene activities in their homes and community. It was noted during consultations that during the dry season, women spend a significant amount of time searching for water. The implementation of the project will help in reducing the distance women have to walk to fetch for water and will improve the access to safe water among households.

5.3.15 Degree of Gender Mainstreaming

Gender mainstreaming refers to promoting gender equality within projects and/or organisations thereby enabling men and women to fully participate within the organisation and enjoy equal opportunities. The SRWB ensures that there is equal opportunity for both males and females, and resort to affirmative action measures in line with the Malawian constitution in order to balance the female-male ratio among the workforce of the organisation.

CHAPTER 6 : ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACT

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

6.1. METHODS FOR IMPACT IDENTIFICATION

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

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

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

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

Table 6.1: Environmental matrix used in the study

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

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

6.2. ANALYSIS OF POTENTIAL BENEFICIAL IMPACTS

6.2.1 Positive impacts during construction phase

a) Creation of employment opportunities

Construction of the proposed water project will create employment opportunities both directly and indirectly during construction phase. Directly, the project will require technical personnel and labourers. Most of the labourers will come from the surrounding communities and will be involved in excavation of pipe trenches, pipe installations, plumbing and carpentry; cement block making, bricklaying and steel fixing. A minimum 200 people are expected to be employed as labourers. Indirect employment will be required for provision of construction materials such as sand and bricks; and the labourers will also require foodstuffs, goods and services. Thus, other people will be indirectly employed to provide the food, goods and services and construction materials.

It is also expected that women, youths and members of the vulnerable groups will be employed on the project. Incorporating the vulnerable is of vital importance to enhance employment equalities.

Recommended enhancement measures

i. Inform local communities of employment opportunities.
ii. Prioritise employment of local persons that qualify.
iii. Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities.
iv. Provide employment to only people who are above 18 years of age.
v. Workers must be treated and paid fairly for the services rendered.
vi. Provide equal employment to women and men.
vii. Wages must be above the minimum wage and overtime must be paid on time.
viii. Workers must be sensitized to save and invest during project implementation.
ix. Encourage the workers to participate in Community Services Investment programmes (COMSIP) and Village Saving and Loans groups.

b) Increase in trade opportunities

The project will provide 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.

Recommended enhancement measures:

i. Pay 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.

6.2.2 Positive impacts during operation phase

a) Improved water supply to Mangochi Town and the surrounding areas

The project is expected result in improved supply of potable water in the Town of Mangochi and the surroundings. The water supply system is expected increase the production of treated water, which will result in adequate water for supply to the town. Coupled by an improved distribution network, the residents of Mangochi Town and the surrounding areas will receive potable water 24 hours of the day. This will improve people's lives as among others, water is needed for cooking, washing dishes and clothes and cleaning the house. In addition, it will reduce drudgery of women, who are mostly involved in fetching water when there is no supply. Hence, the women will have more time for development activities.

Recommended enhancement measures:

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

b) Improved access to portable water source

The project will increase water connections in the town and extend water supply to new areas. This is expected to result in easy access to portable water; reduced distances to draw water and the associated drudgery of carrying heavy buckets of water. Additionally, the queuing time at water points will be reduced, which in turn will lead to increase productivity time for women and girls; the study established that it is mainly women and girls who draw water for the household.

Recommended 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. Ensure water is available all the time at the water points.

c) Improved sanitation, hygiene and health

Increased availability of treated water is expected to 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.

Recommended enhancement measures:

i. Sensitise communities on hygienic practices for handling water to avoid secondary contamination.
ii. Promote general sanitation practices amongst communities in the project area.
iii. Conduct trainings aimed at building the capacity of water kiosks committee.
iv. Monitor the quality of water and to promote health and hygiene at water points.
v. Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene and
vi. Ensure there is adequate drainage within the community water points

d) Improved socio-economic situation of the communities

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.

Recommended enhancement measures

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

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.

Recommended enhancement measures:

i. Sensitize recruiting authorities to maintain work place gender balance in line with the national gender policy
ii. Ensure there are also women in important positions.
iii. Promote gender mainstreaming in development activities through sensitization, advocacy and awareness.
iv. Economically empower women within affected communities by linking them with the Community Services Investment Programmes (COMSIP)

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.

Recommended enhancement measures

i. Conduct sensitizations aimed at encouraging girls to enrol in schools.
ii. Provide the necessary support and adequate resources to schools to ensure that they have adequate resources for the provision of quality of education.

iii. Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees.
iv. Provide adequate water and appropriate sanitation facilities in schools to support female students.

g) Increased development

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

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

Recommended enhancement measures

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

6.3. ANALYSIS OF POTENTIAL ADVERSE IMPACTS

6.3.1 Adverse impacts during planning and design phase

a) Losses and compensation for land and assets

Land will be required for construction of water supply system structures and movement of vehicles. Some of this land will be acquired from people hence some will lose agricultural land and assets which they will need to be compensated for. The SRWB intends to acquire this land through 'owner offers, SRWB agrees and pay' process, with the involvement of the Mangochi District Lands Office and the Regional Physical Planning Department Office (South) to ensure that the values of land offered are acceptable to both parties. So far, an agreement with four (4) Project Affected Persons for compensation for land for proposed pump house.

Recommended mitigation measures

i. Locate transmission and distribution pipe lines within existing road reserves, as much as possible.
ii. Conduct sensitization and awareness on the need for land for the project and compensation process.
iii. Plan, prepare and implement all compensations in coordination with the Mangochi District Commissioner and the Department of Lands.
iv. Conduct a disclosure and verification exercise before payment of compensations to ensure that there are no conflicts.
v. Strengthen the Grievance Redress Mechanism used in Local Development Fund Projects for use in this project
vi. Sensitize the affected people to use the existing Grievance Redress Mechanism
vii. Compensate and resolve any grievances before handing over the land before commencement of construction activities.
viii. Mangochi District Council must help the affected people to identify replacement land.

b) Unrealistic expectations with regard to lands/compensation/resettlement negotiations

The land acquisition process has created expectations among the population in and around the project area in terms of monetary benefits from compensations. Some people are offering land at prices that are very high compared to acceptable compensations; while the land in the road reserve will not be compensated for. This may lead to disagreements.

Proposed Mitigation Measures

i. Conduct adequate thorough public and sensitization meetings in regard to land laws, land acquisition and compensations.
ii. Observe transparency and accountability when evaluating the land and property and paying the compensations.
iii. Proper consultation has to be carried out with the owners of the land and government officers must avoid dictating unfair and unreasonable compensation amounts.

6.3.2 Adverse impacts during construction phase

a) Dust generation, gas and particulate matter emission

Potential significant dust generation will generally occur during the first six months of construction due to site preparation activities and excavations for the construction of treatment plants, pump stations and trenches for transmission and distribution pipes. Dust generation will degrade air quality and may cause respiratory disorders; dust can also cause nuisance problems when re-deposited on clothes and surfaces, and can hinder visibility. The impact will mainly be felt on site; however, fine particles may also be lifted from exposed surfaces by the action of wind.

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

Recommended mitigation measures

i. Use new or fairly new 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.

b) Soil contamination and land degradation

Soil contamination and land degradation may result from the following:

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

Recommended mitigation measures

i. Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils.
ii. Discard waste oil containers in approved disposal sites, as recommended by Mangochi Town Council.
iii. Segregate waste (e.g. cartons and paint containers) to encourage reuse.
iv. Provide all structures required for effective water drainage.
v. Construct waste disposal pits and bury the wastes after the construction period. The pits must not be near to surface water bodies.
vi. Closely supervise the workforce to avoid or limit waste generation.
vii. Store and contain construction materials on lined surfaces and in covered areas.
viii. Sensitize construction workers to avoid littering the site.
ix. Use excavated soils for backfilling and site levelling.
x. Sensitize suppliers to mine sand and source quarry in approved sites and sustainably.
xi. Enforce the use of licenced construction material suppliers through the construction contract(s).

c) Loss of vegetation cover

An unavoidable part of any development project is the clearing of land and the consequential loss of vegetation cover. This is also anticipated in this project; strip clearing of the route of the pipelines, treatment plants and pump stations is expected to result in loss of vegetation cover although not considered ecologically sensitive. Loss of vegetation cover also leads to loss of habitat for wildlife species and degradation of soil due to increased soil erosion. Loss of vegetation cover also contributes to climate change.

Recommended mitigation measures

i. Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation.
ii. Plant appropriate trees and grasses and grasses in all disturbed area.
iii. Cost and appropriately compensate for all the trees to be cut down during construction.
iv. All the trees to be cut down during construction should be costed and appropriately compensated for.
v. Ensure that for every single tree cut down, 10 tree seedlings of a similar species are planted in the adjacent areas.
vi. 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.
vii. Sensitize employees and the community to conserve vegetation.
viii. Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.

d) Accidents and hazards from trenches and 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.

Recommended mitigation measures

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

e) Disruption of water supply

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

Recommended mitigation measures

i. Give adequate notice of potential water disruption to the water users that could be affected
ii. Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate

f) 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.

Recommended mitigation measures

i. Mix cement in areas, which are not directly connected to natural drainage systems.
ii. Store cement, paints, lubricants and fuels in lined and covered areas.
iii. Provide appropriate spill kits when working near water courses.
iv. Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water.
v. Site all material storage areas at least 10 m from watercourses.
vi. Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses.
vii. Connect the drainage systems to oil interceptors.
viii. Line surfaces where cement, paints and oils will be stored and connecting the drainage systems to oil interceptors.
ix. Collect and dispose wastes in designated disposal sites as required by the Local Authority.
x. Construct pit latrines that are at least 1.5 meters deep, lined at the base and 30 metres from a water body.

g) 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.

Recommended 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.

h) Disturbances and accidental damage to assets

Construction of transmission and distribution pipe lines are accepted to be done near or within communities. Disturbance factors will construction workers working near a house, site of heaps of soil, noise, temporary closure of sections of the road where the pipeline is

crossing and many more. Accidental damage to property and land assets may also occur during construction works.

Recommended Mitigation Measures

i. Provide adequate notice before conducting construction activities at a private or public property.
ii. Provide detours and appropriate traffic signs for vehicles and pedestrians where constructions are being conducted across a road.
iii. Restore work sites to their state before construction activities where possible; rehabilitate the sites where it is not possible to restore to the baseline condition.

i) Noise and vibrations

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

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

Recommended mitigation measures

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

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

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

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

Recommended mitigation measures

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

ii. Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place.
iii. Sensitise girls on the dangers of getting involved in pre-marital sex at a tender age.
iv. Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities.
v. Engage stakeholders in encouraging and empowering women to be financially independent.
vi. Provide both male and female condoms to workers for appropriate use.
vii. Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).
viii. Support the District Social Welfare Office and the Community Development Office and Non-Governmental Organisations in the implementation of on-going projects aimed at assisting pupils to go back to school.

k) Incidence of sexual abuse and harassment

Incidence of sexual abuse and harassment are anticipated at the work sites and in the homes. At the worksite, women seeking jobs could voluntarily or involuntarily indulge in sex with the employers in order to get jobs. It was established during the consultations that this is a common practice in Mangochi. Sexual abuse and harassment could also occur during the course of employment, mostly affecting the women due to the perception that women are a weaker gender (gender inequality).

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

Recommended mitigation measures

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

l) Diseases and increased pressure on community health services

The influx of immigrant workers and job seekers may result in increases pressure on community and health services dues to the associated significant health and safety impacts

on local communities. First and foremost, interactions between workers and female community members increase the risk of sexually transmitted diseases such as HIV/AIDS and other STDs. The interactions could also lead to the spread of communicable diseases such as coughs and Tuberculosis. Construction activities such as sand and cement mixing activities could also to lead to respiratory diseases among the workers and the community. On the other hand, poor sanitation at work sites and workers camp, potential land and water resources degradation as a result of construction activities could lead to spread of water related diseases such as malaria among the workers and the communities.

Recommended mitigation measures

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

m) 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 additional, according to the culture of the area, usually men take key positions while women take supportive roles. Similarly, at national level, there are more men in the construction industry than women. As such, women may take more supportive roles (for example cooking and ferrying water).

Recommended mitigation measures

i. Encourage the contractor to employ women as well. A clause should be included in the contract specifying that at least 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 fore men and engineers.
iv. Economically empower women within affected communities by linking them with community investment programmes
v. Create a good work environment to allow female workers report any case of harassment.

6.3.3 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.
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.

6.3.4 Adverse impacts during operational phase

a) Solid waste generation

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

Recommended mitigation measures

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

b) Increased pollution from wastewater and sludge

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

The increase in water consumption (by all types of consumers) due to the expansion of the water supply scheme will result in increased wastewater generation by the consumers. This will lead to surface and groundwater pollution. Increase in wastewater

will manifest itself as sullage at communal water points, bath shelters and septic tank soakaways. This wastewater must be properly managed to avoid pollution.

Recommended mitigation measures

i. Enforce proper excreta and wastewater management especially in the town.
ii. Apply lime treatment to dewatered sludge to suppress pathogens and remove odour.
iii. Enforce the use of licensed liquid waste handlers for liquid waste.
iv. Dry sludge on drying beds before disposing off in a dedicated disposal site.
v. Prepare and enforce operational guidelines for sludge treatment and management.
vi. Conduct WASH activities to sensitize people on the benefits (including prevention of cholera) of good the hygiene.

c) Emergencies

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

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

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

Recommended Mitigation Measures

i. Design and implement an emergency response plan.
ii. Install fire hydrants within the proposed development.
iii. Regularly monitor and maintain the water supply system.
iv. Install a fire extinguisher at the plant and train workers on how use.

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

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

Recommended Mitigation Measures

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

vi. Theft and vandalism cases must be reported to the police.
vii. Regularly monitor the pipeline infrastructure.
viii. Include the people from the local area in the work force.

6.4. SIGNIFICANCE RATING OF THE IMPACTS

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

Significance of the impact	***=***	***consequence x probability***
where:		
Consequence	***=***	***severity + reversibility + duration + spatial extent + environmental context***

The factors are defined as follows:

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

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

Table 6.2: Criteria for Ranking Factors for Consequences and Probability

Severity/ Magnitude	Reversibility	Duration/ frequency	Areal extent	Environmental context	Probability
5 – Very high/ don't know	5 – Irreversible	5 – Permanent and/or continuous impact	5 - International	5 – highly sensitive or very rare environmental component	5 – Definite / don't know
4 – 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	3 – Medium probability

				environmental component	
2 – Low		2 – Short term (0 – 2 years) and/or infrequent impact	2 – Local	2 – non-sensitive or common environmental component	2 – Low probability
1 – Minor	1 – Reversible (regenerates naturally)	1 – Immediate and/or unique impact	1 – Site only	1 – non-sensitive and widely dispersed environmental component	1 – Improbable
0 - None					0 - None

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

Table 6.3: Significance Rating of the Impacts

SIGNIFICANCE RATING FOR POSITIVE IMPACTS		
More than 100	Impact is of the highest order possible.	Very High
Between 76 and 100	Impact is substantial.	High
Between 51 and 75	Impact is real but not substantial in relation to other impacts.	Moderate
Between 26 and 50	Impact is of low order.	Low
25 or less	Impact is negligible.	Very Low
SIGNIFICANCE RATING FOR NEGATIVE IMPACTS		
Value	**Description**	**Significance**
More than 100	Impact is of the highest order possible. Mitigation is required to lower impacts to acceptable levels. Potential fatal flaw.	Very High
Between 76 and 100	Impact is substantial. Mitigation is required to lower impacts to acceptable levels.	High
Between 51 and 75	The impact is real but not substantial in relation to other impacts. Mitigation should be implemented to reduce impact.	Moderate
Between 26 and 50	Impact is substantial. Mitigation is required to lower impacts to acceptable level.	Low
25 or less	Impact is negligible. No mitigation is required.	Very Low

6.5. IMPACT SIGNIFICANCE RATING FOR THE IDENTIFIED IMPACTS

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

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

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ enhancement	Significance with mitigation/ Enhancement
1.	BENEFICIAL IMPACTS									
1.1.	**Construction Phase**									
1.1.1.	Creation of employment opportunities	3	3	3	2	4	4	60	Moderate	High
1.1.2.	Increase in trade opportunities	3	3	3	2	3	3	42	Low	High
1.2.	**Operation and Maintenance Phase**									
1.2.1.	Improved water supply to Mangochi Town and the surrounding areas	5	3	5	2	4	4	76	High	High
1.2.2.	Improved access to portable water source	4	3	5	2	4	4	72	Moderate	High
1.2.3.	Improved sanitation, hygiene and health	4	3	5	2	4	4	72	Moderate	High
1.2.4.	Improved socio-economic situation of the communities	3	3	5	2	4	4	68	Moderate	High
1.2.5.	Enhanced gender and participation in development	2	3	3	2	5	3	45	Low	High
1.2.6.	Education benefits to girl child	2	3	3	2	5	4	60	Moderate	High
1.2.7.	Employment opportunities	4	3	3	2	4	4	64	Moderate	High
1.2.8.	Increased development	2	3	3	2	3	3	39	Low	High
2.	ADVERSE IMPACTS									
2.1.	**Planning and Design Phase**									
2.2.1.	Losses and compensation for land and assets	3	3	5	2	4	3	51	Moderate	Low
2.2.2.	Unrealistic expectations with regard to lands/compensation/resettlement negotiations	4	3	2	2	4	3	45	Low	Low
2.2.	**Construction Phase**									
2.2.1.	Dust generation, gas and particulate matter emission	3	1	2	1	3	4	40	Low	Very low
2.2.2.	Soil contamination and land degradation	3	3	2	1	3	3	36	Low	Very low
2.2.3.	Loss of vegetation cover	2	3	2	1	3	3	33	Low	Very low
2.2.4.	Accidents and hazards from trenches and borrow pits	2	3	2	1	3	3	33	Low	Very low
2.2.5.	Disruption of water supply	3	3	1	2	3	3	36	Low	Very low
2.2.6.	Water pollution and siltation	2	3	2	2	4	3	39	Low	Very low
2.2.7.	Occupational incidents and accidents	3	3	2	1	4	3	39	Low	Very low
2.2.8.	Disturbances and accidental damage to assets	1	3	2	1	3	4	40	Low	Very low
2.2.9.	Noise and vibrations	3	3	2	1	3	3	36	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
2.2.10.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	4	3	3	2	4	4	64	Moderate	Low
2.2.11.	Incidence of sexual abuse and harassment	4	3	3	2	4	3	48	Low	Very low
2.2.12.	Diseases and increased pressure on community health services	3	3	2	2	4	4	56	Moderate	Very low
2.2.13.	Unequal employment	2	3	2	2	4	3	39	Low	Very low
2.2.1.	Loss of jobs and businesses	3	3	2	2	4	4	56	Moderate	Low
2.2.2.	Abandonment of excavated areas for raw materials	2	3	3	1	3	4	48	Low	Very low
2.3.	**Operation Phase**									
2.4.1.	Solid waste generation	2	3	3	2	4	3	42	Low	Very low
2.4.2.	Increased pollution from wastewater and sludge	2	3	3	2	3	3	39	Low	Very low
2.4.3.	Emergencies	2	3	3	1	3	3	36	Low	Very low
2.4.4.	Potential risks of water leakage and flooding from theft and vandalism	2	3	4	1	3	3	39	Low	Very low

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

- Losses and compensation for land and assets.
- Increase in sexual relationships, unplanned pregnancies, breaking up of families.
- Diseases and increased pressure on community health services.
- Loss of jobs and businesses.

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

6.6. Note on Extraction Volumes for Mangochi Water Supply Project

The proposed project to expand the Mangochi Water Supply System will see an increased amount of water of 13,542 m^3/day extracted from Lake Malawi. This water volume to be extracted is an equivalent of 0.157 m3/sec or 0.00491km^3 per year. This means that the amount of water that will be extracted from the lake in the year 2035 will only be 62.92x10^(-6)% of the total permanent storage capacity of Lake Malawi and that of the annual river inflow which is 7,804km^3 (Department of Water Resources).

Shire River is the only outlet of Lake Malawi and it is one of the major tributaries of the Zambezi River. The lowest flows in the Shire River have been recorded to be in the ranges of about 100 m^3/sec and 120 m^3/sec.

Flows in the Shire River and consequently the Zambezi River are influenced by the available water levels in Lake Malawi. The minimum and maximum recorded water levels in Lake Malawi are 473masl and 474.5masl respectively. Lake Malawi water levels are mainly influenced by evaporation from Lake Malawi vast surface area of 29,600km^2. The average evaporation rate from Lake Malawi is 1,500m^3/s which is far greater than the 0.157m^3/s of water that will be abstracted for the extension of the Mangochi Water Supply System. This means that the water levels in Lake Malawi and Shire River outflows will be affected far more by the evaporation than the amount of water that will be abstracted from Lake Malawi for the proposed Mangochi Potable Water Supply Project. It can therefore, be concluded that the abstraction amount of 0.157m^3/s for this project has a negligible influence on the Lake Malawi water levels.

Furthermore, the total residual chlorine levels of the backwash wastewater from the treatment plant will not exceed the maximum limit for industrial effluent discharge into surface waters of 1mg/l (the recommended maximum amount to be taken by humans, MBS-MS 539:2013) because the dosing rate has been limited to a maximum of 0.8mg/l resulting into 0.2 mg/l.

In addition, a backwash wastewater settling basin has been designed to detain water in order to settle the suspended solids before being discharged into the environment. It is, therefore, concluded that through the Mangochi Potable Water Supply Project, as far as water extraction is concerned, Malawi will be realizing more benefits from the shared watercourse

system of Lake Malawi-Shire River-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 TABLE

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

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

The ESMP, presented in Table 7.1 contains the following:

- Potential 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 BENEFICIAL IMPACTS**				
1.1.	**Construction phase**				
1.1.1.	Creation of employment opportunities	• Inform local communities of employment opportunities. • Prioritise employment of local persons that qualify. • Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities. • 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. • Wages must be above the minimum wage and overtime must be paid on time. • Workers must be sensitized to save and invest during project implementation. • Encourage the workers to participate in Community Services Investment programmes (COMSIP) and Village Saving and Loans groups.	Continuously throughout construction	Contractor, District Labour Officer, District Community Development Officer	6,500
1.1.2.	Increase in trade opportunities	• Pay building material suppliers within the agreed times. • Source materials from approved licenced suppliers. • Support and promote of entrepreneurship skills amongst communities and business people in the project area by engaging them where appropriate. • Promote village savings and loan (VSL) schemes during project implementation.	Quarterly	Contractor, District Community Development Officer	Cost included in 1.1.1
1.2.	**OPERATION PHASE**				
1.2.1.	Improved water supply to Mangochi Town and the surrounding areas	• Ensure water reservoir tanks have adequate water all the time to cover periods of no water pumping	Continuously throughout the	SRWB, District Water	To be covered within the operation and

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Sustain the desired performance of the water supply system through timely preventive maintenance. • Quickly carry maintenance works and restore water supply when there are problems. • Adequately treat water at the treatment plant • Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the supply points and implement control measures where results are below safe water standards. • Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules • Sensitize the water users on proper water management practices, water pricing and importance of payments of water bills in time.	operation period	Development Office, NGOs	maintenance budget for the scheme
1.2.2.	Improved access to portable water source	• Process water connection applications and provide water to the communities as quickly as possible. • Ensure that the recommended maximum distances of 500 metres from houses to water point is observed when constructing communal water points. • Ensure water is available all the time at the water points.	Continuously throughout the operation period	SRWB	N/A (Within the operation and maintenance budget of the board)
1.2.3.	Improved sanitation, hygiene and health	• Sensitise communities on hygienic practices for handling water to avoid secondary contamination. • Promote general sanitation practices amongst communities in the project area. • Conduct trainings aimed at building the capacity of water kiosks committee. • Monitor the quality of water and to promote health and hygiene at water points. • Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene.	Monthly for water quality analysis and quarterly for sensitization and capacity building initiatives	SRWB District water officer NGOs	13,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Ensure there is adequate drainage within the community water points			
1.2.4.	Improved socio-economic situation of the communities	• Provide quality water, with minimal loss of supply, through system monitoring and regular maintenance • Support women and other vulnerable groups to start and operate business through appropriate training and start-up capital • Make water costs affordable	Throughout the operation period	SRWB, District Community and Development Office	N/A (Within the operation and maintenance budget of the board)
1.2.5.	Enhanced gender and women participation in development	• Sensitize recruiting authorities to employ about 40% to 60% women. • Ensure there are also women in important positions • Promote gender mainstreaming in development activities through sensitization, advocacy and awareness. • Economically empower women within affected communities by linking them with community service Investment programmes	Throughout the operation period	District social welfare officer, District gender officer	13,000
1.2.6.	Education benefits to girl child	• Conduct sensitizations aimed at encouraging girls to enrol in schools. • Provide the necessary support and adequate resources to schools to ensure that they have adequate resources for the provision of quality of education. • Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees. • Provide adequate water and appropriate sanitation facilities in schools to support female students.	Throughout the operation period	SRWB, District Education Office, District Gender Office	Included in 1.2.5
1.2.7.	Increased development	• New water connection applications must be processed within set time • Provide adequate portable water supply to the new areas	Throughout operation phase	SRWB	N/A (Within the operation and maintenance

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Sensitize the communities to report leakages and breakages of pipes. • The Town Council must ensure that development activities are implemented within Council plans and laws			budget of the board)
2.	**MITIGATION MEASURES FOR ADVERSE IMPACTS**				
2.1.	**Planning and design phase**				
2.1.1.	Losses and compensation for land and assets	• Locate transmission and distribution pipe lines within existing road reserves, as much as possible. • Conduct sensitization and awareness on the need for land for the project and compensation process. • Plan, prepare and implement all compensations in coordination with the Mangochi District Commissioner and the Department of Lands. • Conduct a disclosure and verification exercise before payment of compensations to ensure that there are no conflicts. • Strengthen the Grievance Redress Mechanism used in Local Development Fund Projects for use in this project • Sensitize the affected people to use the existing Grievance Redress Mechanism • Compensate and resolve any grievances before handing over the land before commencement of construction activities. • Mangochi District Council must help the affected people to identify replacement land.	During the planning and design phase	SRWB, District Land Office	5,000
2.1.2.	Unrealistic expectations with regard to lands/compensation/resettlement negotiations	• Conduct adequate thorough public and sensitization meetings in regard to land laws, land acquisition and compensations. • Observe transparency and accountability when evaluating the land and property and paying the compensations.	During the planning and design phase	SRWB, District Land Office	Included 2.1.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Proper consultation has to be carried out with the owners of the land and government officers must avoid dictating unfair and unreasonable compensation amounts.			
2.2.	**Construction Phase**				
2.2.1.	Dust generation, gas and particulate matter emission	• Use new or fairly new vehicular equipment with exhaust gas emissions above permissible emission limits. • Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits. • 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.	Throughout construction	Contractor	To be included in the contractors' bills of quantities
2.2.2.	Soil contamination and land degradation	• Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils. • Discard waste oil containers in approved disposal sites, as recommended by Mangochi Town Council.	Throughout construction	Contractor	To be included in the contractors' bills of quantities

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Segregate waste (e.g. cartons and paint containers) to encourage reuse. • Provide all structures required for effective water drainage. • Construct waste disposal pits and bury the wastes after the construction period. The pits must not be near to surface water bodies. • Closely supervise the workforce to avoid or limit waste generation. • Store and contain construction materials on lined surfaces and in covered areas. • Sensitize construction workers to avoid littering the site. • Use excavated soils for backfilling and site levelling. • Sensitize suppliers to mine sand and source quarry in approved sites and sustainably. • Enforce the use of licenced construction material suppliers through the construction contract(s).			
2.2.3.	Loss of vegetation cover	• Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation. • Plant appropriate trees and grasses and grasses in all disturbed area. • Cost and appropriately compensate for all the trees to be cut down during construction. • All the trees to be cut down during construction should be costed and appropriately compensated for. • Ensure that for every single tree cut down, 10 tree seedlings of a similar species are planted in the adjacent areas. • Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting	Throughout construction (but mainly during land preparation)	Contractor SRWB	4,200

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		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.			
2.2.4.	Accidents and hazards from trenches and borrow pits	• Use construction material suppliers that are licensed by the Mangochi Town Council. • Avoid making deep pits when extracting construction materials. • Refill all borrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems. • Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them. • Inform and sensitise the public about all open pits and trenches. • Supervise adequately the construction activities and follow recommended procedures.	Throughout construction	Contractor	To be included in the contractors' bills of quantities
2.2.5.	Disruption of water supply	• Give adequate notice of potential water disruption to the water users that could be affected. • Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate	Throughout construction	Contractor, SRWB	Cost included in the operation budget of the existing scheme
2.2.6.	Water pollution and siltation	• 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.	Throughout construction	Contractor	To be included in the contractors' bills of quantities

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water. • Site all material storage areas at least 10 m from watercourses. • Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses. • Line surfaces where cement, paints and oils will be stored. • Connect the drainage systems to oil interceptors. • Collect and dispose wastes in designated disposal sites as required by the Local Authority. • Construct a pit latrine that is at least 1.5 meters deep, lined at the base and 30 metres from a water body.			
2.2.7.	Occupational incidents and accidents	• 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	10,000
2.2.8.	Disturbances and accidental damage to assets	• Provide adequate notice before conducting construction activities at a private or public property. • Provide detours and appropriate traffic signs for vehicles and pedestrians where constructions are being conducted across a road. • Restore work sites to their state before construction activities where possible; rehabilitate the sites where it is not possible to restore to the baseline condition.	Throughout construction	Contractor	To be included in the contractors' bills of quantities

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
2.2.9.	Noise and vibrations	• Use appropriate and well-maintained noise mufflers on vehicles and machinery. • Regularly service and carry maintenance of equipment. • Provide ear muffs for the workers in noisy areas. • Use electric motors instead of compressed air driven machinery. • Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and pads on large sheet metal surfaces. • Limit the number of days of operation; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings. • Notify the public of upcoming loud events.	Throughout the construction period	Contractor	Cost of ear muff included in 2.2.7
2.2.10.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	• Sensitise communities on the disadvantages of indulging in extra-marital affairs. • Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place. • Sensitise girls on the dangers of getting involved in pre-marital sex at a tender age. • Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities. • Engage stakeholders in encouraging and empowering women to be financially independent. • Provide both male and female condoms to workers for appropriate use. • Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of	Quarterly	Contractor, District HIV/AIDS Coordinator	10,000

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex). • Support the District Social Welfare Office and the Community Development Office and Non-Governmental Organisations in the implementation of on-going projects aimed at assisting pupils to go back to school.			
2.2.11.	Incidence of sexual abuse and harassment	• Sensitise workers and surrounding communities to avoid sexual abuse and harassment • Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment in the homes. • Publicise places for reporting gender violence and sexual harassment. • Create a good work environment to allow female workers to report cases of harassment. • Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved sexual abuse and harassment. • Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex). • Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-going projects aimed at promoting gender equality and ending sexual harassment. • Implement and follow-up on grievance redress mechanisms. • Require the contractor to be responsible and to take necessary measures so his employees do not commit acts of sexual abuse and/or underage sex.	Quarterly	SRWB, Contractor, District HIV/AIDS Coordinator, District Gender Office	Included in 2.2.10

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
2.2.12.	Diseases and increased pressure on community health services	• Conduct public awareness and sensitization on community health, HIV and AIDS. • Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required. • Require the workers, sensitize the communities follow recommended environmental and water management practices. • Construct adequate sanitation facilities at the work sites and surrounding area. • Provide both male and female condoms to workers for appropriate use. • Locate worker camps at a minimum distance of 1 km from towns and villages in order to limit worker – community interactions. • Maintain construction camps in clean and healthy condition as prescribed by international worker health standards. • Require all contractors and sub-contractors to comply with relevant health and safety requirements and SRWB corporate policy. • Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.). • Involving other stakeholders including NGO's in the promotion of social welfare. • Support and supplement social services including the Health Surveillance Assistants.	Quarterly	Contractor SRWB	Cost included I 2.2.10
2.2.13.	Unequal employment	• 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.	Yearly	Contractor District social welfare officer	Included in 1.1.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (USD)
		• Conduct gender meetings to sensitize and encourage women and to instil confidence that they can also do the work that men do. • Ensure there are also women in important positions such as foremen and engineers. • Economically empower women within affected communities by linking them with the District Council's Community Service Investment Programme (COMSIP). • Create a good work environment to allow female workers report any case of harassment.			
2.3.	**DEMOBILISATION PHASE**				
2.3.1.	Loss of jobs and businesses	• Provide adequate notice to employees to prepare themselves and secure alternative employment. • Sensitize the workers and the general community to be saving. • Sensitize the business persons to diversify and find alternative markets.	Twice during the construction phase	Contractor, District Labour Office, District Community Development Office	Included in 1.1.1
		• Pay severance benefits to leaving workers in line with the labour regulations. • Provide alternative employment to employees where possible e.g. as maintenance staff.	Once during lay offs	Contractor, SRWB	Severance pay to be included in the contractor's bills of quantities
2.3.2.	Abandonment of excavated areas for raw materials	• Fill up and close pits after the construction works; • Rehabilitate all work site. • Construction materials e.g. sand and clay soils should be sourced from licensed suppliers.	After construction	Contractor	Cost to be included in the contractor's bills of quantities
2.4.	**OPERATION PHASE**				
2.4.1.	Increased solid waste generation	• Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale • Provide solid waste storage bins and skips. • Monitor skips so that they do not become overfilled.	Throughout the operation period	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)
		• Ensure that collected solid waste is disposed of in an approved disposal sites. • Implement sensitization campaigns on consequences of indiscriminate waste disposal.			
2.4.2.	Increased pollution from wastewater and sludge	• Enforce proper excreta and wastewater management especially in the town. • Apply lime treatment to dewatered sludge to suppress pathogens and remove odour. • Enforce the use of licensed liquid waste handlers for liquid waste. • Dry sludge on drying beds before disposing off in a dedicated disposal site. • Prepare and enforce operational guidelines for sludge treatment and management. • Conduct WASH activities to sensitize people on the benefits (including prevention of cholera) of good the hygiene.	Twice a year	SRWB Environmental Health Officer	N/A (Within the operation and maintenance budget of the board)
2.4.3.	Emergencies	• Design and implement an emergency response plan. • Install fire hydrants within the proposed development. • Regularly monitor and maintain the water supply system. • Install a fire extinguisher at the plant and train workers on how use.	Monthly	SRWB	N/A (Within the operation and maintenance budget of the board)
2.4.4.	Potential risks of water leakage and flooding from theft and vandalism	• SRWB must periodically conduct consultations and sensitizations with villages and group village heads and security personnel. • Provide security at the intake, treatment plant and water reservoir sites. • Support activities of the neighbourhood watch (community policing) e.g. through provision of torches, uniforms and shoes.	Throughout the operation period	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)
		• Support economic activities in the area as part of corporate social responsibilities. • Reward for reports of vandalism and theft that may lead to capture. • Theft and vandalism cases must be reported to the police. • Regularly monitor the pipeline infrastructure. • Include the people from the local area in the work force.			

7.2. COST FOR ENVIRONMENTAL AND SOCIAL IMPACTS MANAGEMENT

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

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

Table 7.2: Summary of Environmental and Social Management Costs

S/N	Potential Impacts	Implementation cost in USD/Year
1	Creation of employment opportunities	6,500
2	Improved sanitation, hygiene and health	13,000
3	Enhanced gender and women participation in development	13,000
4	Losses and compensation for land and assets	5,000
5	Loss of vegetation cover	4,200
6	Occupational incidents and accidents	10,000
7	Increase in sexual relationships	10,000
	Total	**61,700**

CHAPTER 8 : ENVIRONMENTAL AND SOCIAL MONITORING PLAN

8.1. ENVIRONMENT AND SOCIAL MONITORING PLAN ACTIVITIES

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

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

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

Table 8.1: Environmental and Social Monitoring Plan

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
1.	**ENHANCEMENT MEASURES FOR BENEFICIAL IMPACTS**						
1.1.	**CONSTRUCTION PHASE**						
1.1.1.	Creation of employment opportunities	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, District Gender Officer, SRWB's Project Supervisor	400
		Prioritise employment of local persons that qualify	Percentage of locals employed	Review of employee files			
		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			
		Provide employment to only people who are above 18 years of age	Age of employees	Inspection, Review of employee files			
		Workers must be treated and paid fairly for the services rendered	Number of cases of unfair treatment	Interviews			
		Provide equal employment to women and men	Number of women employed against men	Head count, Review of employee files			
		Wages must be above the minimum wage and overtime must be paid on time	Amount paid as wages including for over time	Interviews, Review of payment records			
		Sensitize workers to save and invest during project implementation.	Number of Workers sensitized, number of workers saving	Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Encourage the workers to participate in Community Services Investment programmes (COMSIP) and Village Saving and Loans groups.	Number of workers participating in COMSIP	Interviews, Review of COMSIP reports			
1.1.2.	Increase in trade opportunities	Pay building material suppliers within the agreed times	Time for paying suppliers	Review of procurement records, Interviews	Quarterly during construction	Director of Planning and Development, District Community Development Office, SRWB's Project Supervisor	Included in 1.1.1
		Source materials from approved licenced suppliers	Percentage of licenced suppliers used				
		Support and promote of entrepreneurship skills amongst communities and business people in the project area by engaging them where appropriate.	Number of people engaged				
		Promote village savings and loan (VSL) schemes during project implementation.	Number of workers participating in VSL				
1.2.	**OPERATION PHASE**						
1.2.1.	Improved water supply to Mangochi Town and the surrounding areas	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 maintenance works schedule and reports	Quarterly	District Water Development Officer, SRWB	1200
		Sustain the desired performance of the water supply system through	Number of times maintenance works are conducted with				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		timely preventive maintenance	respect to set dates				
		Quickly carry maintenance works and restore water supply when there is problem	Duration taken to carry maintenance work and restore water supply				
		Adequately treat water at the treatment plant and encourage water users to add chlorine or any disinfectants at the point of use.	Quality of water at the point of use, Number of water points with chlorine	Review of water quality test results, Inspections, Interviews			
		Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the supply point and implement control measures where results are below safe water standards	Number of times water quality tests are conducted, Reports of appropriate action when there are traces of unwanted elements in the water	Review of water tests results			
		Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules	Number of staffs with respect to the required staff; Presence and reports of following the work schedule	Review of employee records, Review of work schedules, Interviews			
		Sensitize water users on proper water management	Number of times sensitizations are conducted,	Review of sensitization reports, Review of			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		practices and payment of water bills in time	Number of people sensitized,	reports on cases of vandalism			
1.2.2.	Improved access to portable water source	Process water connection applications and provide water to the communities within set time	Duration taken for water applications to be processed	Review of new water connection reports, Interviews	Quarterly	SRWB, District Water Development Officer	Included in 1.2.1
		Ensure that the recommended maximum distances of 500 metres from houses to a water point is observed when constructing communal water points.	Distance between houses to a kiosk	Site visits, Interviews, Review of kiosks management reports			
		Ensure water is available all the time at the water points	Percentage time water is available at the water points				
1.2.3.	Improved sanitation, hygiene and health	Sensitise communities on hygienic practices for handling water to avoid secondary contamination	Number of times sensitizations are conducted; Number of reported secondary contamination	Review of health records from Mangochi District Hospital, Visual inspections, Review of water quality tests results	Quarterly	SRWB, District Health Officer, Environmental Health Office	400
		Promote general sanitation practices amongst	Number of sanitation promotion activities conducted				
		Conduct trainings aimed at building the capacity of water kiosks committee	Number of trainings conducted;				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		monitor. the quality of water and to promote health and hygiene at water points.	capacity of the committees				
		Monitor the quality of water and to promote health and hygiene at water points.	Quality of water				
		Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene.	Level of support provided to the community-based organisations				
1.2.4.	Improved socio-economic situation of the communities	Provide quality water, with minimal loss of supply, through system monitoring and regular maintenance	Water quality results, Average duration for loss of supply	Review of water supply reports, Review of water quality tests results	Quarterly	SRWB, District Social Welfare Office, District Water Office, District Community Development Office	400
		Support women and other vulnerable groups to start and operate business through appropriate training and start-up capital	Number of women and vulnerable groups supported to start businesses	Review of reports for supports with start-up capital			
		Make water costs affordable	Cost of water compared to income levels	Review of water tariffs and social-economic profile			
1.2.5.	Enhanced gender and women participation in development	Sensitize recruiting authorities to employ in line with national gender policy	Number of sensitizations, awareness meetings conducted	Review of sensitization reports	Quarterly	District Gender Office, District Community Development Office, SRWB	Included in 1.2.4

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		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 Office, District Social Welfare Office	Included in 1.2.4
		Provide the necessary support to schools to ensure that they have adequate resources to ensure the provision of quality of education	Availability of adequate resources in the schools	Review of education statistics			
		Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees	Number of deserving girls provided with bursaries and support				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		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.	Increased development	New water connection applications must be processed within set time	Duration for processing applications	Review of water connection records	Quarterly	SRWB, District Water Development Office, Director of Planning and Development	400
		Provide adequate portable water supply to the new areas	Volume of water supplied compared to the demand	Interview, Review of water supply records			
		Sensitize the communities to report leakages and breakages of pipes	Number of sensitizations conducted; Number of leakage and breakage reports received	Review of sensitization reports, Review of maintenance records			
		The Town Council must ensure that development activities are implemented within Council plans and laws	Percentage of time water is available and adequacy of sanitation	Review of water supply reports, Interviews, Visual inspection on sanitation			
2.	**MITIGATION MEASURES FOR ADVERSE IMPACTS**						
2.1.	**PLANNING AND DESIGN PHASE**						
2.2.1.	Losses and compensation for land and assets	Locate transmission and distribution pipe lines within existing road reserves, as much as possible.	Percentage of distribution line located in road reserve area	Review of construction designs	Monthly before commencement of construction	SRWB, District Lands Office, Director of Planning and Development	1,200

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Conduct sensitization and awareness on the need for land for the project and compensation process.	Number of sensitizations conducted, Number of people sensitized	Review of sensitization reports/records			
		Plan, prepare and implement all compensations in coordination with the Mangochi District Commissioner and the Department of Lands.	Number of times the District Council and Department of Lands are involved and level of involvement	Review of land acquisition and compensation reports, Interviews			
		Conduct a disclosure and verification exercise before payment of compensations to ensure that there are no conflicts.	Number of people to have attended to the disclosure exercise and to have signed the compensations due	Review of the disclosure exercise report and compensation schedule			
		Strengthen the Grievance Redress Mechanism used in Local Development Fund Projects for use in this project	Strength of the Grievance Redress Mechanism	Audit of the Grievance Redress Mechanism			
		Sensitize the affected people to use the existing Grievance Redress Mechanism	Number of PAPs sensitised	Review of sensitization reports			
		Compensate and resolve any grievances before handing over the land	Percentage of people to have not received compensations	Interview, review of grievance redress			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		before commencement of construction activities.	and/or with grievances before commencement of construction				
		Mangochi District Council must help the affected people to identify replacement land.	Percentage of PAPs helped to find replacement land	Interviews			
2.2.2.	Unrealistic expectations with regard to lands/compensation/ resettlement negotiations	Conduct adequate thorough public and sensitization meetings in regard to land laws, land acquisition and compensations.	Number of awareness and sensitization meetings conducted	Audit of the land acquisition process	Monthly before commencement of construction	SRWB, District Lands Office, Director of Planning and Development	Included in 2.1.1
		Observe transparency and accountability when evaluating the land and property and paying the compensations.	Degree of transparency and accountability when evaluating land				
		Proper consultation has to be carried out with the owners of the land and government officers must avoid dictating unfair and unreasonable compensation amounts.	Number of consultations conducted				
2.2.	**CONSTRUCTION PHASE**						
2.2.1.	Dust generation, gas and particulate matter emission	Use new or fairly new vehicular equipment with exhaust gas emissions	Number of years equipment has been in use, Level	Review of procurement records,	Monthly	Contractor, SRWB,	1,200

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		within permissible emission limit	of emissions from equipment	Inspection, Interviews		Environmental District Office	
		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, Visual 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, Visual 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, Presence of dust	Interviews, Visual inspections			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Optimize transportation management to avoid needless truck drives.	Number or errands for vehicles per day	Review of vehicle logs			
		Control vehicle speeds	Number of reports of over speeding, Presence of vehicle speed signs	Interviews, Visual inspections			
		Reduce engine idling time	Time period vehicles remain on idling	Random checks, interviews			
		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			
2.2.2.	Soil contamination and land degradation	Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils.	Size of surfaced areas	Visual inspection, Measurements, Review of waste management records	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1
		Discard waste oil containers in approved disposal sites, as recommended by Mangochi Town Council.	Volume of waste disposed in approved sites				
		Segregate waste (e.g. cartons and paint containers) to encourage reuse	Volume of waste segregated and reused				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Provide all structures required for effective water drainage.	Presence of adequate drainage structures				
		Construct waste disposal pits and bury the wastes after the construction period. The pits must not be near to surface water bodies.	Presence of waste disposal pits and distance to water bodies				
		Closely supervise the workforce to avoid or limit waste generation.	Volume of generated waste				
		Store and contain construction materials on lined surfaces and in covered areas.	Percentage of construction materials stored and contained on lined surface				
		Sensitize construction workers to avoid littering the site	Number of sensitizations; Presence of littered sites	Inspections, Review of sensitization records			
		Use excavated soils for backfilling and site levelling.	Volume of excavated used for backfilling and levelling	Inspections			
		Sensitize suppliers to mine sand and source quarry in approved sites and sustainably	Sites and methods for sand mining and quarrying	Inspection, Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Enforce the use of licenced construction material suppliers through the construction contract(s).	Clause in contracts, and the types of suppliers that are used	Review of contracts and suppliers used			
2.2.3.	Loss of vegetation cover	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				
		Cost and appropriately compensate for all the trees to be cut down during construction	Percentage of trees compensated for	Review of compensation records			
		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, Measurement			
		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				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Sensitize employees and the community to conserve vegetation.	Number of employee and community sensitized	Review of sensitization records			
		Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.	Volume/number of reused plants materials	Interviews, Inspections			
2.2.4.	Accidents and hazards from trenches and borrow pits	Use construction material suppliers that are licensed by the Mangochi Town Council	Size of rehabilitated sites	Inspection, Measurement Review of sensitization reports Interview	Monthly	Contractor, SRWB, Environmental District Office	Included in 2.2.1
		Avoid making deep pits when extracting construction materials.	Depths of pits				
		Refill all borrow pits to be created during the upgrading, rehabilitation and expansion of the water supply systems;	Number of barrow pits rehabilitated				
		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				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Supervise adequately the construction activities and follow recommended procedures.	Number of hours a supervisor is on site				
2.2.5.	Disruption of water supply	Give adequate notice of potential water disruption to the water users that could be affected	Number of times water supply is disrupted without notice	Review of construction reports, Interviews	Monthly	Contractor, SRWB, District Water Office	1,200
		Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate	Availability of alternative means of supplying water				
2.2.6.	Water pollution and siltation	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	Daily	Contractor	Included in 2.2.5
		Store cement, paints, lubricants, and fuels in lined and covered areas.	Presence and size of cover and surface lining		Monthly	SRWB, Environmental District Office	
		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				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Site all material storage areas at least 10 m 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				
		Line surfaces where cement, paints and oils will be stored	Percentage of construction material on lined surface				
		Connect the drainage systems to oil interceptors.	Presence of oil interceptors				
		Collect and dispose wastes in designated disposal sites as required by the Local Authority.	Percentage of wastes collected and disposed in approved sites				
		Construct a pit latrine that is at least 1.5 meters deep, lined at the base and 30 metres from a water body.	Specification of pit latrines				
2.2.7.	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	Daily	Contractor	
		Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of	Presence of an OSH expert	Review of human resources records, Inspection	Quarterly	District Labour Office, SRWB	400

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		practice for various tasks are 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			
2.2.8.	Disturbances and accidental damage to assets	Provide adequate notice before conducting construction activities at a private or public property.	Notice period	Interviews	Daily Monthly	Contractor SRWB, District Director of Planning and Development, Director of Public Works	400
		Provide detours and appropriate traffic signs for vehicles and pedestrians where constructions are being conducted across a road.	Presence of detours and traffic signs	Inspections, Interviews, Review of construction records			
		Restore work sites to their state before construction activities where possible; rehabilitate the sites where it is not possible to restore to the baseline condition.	Percentage of site restored or rehabilitated				
2.2.9.	Noise and vibrations	Use appropriate and well-maintained noise mufflers on vehicles and machinery	Types and number of times noise mufflers are used and maintained	Inspections and Interviews	Daily Monthly	Contractor	Included under 2.2.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Regularly service and carry maintenance of equipment	Number of times the equipment is maintained; Condition of equipment	Inspection, Review of maintenance reports		SRWB, Environmental District Office	
		Provide ear muffs for the workers in noisy areas	Number of workers are provided with ear muffs	Inspection, Interviews			
		Use electric motors instead of compressed air driven machinery	Use of electric motors against the use air driven machinery	Inspection			
		Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and pads on large sheet metal surfaces.	Number of complaints during construction	Interviews			
		Limit the number of days of operation; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings	Number of days and hours of noise activities	Random interviews, Construction reports			
		Notify the public of upcoming loud events	Number of notices sent, and the time when notices are sent	Inspection of records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
2.2.10.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	Sensitise communities on the disadvantages of indulging in extra-marital affairs	Number of sensitization meetings conducted Number of people sensitized	Review of sensitization records/minutes	Quarterly	Contractor, SRWB, District Social Welfare Office, District Gender Office	400
		Sensitise girls on the dangers of getting involved in pre-marital sex at a tender age.					
		Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place					
		Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved in any social malpractices with surrounding communities.	Number of workers disciplined for engaging in illicit sex with school going girls	Review of human resources/disciplinary records			
		Engage stakeholders in encouraging and empowering women to be financially independent	Number of stakeholders engaged in empowering women	Review of stakeholders (e.g. NGO and CBO) activities records			
		Provide both male and female condoms to workers for appropriate use.	Availability and number of male	Inspections, Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
			and female condoms				
		Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).	Presence and implementation of an STD and HIV/AIDS prevention programme	Interviews, Review of reports of implementation of STDs and HIV/AIDS program			
		Support the District Social Welfare Office and the Community Development Office and Non-Governmental Organisations in the implementation of on-going projects aimed at assisting pupils to go back to school.	Level of support	Interviews, review of reports indicating activities for supporting various District Council Offices and NGO			
2.2.11.	Incidence of sexual abuse and harassment	Sensitise workers and surrounding communities to avoid sexual abuse and harassment	Number of sensitizations conducted	Review of sensitization records	Quarterly	SRWB, Environmental District Office, District Health Offices, District Gender Office, District Labour Office	Included in 2.2.10
		Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment in the homes.	Number of sensitizations conducted; Number of reports received on sexual harassment				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Publicise places for reporting gender related violence and sexual harassment.	Availability of places for reporting gender related and sexual harassment	Inspections, Interviews			
		Create a good work environment to allow female workers report any case of harassment	Availability of a good work environment, Number of harassment reports received	Interviews, Review of human resources records			
		Enforce punitive and disciplinary measures, including dismissal from employment, on any project workers involved sexual abuse and harassment	Number of workers disciplined for being involved in sexual harassment	Review of human resources/ disciplinary records			
		Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).	Presence and implementation of an STD and HIV/AIDS prevention programme	Interviews, Review of reports of implementation of STDs and HIV/AIDS program			
		Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-going	Level of support provided	Interviews, Review of support records			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		projects aimed at promoting gender equality and ending sexual harassment.					
		Implement and follow-up on grievance redress mechanisms.	Number of times the grievance redress mechanism and follow ups	Audit of the grievance redress mechanism, Review of grievance redress records			
		Prepare and implement an STD and HIV/AIDS prevention program including a strict prohibition of sexual abuse and sexual intercourse with partners younger than 18 years of age (underage sex).	Availability of an STD and HIV/AIDS prevention programme	Audit of the implementation of the STD and HIV/AIDS prevention programme			
		Require the contractor to be responsible and to take necessary measures so his employees do not commit acts of sexual abuse and/or underage sex.	Availability of a clause in the contract requiring the contractor to take measures for avoiding sexual abuse and underage sex	Review of the contract			
2.2.12.	Diseases and increased pressure on community health services	Conduct public awareness and sensitization on community health, HIV and AIDS.	Number of awareness and sensitizations conducted	Review of sensitization records	Quarterly	Contractor, SRWB, Environmental District Office,	400

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required.	Percentage of potential employees screened	Review of recruitment reports		District Health Offices	
		Require the workers, sensitize the communities to follow recommended environmental and water management practices.	Percentage of workers and communities following recommended water resources and environment management practices	Inspections, Interviews			
		Construct adequate sanitation facilities at the work sites and surrounding area.	Number of sanitation facilities constructed, compared to the population to use them	Visual inspections, Counting			
		Provide both male and female condoms to workers for appropriate use.	Number of condoms provided	Interviews, Inspections			
		Locate worker camps at a minimum distance of 1 km from towns and villages in order to limit worker – community interactions.	Distance between workers camp and community	Inspection, Measurement			
		Maintain construction camps in clean and healthy condition as prescribed by	Adherence to the international	Inspections, Comparisons of the conditions in the			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		international worker health standards.	worker health standards	camps to the international standards			
		Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.).	Presence of a clause in the contract requiring the contractor to comply with health and safety standards	Review of contract			
		Develop and implement an H&S management plan to protect every worker involved in construction activities, even temporary workers (e.g. vaccines, etc.).	Presence and implementation of an H & S management plan	Inspections, Interviews, review of an H & S management plan			
		Support and supplement social services including the Health Surveillance Assistants.	Level of support and supplement to health surveillance system	Interview, Review of support records			
2.2.13.	Unequal employment	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.	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 2.2.7
		Conduct gender meetings to encourage women and to instil confidence that	Number of women sensitized, Number of women doing				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		they can also do the work that men do	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			
		Create a good work environment to allow female workers report any case of harassment.	Number of females being able to report harassment	Interview, Review of harassment records			
2.3.	**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 demobilizatio n phase	Contractor, SRWB, District Labour Officer	100
		Provide adequate notice to employees to prepare themselves and secure alternative employment	The notice period before layoffs	Interviews, Review of employee files			
		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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		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 demobilizatio n 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				
2.4.	**OPERATION PHASE**						
2.4.1	Solid waste generation	Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale	Volume of wastes sold or reused	Inspections, Interviews	Quarterly	SRWB, Environmental District Office, District Health Office	Included in 2.4.1
		Provide solid waste storage bins and skips	Number of storage bins and skips at the sites				
		Monitor skips so that they do not become overfilled.	Number of times skips are over filled				
		Ensure that collected solid waste is disposed of in an approved disposal site	Volume of waste disposed in approved sites				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
		Implement sensitization campaigns on consequences of indiscriminate waste disposal.	Number of times sensitizations are conducted				
2.4.2	Increased pollution from wastewater and sludge	Enforce proper excreta and wastewater management	Evidence of proper waste management	Inspections	Quarterly	SRWB, Environmental District Office, District Health Office	Included in 2.4.1
		Apply lime treatment to dewatered sludge to suppress pathogens and remove odour	Number of times quicklime is used to treat sludge	Interviews			
		Enforce the use of licensed liquid waste handlers for liquid waste.	Number of times licensed liquid waste handlers are used	Review of waste collection records, Interview			
		Dry sludge on drying beds before disposing off in a dedicated disposal site.	Volume of waste dried before disposing				
		Prepare and enforce operational guidelines for sludge treatment and management.	Availability and reports of enforcement of operational guidelines for sludge treatment	Review of the operational guidelines, Interviews, Inspection			
		Conduct WASH activities to sensitize people on the benefits (including prevention of cholera) of good the hygiene.	Number of sensitizations; Number of reported cholera cases	Review of diseases statistics			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (USD)/Year
2.4.3	Emergencies	Design and implement an emergency response plan.	Presence of a written emergency preparedness plan	Inspections, Interviews	Quarterly	SRWB, Environmental District Office, District Water Development Office	
		Install fire hydrants within the proposed development.	Presence and number of fire hydrants				
		Regularly monitor and maintain the water supply system.	Number of times monitoring is conducted				
		Install a fire extinguisher at the plant and train workers on how use.	Presence and number of fire extinguishers				
2.4.4	Potential risks of water leakage and flooding from theft and vandalism	SRWB must periodically conduct consultations and sensitizations with villages and group village heads and security personnel.	Number of times consultations and sensitizations are conducted	Review of consultations records	Bi-annually	SRWB, District Water Development Office	Included in 2.4.1
		Provide security at the intake, treatment plant and water reservoir sites.	Presence and number of security personnel	Inspections			
		Support activities of the neighbourhood watch (community policing) e.g. through provision of torches, uniforms and shoes.	Support provided to the neighbourhood watch	Interviews, Review of Cooperate Social Responsibility records			
		Support economic activities in the area as part of corporate social responsibilities.	Reports of implementation of cooperate social responsibility programmes				

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

8.2. SUMMARY OF MONITORING COST

The costs in the Environmental and Social Monitoring Plan have been summarised and presented in Table 8.2. The total cost for monitoring the impacts from the planning and design to the construction phase is established as 6,640 USD per year (Six Thousand Six Hundred and Forty 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.

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

Table 8.2: Cost for monitoring activities

S/N	Potential Impact	Cost in USD per Year
1	Creation of employment opportunities	400
2	Improved water supply to Mangochi Town and the surrounding areas	100
3	Improved sanitation, hygiene and health	400
4	Improved socio-economic situation of the communities	400
5	Increased development	400
6	Losses and compensation for land and assets	1,200
7	Dust generation, gas and particulate matter emission	1,200
8	Disruption of water supply, Water pollution and siltation	1,200
9	Occupational incidents and accidents	400
10	Disturbances and accidental damage to assets	400
11	Increase in sexual relationships	400
12	Diseases and increased pressure on community health services	40
13	Loss of jobs due to completion of construction works, Abandonment of excavated areas for raw materials	100
	Total	6,640

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 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 Mangochi 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 Mangochi District Council.

- Direct interviews with stakeholders, and particularly representatives of regional and district level governmental institutions, service providers and NGOs/CSOs; and
- Formal and informal meetings with affected people through focus group discussions and individual interviews through household survey.

9.3. CONSULTATION OUTCOMES

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

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

CHAPTER 10 : CONCLUSION AND RECOMMENDATIONS

10.1. CONCLUSION

This Environmental and Social Impact Assessment report has identified and assessed significant environmental and social impacts of the proposed rehabilitation, upgrading and expansion works for Mangochi 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 must be prioritised to encourage community ownership and sustainability of the project.

10.3. References

GOVERNMENT LEGISLATIONS

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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

1.0 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.

1.1 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.

1.2 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.

1.3 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.

1.0 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.

1.1 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 saved 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..

1.6 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:

a. 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.

b. 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.
c. 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.
d. 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.
e. Provide a concise description of the existing biophysical characteristics and the socio-economic environment status of the proposed area by identifying and analyzing:
    i. Physical conditions: soil, geology, site topography, temperature, rainfall patterns and drainage system (water courses);
    ii. Biological Resources: scope of vegetative resources of the project area including riparian vegetation, extent of terrestrial and aquatic fauna;
    iii. 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
    iv. Any changes anticipated during implementation of the project area.
f. 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.
g. 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:
    i. 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);
    ii. Project construction (e.g. soil erosion, disposal of construction spoils);

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

h. Prescribe the measures to eliminate, reduce or mitigate the negative effects identified and the measures to enhance the positive effects.
i. 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.
j. 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.
k. 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.
l. 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.
m. 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.
n. Assess Trans-boundary impacts of the projects on downstream countries according to 1991 Espoo Convention on Environmental Impact in a Trans-boundary Context.
o. Submit 10 hard copies for each project and two soft copies of the EIA report to the Director of Environmental Affairs.
p. 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:-

(i) Inception Report for both projects
(ii) Draft ESIA report for each project

(iii) Final ESIA report for each project

TIME FRAME

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

(i) Inception report second week after contract signing;
(ii) ESIA draft report by fifth week after contract signing;
(iii) 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

a) **Environmental Expert:**

The Environmental Expert shall at least have a Master's Degree in Environmental Management or Environmental Engineering and at least 15years 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.

b) **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.

c) **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:

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

b. Settle own logistical expenses for attending scheduled meetings and/or workshops (daily subsistence allowance, accommodation and transport).
c. 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.
d. Source relevant documents and any information required from various authorities. The Client shall make available all relevant reports in its custody.

Client's Responsibilities

a. 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.
b. 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:

a) Deadline for submission of EoIs:
b) 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 4: SELECTED CONSULTATION OUTCOMES

Date	01 August 2019
Place	Mangochi District Council
Participants	Interviewee: Smith Mnenula Interviewer: Peter Kafatia, WWEC
Discussion	Views from the Department of HIV and AIDS, at district level regarding the proposed extension works for Mangochi Town Potable Water Supply. The discussion focused on obtaining input from the HIV and AIDS officer regarding how the proposed project should be conducted such that positive impacts are enhanced and that negative impacts are avoided or mitigated.

Issues

Key points to note from the interview were as follows:

- Found out about the project from the Social Economic Profile for the Town Council earlier this year (January and February).
- The major concern is the potential for the project to facilitate in the influx of travelling workers to the project site. This not only brings about conflicts between the travelling workers and the locals due to the spread of venereal diseases, differences in culture and traditional beliefs, and job opportunities to mention a few.
- The major expectation is that the communities should be sensitized in order to prevent or limit social factors that may negatively impact the community. Another expectation is that the project sensitizes travelling workers upon arrival to the project site, and periodically during the project.

- The following are the active/planned projects in Mangochi District that the interviewee is aware of:
  - Icelandic Embassy is working with four TAs (Namavi, Mpinda, Chimwala and Makanjila) who offer support with increasing capacity of health buildings and infrastructure, and aid the District with drilling and maintaining water points, sanitation, open defecation, youth and women economic empowerment. The Embassy has invested over 3 billion MWK in 2018, and plan to do the same for 2019.
  - The World Vision is working with young girls and women with the goal of reducing the spread of HIV.
  - Globe fund through Action Aid is working with the following TAs: Bwananjambi, Jalasi, Tchowe, Chiunda, Mponda, Chimwala, Chilipa and Nankumba).

- Despite the issues identified above, the interviewee believes that the project will nevertheless contribute to the economic growth at local and national level. Specifically, the interviewee believes that adequate safe water supply is a determinant of the residents health at household, community, and even National level.

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

COMPONENTS		STATUS (IMPROVING/ WORSENING)	CAUSE	SUGGESTION TO TACKLE THE PROBLEM
1.	HIV/AIDS	Generally improving with the exception of hotspots with higher HIV/AIDS prevalence	Lack of sensitization in trading centers to business owners and sex workers regarding the spread of HIV/Aids	Establish prevention programs to provide education and support to business owners and the workplace.
2.	Population	Growing, population is currently at 1.2 million	Increased fertility rate. Average household size is 4.3	Educate the community about family planning.
3.	Gender issues	Literacy levels are low due to the traditional gender approach, for example, girls stay at home while boys attend school)	The cultural, traditional, and religious beliefs conflict with gender equality.	Continually work with leaders in the community to help them educate and sensitize locals on the benefits associated with gender equality
4.	Water Supply	Worsening, there is water shortages	Supply of potable water not adequate	Projects like this will eventually address this issue
5.	Sanitation and Hygiene	Worsening	Current water supply not adequate and managed well	Improve water supply and provide sanitation and hygiene resources to communities
6.	Waste	Worsening	Poor management of liquid and solid waste	Establish dedicated sites for liquid and solid waste

- Below is a table listing the likely positive environmental and social impacts the project might cause:

POSITIVE IMPACTS		SUGGESTED MEASURE TO ENHANCE POSITIVE IMPACT
1.	Increased access to clean potable water	Value of water: Cost of water should be affordable to most in the community
2.	Employment opportunities	Prioritize sourcing skilled and non-skilled workers locally

3.	Vegetation planting to replace affected existing vegetation or barren areas	Project should plant more trees than those affected by the project

- Below is a table listing the likely negative impacts the project will have on the environment and society:

NEGATIVE IMPACT		SUGGESTED MEASURE TO AVOID IMPACT	SUGGESTED MEASURE TO MITIGATE IMPACT
1.	Gender inequality issues	Provide equal employment opportunities to both genders where possible	Sensitize community leaders and members.
2.	Project Waste Disposal	Establish dedicated Dumping sites for liquid and solid waste	Ensure there are means to monitor and enforce the use of dumping sites.
3.	Spread of HIV/AIDS	Prioritize using locals workers before engaging travelling workers	Sensitize locals, travelling workers regarding the impacts associated with increasing earning potential and the spread of HIV/AIDS

- The interviewee anticipates the following groups to be most affected by the negative impacts of the project:
  - **Adolescent girls and women -** Sex work and unequal employment opportunities due to gender discrimination
  - **Adults (15-47)** – The most sexually active group
  - **The poor and vulnerable** – These groups are likely not to have equal opportunities due to their social economic status and disability etc.

- The interviewee anticipates the following groups to benefit from the positive impacts of the project:
  - **All members of the district** – Improved potable water supply will positively impact all members of the household
  - **Government Institutions** – Especially health facilities as there will be a reduction in poor water supply related ailments; Government resources would be better utilized as they are likely to not be overwhelmed with community demands.
  - **Working class -** will likely have the financial resources and means to best access the benefits that will come with the project

- Conflicts may arise between the community and the contractor or/SRWB during the implementation of the project. (Below are the conflicts and suggested ways of solving them)
    - **Land disputes among commuunity members:** Community members should be adequately sensitized with regard which land areas might be affected and also to avoid/minimize the occurrence of land-related disputes between the project teams and locals.
    - **Employer-employee disputes:** Contracts, job descriptions should follow and abide by the local laws. Also, employers should ensure that employees understand the terms of their contracts
    - **Worker-community Confilcts:** Workers, especially those foreign to the districts affected by the project, should have a good understanding of the local traditions, culture and religious beliefs etc.
- Have an active role in conflict resolution on matters pertaining to HIV and AIDS. However the District Council delegates conflicts based on the nature of the conflict

Date	01 August 2019
Place	Mangochi District Council
Participants	Interviewee: Metro Ching'ani Interviewer: Peter Kafatia, WWEC
Discussion	Views from the Department of Gender, at district level regarding the proposed extension works for Mangochi Town Potable Water Supply. The discussion focused on obtaining input from the Gender officer regarding how the proposed project should be conducted such that positive impacts are enhanced and that negative impacts are avoided and mitigated.

Issues

Key points to note from the interview were as follows:

- This was the first time the interviewee heared about this project
- Major concerns and expectations from the proposed project:
    - Insufficient and unreliable supply of water. Currently, people are having to store water in buckets and drums when water supply to be later used when supply is scarce.
    - There is a borehole at one of the catholic schools in the district that gets very overwhelmed during water outages.
    - Women face a lot of difficulties when water stops, and this is a very frequent issue.
    - Current water supply from the Southern Region Water Board (SRWB) is not inspire confidenc as it is visibly dirty, especially when stored in buckets where impurities settle to the bottom of storage containers.
    - Do not have an active role during this phase of the project, but has been actively involved with gender-based violence (GBV), and ending of child marriages with TA Bwananyembi in past projects.
    - Not actively involved during planning and design phases of the project, but anticipate involvement in the latter phases of the project.

- The following is the active/planned project in Balaka District that the interviewee is aware of:

- Plan Malawi: Gender-based violence
- World Vision: girls and young women, Also focusing on gender-based violence
- CAMFED: Promoting education for girls
- JPGE: Joint girls education
- ICEIDA: Promoting education-structures and supplies.

- The interviewee believes that the locals are more likely to be empowered to run water kiosks if the supply of potable water was available in the surrounding communities and not just the town, if water bills are more user-friendly or easy to comprehend and lastly, there should be the consideration of using prepaid water meters. With these, the interviewee believesproject is likely to contribute to the economic growth at both local and national levels.

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

COMPONENT		STATUS (IMPROVING/ WORSENING)	CAUSE	SUGGESTION TO TACKLE THE PROBLEM
1.	Gender issues	No evident improvement. Still needs a lot of work. Face a lot of resistance from locals who believe that women are inferior to men	Religion, traditional and cultural beliefs	Continual sensitization of locals and project works and personnel
2.	Water	Worsening	Source is insufficient and population growth	Increase water supply capacity and reliability
3.	Sanitation and Hygiene	Worsening	Inadequate and unreliable water source	Improve water supply

- Below is a table listing the likely positive environmental and social impacts the project might cause:

POSITIVE IMPACTS		SUGGESTED MEASURE TO ENHANCE POSITIVE IMPACT
1.	Improved livelihoods for locals	Provide employment opportunities to locals, and better markets for vendors.
2.	Improved Health: Reduced waterborne diseases due to improved sanitation.	Sensitize communities on sanitary
3.	Economic Empowerment (Water Kiosks)	Educate aspiring business men and women on money management and business skill-sets

4.	Improved access to water sources will be closer than before, reducing the travel distances for women to fetch for water.	Consider implementing water taps at household level.

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

NEGATIVE IMPACT		SUGGESTED MEASURE TO AVOID IMPACT	SUGGESTED MEASURE TO MITIGATE IMPACT
1.	Gender-based violence especially from travelling workers	Prioritize hiring locals over travelling workers	Sensitize and educate both local and travelling workers
2.	Vandalism and theft of worker equipment and material	Workers should secure tooling, material and equipment to ensure it is safe from vandalism and potential theft.	Sensitize locals and project team members on the risks associated with the presence of project equipment, tooling, and materials

- 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 that 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 conflicts and suggested ways of solving the above issues:
  - **Labour conflicts:** Conflict between travelling/foreign workers vs locals regarding the entitlement of job opportunities associated with the project.
  - **Boundary-based conflicts:** The Project team and client should ensure that the scope of the project is well defined and that workers are well aware of the limits/boundaries of the project in an effort to eliminate encroachment
- Conflict resolution involvement:
  - Part of conflict resolution team (ACB). This team was formed this year.
  - Have a large stake in Gender-based violence related conflicts in the district.

Date	1 August 2019
Place	AMREF Africa Offices
Participants	Mr Petros Kamanga (Assistant Project Officer) AMREF; Prisca Malenga, WWEC.
Discussion	Project Concerns and Issues

Positive Impacts

- Clean water supply, which will reduce water related diseases.
- People will have access to cheap water as compared to the water that is supplied by WUA in some areas like Koche within the project footprint.

Negative Impacts

- Competition with Koche WUA, which will result in some people losing their jobs as Koche WUA water is expensive as compared to water supplied by SRWB.

Recommendations

- Avoid installing water pipes close to roads to prevent contamination in case of pipes failure. This will also help when they want to expand the roads. In addition, check with the Physical Planning Department for future plans in areas where pipes will pass. An example is an area where the Sawa group is constructing an agricultural farm. Further, the pipes should be properly installed to prevent water from contamination with fertilizers and agricultural chemicals
- The water prices should be fair to customers so that they are able to connect and have access to clean water as it is one objective of the project.

Date	1 August, 2019
Place	Fisheries Department
Participants	Bett Scott (Fisheries Office) Prisca Malenga (WWEC)
Discussion	Issues and concerns on the project; Information on fisheries resources, Impacts of the project on fisheries

Issues

- The Project is a good initiative as it will help in supplying good quality water to people which will help in reduction of water related diseases.
- It was mentioned that breeding grounds for fish should be observed when installing the suction pipes. Consult the department of fisheries for such places before the construction activities are initiated.

Date	1 August, 2019
Place	Education Department-Mangochi District
Participants	Noel Nzungu (SHN Cordinator) 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 will be beneficial to residents of the areas where water will be supplied.
- Dropout rate in the project communities is reducing.
- Causes of dropouts in schools include;
  - Early pregnancies and marriages
  - Lack of good parental care
  - Technology i.e. Increased absences due to local video shows.
- The project will affect the education sector in reducing number of absenteeism. When there are water problems in the dry season (October to December), attendance rates in schools are low especially for girls as they spend much time searching and fetching water.
- The project will also help in improving sanitation and hygiene in different schools because the schools will be connected to a water supply. The pupils will have access to safe drinking water at school and water for making porridge will also be available. On the same note, if water is connected to toilets it will help in improve sanitation.
- Improvement in menstrual hygiene was also mentioned as one of the positive impacts of the project. Some girls are absent from school when they are in their menses because of lack of quality menstrual hygiene services including water in different schools.

Date	3 August, 2019.
Place	Catholic Bishops Place- Mangochi
Participants	Fr. Israel Madziakaphwa (Bishops Secretary) Prisca Malenga (WWEC – Consultant)
Discussion	Issues and concerns on the project

Issues

- The Project is a good initiative as it will help supply water to the people and reduce water borne diseases.
- The houses within the compound use underground water. The water is stored in tanks, treated and piped to the rest of the houses in the compound. However, the water is salty as compared to the water supplied by SRWB. Hence, water supplied by SRWB is used for drinking.
- It was mentioned that the development will improve the lives of people as they will have access to clean water as compared to the water they are consuming because it is salty.
- On the other hand, it was mentioned that water from SRWB is expensive. As such, this is cost prohibitive and as a result the residents continue to consume the salty water now. Hence, the interviewee recommended that SRWB subsidise the water for poor people to make it affordable and more accesible. In addition, the interviewee indicated that that, if few people had access to the water supply, then it will be a loss to SRWB. As such, all these points must be considered.

Place	Community Development Department
Participants	Prisca Malenga (WWEC)
Discussion	Social Welfare and development impacts of the project.

Issues

The project will have a greater impact in providing safe water for people in the project area. However, the water price has to be affordable for people to connect and benefit from the project.

The following were listed as negative impacts of the project

- Breaking up of families and early pregnancies because of the presence of workers in the project communities.
- Spread of sexually transmitted diseases in the area which will also result from the presence of workers in the community.
- Other environmental structures will be affected. For example there will be soil disturbance and loss of vegetation i.e. trees.
- Loss of land for agriculture and settlements in the area the pipes will pass through.

Recommendations

- Provide civic education to the people in the project areas before the implementation of the project.
- Compensation for property loss such as land and trees.

Date	1 August, 2019
Place	Mponda Village- Mponda Court
Participants	As attached below
Discussion	To get information on water issues and impacts of the project to the community

Issues

Water and sanitation

- Water from the Shire river is used for drinking and domestic purposes, despite the availability of tap water, which is provided by Koche WUA in the community. This is because some households that are connected to the WUA water do not have access to the water because it is expensive.
- The community makes sure that people don't dispose fecal matter in the river side near the village or wash baby nappies. However, problems come in during the rainy season as the water is dirty, which washes the waste including the fecal matter form some area. As a result, the number of people suffering from water borne diseases in the community is high. To avoid using water from the Shire river during this period, the locals harvest the rainy water to use it for drinking and domestic purposes.

Positive impacts

- Safe water provision that will improve the people's health

Negative impacts

- People will have to pay for the water after the new water connection applications. Therefore, the people suggested to have pre-paid water meters so that the water is used according to the money they have.

Date	1 August, 2019
Place	Chizula Village-Ntakataka Turn Off
Participants	As attached below
Discussion	To get information on water issues and the impacts the project has on the community

Water and sanitation

- There is only one borehole that supplies water to more than 4000 people in the community. The water from this borehole is mainly used for drinking. Water for other purposes i.e. domestic use is mostly accessed from the Lake Malawi and Shire River.
- Water is always available in the community but it is not safe for consumption.

Positive impacts

- Waiting time at the borehole will be reduced as some households will have piped water connections from SRWB. This will help increase productivity for women and likely enhance their livelihoods.
- There will be reduction in water borne diseases because of the good quality water supply.

Negative impacts

- It was mentioned that water supplied by SRWB is expensive in terms of paying bills. The people recommended having community water points, in the form of Kiosks, so that those that who do not have piped water connections can have access to the clean and safe water.

The people in the community depend on piece works (also known s ganyu) and self-employment in the form of businesses for livelihood and support.

Date	2 August 2019
Place	Mangochi District Council
Participants	Interviewees: Lazarus Kamangadazi (District Forestry Officer) – Tel: 0888556302 | Aubrey Chaima (Environmental District Officer) – Tel: 0999749226 | Mathews Banda (Fisheries District Officer) – Tel: 0888118031 Interviewer: Humphrey Chapama (Biodiversity Expert) , WWEC
Discussion	To get views from the Department of Forestry at district level regarding the proposed extension works for Mangochi Potable Water Supply Project to Lakeshore areas and resorts. 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 District Forestry Officer, Environmental District Officer interviewed during the consultations all informed the interviewer that he had heard about the proposed project from SRWB staff.

- All the three officers informed the interviewer that the proposed project is very important as it will provide potable water supply and improve sanitation in the district.
- It was mentioned that the project will also boost the tourism industry in the lake shore areas as well as creating employment opportunities for the locals.
- Below is the status of the listed components per the interviewee:

Component	Status (improving/ worsening)	Cause	Suggestion to tackle the problem
Forests	Worsening	Over-exploitation for charcoal and firewood. Agricultural expansion and urbanization due to limited land resulted in clearing of forests for prime land Political interference High population growth	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. The construction team should be prohibited from cutting down trees carelessly in the project area and encroaching other areas which are not on the project
Wildlife	Worsening	Hunting for bush meat and sale for income Over-fishing of chambo, utaka, chisawasawa, kampango, mpasa, sanjika, mntcheni, batala, galawe, mlamba, usipa, bombe, nkholokolo for consumption and income Loss of habitats to agricultural expansion and urbanization	Prohibiting illegal poaching Prohibiting deforestation Prohibiting setting of bush fires Mangochi District Council should develop urban plan to regulate construction of infrastructure

			Bush fires	
	Energy	Improving at a slow rate	Over-dependency on fuelwood (firewood, charcoal) Intermittent electricity supply	Train communities on production of more efficient cook-stoves and to use briquettes and gas from wastes
	Land	Worsening due to soil erosion and degradation	Poor agricultural practices Soil erosion	Continue sensitizing farmers on good agricultural practices Train more farmers on Climate-smart conservation agriculture
	Waste	Worsening	High illiteracy rate Lack of designated waste dumping site	Sensitize and educate local communities on proper waste management. Council should designated proper site for waste dumping
	HIV/AIDS	Worsening	Prostitution High poverty level	Continue sensitizing the general public on dangers of HIV/AIDS including STIs Increase access to condoms Economically empower locals

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

IMPACT		SUGGESTED MEASURE TO AVOID IMPACT	SUGGESTED MEASURE TO MITIGATE IMPACT
1.	Loss of trees from project areas	Avoid planting exotic trees such as Bluegum and pine which may become invasive to the indigenous biodiversity. Sensitize workers not to cut down trees from	Sensitize and educate Client and contractor, including communities on the conservation of biodiversity Plant trees in all disturbed areas.

			outside the project footprint areas. The Department of Forestry should also be involved in monitoring of project activities Prohibit construction workers from cutting down trees carelessly in the project area and outside the project areas.	Plant 5 seedlings for every single tree to be cut down during the project implementation.
	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
	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	Ensure only project footprint areas are used for this project Campsites and workshops should not be constructed on arable land	Compensate fairly project affected persons (PAPs) so that they can buy a similar piece of land elsewhere for cultivation
	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 Plant grass on all disturbed areas to stabilize soil Apply agricultural land compost manure Rehabilitate and restore vegetation in all disturbed areas

6.	Poor waste management	Continue sensitizing the general public on good hygiene practices. Provide workers with rubbish and dust bins Provide workers with appropriate toilets both at campsite and on work place	Ensure both solid and liquid wastes are properly dumped in appropriate dumping places Ensure all contaminated sites are cleaned up and waste dumped in designated sites.
7.	Air and water pollution	Ensure oils and fuels do not leak into nearby water waters. Suppress dust by sprinkling water on all loose soils Sold all used oils to wood sawyers	Clean contaminated and or polluted sites.

- **Employment Opportunities:** Job opportunities should first be offered to local people to reduce conflicts.
- **Loss of property:** Affected members of the 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	2 August 2019
Place	Monkey Bay Lake Malawi National Park Offices
Participants	Interviewee: Edwin Chiza (Wildlife Officer) – Tel: 0999938459 Interviewer: Humphrey Chapama (Biodiversity Expert) , WWEC
Discussion	To get views from the Department of Forestry at district level regarding the proposed extension works for Mangochi Potable Water Supply Project to Lakeshore areas and resorts. 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 Wildlife Officer informed me that his office had never heard about the proposed project. • However, he pointed out the proposed project is important to the country and the area because it would help improve the shortages of potable and safe water in the Lakeshore areas.	

- The project will provide local community with employment opportunities.

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

Component		Status (improving/ worsening)	Cause	Suggestion to tackle the problem
1.	Forests	Worsening	- Over-exploitation for charcoal and firewood. - Agricultural expansion and urbanization due to limited land resulted in clearing of forests for prime land. - Illegal logging - High population growth	- 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. - The construction team should be prohibited from cutting down trees carelessly in the project area and encroaching other areas which are not on the project
2.	Wildlife	Worsening	- Illegal poaching for bush meat and sale - Over-fishing of chambo, utaka, chisawasawa, kampango, mpasa, sanjika, mntcheni, batala, galawe, mlamba, usipa, bombe, nkholokolo for consumption and income	- Prohibit illegal poaching - Prohibit deforestation - Prohibit setting of bush fires

			- Loss of habitats to agricultural expansion and urbanization Bush fires	
3.	Land	Worsening	High population growth	Continue sensitizing on reproductive health issues
4.	Waste	Worsening	High illiteracy rate and Lack of designated waste dumping site	Sensitize and educate local communities on proper waste management. Council should designated proper site for waste dumping
5.	HIV/AIDS	Worsening	Prostitution and High poverty level	Continue sensitizing the general public on dangers of HIV/AIDS including STIs Increase access to condoms Economically empower locals

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

IMPACT		SUGGESTED MEASURE TO AVOID IMPACT	SUGGESTED MEASURE TO MITIGATE IMPACT
1.	Loss of trees from project areas	Avoid planting exotic trees such pine which may become invasive to the indigenous biodiversity. Sensitize workers not to cut down trees from areas outside the project footprint. Avoid encroaching the Lake Malawi National Park	Sensitize and educate Client and contractor, including communities on the conservation of biodiversity Encourage areforestation. Install or construct water pipeslines outside the national park

			Prohibit construction workers from cutting down trees carelessly in the project area and outside the project areas.	
	2.	Loss of wildlife (fauna)	Implement meaures to prohibit workers from poaching Avoid disturbing or destroyong wildlife unnecessarily	All law breakers must be prosecuted before the court of the land Rehabilitate and restore all damaged habitats
	3.	Spread of HIV and AIDS	Sensitize and educate locals, the project team and travelling workers prior to the start of the project	Provide contraceptives such as condoms to community members.
	4.	Loss of land for cultivation	Ensure only project footprint areas are used for this project Campsites and workshops should not be constructed on arable land	Fairly compensate project-affected persons (PAPs) so that they can purchase a similar piece of land elsewhere for cultivation
	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 Plant grass on all disturbed areas to stabilize soil Apply agricultural land compost manure Rehabilitate and restore vegetation in all disturbed areas
	6.	Poor waste management	Continue sensitizing the general public on good hygiene practices.	Ensure both solid and liquid wastes are properly disposed of

		Provide workers with rubbish/dust bins Provide workers with appropriate toilets both at campsite and at work places	Ensure all contaminated sites are cleaned up and waste dumped in designated sites.

- **Employment Opportunities:** Job opportunities should only be offered to local people in the area to reduce conflicts, unless the job requires highly skilled personnel.
- **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	Mangochi District Council Offices, Mangochi
Participants	Interviewee: Mr Clement Ntambo, District Director of Public Works Interviewer: Mr Mazaza Mwafulirwa, WWEC
Discussion	The discussion was centred on getting views from Director of Public Works (DPW) regarding his expectations concerning the proposed project to extend the Mangochi Water Supply System. Any recommendations from the DPW concerning project implementation were also sought.
Issues	

Key points to note from the interview were as follows:

- As the office of the director of public works for Mangochi District, the expected involvement of his office on this SRWB project would be very limited. The district's council's office would mainly be involved in the monitoring of jobs done by the consultants and contractors who will be engaged on the project.
- The monitoring of the consultants and contractors is mainly in checking quality of the construction but must not issue instructions to the consultants/contractors that are engaged by the SRWB.
- Nevertheless, the district council's office put forth these recommendations, indicating they would help for smooth implementation of the project :
    - The local communities should be adequatley sensitized about the project areas to make sure that a "sense ownership" to the project is developed among the project beneficiaries.
    - Arrangements for the payment of any local people that would be engaged on the project (i.e. as casual labourers) should be well planned out to avoid any delays in such payments, which may attract community resistance to the project and conflicts.
    - The developer should also ensure that proper investigations and designs are made, which are suited to the local conditions. All plausible challenges must be well envisaged right at the planning stage to avoid technical challenges at the project implementation stage. On this, the District Director cited an example of a project to construct an irrigation scheme in the project area, in which very

expensive steel pipes were replaced because they had corroded right before the irrigation scheme was commissioned. However, the District Director believes thahat this would not have been the case if there had been proper planning.

- The District Director also mentioned other looming projects that were about to start within the project area for the expansion of the Mangochi water supply system. These projects include the development of a five star hotel as well as an airport.

Date	1 August 2019
Place	Mangochi District Hospital, Mangochi Town
Participants	Interviewee: Dr Kondwani Mamba, District Environmental Health Officer for Mangochi Interviewer: Mr Mazaza Mwafulirwa for WWEC
Discussion	The discussion was centred on getting views from the District Environmental Health Officer (DEHO) regarding his expectations concerning the proposed project to extend the Mangochi Water Supply System. Any recommendations from the DEHO concerning project implementation were also sought. The DEHO also highlighted the waste management capacity for the district council in this interview. Requests were made to him also for data regarding the health situation of the project area.

Issues

Key points to note from the interview were as follows:

- As an individual, the DEHO first heard of this project earlier this year from a colleague from SRWB. However, this consultation is the first time he is officially hearing about the project.
- Hearing of this project, the DEHO expects the good things mainly in having safe piped drinking water that is well treated and supplied to communities did not have access to it. The area being supplied mainly has ground water which is salty, hence people often do not drill boreholes due to the objectionable aesthetics of the water. The DEHO also states that the area where the SRWB project is to supply water, is one of the hotspots for cholera and bilharzia mostly during rainy season. One of the major contributing factors to this is the lack of adequate potable water which forces people to use unsafe water directly from the lake. Hence, the DEHO noted that the project will really do more good because the availability of clean water will help reduced cases of skin diseases and people will be bathe regularly.
- Another benefit will be on the economic side where the health centres in the project area that are labouring to treat the water which they get from the lake, will now save the money which they were spending on the water treatment.
- The DEHO however expressed concern regarding what would happen to the piped water schemes that are operating around the Namiyasi-Koche area. These schemes are supplying piped water from the lake to households without it undergoing the whole convectional water treatment arrangement. Moreover, apart from the Koche WUA, there is also a scheme which supplies water under a private arrangement, as such, these would suffer in terms of losing the revenue they are generating.
- The other negative impact the DEHO foresees is the increase of social activities with the incoming of workers mostly at project construction phase. The DEHO believes this is likely to lead to increased spread of sexually transmitted infections.

- The other challenge the DEHO foresees is that of waste management at the sites where thaconstruction works will occur. The DEHO suggested that the solid waste disposal site which the Mangochi District Council be utilised on generated wastes which would be acceptable for disposal at the dump site. The waste disposal site is located at Nansenga at about 8km west of the Mangochi Town Centre.
- With regard to on how to handle human waste when the pit latrines are full at construction sites, the DEHO recommends use of double-hole pit latrines so that when one hole is full chemicals should be applied while the other pit is in use. After a while the decomposed sludge in the full pit would be removed, treated and disposed.
- The DEHO then highlighted a few issues on waste management for the Mangochi District Council, which are as follows:
    - The council does not have a designated disposal/management site for sludge removed from pit latrines or septic tanks. Disposal is normally done in nearby forest areas to the town.
    - The council also does not have their own tankers to transport sludge removed from the septic tanks and latrines, instead they hire tankers from private operators from Liwonde or from the Malawi Defence Force at Monkeybay.
    - The council has one 7-ton tractor that is used to collect solid waste from areas around the town to dispose at the dump site. However, this tractor is cannot get the job done, so the council hires 10-ton trucks from private operators around the town. The collection of solid waste is done once a week from about 15-20 designated locations around the town.

Date	1 August 2019
Place	Malawi Defence Force Marine Services offices, Monkey bay
Participants	Interviewee: WOII J.M. Gama, Soldier (Officer responsible on matters of water supply and waste management issues at the office) Interviewer: Mr Mazaza Mwafulirwa for WWEC
Discussion	The discussion was centred on getting views from the Marine Services Department of the MDF (Malawi Defence Force) on the proposed project to upgrade the Mangochi Water Supply System.

Issues

Key points to note from the interview were as follows:

- This was the first time they are hearing of this proposed project to upgrade and extend the water supply system in Mangochi.
- They have recently noted that the SRWB, at Monkey bay, is carrying out excavation works to lay new pipelines, which they noted will extend all the way to Ntakataka side. The MDF wonders if this development is part of the proposed project to upgrade the Mangochi Water Supply System, or if water from the proposed new source at Nkhudzi will also reach Monkeybay.
- Presently, the Marine Services Department does not have any satellite centres or departments/agencies located in the proposed SRWB project area, which is proposed to run from Mpondasi to Ntakataka Turn-off.
- The MDF currently utilizes water supplied by the SRWB, from the Monkeybay supply system. They do not really have any significant concerns with the system as the current

water supply is adequate. The only challenge they face is when there are power outages from ESCOM; that is when there are water interruptions, since the SRWB relies largely on ESCOM power to pump water to supply the area.

- MDF does not think that the abstraction of water by the SRWB at Nkhudzi bay for this proposed project will affect their work as the Marine Services Department of the MDF in any way.
- The MDF officer noted that currently there are no any plans he is aware of to expand the Marine Services Department by either taking in more soldiers or by establishing any satellite centres.

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: Mangochi DATE OF THE MEETING: ~~July~~ August 1, 2019

Name	Position/Occupation	Phone number	Signature
Faust Kaphuka	Director of Planning	0888 142 981	
Sylvester Maluwa	District Lands Officer	0888 579 362	
Smith Macrule	PWHAD	0999731781	
Francisco Mwaumtobe	EO	0995242702	
METRO CHENGA'ANI	DISTRICT GENDER OFFICER	0999104011	

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: MANGOCHI DATE OF THE MEETING: _____

Name	Position/Occupation	Phone number	Signature
Prisca Maleunga	Junior consultant	0992125015	P.M
Beck Scott	Mangochi Fisheries Office	0996648699	
Fr. Israel Madzakaphwa	Bishop's Secretary	0999556612	
Petros Kamanga	Project Assistant/Eng	0999702265	
Noel Nyunge	SHN COORDINATOR	0888826060	
Michael Mwenifumbo	ACDO/Comm. Dev't	0881527683	Mwenifumbo

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: MEETINGS AT MANGOCHI & MACHINGA DC OFFICES AND MARINE SERVICES (MONKEY BAY) DATE OF THE MEETING: 01/08/2019 –

Name	Position/Occupation	Phone number	Signature
WOII J.M. GAMA	SOLDIER- MARINE SERVICE	0995580011	
Clement Ntambo	DPW - MANGOCHI	0888320588	
Kadziani Mambo	DEMO - MANGOCHI	0995855623	
Morson Magombo	DPD - MACHINGA	0999381101	

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

FLORA SPECIES

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

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

FAUNA SPECIES

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

BIRD SPECIES

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

FISH SPECIES

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

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

APPENDIX 5: HOUSEHOLD SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

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 (WWEC,) 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 *(only if respondent is not the head of the household)*	1a. First name(s):		1b. Surname(s):
Gender	**Male** □	**Female** □	**Identified as other** □
Age (estimate or actual if known): Enter in number format.			
Name of respondent	4a. First name (s):	4b. Surname (s):	

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

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?	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?	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?	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?	1. Yes 2. No → skip to section 4
E. What kind of challenges do they meet?	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	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)	1. Less than MK 10,000 2. MK 10,000 – MK 25,000 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
SECTION 5: HEALTH	
A. What is the nearest health facility in your village/area?	1. Government Hospital 2. Private Hospital 3. Mission Hospital
B. How long does it take you to reach nearest health facility (the nearest)?	1. Less than 30 minutes 2. 30 minutes to 1 hour 3. 1 hour to 2 hours 4. More than 2 hours
C. Has anyone from the household suffered from the following?	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 healthy facility in the last 3 months?	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?	1. Yes → skip to D 2. No
B. If no, what do you use?	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	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?	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?	1. Yes 2. No
F. What do you use for washing hands?	1. Water only 2. Water and soap 3. Water and ash 4. Other (specify)
G. How is the household waste disposed?	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?	1. Yes 2. No →skip to section 8
B. Type of claim/ ownership	1. Leased / Certificate of ownership 2. Customary 3. Government land 4. Freehold land 5. Other (specify)
C. What are the uses of your land?	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	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?	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?	1. Lake/river/streams 2. Unprotected wells/spring 3. Protected wells/springs 4. Piped water(tap)

SECTION 9: WATER	
	5. Boreholes/tube well 6. Rain water 7. Piped from the lake 8. Other (specify)
B. Where is the water source located?	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)	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?	1. <5 min 2. 6-10 min 3. 11-15 min 4. >15 min
E. Do you treat your drinking water?	1. Yes 2. No →Skip to G 3. Don't know →Skip to
F. How do you treat the drinking water?	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?	1. Non-Governmental Organizations 2. Water User Association 3. Southern Region Water Board 4. Government 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

SECTION 9: WATER	
	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.	1. Earth floor 2. Wood planks 3. Cement 4. Ceramic tiles 5. Carpet 6. Other (specify)
B. Observe the main roof of the dwelling	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.	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?	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?	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)	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)