SOUTHERN REGION WATER BOARD

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

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EXECUTIVE SUMMARY

Southern Region Water Board through the Malawi Government has acquired funds from Kuwait Fund for Arab and Economic Development (KFAED) to extend Mangochi water supply system to lakeshore areas. Under this project, SRWB will extend the system to un-served areas along the Lakeshore from Mpondasi to Mtakatata Turn-Off and will cover the trading centres of Namiasi, Maldeco, Makawa, Mtakatata 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 to the south, Ntcheu to the south-west, Dedza to the 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 Lilongwe City. The Mtakatata 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-Monkey bay road

The proposed project to upgrade and extend the Mangochi Water Supply System has a design horizon extending up to the year 2035. 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 Mtakatata Turnoff.
- Construction of auxiliary buildings
- Construction of two service reservoirs, one at Nkhudzi Hill and another at Namiasi.
- Procurement of materials for new water connection
- 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 92,847 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.

Justification for the project

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. Communities in these areas 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.

In addition, presence of reliable water supply in terms of quality and quantity from a mandated organisation such as the SRWB will promote tourism in Mangochi Lakeshore area which has high potential for tourism. Hence leading to economic empowerment of the locals.

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 15,400 m^3/day extracted from Lake Malawi. This water volume to be extracted is an equivalent of 0.178 m^3/sec or 0.00488km^3 per year. This means that the amount of water that will be extracted from the lake in the year 2035 will only be 62.53x10^(-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.

Rationale for the ESIA and Methodology

According to the Malawi Environmental and Social Impact Assessment Guidelines of 1997, 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 development and upgrading. The ESIA aims at enhancing the benefits and mitigating the adverse impacts of the project on the biophysical, cultural 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)** Cultural heritage appraisal through desk research, archaeological site surveys and community consultations in the project area in order assess project impact on heritage resources and integrity of the area as a World Heritage Site.
- **d)** Updating literature on policies, regulations, standards, administrative records and sustainable management practices related to Drinking Water Supply and Sanitation (DWSS),
- **e)** 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;
- **f)** Interviews with key informants from the surrounding communities affected directly or indirectly by the project; and

g) 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

Proposed enhancement measures

Inform local communities of employment opportunities; Prioritise employment of local persons that qualify; Treat workers well, pay them fairly (above the minimum wage) and pay overtime timely; and Sensitize workers to save and invest during project implementation

b) Increase in trade opportunities

Proposed enhancement measures

Pay materials suppliers within the agreed times; Source materials from licenced suppliers; Support and promote of entrepreneurship skills amongst the communities and business people in the project area by engaging them where appropriate; and Promote village savings and loan (VSL) schemes during project implementation.

Positive Impacts during the operational phase include:

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

Proposed enhancement measures

Ensure water reservoir tanks have adequate water all the time to cover periods of no water pumping; Sustain the desired performance of the water supply system through timely preventive maintenance; Quickly carryout maintenance works and restore water supply when there are problems; Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules; and 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

Proposed enhancement measures

Adequately treat water; 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; Process water connection applications and provide water to the communities as quickly as possible; Observed the recommended maximum distances of 500 metres from houses to water points when constructing communal water points; and Ensure water is available all the time at the water points.

c) Improved sanitation, hygiene and health

Proposed enhancement measures

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; and Ensure there is adequate and efficient drainage within the community water points

d) Improved socio-economic situation of the communities

Proposed enhancement measures

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

e) Increase in revenue generation

Proposed enhancement measures

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

f) Enhanced gender and women participation in development

Proposed enhancement measures

Sensitize recruiting authorities to maintain work-place gender balance in line with the national gender policy; 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 to Savings programs or initiatives

g) Education benefits to the girl child

Proposed enhancement measures

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.

h) Increased development

Proposed enhancement measures

Provide new water connection applications within the set time; Provide adequate potable water supply to the new areas; 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

<u>Adverse impacts during planning and designing phase:</u>

a) Loss of land and properties

Proposed mitigation measures

Locate transmission and distribution pipelines within existing road reserves, as much as possible. Conduct sensitization and awareness on the need for land for the project and the 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 other 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; SRWB through Mangochi District Council must help the affected people to identify replacement land

b) Unrealistic expectations regarding lands/compensation/resettlement negotiations

Proposed mitigation measures

Conduct adequate and thorough public sensitization meetings on land laws, land acquisition and compensations; Value the land and property and pay compensations in a transparent manner; Conduct sincere and adequate sensitizations with the owners of the land and government officers must avoid dictating unfair and unreasonable compensation amounts.

Adverse impacts during construction phase

a) Dust generation

Proposed mitigation measures

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; Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.

b) Gas and particulate matter emission

Proposed mitigation measures

Use new or fairly new vehicles and equipment with exhaust gas emissions below permissible emission limits; Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits; Optimize transportation management to avoid needless truck drives; Control vehicle speeds; Reduce engine idling time; and Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.

c) Soil contamination

Proposed mitigation measures

Line 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, in line with Waste Management and Sanitation Regulations; 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 activities. The pits must not be near to surface water bodies;

Closely supervise the workforce to avoid or limit waste generation; Sensitize construction workers to desist from littering the site.

d) Land degradation and soil erosion

Proposed Mitigation Measures

Provide lined drainage with check dams along access roads; Plant grass and restore vegetation on disturbed areas, along the access roads and around the tank; Landscape and concrete surfaces on construction sites and around the tank as appropriate.

e) Loss of vegetation cover, aesthetic scenery and disturbance or loss of wildlife

Proposed Mitigation Measures

Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation; Plant appropriate trees and grass in all disturbed areas; Value and appropriately compensate for all the trees to be cut down during construction; Provide resources for conservation activities to be done by the Department of Parks and Wildlife; Construct fire bands to protect the area from fires; Include elements of ecosystem protection in the Memorandum of Understanding to be signed by the Department of Parks and Wildlife and Southern Region Water Board; For every tree cut down, provide 10 tree seedlings of a similar species to be planted in the adjacent areas; Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass after construction works and just before the rains 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; Fence Nkhudzi Hill to ward off animals and sensitise people against making noises that would disturb/ scare away animals; Relocate endangered species where appropriate; and Paint structures in protected area with green colour to blend with environment.

f) Exposure of people and animals to injuries and accidents

Proposed Mitigation Measures

Develop a workplace safety policy induct workers on OSH requirements and repeat reminders on the same; Inform and sensitise the public about all open pits and trenches; Provide appropriate personal protective equipment (PPEs) to construction workers. and ensure that it is always used; Provide firefighting equipment and training; and reserve fire assembly points; Train First Aiders and provide first aid kit**;** Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife; Buy construction materials from suppliers that are licensed by the Mangochi Town Council; Avoid making deep pits when extracting construction materials and backfill all excavated trenches/ areas immediately after pipelaying. Re-fill borrow pits immediately after use; Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them; Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife; Buy construction materials from suppliers that are licensed by the Mangochi Town Council; and Adequately supervise the construction activities and follow recommended procedures.

g) Disruption of water supply

Proposed Mitigation Measures

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

h) Water pollution and siltation

Proposed Mitigation Measures

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

i) Disturbances and accidental damage to assets

Proposed Mitigation Measures

Provide adequate notice before construction activities at a private or public property; Provide detours and appropriate traffic signs for vehicles and pedestrians where construction is across a road; and 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.

j) Noise and vibrations

Proposed Mitigation Measures

Use appropriate and well-maintained noise mufflers on vehicles and machinery; Regularly service and maintain equipment; Provide ear muffs for the workers in noisy areas; Use electric motors instead of compressed air driven machinery and use controlled blasting to dampen noise; 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 and animal presence on the project surroundings; and Notify the public of upcoming loud events.

k) Potential increase in poaching

Proposed Mitigation Measures

Sensitize the workers and the community against poaching and the applicable laws as well as the penalties; Support and work with the National Parks and Wildlife Rangers to prevent poaching especially during construction and operation; Provide temporary structures (flying camps) for Rangers especially during construction; and Liaise and work with the Department of Parks and Wildlife during any clearing of vegetation.

l) Increase in spread of Sexually Transmitted Infections (STIs), HIV and AIDS, unplanned pregnancies and breaking up of families

Proposed Mitigation Measures

Sensitise workers and surrounding communities on the risks of indulging in casual sex; Sensitise girls on the dangers of getting involved in pre-marital sex; Provide both male and female condoms to workers; Develop and implement a workplace policy on HIV and AIDs; and Implement and follow-up on grievance redress mechanisms.

m) Increased pressure on community health services

Proposed Mitigation Measures

Develop and implement a Health and Safety management plan to protect workers from communicable diseases and injuries; Conduct public awareness and sensitization on communicable diseases including HIV and AIDS and how these can be prevented; Sensitise the workers and the communities to follow good sanitation and hygiene practices; Construct adequate sanitation facilities and provide basic medical services at the work sites; Provide both male and female condoms to workers for preventive measures for spread of HIV and Aids; andSupport the services of the local clinics and the Health Surveillance Assistants.

n) Increased COVID – 19 infections and related deaths

Proposed Mitigation Measures

Provide COVID-19 preventive measures including of sanitization products, protective masks or shields; Enforce hygiene practices including the wearing of masks and shields, hand washing and sanitising; Divide the workers into shifts to decongest the work area and improve social distancing; Assist suspected COVID-19 cases to access approved testing centres and hospitals; and Provide continuous communication and awareness on COVID-19 issues.

o) Sexual abuse and harassment

Proposed Mitigation Measures

Sensitise workers and nearby communities to desist from sexual abuse and harassment; Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment and publicise places for reporting the cases; 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; Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-going projects aimed at promoting gender equality, ending sexual harassment and empowering women to be financially independent; Implement and follow-up on grievance redress mechanisms; and 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

p) Unequal employment

Proposed Mitigation Measures

Include a clause in the contract specifying that at least 40% of the employees but not more than 60% should be women; Sensitize and encourage women to build their confidence for applying for in as foremanship, engineers etc.; and Create a good work environment to allow female workers report any case of gender discrimination.

q) Child labour and trafficking

Proposed Mitigation Measures

Employ people who have genuine identification to prove that they are 18 years old and above; Employ workers through established recruitment agencies; and Maintain an accurate staff register against which employee presence must be checked every day.

r) Gender Based Violence (GBV) and Violence Against Children (VAC)

Proposed Mitigation Measures

Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to implementation of the project; Sensitize the community on the grievance redress mechanism (GRM) before implementation of project; Ensure that Codes of Conduct are prepared, signed, understood and applied by all contractor's staff; Provide separate facilities for men and women; Provide appropriate signage on GBV in local language; and Provide equal employment to women and men.

s) Loss of Cultural Heritage Sites and Outstanding Universal Value (OUV)

Proposed Mitigation Measures

Avoidance of construction-related impacts to important cultural resources; Preparation of a cultural heritage management plan to avoid or limit adverse impacts of the project; Provide training in cultural heritage management and undertake possible heritage research programs in the area; Implement internationally recognized practices for the protection of cultural heritage resources; Involve relevant government authorities responsible for the protection and management of cultural heritage resources in Malawi in the implementation of the project's cultural heritage management plan; Conduct a Contractor Training and Awareness Program; Selective archaeological monitoring of surface clearing and trenching activities during development in areas with poor surface visibility and/or a high probability for cultural resources buried below the surface; Rescuing archaeology at sites deemed as of high priority; and Applying Chance Find Procedures to be decided upon and development of the necessary management measures

Adverse impacts during demobilization phase

a) Loss of jobs and businesses

Proposed Mitigation Measures

Provide alternative employment to employees e.g., as maintenance staff; Provide adequate notice to employees to prepare themselves and secure alternative employment; Pay severance benefits to leaving workers in line with the labour regulations; and Sensitize the workers and the general community to be saving.

b) Borrow pits and excavated areas for raw materials

Proposed Mitigation Measures

Fill up and close pits after the construction works; Rehabilitate all work sites; and Source construction materials (e.g., sand and soils) from licensed suppliers

Adverse impacts during operational phase

a) Solid waste generation

Proposed Mitigation Measures

Sell or recycle metal waste to tinsmiths or vendors for reuse or re-sale; Provide solid waste storage bins and skips and prevent overfilling; Dispose collected waste in an approved disposal site; and Implement sensitization campaigns on consequences of indiscriminate waste disposal.

b) Increased pollution from wastewater and sludge

Proposed Mitigation Measures

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; and Sensitize people on the benefits (including prevention of cholera) of good the hygiene

c) Risk of emergencies

Proposed Mitigation Measures

Design and implement an emergency response plan; Install fire hydrants within the proposed development; Regularly monitor and maintain the water supply system; and 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

Proposed Mitigation Measures

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; 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; and Include the people from the local area in the work force.

In view of the negative impacts outlined above, this document has presented an environmental and social management plan (ESMP) and a Cultural Heritage Management Plan (CHMP) in Chapter 7, which outlines mitigation measures that must be undertaken by SRWB and other key stakeholders in order to eliminate or decelerate the impacts on the environment and the OUV of Lake Malawi World Heritage Site. 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 environmental and social impacts have been determined to be **55,498,952 Malawi Kwacha** (1 USD is equivalent to 732.56 Malawi kwacha**) per year**; and the costs for monitoring are estimated to be **5,127,920.00 Malawi Kwacha per year**. In addition, the cost for mitigation of Cultural Heritage Impacts and the World Heritage Attributes is estimated at **45,000,000.00 Malawi Kwacha.** This means that the total cost for management and monitoring of environmental and social impacts and cultural heritage impacts is **105,626,872 Malawi Kwacha**

Conclusion

If the proposed mitigation measures are effectively and efficiently implemented, it is expected that the adverse environmental and social and heritage impacts will be reduced or eliminated for the sustainability of the project in Mangochi Town.

According to the nature of the project, negative impacts on the OUV, integrity, protection and management of Lake Malawi National Park as a World Heritage Site are minimal and will mainly occur during construction phase. These are likely to be mitigated through application of appropriate and practical mitigation measures.

Recommendations

The report makes the following key recommendations:

i. Water abstraction has to be in accordance to the Water Right, which SRWB will be required to obtain before the project can be implemented 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.
ii. During construction, the contractor should avoid clearing any protected or endangered plant species. Where they are removed, they must be replanted.
iii. Adequate and fair compensation must be given to all the affected people before construction activities start.
iv. Rescue archaeology needs to be conducted in all significant sites after completion of initial test excavations and before the actual start of the project. The materials to be salvaged will be an important resource in linking the settlement of the area by early peoples. It is the believed that this excavation can lead to further discovery of earlier settlements by Early Iron Age (EIA) and Late Stone Age (LSA) peoples.
v. Archaeological and World Heritage monitoring of land transformation activities by the Department of Museums and Monuments should be implemented during the construction phase of the project.
vi. Contractor training and awareness program must be carried out before land transformation activities

In this respect it is therefore strongly recommended that the project should be implemented without further delay by adhering to all suggested mitigation measures.

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AIDS	Acquired Immune -Deficiency Syndrome
BBTV	Banana Bunchy Top Virus
BoQ	Bills of Quantities
CHIA	Cultural Heritage Impact Assessment
COMSIP	Community Savings Investment Programme
DEC	District Executive Committee
DI	Ductile Iron
DLO	District Land Officer
DMM	Department of Museums and Monuments
DNPW	Department of National Parks and Wildlife
DPD	Director of Planning and Development
EAD	Environmental Affairs Department
EIA	Environmental Impact Assessment
EMA	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GI	Galvanised Iron
GoM	Government of Malawi
HIV	Human Immunodeficiency Virus
IAS	Invasive Alien Species
KFAED	Kuwait Fund for Arab and Economic Development
LIA	Late Iron Age
LMNP	Lake Malawi National Park
LSA	Late Stone Age
MBS	Malawi Bureau of Standards
MDGS	Malawi Development Growth 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
OUV	Outstanding Universal Value
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	Occupational Safety Health and Welfare
SEP	Social Economic Profile
STIs	Sexually Transmitted Infections
TCE	Technical Committee on the Environment
TNM	Telecom Networks of Malawi
UNESCO	United Nations for Education, Scientific and Cultural Organization
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
WHC	World Heritage Convention
WHO	World Health Organisation
WHS	World Heritage Site
WTP	Water Treatment plant

CHAPTER 1 : BACKGROUND AND INTRODUCTION

1.1. PROJECT BACKGROUND

Tourism is identified in the Malawi Growth and Development Strategy II (MGDS II) as one sectors 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 Mtakataka Turn off, is 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.

The 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 Mtakataka 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, 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 Mtakataka Turn-Off and will cover the trading centres of Namiasi, Maldeco, Makawa, Mtakataka 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 completed, SRWB will need to employ additional staff for the operation of the new facilities, including a new water treatment plant.

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 report is prepared under this assignment. Key staff that undertook the assignment are listed in appendix 2.

1.2. EXISTING MANGOCHI WATER SUPPLY SYSTEM

1.2.1 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.

1.2.2 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 Alluminium Sulphate (alum) while HTH is utilized for disinfection.

1.2.3 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.

1.2.4 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.

1.2.5 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.

1.3. PROJECT OVERVIEW

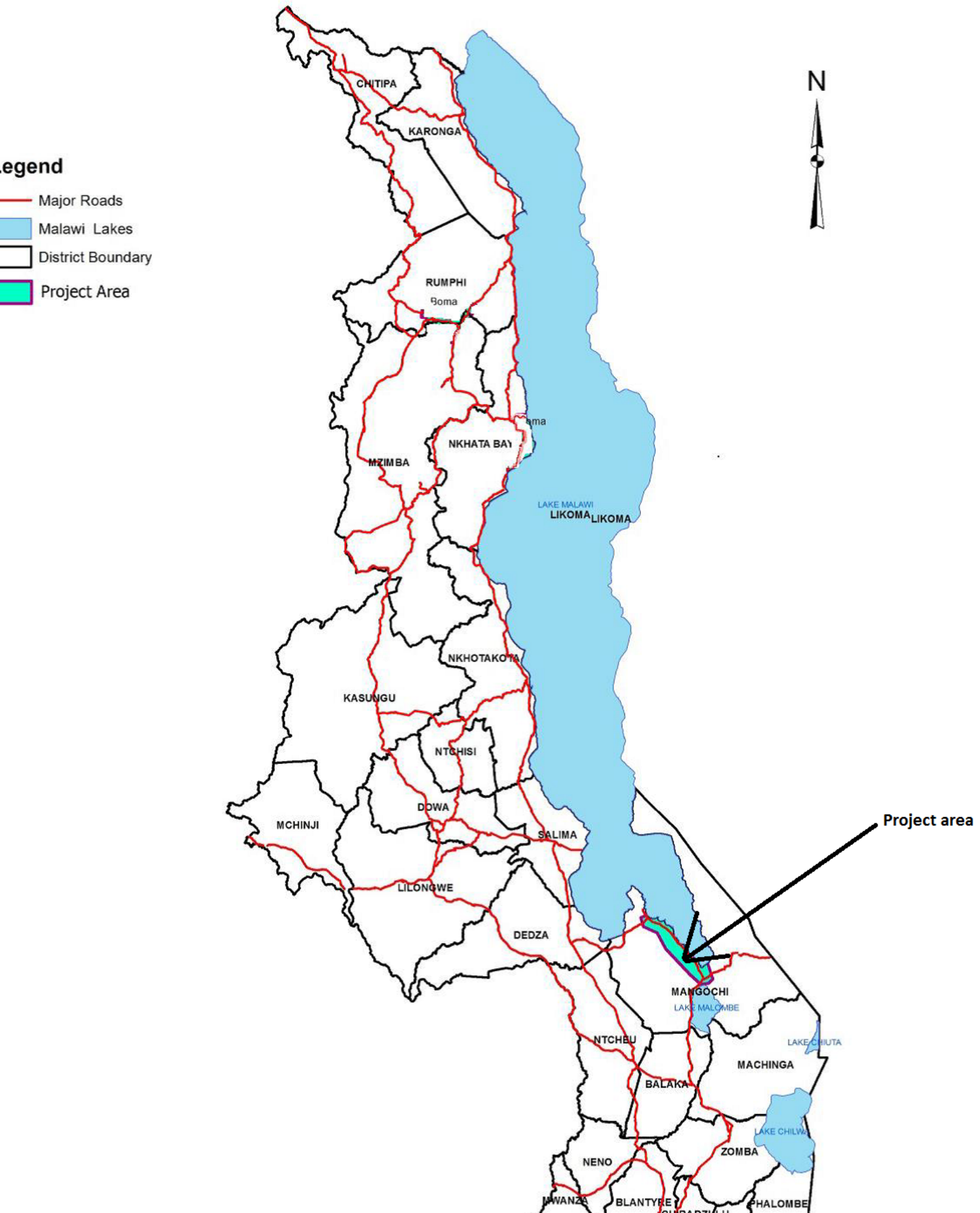
The proposed project to upgrade and extend the Mangochi Water Supply System has a design horizon extending up to the year 2035. Key project components include:

- 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 Mtakataka Turnoff.
- Construction of auxiliary buildings
- Procurement of materials for new water connections
- Procurement of equipment to support day-to-day management of the project.

1.4. PROJECT LOCATION

The project area falls within Mangochi District and will extend from Mangochi Town which is the administrative centre for Mangochi District Council in the Southern Region of Malawi. Mangochi District boarders the districts of Machinga in the south east, Balaka to the south, Ntcheu to the south-west, Dedza to the west, Salima to 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 of Lilongwe City. The Mtakataka 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 M10 Road.

Figure 1.1 shows the location of the project area for the proposed extension of the Mangochi Potable Water Supply System. The proposed area to be covered by the project is shown in more detail in figure 1.2, which also shows the proposed layout of facilities to be constructed.


Legend
Major Roads
Malawi Lakes
District Boundary
Project Area
N
CHITIPA
KARONGA
RUMPHI
Boma
NKHATA BAY
MZIMBA
LAKE MALAWI
LIKOMA
LIKOMA
NKHOTAKOTA
KASUNGU
NTCHISI
DOWA
MCHINJI
SALIMA
LILONGWE
DEDZA
Project area
MANGOCHI
LAKE MALOMBE
NTCHEU
LAKE CHIUTA
MACHINGA
BALAKA
LAKE CHILWA
ZOMBA
NENO
BLANTYRE
PHALOMBE

1.5. PROJECT PROPONENT

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

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

1.6. PURPOSE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Environmental and Social Impact Assessment is aimed at improving the overall environmental performance of the project through enhancing positive impacts and minimizing 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 Supply 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.
3. To identify and evaluate the significance of the cultural heritage resources within the project area
4. To identify and evaluate impacts the water supply project would have on the identified cultural resources and the integrity and OUV of the area.

The ESIA study was to be undertaken in accordance with the Environment Management Act of 2017, Guidelines for Environmental Impact Assessment of 1997 and Environmental Impact Assessment Guidelines for Water Sector Projects of 2006; and the International Union for the Conservation of Nature (IUCN), "World Heritage Impact Assessment Principles" which recommend a minimum of 8 principles that Environmental Assessments for development proposals affecting natural World Heritage Sites should follow. 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 with water reticulation networks with more than 10 kilometres of pipeline (Appendix B, Section A3.4);
- Projects in proximity to or which have the potential to affect water bodies (Appendix B, Section A13), sub-section A13.4.

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

1.7. SCOPE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

To satisfy the requirements of the Terms of References (appendix 1), 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. **World Heritage Impact Assessment:** Assessing the impacts of the water supply project would have on the Outstanding Universal Value (OUV) of Lake Malawi National Park as a World Heritage Site, its integrity and protection and management according to World Heritage Convention Operational Guidelines.
vii. **Cultural Heritage Impact Assessment:** Assessing the project impact on archaeological and cultural heritage resources such as historic buildings, archaeological sites, traditional sites, sacred sites and / or grave yards and propose mitigation measures
viii. **Preparation of Environmental/Social Management Plan and Environmental/Social Monitoring Plan\Cultural Heritage Management Plan and World Heritage Attributes Monitoring Protocol** detailing the positive and negative effects of the proposed developments on the environment, World Heritage and traditional society, and shall recommend appropriate solutions to minimize any undesirable effects resulting from the proposed developments.
ix. **Cost Estimates:** determine costs for implementing the recommended mitigation measures. The costs shall be based on similar works implemented recently in Malawi.

1.8. METHODOLOGY FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

1.8.1. Literature Review

This involved the review of existing literature related to the project. The literature that was reviewed included the Project's Environmental and Social Management Framework (ESMF); Environmental and Social Impact Assessment Guidelines; World Heritage Convention

Operational Guidelines, IUCN World Heritage Impact Assessment Principles, Environmental Management Act; Forestry Act; Water Resources Act; Parks and Wildlife Act; Public Health Act; Occupational Safety, Health and Welfare Act; Monuments and Relics Act; Cultural Policy; National Water Policy; National Environment Policy; Malawi National Land Policy; Malawi Development and Growth Strategy (III), among other pieces of relevant legislation and policies. In addition, a review of other Environmental and Social Impact Assessment reports related to water development projects was conducted.

The Consultant also 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; project feasibility study reports and baseline heritage profile reportsrelevant to the project. The reviewed documents have been included in the reference section.

1.8.2. Field Visits

Anumber of field visits were conducted to the proposed Nkhudzi Bay Water Supply project site. This was done to enable specialists to acquaint themselves with the project area and surrounding communities. The field visits also enabled different specialists to observe and capture baseline data on the existing environment. Specialist studies that were conducted included World Heritage studies, archaeology and heritage , 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, and surface water bodies; Socio-economic and cultural environment: cultural issues and economic activities, current land use and future development activities; among others.

The studies assisted in identifying and assessing environmental and social impacts that might occur as a result of project implementation.

The investigations also facilitated the verification of information from literature, with what is on the ground. Information was collected through transect walks and observations, onsite consultations and expert assessments. enterprises.

1.8.3. Stakeholder Consultations

Consultations are an important component of an ESIA process because they reduce anxiety and concerns likely to be brought about by a project so that the project is more acceptable by people and government authorities. Consultations also help to incorporate views of local communities, government officials and different stakeholders on ways of avoiding or mitigating adverse/negative impacts and enhancing the positive impacts.

Consultations were done with some of the project beneficiaries from villages under Group Village Head (GVH) Mwanyama where Nkhudzi Bay Water Supply Project is located; and various stakeholders. Consultations were also carried out at the national, regional and district levels. The outcomes of these consultations are provided in Appendix 3; while the list of people consulted is given in Appendix 4. The consultations were aimed at soliciting the views of the stakeholders and incorporating their views on ways of avoiding or mitigating

adverse/ negative impacts and enhancing positive impacts when implementing the project. During the consultations, questionnaires and interviews were used to collect information.

Appendix 4 is a list of the key stakeholders consulted, while a summary of key issues raised during the consultations is attached as appendix 5. Below is a brief description of how each of methods for conducting public consultations was carried out

- **Key Informant Interviews (KII):**

Because of their ability to complement questionnaire survey and Focus Group Discussion (FGD), KII were also used in data collection. Key informants were purposively selected based on their knowledge of, participation, and role in the project. The key informants included: Department of National Parks and Wildlife, Department of Museums and Monuments, National Commission for UNESCO, Mangochi District Concil, District Lands Officers, Community Leaders, Members of the Water Users Association (WUA), Members of Village Natural Resources Management Committees (VNRMCs); and ordinary men and women benefiting from the project, among others.

- **Household Questionnaire**

A questionnaire survey was used to collect data on demographic and socio-economic characteristics surrounding communities and their perceptions on the project's impact. The draft household questionnaire for data collection was reviewed and approved by the client; and pretested before it was administered. The questionnaire is attached as appendix 6.

- **Focus Group Discussions**

FGDs were conducted and comprised purposively selected participants. FGD as a method was chosen for its ability to provide a relatively less intimidating environment for the participants to effectively discuss their views and experiences. This method allows a reflection of participants' viewpoints thus clarifying issues and enabling the study team gain more insights into issues.

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) and World Heritage Monitoring Protocol that have been developed; while positive impacts of the proposed project have been recommended for enhancement.

1.9. STRUCTURE OF THE REPORT

The report has been organised into the following chapters:

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

Chapter 2: Detailed description of the proposed project - discusses the main project activities, equipment and materials to be used in the project and 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 in 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 andsocial conditions including physical, biological.socioeconomic, cultural and world heritage 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. Cultural and World Heritage aspects include the archaeological heritage resources, and other cultural sites and archaeology as well as the sensitivity of the surrounding areas to any change

Chapter 6: Public Consultations gives the objectives of the consultations; the approach used, the target groups consulted and the consultation outcomes.

Chapter 7: Assessment of environmental and social impacts and World Heritage impacts - outlines the approach and methodology for impact identification. It provides information on affected environmental and social components, based on the project phases and proposed project activities. The chapter also covers impact assessment and determination of mitigation measures.

Chapter 8: 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 9: 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 10: Provides the assessment and evaluation of Cultural Heritage Impacts, providing the summary of the identified impacts and the proposed mitigation measures.
Chapter 11: 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 Mtakataka turn-off is aimed at maximizing the investments in the project area and to enhance tourism along the lakeshore. The project seeks to also address water related problems existing within the area.

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 ACTIVITIES FOR THE 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 preliminary designs for the project. Currently, SRWB is in the process of recruiting a contractor who is expected to come up with detailed designs for the proposed project. Activities for the preparation of detailed designs will include surveying, site planning and preparation of maps as well as technical drawings and bills of quantities.

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. MAIN PROJECT COMPONENTS AND ACTIVITIES FOR THE CONSTRUCTION PHASE

2.2.1 Construction of a new water intake structure, raw water 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) Raw Water Submersible Pumps

These pumps will be for the abstraction of raw water from the lake. They 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) Pier Bridge

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 is to be at 4m and it will be a floating type to allow some fish and other aquatic fauna to swim under it. The bridge will also consist of pump cages and handrails for personnel protection.

c) Suction Pipeline

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 for the pumps will also be installed in the room.

2.2.2 Construction of the 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) *Two Clarifiers/sedimentation tanks*

The two clarifiers shall be constructed to have a depth of 5m with a total surface area of 200m^2. 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) Three pressure filtration cylinders

3 pressure filters each with a filtration capacity 1,88m^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. The backwash wastewater will be made to flow into a drain and discharge into the lake. 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 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 will 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 80m^3/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 Nkhudzi Bay treatment plant and to allow water supply by gravity to areas towards Mtakataka turn-off and also all the way to areas around the Bishops House near Mangochi Town.

The steel tank at Namiasi will be located such that it receives branched off water from Nkhudzi 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 Mtakataka	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 of mains		48300			
SECONDARY LINES-BRANCHES					
6	Mtakataka 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
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 secondary lines		27000			

Item	Areas/sections to be covered by pipeline	Pipeline length (m)	Pipe diameter (mm)	Pipe material	Pipe pressure class
TERTIARY LINES					
21	Various targeted areas	5000	63	PVC	6
22	Various targeted areas	5000	40	PVC	6
Subtotal length tertiary 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 Nkhudzi 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 Nkhudzi Bay treatment plant site.

2.2.7 Construction of access roads

This will mainly include the construction of a concrete access road at the Namaso bay side of Nkhudzi Hill service reservoir. The road is to be 5m wide and will run for a distance of 3km to connect the nearby tarmac road to the site of the tank at the top of Nkhudzi Hill. The access road will be utilised both at the construction as well as operation phases of the project.

2.3. PROJECT COMPONENTS AND ACTIVITIES FOR DEMOBILISATION AND OPERATION

2.3.1. Components and activities during demobilization phase

For the demobilisation phase, all temporary works and structures will be removed as soon as possible after their use. The structures 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 are anticipated from the activities realated to the removal of the temporary structures and the disposal of unused or waste materials.

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.

2.3.2. Extraction Volumes for Mangochi Water Supply Project

The main activity during operation of the proposed project, will entail water abstraction from Lake Malawi through pumping using the proposed intake pumps and structure. An increased amount of water of 13,542 m^3/day will be abstracted from Lake Malawi. This volume of water is equivalent to 0.157 m^3/sec or 0.00491km^3 per year. Hence, the amount of water that will be abstracted 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 extended Mangochi Potable Water Supply Project. 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 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. It is, therefore, concluded that through the Mangochi Potable Water Supply Project, as far as water abstraction is concerned, Malawi will be realizing more benefits from the shared watercourse system of Lake Malawi-Shire River-Zambezi River, while ensuring adequate protection of the watercourse system.

After abstraction, the water will be processed in the water treatment plant where dissolved and suspended solids will be removed by clarification. A backwash wastewater settling basin has been designed to detain water in order to settle the suspended solids before the water is discharged into the environment. Sludge from the clarifiers will be thickened, dried on evaporation beds and will be offered to local farmers as manure for gardening activities.

Chlorination of the clarified water will be done after clarification, using automatic dosing pumps. After chlorination, the total residual chlorine levels of the backwash wastewater from the treatment plant will not exceed the maximum limit of 1mg/l, for industrial effluent discharge into surface waters (the recommended maximum amount to be taken by humans, MBS-MS 539:2013). This is because the maximum dosing rate will be 0.8mg/l, resulting in 0.2 mg/l residual chlorine.

Community water user associations will be set up and trained to manage the 15 communal water points that will be delivered to the local communities. It is also expected that individual/ household service connections to the extended water supply system will be done during the project operation phase. Activities under the operation phase 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 of 40-60% employed females to males is observed. Out of the people to be employed during the construction phase, 45% are expected to be 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 1000 people will be employed for the different construction activities, out of which 30%

will be women. 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.

During the operation phase, it has been estimated that SRWB will employ 15 people to operate the new facilities installed under the project.

Table 2.2 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	T.o 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
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	Completed structures

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
			could be sourced from nearby quarries	
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 2.3 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 Nkhudzi 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.

c) The selecting of the Nkhudzi Hill as the proposed site for the main service reseivoir for the system also maximizes the potential of gravity flow for the supply of water. The site at Nkhudzi Hills has a minimum elevation of about 610m, significantly at a higher altitude than sorrounding areas therefore making gravity flow for supply more effective and minimising the need for incorporation of power supply to help in pumping supply water.

d) The Department of Museums and Monuments conducted a Cultural Heritage Impact Assessment (CHIA) for the project area, including where construction of the storage tank is proposed on Nkhudzi Hill. The CHIA report, which is attached as an independent report, concluded that the project area is endowed with several archaeological heritage resources. However, according to the nature of the project, negative impacts on the Outstanding Universal Value (OUV), integrity, protection and management of Lake Malawi National Park as a World Heritage Site are minimal and will mainly occur during construction, operation and decommission phases of the project. These negative impacts can be mitigated through application of appropriate and practical mitigation measures.

2.7. WASTE MANAGEMENT

The table 2.4 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 later be 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).

Waste type	Management
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 put in place to get the collected waste disposed at waste disposal sites for the Mangochi Town Council.
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 put 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 put 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 extension 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 Mtakataka 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. Most of these lodges and hotels abstract and treat water from the Lake Malawi while the communities source water from both boreholes and 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 Mtakataka 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.
f) Government would continue to lose revenues from water abstraction and treatment from Lake Malawi. This is mainly water that is abstracted and treated in lodges close the Lake Malawi. Lodges and hotels use high volumes of water which would increase revenue collection by government if the water is supplied by SRWB.
g) Lodges and hotels would continue abstraction water from Lake Malawi illegally which means that government will be losing money from permits and revenues.

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

3.2. ECONOMIC ALTERNATIVES

The upgrading of the Mangochi water supply system through extension of the system to the lakeshore areas from Mpondasi and Mtakataka Turn-Off will result in 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 sourced 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.

3.3. TECHNICAL ALTERNATIVES

3.3.1. Alternatives for the intake location

Three water intake site alternatives were considered as follows:

a) The presently selected site (near the Roman Catholic Bishop's residence),
b) A site to the western side of the presently selected site near Dr. Banderson's residence of Total Land Care (TLC),
c) A site also near Dr. Banderson's property.

Common challenges for sites b) and c) were the difficulty of accessibility to the potential intake areas during construction and operation activities; and the long distance to the existing power lines. Site c) was particularly difficult to access for pipeline construction from the intake site. Site c) had an additional challenge of encroachment into the residence of Dr Banderson, who was not in favour of the encroachment.

Site a) was particularly favourable due to the following factors:

- It is located near the Roman Catholic Bishop's residence. They had no reservations on any of the water supply extension works and access,
- The design and positioning of the intake pipeline is such that water abstraction will be from a point not less that 330 metres away from the shoreline. This is to prevent the pumping from affecting the fish (especially mbuna), which normally stay close to the shoreline, in the shallow waters. Site a) conditions are favorable for a 330-meter water intake pipeline construction into the lake; and for minimum pollution from human activity,
- Site c) is also easy to connect to ESCOM power and for the intake pipeline construction

3.3.2. Alternatives for the intake source

For the newly developed areas where the piped water supply system will be extended to, an alternative is to drill boreholes so that water can be supplied to the communities using hand-pumps. While this is possible and cheaper, water from the boreholes in these areas is known to be of poor water quality due to excess calcium. These chemicals are costly to remove. Therefore, the option of supplying water using boreholes with hand-pumps was not further pursued.

Koche and Shire rivers can be used for water sources. However, due to inadequate water flows during dry season; and due to poor water quality, which can attract additional treatment costs, the option was is not viable. Therefore, the works for upgrading of Mangochi water supply system, using the lake as the water intake; and extending water supply to the newly developed areas, constitute the most technically feasible option for supplying potable water to the communities of Mangochi Town and the surrounding areas.

3.3.3. Alternatives for types of materials

The choice of type of pipe material is generally based on technical and economic advantages and disadvantages and these choices also have environmental implications. uPVC pipes have the advantage that they are generally cheaper than steel or duct iron pipes. However, steel and duct iron pipes are stronger and last longer than uPVC pipes. Hence, they do not easily burst, thereby preventing or minimising non-revenue water. The project design has used different types of pipes to optimise pipeline strength and at the same time to minimise cost. Chapter 2 and table 2.1 provide information on types of pipes selected for different applications and the reasons for the selection.

In the design, pressure filters are preferred against gravity filters because they are easy to use and the quantity of water to be produced in the design period is not much.

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. 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.

4.2. 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.

4.3. POLICY FRAMEWORK

4.3.1. 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.

4.3.2. 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.

4.3.3. 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.

4.3.4. 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.

4.3.5. 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.

4.3.6. National Sanitation Policy 2006

The National Sanitation Policy (NSP) aims at addressing sanitation problems in the country. It provides a vehicle to transform the hygiene and sanitation situation in Malawi. It provides both guidelines and an action plan whereby 2020 all the people of Malawi will have access to improved sanitation, safe hygienic behaviour will be the norm and recycling of solid and liquid waste will be widely practiced leading to a better life for all the people of Malawi, through healthier living conditions, a better environment and a new way for sustainable wealth creation.

The Sanitation Policy links with the National Water Policy, which activities 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 ecosystems.

The policy stipulates that all community water supply programmes and projects shall promote hygiene education and improved sanitation in accordance with the NSP. Members of water point committees will be trained in hygienic use of water and sanitation. Regulation to be the responsibility of District Assemblies and MoIWD, inspection by the District Coordinating Team. In addition, the policy also instructs that water points should have adequate provision for disposal of waste water with aprons, drainage channels and 'soak-aways' or with plants or trees to absorb standing water. Responsibility should rest with village water point committees and health committees.

In line with the policy, SRWB will make sure that hygiene and sanitation education is provided to the water committees for the communal water taps to be provided in different area. in addition, the SRWB will consider constructing drainage channels and soak ways for communal taps so to improve sanitation and hygiene of the water points.

4.3.7. The National Forestry Policy of 2016

The goal of the National Forest Policy, 2016, is for the conservation, establishment, protection and management of trees and forests for the sustainable development of Malawi. The policy aspires to control deforestation and forest degradation. The policy aims at providing an enabling framework for promoting the participation of local communities, the civil society and the private sector in forest conservation and management and promotion of sustainable

management of forests for the protection of the environment, conservation of biodiversity and climate change management among others.

The proposed project will prioritize protection of forests and support the communities to rehabilitate degraded areas by providing seedlings to the community. The Department of Forestry will be in the forefront in engaging the communities in tree planting and appropriately experienced, NGOs will also have to be involved.

4.3.8. National Parks and Wildlife Policy (2000)

The National Parks and Wildlife Policy facilitates sustainable conservation and management of wildlife resources; and the sharing of benefits arising from use of the resources for both present and future generations. One of the policy objectives is to ensure adequate protection of ecosystems and their biological diversity, through promotion and adoption of appropriate practices that adhere to the principle of sustainable development. In this regard, appropriate clauses will be included in the contract to protect wildlife resources.

The aim of the National Parks and Wildlife Policy is to ensure proper conservation and management of wildlife resources, to provide for sustainable utilization and equitable access to the resources; and the sharing of benefits arising from the use of the resources for both present and future generations. One of the policy objectives is to ensure adequate protection of ecosystems and their biological diversity, through promotion and adoption of appropriate land management practices that adhere to the principle of sustainable use.

The policy recognizes the Poverty Alleviation Program and any efforts that target the eradication of poverty so as to remove poverty driven pressures on protected areas and wildlife reserves (Chapter 2, sub section (ix)). It empowers communities to manage wildlife resources on communal land, to support the management of national parks, wildlife and forest reserves and to be involved at all stages of planning and implementation (Sub section 3.2).

Therefore, the proposed project should adhere to the National Parks and Wildlife Policy to ensure that the project implementation protects wildlife resources that are found in the project area particularly the Lake Malawi National Park.

4.3.9. National Cultural Policy (2005)

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

The National Cultural Policy also takes into account the need to preserve the natural environment and protect it from further degradation. One of the objectives of the policy is to promote environmental and biodiversity conservation and preservation methods that are in harmony with cultural beliefs. Strategies to achieve this objective include to:

i. facilitate the introduction of community based land use programs whose benefits

shall accrue to the local communities themselves;

ii. encourage traditional and environment friendly architectural designs that use less plant material;
iii. facilitate provision of well-maintained open spaces and parks in urban areas, to encourage mental relaxation; and the erection of sculptures by Malawian artists; and
iv. provide civic education on environmental conservation from the cultural point of view.

The proposed project has aligned itself to the above policy strategies by preparing the Cultural Heritage Impact Assessment to ensure protection and preservation of cultural heritage.

4.4. LEGAL FRAMEWORK

4.4.1. The Environment Management Act (EMA, 2017)

The Environment Management Act 2017 makes provision for the protection and management of the environment; the conservation and sustainable utilization of natural resources and for matters connected therewith and incidental thereto.

Part II, Section 3 of the Act recognizes the need for preparation of an Environmental and Social Impact Assessment prior to project implementation for all proposed projects which may significantly affect the environment or use of natural resources. The Act also states that the project developer shall take all reasonable measures for mitigating any undesirable effects on the environment arising from the implementation of a project which could not reasonably be foreseen in the process of conducting an Environmental and Social Impact Assessment. The project developer is also responsible for reporting to the Authority on the effects and measures taken within a reasonable time.
Therefore, the project needs to be undertaken in an environmentally responsible manner to ensure protection and management of the environment and the conservation as well as sustainable utilization of natural resources.

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.

4.4.2. 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 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.

4.4.3. 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.

4.4.4. The Water Resources Act (2013)

The Water Resources Act of 2013 supersedes the 1969 Water Resources Act and aims to provide for the management, conservation, use and control of water resources; for the acquisition and regulation of the rights to use water; and for matters connected therewith or incidental therefore.

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

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

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

4.4.5. 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.

4.4.6. 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.

4.4.7. 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.

4.4.8. 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.

4.4.9. National Parks and Wildlife (Amendment) Act, 2017

The National Parks and Wildlife Amendment Act 2017, was enacted to consolidate the law relating to national parks and wildlife management; to establish the wildlife research and management boards; and to provide for matters incidental to or connected therewith.

The Act stipulates the need for acquisition of a licence, a permit or certificate for activities conducted in the park particularly hunting. The Act, however, does not provide the need for licence/ permit acquisition for developmental activities apart from prohibition of commercial enterprises within a national park. However, according to the National Parks and Wildlife department in Mangochi, the Government of Malawi requires that a project developer, in this case SRWB, is mandated to acquire a licence/permit for working within the Lake Malawi National Park.

The Act also states the need for a Wildlife Impact Assessment (WIA) for projects that are likely to have adverse effects on any wildlife species and community (Part IV, Section 23 (i)). Therefore, the project developer should conduct an independent Wildlife Impact Assessment as the project is likely to cause adverse impact to Lake Malawi National Park. The assessment has to be conducted in consultation with the Department of National Parks and Wildlife in Mangochi District.

4.4.10. Monuments and Relics Act (1990)

The Act has provision for the conservation, preservation and study of cultural heritage including places of distinctive natural beauty and of sites, buildings and objects of archaeological, palaeontological, geological, anthropological, ethnological, historical, prehistorical and other interests. The Act provides for the procedure to be followed in relation to the discovery, excavation, removal, sale, exportation and importation of monuments, relics and collections of cultural heritage.

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

Section 29 of the Monuments and Relics Act, 1990 (Cap. 29:01) states the following in relation to development:

- *A person in charge of any survey, excavation, exploration, construction or new development shall, at the earliest stages of planning for such activities, give notice to the Minister to enable, where necessary, rescue archaeology to be carried out* (…). (…) *The cost of such work shall … be borne by the person in charge of any survey, excavation, exploration, construction or other development.*

The Act provides statutory protection against all kinds of threats on all cultural resources as defined in it.

The Mangochi Water Supply Extension Project development has high likelihood of impacting cultural resources in both Nkhudzi and Namaso bays. During construction, excavation activities have the potential to expose some archaeological remains such as cultural artefacts, for example pottery and stone tools. When that happens these will be recorded and Department of Museums and Monuments will be engaged. The Department will (as provided for in the Cultural Heritage Impact Assessment recommendations) collect the remains for analysis at the Department of Museums and Monuments repository.

4.5. Subsidiary legislation

4.5.1. 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.

4.5.2. 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.

4.5.3. 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 Mangochi 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.

4.5.4. Environment Management (Waste Management and Sanitation) Regulations, 2015

Environment Management (waste management and sanitation regulation) 2015 stipulates that every person, business or industry shall exercise duty of care by avoiding indiscriminate disposal of litter, garbage, commercial solid waste, and construction and demolition wastes. Contrary to this the person commits an offence.

The regulation also states that no person shall introduce effluent to water unless—(a) the effluent quality standards for discharges to water requirements are met and (b) there is adequate proof that the receiving water body shall efficiently dilute the effluent so as to prevent any hazard to the environment or public health. On discharging waste into the environment the regulation states that no person shall discharge effluent into the environment unless it meets prescribed environment standards.

On construction and use of pit latrines, the regulation states that where a household uses a pit latrine, it shall be improved pit latrine which shall be properly ventilated, well built with slab and should be built at least two and half metres in depth from ground level to bottom and be located at least thirty metres away from wells, springs, streams, underground water supply, water reservoirs, pools or boreholes.

Southern Region Water Board will ensure that both solid and liquid waste is properly disposed in accordance this regulation. In case where pit latrines are to be constructed at the site, proper measures as described above will be adhered to.

4.5.5. Environment Management (Waste Management (Plastics) Regulations, 2015

Environment management (plastic) regulation of 2015 prohibits the importation, manufacture and commercial distribution of plastic bags and plastic sheets made of plastic firm with a wall thickness of less than sixty micrometres in Malawi. To comply to this regulation, SRWB will ensure that thin plastics are not used in any phase of the project for either project related activities or domestic use by the employees.

4.6. REGULATORY LICENCES AND APPROVALS RELEVANT FOR THE PROJECT

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 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

No	Regulations/ Standards/Approvals	Description	Reference	Issuing Institution
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
6.	National Parks and Wildlife permit	Controls the use of national parks and wildlife	National parks and wildlife (Amendment Act, 2017)	Ministry of Forestry and Natural Resources
7.	Title deeds	Offered as a proof for land ownership before project implementation	Lands Act 2016	Ministry of Lands
8.	Antiquities Clearance Certificate	Offered as proof that Cultural Heritage Impact Assessment was completely carried out and Rescue Archaeology conducted	Monuments and Relics Act and Antiquities Policy	Department of Museums and Monuments

4.7. 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

4.8. RELEVANT INTERNATIONAL POLICIES

Malawi is a signatory to the 1972 UNESCO World Heritage Convention concerning the Protection of the World Cultural and Natural Heritage; and the 2003 UNESCO Convention on Safeguarding of the Intangible Cultural Heritage. Malawi thus has an international obligation to preserve its cultural heritage.

4.9. WORLD HERITAGE IMPACT ASSESSMENT PRINCIPLES

The International Union for the Conservation of Nature (IUCN) recommends that Environmental Assessments for development proposals affecting natural World Heritage Sites should, as a minimum, meet the following eight *World Heritage Impact Assessment Principles:*

Principle 1: Take place as early as possible in the decision-making process.
Principle 2: Identify and evaluate reasonable alternatives to the proposal.
Principle 3: Assess the likely environmental and social effects of the development proposal(s) on the Outstanding Universal Value of the site.
Principle 4: Identify adequate mitigation measures for any residual negative impacts on Outstanding Universal Value that cannot be further reduced.
Principle 5: Include a separate chapter on World Heritage impacts in the Environmental Assessment report.
Principle 6: Be publicly disclosed and subject to thorough public consultation.
Principle 7: Propose, implement and independently audit an environmental management plan.
Principle 8: Effectively integrate the conclusions of the assessment into the decision-making process

4.10. RELEVANT INTERNATIONAL ENVIRONMENTAL/SOCIAL AGREEMENTS

The activities throughout the whole cycle of the project will trigger a number of international agreements set by different frameworks and institutions. Table 4.3 lists relevant international agreements that may be triggered by the project

Table 4.3: Relevant Conventions or Treaties

Convention or Treaty	Year of adoption	Objectives
Dublin Principle-International Conference on Water and Development	1992	Summaries the importance of an integrated approach on water and clearly articulates the link between water resources management and the "3Es" of sustainable development; economic efficiency in water user; social equity and environmental ecological sustainability. This has 4 guiding principles
UN Convention on Biological Diversity	1993	To conserve biodiversity; to use biological resources sustainability; to ensure equitable distribution of the benefits of using genetic resources
African Convention on Conservation of Nature and Natural Resources	1968	All protected and sensitive areas such as forest reserves, seasonal wetlands, river crossings and rivers to be affected by this Project shall be conserved through rehabilitation and restoration. This initiative shall ensure conservation of nature and natural resources as stipulated by the Convention.
Agenda 21 UN Conference and Development	1992	Application of the integrated approaches to the development, management and use of water resources.

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 245 kilometres from Lilongwe which is the capital city of Malawi. Mangochi town is located on latitude $14^0$23'34.66" S and longitude $35^0$20'47.69" E.

Determination of specific locations for major units for the proposed water supply system is a work in progress. However, coordinates for the proposed Water Treatment Plant Site are provided below.

SR1	715372.24mE	8431630.93mN
SR2	715338.93mE	8431548.93mN
SR3	715321.98mE	8431548.95mN
SR4	715173.06mE	8431595.82mN
SR5	715237.38mE	8431631.93mN
SR6	715311.46mE	8431631.93mN
SR7	715325.43mE	8431649.41mN

The proposed area for the Water Treatment Plant Site is 1.35 hectares.

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* (Mombo**), B. Boehmii** (mombo), *B. longifolia* (Mombo), *B. utilis* (Nzale), *Jubenardia floribunda* (Tsamba), *J. paniculata* (Ntondo), *Acacia polyacantha* (White Acacia), *A. abyssinica* (Umbrella thorn), *Burkea africana* (Mufulu), *Erythrophloeum africanum* (mpapa), *Uapaca kirkiana* (Sugar plum) and *Bauhinia thonningii* (White bauhinia) (Mangochi District Socio-economic Profile, 2016).

5.2.1. Flora of the Project Area

A total of 73 flora species were recorded from the proposed project area comprising Mangochi Town, Mtakatata Turn-off, Lakeshore resorts of Lake Malawi and Nkhuzi Bay near Monkey Bay (Table 5.1). The common flora species that were frequently encountered were *Diplorhynchus condylocarpon* (Wild rubber), *Bauhinia petersiana* (Large white bauhinia), *Terminalia sericea* (Silver terminalia), *Adansonia digitata* (Baobab tree), *Faidherbia albida* (White Acacia), *Lannea stuhlmannii* (False marula), *Brachystegia boehmii* (mombo) and *Eriosema shirense* (Adokolet).

5.2.2. Threatened and endemic flora species of the project area

There are two species of trees that were sampled from the project area that are threatened. These are *Pterocarpus angolensis* (African teak) and *Dalbergia melanoxylon* (African blackwood)). The conservation status of these two flora species according to the National Plant Red-List and IUCN Red-List, *Pterocarpus angolensis* is classified as Vulnerable in Malawi while at a global level, it is classified as Least Concern whereas *Dalbergia melanoxylon* species is classified as Vulnerable in Malawi while at a global level is classified as Near-Threatened. Both species were recorded from Secondary Mixed Savannah Woodland. These tree species should not be cut down unless permission is sought from the Director of the Department of Forestry.

5.2.3. Protected tree species

Five (5) protected tree species of Malawi namely; *Adansonia digitata* (Baobab), *Sterculia africana* (African star-chestnut), *Stecurlia quinqueloba* (Large-leaved star-chestnut), *Sclerocarya birrea* (Marula) and *Faihderbia albida* (White Acacia) 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.

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

Six (6) invasive alien plant species namely; *Azolla nilotica* (Nile Azola), *Eichhornia crassipes* (Water hyacinth), *Pistia stratiotes* (Water lettuce), *Salvania hastata* (Floating salvinia),

Calotropis procera (Giant milkweed) and *Eucalyptus camaldulensis* (River red blue gum) 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. In order to avoid these species being encouraged to increase, workers need to be sensitized as well as be prohibited to bring into the study area any classified endangered species in form of firewood

Table 5.1: Flora species recorded from the project area and their conservation status.

SCIENTIFIC NAME	LOCAL NAME	IUCN RED-LIST
Zea mays	Maize	Least Concern
Oryza sativa	Asian rice	Least Concern
Gossypium herbaceum	Cotton	Data Deficient
Sorghum bicolour	Sorghum	Least Concern
Eleusine coracana	Wild African Finger Millet	Least Concern
Manihot esculanta	Cassava	Least Concern
Cucubirta maxima	Pumpkin	Least Concern
Vigna unguiculata	Cowpea	Least Concern
Cajanus cajana	Pigeon pea	Least Concern
Nicotiana tabacum	Tobacco	Least Concern
Ipomoea batatas	Sweet potato	Least Concern
Hibiscus cannabinus	Kenaf	Least Concern
Rawsonia lucida	Forest peach	Least Concern
Oncoba spinosa	Snuff box tree	Least Concern
Adansonia digitata	Baobab tree	Least Concern
Ocimum americanum	Basil	Least Concern
Faidherbia albida	White Acacia	Least Concern
Piliostigma thonningii	Camel's foot tree	Least Concern
Combretum zeyheri	Large-fruited bushwillow	Least Concern
Sterculia africana	African star-chestnut	Least Concern
Stecurlia quinqueloba	Large-leaved star-chestnut	Least Concern
Vangueria infausta	Wild medlar	Least Concern
Ximenia caffra	Large sourplum	Least Concern
Ximenia caffra	Yellow plum	Least Concern
Calotropis procera	Giant milkweed	Least Concern
Ficus thonningii	Strangler fig	Least Concern
Bauhinia petersiana	Large white bauhinia	Least Concern
Commelina benghalensis	Tropical spiderwort	Least Concern
Ageratum conyzoides	Billy goat weed	Least Concern
Pennisetum unisetum	Silky grass	Least Concern
Trichilia emetica	Natal mahogany	Least Concern
Trichodesma zeylanicum	Camel bush	Least Concern
Eriosema shirense	Tsombori	Least Concern
Sclerocarya birrea	Marula	Least Concern
Dalbergia nitidula	Purplewood-dalbergia	Least Concern
Lannea stuhlmannii	False marula	Least Concern

Cordyla africana	Wild mango	Least Concern
Lonchocarpus bussei	Small apple-leaf	Least Concern
Lonchocarpus capassa	Apple-leaf	Least Concern
Acacia polyacantha	Hook thorn	Least Concern
Acacia goetzei	Purple-pod acacia	Least Concern
Acacia karroo	Sweet thorn	Least Concern
Acacia *nigrescens*	Knob acacia	Least Concern
Acacia abyssinica	Umbrella thorn tree	Least Concern
Brachystegia boehmii	Prince of Wales feathers	Least Concern
Brachystegia longifolia	Mombo	Least Concern
Julbernadia floribunda	Tsamba	Least Concern
Brachystegia bussei	Tsamba	Least Concern
Diplorhynchus condylocarpon	Wild rubber tree	Least Concern
Dalbergia melanoxylon	African blackwood	Near Threatened
Zahna Africana	Velvet-fruited zahna	Least Concern
Pterocarpus angolensis	Bloodwood	Least Concern
Bauhinia petersiana	White bauhinia	Least Concern
Terminalia sericea	Silver terminalia	Least Concern
Pericopsis angolensis	East African afrormosia	Least Concern
Colophospermum mopane	Butterfly tree	Least Concern
Syzygium cordatum	Water berry	Least Concern
Typha latifolia	Common cattail	Least Concern
Leersia hexandra	Southern cutgrass	Least Concern
Cyperus papyrus	Papyrus sedge	Least Concern
Vossia cuspidate	Hippo grass	Least Concern
Phragmites mauritianus	Reed grass	Least Concern
Ipomoea aquatica	Swamp morning-glory	Least Concern
Azolla nilotica	Nile Azolla	Least Concern
Eichhornia crassipes	Water hyacinth	Least Concern
Pistia stratiotes	Water lettuce	Least Concern
Salvinia hastata	Floating salvinia	Least Concern
Ceratophyllum demersum	hornwort	Least Concern
Eriochloa borumensis	Axis terete	Least Concern
Sporobolus consimilis	Small dropseed grass	Least Concern
Sporobolus robustus	Rat's tail grass	Least Concern
Eucalyptus camaldulensis	River red blue gum	Least Concern
Uapaca kirkiana	Sugar plum	Least Concern

5.2.2. 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 natural 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

5.2.3. Fauna of Mangochi District

The fauna comprises birds, mammals, fish, reptiles and amphibians. The majority of the faunal species are those that are associated with mixed deciduous woodland, wetland, marshes, shoreline, riverine and cultivation.

5.2.3.1. Birds

According to the International Union for the Conservation of Nature (IUCN) Red List, Malawi has 11 species of birds that are listed as endangered, threatened and vulnerable (BirdLife International 2004), as well as several additional species of particular concern (Dowsett-Lemaire, Dowsett & Dyer 2001). These species are also covered under the Convention on International Trade for Endangered Species (CITES).

Information on avifauna or birds was obtained through literature review, field surveys during which site Global Positioning System (GPS) readings were recorded to relate the species and their location. Sampling of avifauna was by walking through the distinct microhabitats of the survey area and making observations using binoculars. Indirect evidence (nests and feathers) was used to identify bird species available. Mist nets were also used, constructed in a transect line, to get those bird species that could not easily be observed. These birds were extracted from the mist nets, identified and released within the locality. Bird calls or songs were also used in the identification of bird species present in the study site. Semi structured questionnaires were administered to some selected key people within the study sites, for information on the birds they knew existed in the area and were verified using bird field guides.

A total of fifty (50) bird species were recorded from the study area as presented in table 5.2.

Table 5.2: Bird species recorded from the project area and their conservation status

LOCAL NAME	SCIENTIFIC NAME	IUCN RED-LIST
Richard's Pipit	*Anthus richardi*	Least Concern
Grey Heron	*Ardea Cinerea*	Least Concern
Spotted Eagle Owl	*Bubo africanus*	Least Concern
Burchel's Coucal	*Centropus superciliosus*	Least Concern
Pied Kingfisher	*Ceryle rudis*	Least Concern
Black Sunbird	*Chalcomitra amethystina*	Least Concern
Red-faced Cisticola	*Cisticola erthrops*	Least Concern
Speckled Mousebird	*Colius striatus*	Least Concern
Lilac-breasted Roller	*Coracias caudutus*	Least Concern

White-breasted CuckooShrike	*Coracina pectoralis*	Least Concern
Harlequin Quail	*Cortunix deleqorquei*	Least Concern
Pied Crow	*Corvus albus*	Least Concern
Heuglin Robin Chat	*Cossypha heuglini*	Least Concern
White-faced Tree Duck	*Dendrocygna viduata*	Least Concern
Folk-tailed Drongo	*Dicrurus adsimilis*	Least Concern
Yellow-billed Egret	*Egretta intermedia*	Least Concern
Common Waxbill	*Estrilda astrild*	Least Concern
Yellow-Rumped Bishop	*Euplectes capensis*	Least Concern
Red Bishop	*Euplectes orix*	Least Concern
Coqui Francolin	*Francolinus coqui*	Least Concern
African Fish Eagle	*Haliaeetus vocifer*	Least Concern
Collored Sunbird	*Hedydipna collaris*	Least Concern
Barn Swallow	*Hirundo rustica*	Least Concern
Red-throated Twinspot	*Hypargos niveoguttatus*	Least Concern
Blue-billed Fire Finch	*Lagonosticta lubricata*	Least Concern
Tropical Boubou	*Laniarius aethiopicus*	Least Concern
Yellow-throated Longclaw	*Macronyx croceus*	Least Concern
Little Bee Eater	*Merops pusillus*	Least Concern
African pied Wagtail	*Motacilla aguimp*	Least Concern
Helmeted Guinea Fowl	*Numida meleagris*	Least Concern
House Sparrow	*Passer domesticus*	Least Concern
Yellow-throated Petronia	*Petronia superciliaris*	Least Concern
Village Weaver	*Ploceus cucullatus*	Least Concern
Tawny-flanked Prinia	*Prinia subflava*	Least Concern
Black-eyed Bulbul	*Pycnonotus tricolor*	Least Concern
Red-billed Quelea	*Quelea quelea*	Least Concern
Yellow-fronted Canary	*Serinus mosambicus*	Least Concern
Bronze Manikin	*Spermestes cucullata*	Least Concern
Cape Turtle Dove	*Streptopelia capicola*	Least Concern
Red-eyed Dove	*Streptopelia semitorquata*	Least Concern
Red-faced Crombec	*Sylvietta whytii*	Least Concern
Black-crowned Tchagra	*Tchagra senegalensis*	Least Concern
African Paradise Flycatcher	*Terpsiphone viridis*	Least Concern
Crowned Hornbill	*Tockus alboterminatus*	Least Concern
Arrow-marked Babbler	*Turdoides jardinei*	Least Concern
Blue Spotted Wood Dove	*Turtur afer*	Least Concern
Barn Owl	*Tyto alba*	Least Concern
Blue Waxbill	*Uraeginthus angolensis*	Least Concern
Village Indigo Bird	*Vidua chalybeata*	Least Concern
Pin-tailed Whydah	*Vidua macroura*	Least Concern

5.2.3.2. Threatened, endemic and Invasive bird species recorded from the project area

No threatened or endemic bird species was recorded from the proposed project area of Nkhudzi bay and the surrounds during the field survey. In addition, not any other researcher

has ever recorded any threatened or endemic species from these areas. Bird species reported being of Least Concern as revealed by the IUCN Red List Status, the proposed project will have minimal impact on the avifauna species.

5.2.3.3. Mammals

Information for both small and large mammals was also obtained using three main methods of literature review, field visits and administering semi-structured questionnaires.

The literature reviewed was obtained from institutions and from internet, especially on the Red List data for mammals. GPS reading were recorded and, on each site, a representative habitat was selected during zigzag transect walks of 100 by 50 metres each. Information on the presence of mammals was obtained using animal sightings and signs e.g. footprints, droppings, sound, soil excavations, holes, trails and chewed grass.

Live traps such as Sherman live traps baited with peanut butter and set overnight in different micro-habitats were also used. Where necessary, pitfall traps were used to intercept rodents and shrews moving on the ground and redirect them into pitfalls. Animals from the traps were identified and released at their places of capture. Mist nets were also used for bats in each locality, set along a transect line. The nets were set at 6pm and folded at 8pm. Identification of bats was done immediately after extracting and releasing them.

Semi structured questionnaires were administered to selected people in the study sites, for information on the mammals they knew existed. These were verified using mammal field guides. A total of twenty (22) mammal species were recorded as presented in table 5.3.

Table 5.3: Mammal species recorded in the project area and their conservation status

LOCAL NAME	SCIENTIFIC NAME	IUCN RED-LIST
Angoni Vlei Rat	*Otomys angoniensis*	Least Concern
Fat Mouse	*Steatomys pratensis*	Least Concern
Four-toed Elephant Shrew	*Petrdromus tetradactylus*	Least Concern
Giant Rat	*Cricetormy gambianus*	Least Concern
Greater Dwarf Shrew	*Suncus lixus*	Least Concern
Multimammate mouse	*mustomys natalensis*	Least Concern
Pouched Mouse	*Saccostomus capensis*	Least Concern
Red Squirrel	*Paraxerus palliatus*	Least Concern
Scrub Hare	*Lepus saxotilis*	Least Concern
Swamp musk Shrew	*Crocidura mariquensis*	Least Concern
Bushveld gerbil	*Gerbilliscus leucogaster*	Least Concern
Spotted Hyena	*Crocuta crocuta*	Least Concern
Bushveld gerbil	*Gerbilliscus leucogaster*	Least Concern
Common Mole rat	*Cryptomys hottentotus*	Least Concern
Large grey Mangoose	*Herpestes ichneumon*	Least Concern
Velvet monkey	*Cercopithecus aethiops*	Least Concern
Short-snouted Elephant Shrew	*Elephantulus bradyrynchus*	Least Concern
Large grey Mangoose	*Herpestes ichneumon*	Least Concern
Water rat	*Hydromys chrysogaster*	Least Concern

Serval	*Leptailurus serval*	Least Concern
Common Baboon	*Papio ursinus*	Least Concern
Bush Pig	*Potamochoerus porcus*	Least Concern
Hippopotamus	*Hippopotamus amphibius*	Least Concern
Tree squil	*Paraxerus cepapi*	Least Concern
Mus	*Mus triton*	Least Concern

5.2.3.4. Threatened and endemic mammal species

There were neither threatened nor endemic mammals species recorded from and/or reported to occur in the project area. Lack of primary and thick secondary vegetation communities and the presence of both large and small mammals of Least Concern indicated Low conservation concern, as such the mammal population will have minimal impact by the proposed project.

5.2.3.5. Reptiles

Reptiles play a very important role in nutrient cycling within the ecosystems and population control of their prey. Information for reptiles was obtained using literature review, field surveys and administering semi-structured questionnaires. Literature reviewed was from institutions that have relevant information on the herpetofauna of Malawi and from the internet especially on the Red List data for reptiles. Field visits were carried out through GPS recordings of a species and its locality, and Opportunistic sampling and Drift fences. Specimens were mainly sampled opportunistically, during visual surveys of all habitats, undertaken during the day and evening. Search techniques included visual scanning of terrain (using flashlight by night) and refuge examination (e.g., lifting rocks and logs, peeling away bark and exfoliating rock flakes, scraping through leaf litter, etc.). Acoustic monitoring of all available habitat types was also applied. 'Drift Fences' supplemented 'Opportunistic Sampling'. Habitats were also sampled using pitfall traps, covered with light vegetation, to hide them and to provide cover for captured specimens along drift fences. These were checked every morning and evening; and GPS readings were recorded at each site for easy references. Semi structured questionnaires were administered to selected people within the study sites, for information on the reptiles they knew existed in the area and verified using reptile field guides.

A total of seventeen (17) reptile species were recorded from the study area, as presented in Table 5.4.

Table 5.4: Reptile species recorded from the project area and their conservation status

LOCAL NAME	SCIENTIFIC NAME	IUCN RED-LIST
African Python	*Python sebae*	Least Concern
Puff adder	*Bitis arietans*	Least Concern
Black Mamba	*Dendroaspis polylepis*	Least Concern
Green Water snake	*Philothamnus hoplogaster*	Least Concern
Stripe-bellied sand snake	*Psammophis subtaenjatus*	Least Concern
Variabe Skink	*Mabuya varia*	Least Concern
Cape dwarf gecko	*Lygodactylus capensis*	Least Concern
Yellow-throated Plated Lizard	*Gerrhosaurusy flavigularis*	Least Concern
Stripped Skink	*Mabuya striata*	Least Concern

Ground Agama	*Agama aculeata distanti*	Least Concern
Spitting cobra	*Naja nigricollis*	Least Concern
Nile Monitor	*Varanus niloticus*	Least Concern
Crocodile	*Crocodylus niloticus*	Least Concern

5.2.3.6. Threatened, endemic and Invasive reptile species recorded from the project area

No threatened or endemic reptile species was recorded from the proposed project area of Nkhudzi bay and the surroundings during the field survey. In addition, not any other researcher has ever recorded of any threatened or endemic species from this area. Reptile species recorded being of Least Concern as revealed by the IUCN Red List category, the proposed project will have minimal impact on the herpetofauna species.

5.2.3.7. Amphibians

Information for amphibians were obtained using literature review, field surveys and administering semi-structured questionnaires. The literature reviewed was from institutions with relevant information on amphibians of Malawi and from the internet, especially on the Red List data for amphibians. During field surveys, GPS readings were recorded for easy reference of a species and its locality. Field sampling involved Opportunistic sampling and Drift fences. Specimens were mainly sampled opportunistically, during visual surveys of all habitats, undertaken during the day and during the evening. Search techniques included visual scanning of terrain (using flashlight by night) and refuge examination (e.g., lifting rocks and logs, peeling away bark and exfoliating rock flakes, scraping through leaf litter, etc.). Acoustic monitoring of all available habitat types was also applied. 'Drift Fences' were usually used to supplement 'Opportunistic Sampling'. Habitats were also sampled using pitfall traps placed along drift fences. Traps were covered with light vegetation to hide them and to provide cover for captured specimens. These were also checked every morning and evening. At each site GPS reading was recorded for easy references. Semi structured questionnaires were administered to selected people within the study sites. The people provided information on the amphibians they knew existed in the area and verified using amphibian field guides.

A total of ten (10) amphibian species were recorded from the study area, as presented in table 5.5.

Table 5.5: Amphibian species found in the project area and their conservation status

LOCAL NAME	SCIENTIFIC NAME	IUCN RED-LIST
Mascarene riggedfrog	Ptychadena mascareniensis	Least Concern
Power's rain frog	Breviceps poweri	Least Concern
Tinker Reed frog	Hyperilius tuberilinguis	Least Concern
Mulle's clawed frog	Xenopus muelleri	Least Concern
Common river frog	Amietia angolensis	Least Concern
Square Marked Toad	Amietophrynus gutturalis	Least Concern
Savanna Ridged Frog	Ptychadena anchietae	Least Concern
Flat Backed Toad	Amiietophrynus maculatus	Least Concern
Common river frog	Amietia angolensis	Least Concern
Yellow-bellied Rigged Frog	Ptychadena guibei	Least Concern

5.2.3.8. Threatened, endemic and invasive reptile species recorded in the project areas

No threatened or endemic amphibian species were recorded from the proposed project area and the surroundings during the field survey. In addition, not any other researcher has ever recorded of any threatened or endemic species from these areas. Therefore, amphibian species recorded being of Least Concern as revealed by the IUCN Red List category, the proposed project will have minimal impact on the species.

5.2.3.9. Fish

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.

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 Intake will be constructed. The number of species could be higher than this if more days were allocated for the field survey.

5.2.3.10. Threatened and endemic fish species

One fish species *Oreochromis karongae* (chambo) was recorded from the waters of Lake Malawi near Nkhudzi Bay, which is part of the proposed project area along the lakeshore resorts of Mangochi District. This species is classified as Critically Endangered (CR) by both National and IUCN Red lists. The species status of being critically endangered would not be further be exacerbated by the project activities if:

- There is no tolerance of Illegal harvest of fish,
- There is control of soil erosion which destroys breeding grounds for fish species

5.2.3.11. Invasive alien fish species

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

5.3 SOCIO-ECONOMIC SETTING

5.3.1 Population Characteristic

The population of Mangochi district was 1,148,611 in 2018 (National Statistics Survey report 2018). The project covers areas from Mangochi Boma to Mtakatata 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 Maldeco, Namiasi and Makawa trading centres.

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 5.1. In regards to language, it was noted that Yao is the most common language in the project area seconded by Chichewa.

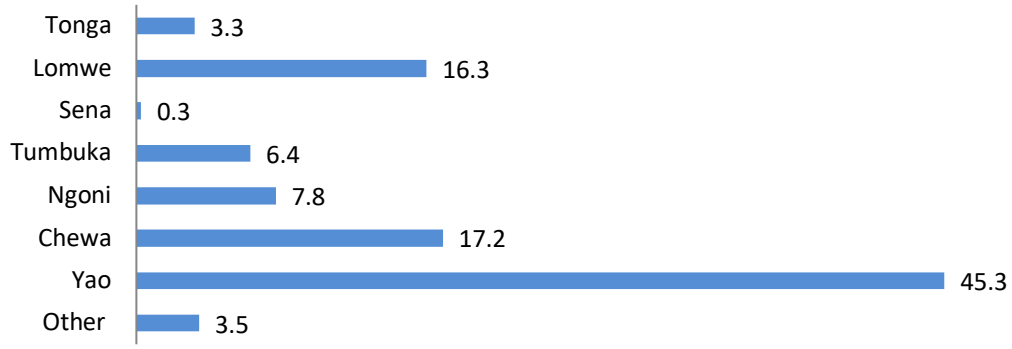


Figure 5.1: Ethnicity (Household Survey August, 2019).

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 5.2.

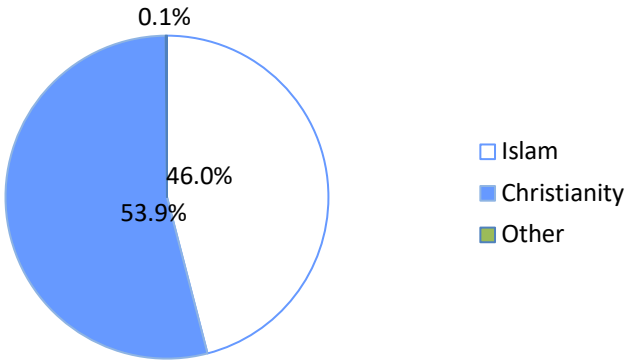


Figure 5.2: Composition of the religions (Household Survey August, 2019).

5.3.4 Culture

5.3.5.1. Intangible Cultural Heritage

Most people in the project area practice matrilineal system of marriage where the husband moves to the wife's house/village. Chieftainship is handed down from one generation to another with the heir being a nephew or niece usually coming from one of the chief's sisters. Children have to undergo initiation ceremonies known as Jando for boys and Nsondo for girls at puberty. Such ceremonies cover subjects on morality, adult life, norms, customs and marriage. A wide variety of traditional dances are performed during such initiation ceremonies. However, there were no initiation sites recorded in the project site. Overall, the observation of cultural rites has been slowly diluted by modernization, as more people inter-marry across tribes and get access to better education.

5.3.5.2. Historical/Archaeological Cultural Heritage

During the study period screening of the surface area, natural gullies cut by rivers and rivulets, eroded pedestrian pathways, cultivated fields and bare premises around the people's homes was done. Twelve (12) sites of archaeological and cultural interest and 3 grave sites were identified within the project impact zone.

The presence of these archaeological sites is not surprising, considering the closeness to Lake Malawi as a water source. Lakeshores have always been preferred places of human habitation because apart from being a line of defence, they were sources of food, water and transport. These findings also give light to the dispersion of early settlements in the area, their material culture and their affinities. The most common field work findings that point to settlement of early people are pottery fragments. Analysis of these fragments has shown that there were distinct types during different time periods.

In the EIA, Nkope and Kapeni wares were the prevailing industries. Graphite burnish was sometimes applied to these pots. Another major typology is the Mawudzu ware which coincides with the settlement of the Maravi people in Malawi. In most places where this group migrated to within Malawi, there has been the presence of this ware. The later typology during the LIA was the Nkhudzi pottery. The latter two typologies have red ochre and graphite burnish inside and sometimes outside the wares. Where an excavation has been done, these

pottery typologies most often appear in different layers as testimony to these time periods. Table 5.5 below summarises the identified archaeological sites and their location.

Table 5.6: Recorded cultural heritage sites

No	Name of site	Description	Northings	Easting
1	MH-Nkhudzi 1 Archaeological Site	Potential Iron Age site, with concentration of potsherds, some decorated with rims intact. Situated near Flanzilo cottage.	36-715711	8432028
2	MH-Nkhudzi 2 Archaeological Site	Potential historical site with scatters of embedded weathered pottery and iron implements.	36-715644	8432001
3	MH-Nkhudzi 3 Archaeological Site	Potential iron age settlement with concentration of embedded decorated pottery.	36-715680	8431936
4	MH-Nkhudzi 4 Archaeological Site	Iron Age site along a pathway with embedded decorated potsherds.	36-715633	8431924
5	MH-Nkhudzi 5. Rock Art Site	A massive rock shelter with ancient rock art (combination of red and white paintings). Need detailed survey within the vicinity to locate more rock art sites. Pottery, bones and shells were also recorded at the site	36-714092	8432352
6	MH-Nkhudzi 6 Namalowe sacred site\potential grave site	This site is located in a cluster of hills near Mwanyama Village. According to local informants, the site was used to bury dead people from the Mwanyama village.	36-714682	8431255
7	MH-Nkhudzi 8 Potential Grave Site	This is a potential burial place along the proposed access road to the water tank. Recommended for test excavation with exhumation and relocation follow-ups.	36-714657	8432031
8	MH-Nkhudzi 11 Grave site and Sacred site I	This site is under Ndondwa tree and Chilusa tree, this was the oldest grave where the first Chief, Group Village Headman Mwanyama was buried. Adjacent to this grave site is a sacred site, under the Ndondwa tree where traditional sacrifices used to happen	36-715413	8431271
9	MH-Nkhudzi 12 Sacred Site II	A sacred site where in the past local people used to offer sacrifices. The site no longer used for traditional practices	36-715473	8431940
10	Sacred Site III	A sacred site where local used to offer sacrifices under a Nsangu tree. The site no longer used for traditional practices	36-716213	8431323

11	MH-Nkhudzi 14 Archaeological Site	Potential iron age site, with scatters of potsherds. Need further subsurface investigations.	36-714372	8432499

5.3.5 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 5.3 shows graphically illustrates the income and livelihood support means in the project area.

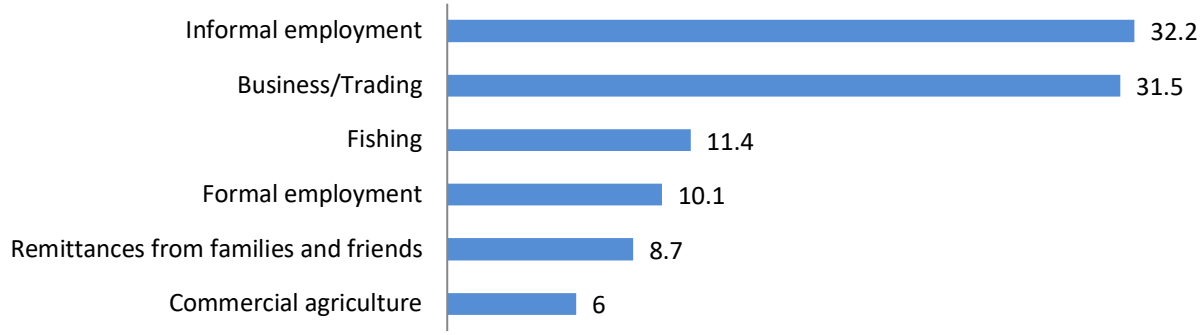


Figure 5.3: Income sources in the project area (HH survey, August 2019)

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 5.4.

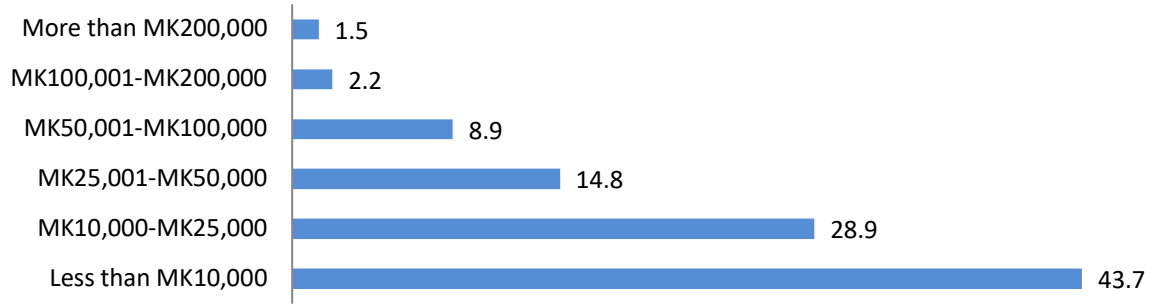


Figure 5.4: Income per month (Household survey, August 2019).

5.3.6 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 5.5. 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.

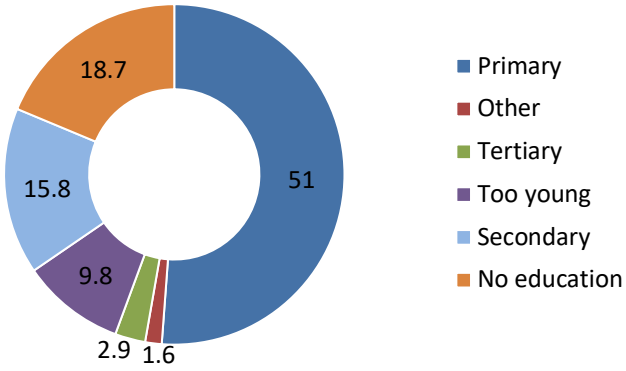


Figure 5.5: Education levels for Mangochi Town (Household survey, August 2019).

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, lack of qualified teachers, lack of sanitation and hygiene facilities including menstrual hygiene products 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 5.6.

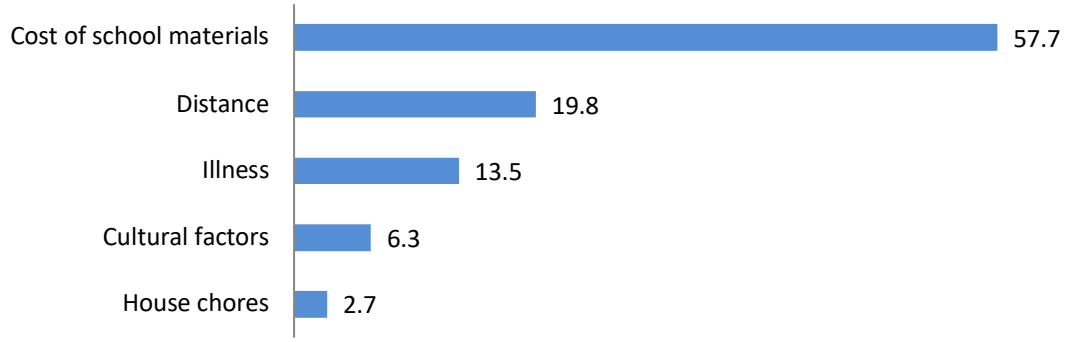


Figure 5.6: Challenges in accessing education.

5.3.7 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 5.7. 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).

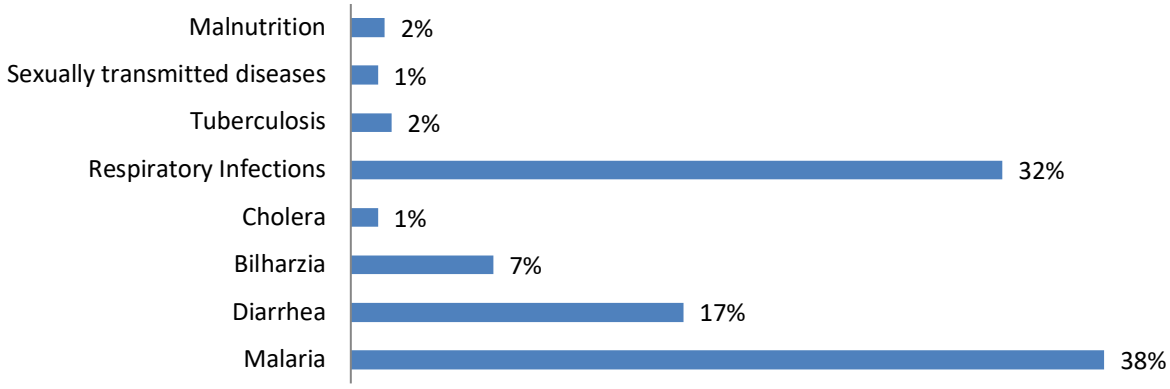


Figure 5.7: Common diseases the project area.

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.

Inadequate 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 people 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 5.8 shows distance to the nearest health care services.

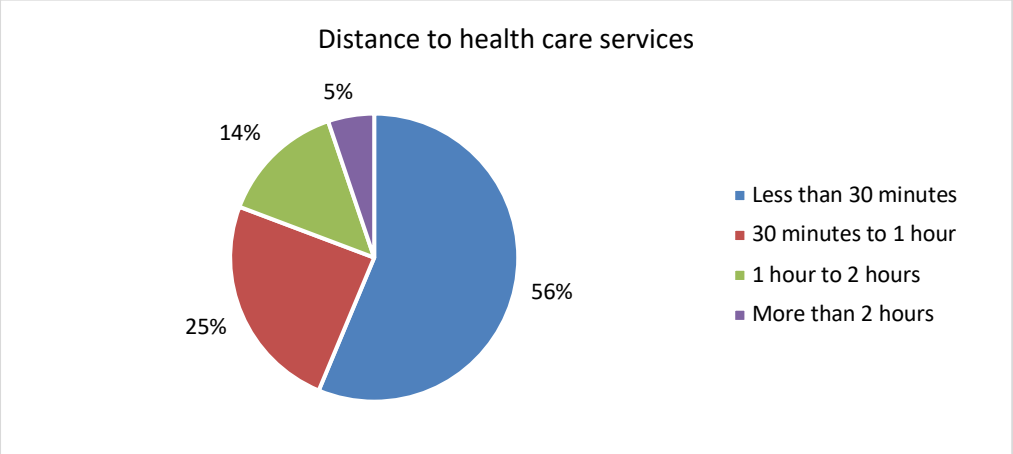


Figure 5.8: distance to health care services

5.3.8 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 within in 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 5.9 graphically illustrates this.

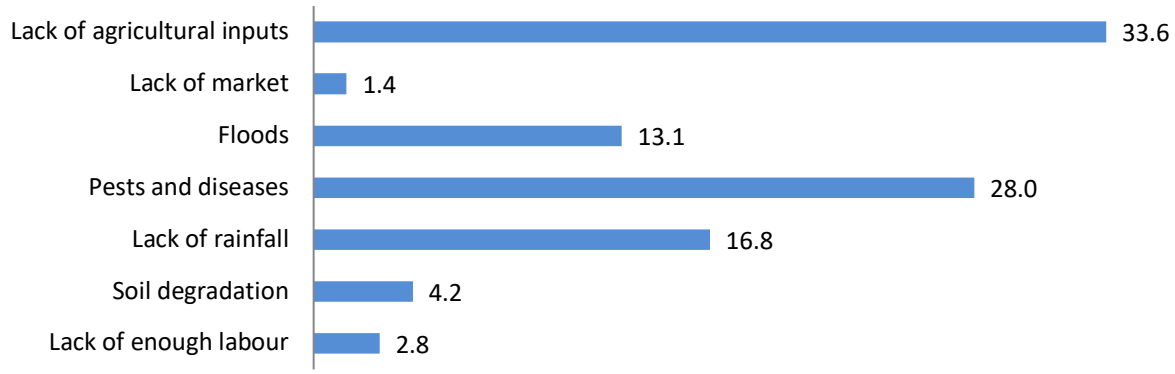


Figure 5.9: Agricultural Challenges

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, inadequate use of irrigation technologies and frequent failure of irrigation equipment poses a challenge.

5.3.9 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.

Tourism has the potential to significantly contribute to economic growth of the country. Currently, the sector didn't contribute much to GDP as evidenced by a meagre 7% contribution to GDP 6.2% of total employment in 2016 (GoM, Mangochi SEP 2017-2022). There is need to foster infrastructure development in all tourism potential areas by constructing good roads that will act as catalyst for other developments. There is also a need to construct proper waste disposal sites for tourist areas in the district. Generally, there is adequate security in the district, banking facilities and the locals are friendly to tourists.

5.3.10 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.

5.3.11 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.

5.3.12 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 5.10. Firewood is mainly collected from nearby forests.

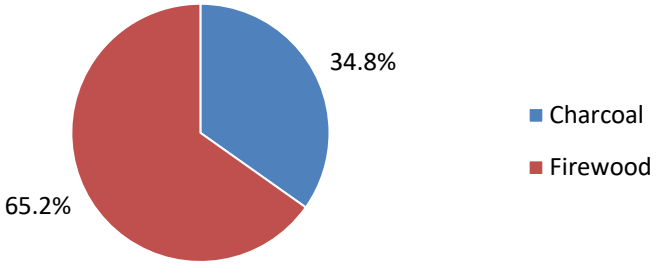


Figure 5.10: Types of fuel used for cooking

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 5.11.

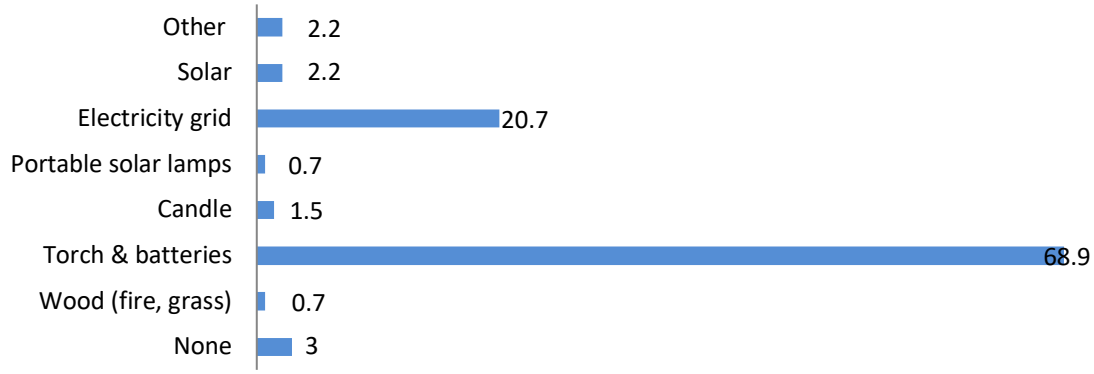


Figure 5.11: Sources of Lighting

5.3.13 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 its 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 5.12 shows the types of toilets used in the project area.

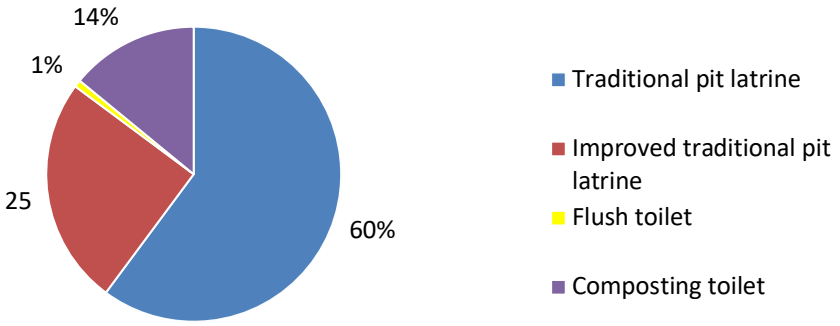


Figure 5.12: Types of toilets in the project area

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.

5.3.14 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 5.13.

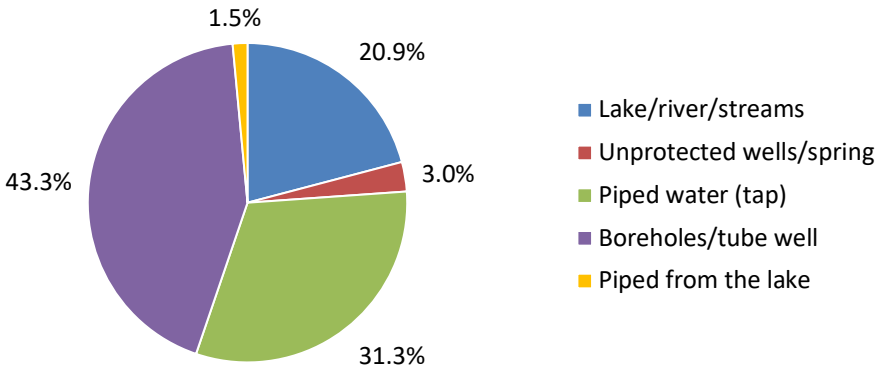


Figure 5.13: Water Sources

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 5.14. 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.

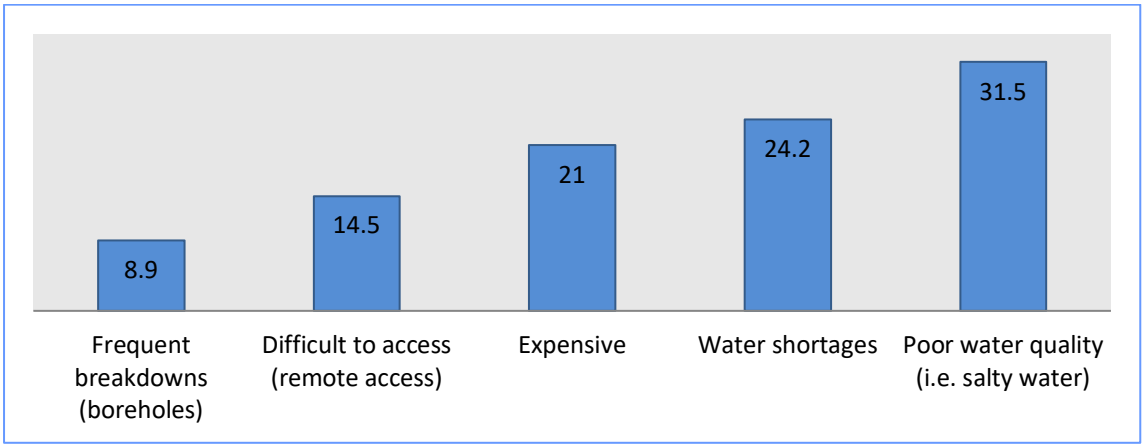


Figure 5.14: Water Supply Challenges-Mangochi Town

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 5.15. This is because the households in the project villages are not scattered and the unsafe water sources are not far from most households.

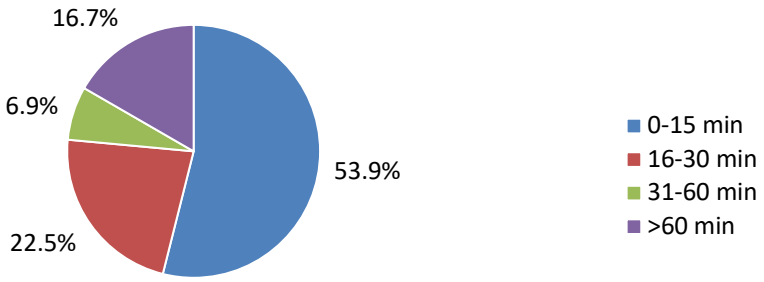


Figure 5.15: distance to water sources

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 5.16 shows water treatment means.

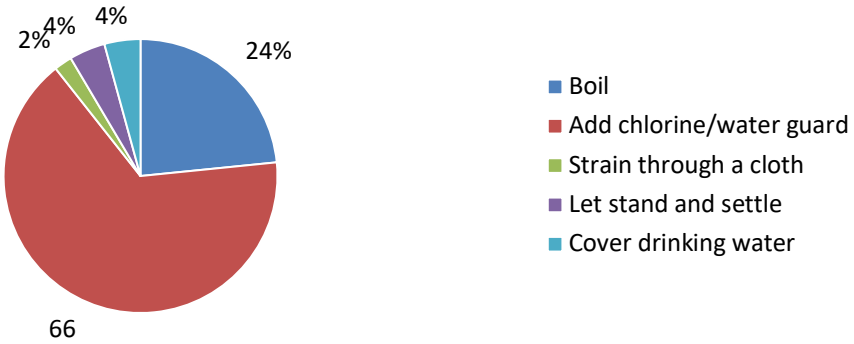


Figure 5.16: Water Treatment

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 respondent's 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 5.17 shows the amount of money people are willing to pay for the water on a monthly basis.

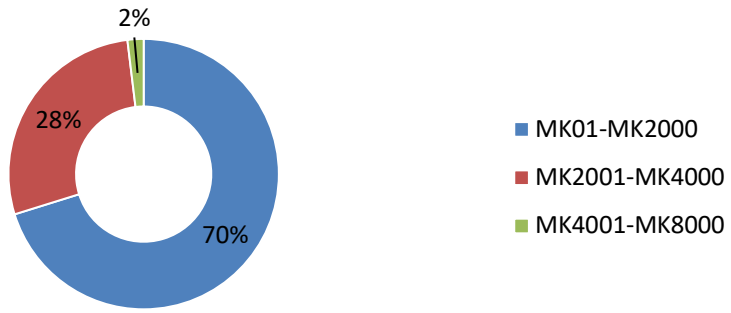


Figure 5.17: Willingness to Pay

5.3.15 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.

5.3.16 Degree of Gender Mainstreaming

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

6.1. 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.

6.2. 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.

6.3. CONSULTATION OUTCOMES

Details of consultation undertaken by WWEC, including the people consulted, dates of consultations and the issues discussed are presented in Appendix 3 and 4. 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 7 : 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.

7.1. 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 is 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.
- **Cultural Heritage Impact Assessment and World Heritage Impact Assessment conducted as an independent study to complement the ESIA.**
- **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. Outcomes of the public consultations are presented in appendix 3.

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 7.1: 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	x	
Site preparation	x	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	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	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	

7.2. ANALYSIS OF POTENTIAL BENEFICIAL IMPACTS

7.2.1. 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 75 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.

Proposed enhancement measures

i. Inform local communities of employment opportunities.
ii. Prioritise employment of local persons that qualify.
iii. Treat workers well, pay them fairly (above the minimum wage) and pay overtime timely.
iv. Sensitize workers to save and invest during project implementation

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.

Proposed enhancement measures:

i. Pay materials suppliers within the agreed times.
ii. Source materials from licenced suppliers.
iii. Support and promote of entrepreneurship skills amongst the communities and business people in the project area by engaging them where appropriate.
iv. Promote village savings and loan (VSL) schemes during project implementation.

7.2.2. 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 Mangochi Town 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 with 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. In addition, lodges and hotels will be provided with good quality water, treated according to Malawi Bureau of Standards, unlike the water that is treated by themselves which is of low quality due to lack of trained personnel.

Proposed 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. Employ adequate staff and ensure that they provide appropriate work inputs through proper work schedules
v. Sensitize the water users on proper water management practices, water pricing and importance of payments of water bills in time.

b) Improved access to potable 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.

Proposed enhancement measures:

i. Adequately treat water at the treatment plant.
ii. 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.
iii. Process water connection applications and provide water to the communities as quickly as possible.
iv. Observed the recommended maximum distances of 500 metres from houses to water points when constructing communal water points.
v. 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.

Proposed 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 and efficient 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.

Proposed 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. Provide water at affordable tariff.

e) Increase in revenue generation

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

Enhancement measures:

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

f) 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.

Proposed 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 to Savings programs or initiatives

g) Education benefits to the girl child

Availability of water will remove the burden of collecting water by 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.

Proposed 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.

h) 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 contribute to sustainable water resources us and will be less costly than when people 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 save financial resources for their activities.

Proposed enhancement measures

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

7.3. ANALYSIS OF POTENTIAL ADVERSE IMPACTS

7.3.1. Adverse impacts during planning and design phase

a) Loss of land and assets

Land will be required for construction of the 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 has been made with four (4) Project Affected Persons for compensation for land for proposed pump house.

Proposed mitigation measures

i. Locate transmission and distribution pipelines within existing road reserves, as much as possible.
ii. Conduct sensitization and awareness on the need for land for the project and the 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 other 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. SRWB through Mangochi District Council must help the affected people to identify replacement land.

b) Unrealistic expectations regarding 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 and thorough public sensitization meetings on land laws, land acquisition and compensations.
ii. Value the land and property and pay compensations in a transparent manner.
iii. Conduct sincere and adequate sensitizations with the owners of the land and government officers must avoid dictating unfair and unreasonable compensation amounts.

7.3.2. Adverse impacts during construction phase

a) Dust generation

Dust generation will generally occur during the first six months of construction due to site preparation activities and excavations for the construction of the treatment plant, pump

station and excavation of trenches for transmission and distribution pipes. Dust 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.

Proposed Mitigation Measures

i. Apply water sprays when dust is being generated or at times of strong wind.
ii. Provide protective gear (dust masks) to workers and ensure that they wear them.
iii. Erect a barrier around the work sites where major construction activities are taking place to break or reduce wind and dust movement.
iv. Store and handle sand and cement properly to limit dust generation.
v. Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.

b) Gas and particulate matter emission

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.

Proposed mitigation measures

i. Use new or fairly new vehicles and equipment with exhaust gas emissions below permissible emission limits.
ii. Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits.
iii. Optimize transportation management to avoid needless truck drives.
iv. Control vehicle speeds.
v. Reduce engine idling time.
vi. Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.

c) Soil contamination

soil contamination may result from the following:

- Fuel and oil leaks from construction plant and vehicles, spills from vehicle maintenance operations, and spills from waste oil containers discarded from plant and vehicle maintenance during construction activities; and
- Accidental or deliberate disposal of construction waste and chemicals

Proposed Mitigation Measures

i. Line 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, in line with Waste Management and Sanitation Regulations
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).

d) Land degradation and soil erosion

Land degradation may result from the following:

- Fuel and oil leaks from construction plant and vehicles, spills from vehicle maintenance operations, and spills from waste oil containers discarded from plant and vehicle maintenance 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 and inappropriate disposal of domestic wastes;
- Unsustainable sand mining and quarrying – this is likely to result in land degradation outside the project site in sand mining and quarrying areas.
- Soil erosion will result from clearing of the land for construction of the tank, access roads and excavation for the pipelines. This would have both local and off-site effects, contributing to siltation and sedimentation of the lake and affecting the breeding sites for fish, especially the Mbuna. However, the effect would be moderate to minimal.

Proposed Mitigation Measures

i. Provide lined drainage with check dams along access roads.
ii. Plant grass and restore vegetation on disturbed areas, along the access roads and around the tank.
iii. Landscape and concrete surfaces on construction sites and around the tank as appropriate.

e) Loss of vegetation cover, aesthetic scenery and disturbance or loss of wildlife

Clearing of land and the consequential loss of vegetation cover is anticipated in this project. Strip clearing of the route of the pipelines, treatment plant and pump station is expected to result in loss of vegetation cover, although not considered ecologically sensitive. Vegetative cover is also possible from bush fires. Loss of vegetation cover leads to loss of habitat for wildlife species and land degradation due to increased soil erosion. Loss of vegetation cover also contributes to climate change. Land clearing for construction of scheme structures in the protected area will degrade its natural beauty.

Proposed 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 grass in all disturbed areas.
iii. Value and appropriately compensate for all the trees to be cut down during construction.

iv. Provide resources for conservation activities to be done by the Department of Parks and Wildlife.
v. Construct fire bands to protect the area from fires.
vi. Include elements of ecosystem protection in the Memorandum of Understanding to be signed by the Department of Parks and Wildlife and Southern Region Water Board
vii. For every tree cut down, provide 10 tree seedlings of a similar species to be planted in the adjacent areas.
viii. Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass after construction works and just before the rains to minimise soil erosion.
ix. Sensitize employees and the community to conserve vegetation.
x. Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.
xi. Fence Nkhudzi Hill to ward off animals and sensitise people against making noises that would disturb/ scare away animals.
xii. Relocate endangered species where appropriate
xiii. Paint structures in protected area with green colour to blend with environment.

f) Exposure of people and animals to injuries and accidents

Workers will be exposed to injuries from construction plant and machinery that could cause injuries. 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 Occupational Safety and Health (OSH) directorate. The employers are also supposed to cooperate in any investigations that may follow.

The communities especially children might be exposed injuries whenever they visit and play around the construction sites. Furthermore, wildlife and workers may fall into unattended excavations leading to injuries or deaths. This is likely to occur during construction phase.

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.

Proposed mitigation measures

i. Develop a workplace safety policy induct workers on OSH requirements and repeat reminders on the same.
ii. Inform and sensitise the public about all open pits and trenches.
iii. Provide appropriate personal protective equipment (PPEs) to construction workers. and ensure that it is always used.
iv. Provide firefighting equipment and training; and reserve fire assembly points.
v. Train First Aiders and provide first aid kit
vi. Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife.
vii. Buy construction materials from suppliers that are licensed by the Mangochi Town Council.

viii. Avoid making deep pits when extracting construction materials and backfill all excavated trenches/ areas immediately after pipelaying. Re-fill borrow pits immediately after use.
ix. Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them.
x. Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife.
xi. Buy construction materials from suppliers that are licensed by the Mangochi Town Council.
xii. Adequately supervise the construction activities and follow recommended procedures.

g) 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.

Proposed 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

h) Water pollution and siltation

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

Proposed 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 10m from watercourses.
vi. Provide appropriate barriers to separate worksites from water resources in order to prevent accidental spillage into water courses.
vii. Line surfaces where cement, paints and oils will be stored and connecting the drainage systems to oil interceptors.
viii. Collect and dispose wastes in designated disposal sites as required by the Local Authority.
ix. Construct pit latrines that are at least 1.5 meters deep, lined at the base and 30 metres from a water body.

i) Disturbances and accidental damage to assets

Construction of transmission and distribution pipelines are to be done near or within communities. Disturbance will emanate from construction works near houses, 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.

Proposed Mitigation Measures

i. Provide adequate notice before construction activities at a private or public property.
ii. Provide detours and appropriate traffic signs for vehicles and pedestrians where construction is 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.

j) 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.

Proposed mitigation measures

i. Use appropriate and well-maintained noise mufflers on vehicles and machinery.
ii. Regularly service and maintain equipment.
iii. Provide ear muffs for the workers in noisy areas.
iv. Use electric motors instead of compressed air driven machinery and use controlled blasting to dampen noise.
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 and animal presence on the project surroundings.
vii. Notify the public of upcoming loud events.

k) Potential increase in poaching

There is potential for an increase in poaching, as more and more people gain access to the wildlife protected area during construction. This will be as a result of an influx of people into the area for construction works. This impact is likely to be localised and more pronounced during the construction phase of the project.

Proposed mitigation measures

i. Sensitize the workers and the community against poaching and the applicable laws as well as the penalties
ii. Support and work with the National Parks and Wildlife Rangers to prevent poaching especially during construction and operation. Provide temporary structures (flying camps) for Rangers especially during construction
iii. Liaise and work with the Department of Parks and Wildlife during any clearing of vegetation.

l) Increase in spread of Sexually Transmitted Infections (STIs), HIV and AIDS, unplanned pregnancies and breaking up of families

Women of the local communities may have sexual relationships with the men at the construction site, to earn some money. This could lead to spread of Sexually Transmitted Infections (STIs), HIV and AIDS, unplanned pregnancies and breaking up of families. School girls and teenagers are likely to be exposed these risks, thereby contributing to an increased poor performance and school drop-out cases.

Proposed mitigation measures

i. Sensitise workers and surrounding communities on the risks of indulging in casual sex.
ii. Sensitise girls on the dangers of getting involved in pre-marital sex.
iii. Provide both male and female condoms to workers.
iv. Develop and implement a workplace policy on HIV and AIDs
v. Implement and follow-up on grievance redress mechanisms.

m) Increased pressure on community health services

Influx of workers and job seekers may result in increased pressure on the local community health services. Interactions between workers and female community members will increase the risk of sexually transmitted diseases such as HIV and AIDS and other Sexually Transmitted Diseases (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 could also lead to respiratory diseases among the workers and the community. In addition, poor sanitation at the work sites and workers camp could lead to spread of water related diseases such as malaria among the workers and the communities.

Proposed mitigation measures

i. Develop and implement a Health and Safety management plan to protect workers from communicable diseases and injuries.
ii. Conduct public awareness and sensitization on communicable diseases including HIV and AIDS and how these can be prevented.
iii. Sensitise the workers and the communities to follow good sanitation and hygiene practices.
iv. Construct adequate sanitation facilities and provide basic medical services at the work sites.
v. Provide both male and female condoms to workers for preventive measures for spread of HIV and Aids.
vi. Support the services of the local clinics and the Health Surveillance Assistants.

n) Increased COVID – 19 infections and related deaths

There is a risk of increased the Corona virus cases if works do not respect social distancing and other recommended COVID-19 prevention measures.

Proposed Mitigation measures

i. Provide COVID-19 preventive measures including of sanitization products, protective masks or shields.
ii. Enforce hygiene practices including the wearing of masks and shields, hand washing and hand sanitising.

iii. Divide the workers into shifts to decongest the work area and improve social distancing.
iv. Assist suspected COVID-19 cases to access approved testing centres and hospitals.
v. Provide continuous communication and awareness on COVID-19 issues.

o) Sexual abuse and harassment

Sexual abuse and harassment are anticipated at the work sites and in the homes. At the worksite, women seeking jobs could be enticed to 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 employment.

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.

Proposed mitigation measures

i. Sensitise workers and nearby communities to desist from sexual abuse and harassment.
ii. Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment and publicise places for reporting the cases.
iii. Create a good work environment to allow female workers to report cases of harassment.
iv. Enforce punitive and disciplinary measures, including dismissal from employment on any project workers involved sexual abuse and harassment.
v. Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-going projects aimed at promoting gender equality, ending sexual harassment and empowering women to be financially independent.
vi. Implement and follow-up on grievance redress mechanisms.
vii. 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.

p) Unequal employment

During informal consultations, it was observed that most of the project activities in the construction phase are perceived as 'strength-requiring-jobs' or "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).

Proposed mitigation measures

i. Include a clause in the contract specifying that at least 40% of the employees but not more than 60% should be women.
ii. Sensitize and encourage women to build their confidence for applying for in as foremanship, engineers etc.
iii. Create a good work environment to allow female workers report any case of gender discrimination.

q) Child labour and trafficking

Children may come to the work sites, looking for employment during construction. Trafficking in persons is common in Malawi and the project sites may be used for such activities.

Proposed Mitigation Measures:

i. Employ people who have genuine identification to prove that they are 18 years old and above;
ii. Employ workers through established recruitment agencies;
iii. Maintain an accurate staff register against which employee presence must be checked every day.

r) Gender Based Violence (GBV) and Violence Against Children (VAC)

These acts constitute gross misconduct and are therefore grounds for sanctions, penalties and/ or termination of employment and/ or contract. All forms of social risks including grooming are unacceptable; be it on the work site, the work site surroundings, or at worker's camps.

Proposed Mitigation Measures:

i. Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to implementation of the project;
ii. Sensitize the community on the grievance redress mechanism (GRM) before implementation of project;
iii. Ensure that Codes of Conduct are prepared, signed, understood and applied by all contractor's staff;
iv. Provide separate facilities for men and women;
v. Provide appropriate signage on GBV in local language; and
vi. Provide equal employment to women and men.

7.3.3. 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.

Proposed 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.

b) Borrow pits and 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 can be breeding grounds for mosquitoes. Borrow pits can also influence change the ecosystem.

Proposed mitigation measures

i. Fill up and close pits after the construction works.
ii. Rehabilitate all work sites.
iii. Source construction materials (e.g., sand and soils) from licensed suppliers.

7.3.4. 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 some generation of solid waste (e.g., plastic, wrappings and containers, paper, office wastes including printing cartridges and kitchen wastes etc).

Proposed 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 and prevent overfilling.
iii. Dispose collected waste in an approved disposal site.
iv. 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 may lead to surface and groundwater pollution. Increase in wastewater may occur at communal water points, from bath shelters and septic tank soakaways. This wastewater must be properly managed to avoid pollution.

Proposed 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. Sensitize people on the benefits (including prevention of cholera) of good the hygiene.

c) Risk of emergencies

The Southern Region Water Board (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 of 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 burst pipes can wash away people's property.

Proposed 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 due to rapid population growth and a small economic base have resulted in increased criminal activities in Malawi. As such, cases of vandalism and 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. 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.

Proposed 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.

7.4. Significance rating of the Environmental and Social 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 7.2 below.

Table 7.2: 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 environmental component	3 – Medium probability
2 – Low		2 – Short term (0 – 2 years) and/or infrequent impact	2 – Local	2 – non-sensitive or common environmental component	2 – Low probability
1 – Minor	1 – Reversible	1 – Immediate	1 – Site only	1 – non-sensitive and	1 – Improbable

	(regenerates naturally)	and/or unique impact		widely dispersed environmental component	
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 8.3 following.

Table 7.3: 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

7.5. 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 8.4.

Table 7.4: 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

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ enhancement	Significance with mitigation / Enhancement
2.2.2.	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
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	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.
- 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.

CHAPTER 8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 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 8.1 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 8.1: Environmental and Social Management Plan for the Project

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
1.	**ENHANCEMENT MEASURES FOR 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. • Treat workers well, pay them fairly (above the minimum wage) and pay overtime timely. • Sensitise workers to save and invest during project implementation.	Continuously throughout construction	Contractor, District Labour Officer, District Community Development Officer	4,761,640.00
1.1.2.	Increase in trade opportunities	• Pay materials suppliers within the agreed times. • Source materials from licenced suppliers. • Support and promote of entrepreneurship skills amongst the 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 • 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.	Continuously throughout the operation period	SRWB, District Water Development Office, NGOs	To be covered within the operation and maintenance budget for the scheme

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• 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.			
1.2.2.	Improved access to portable water source	• 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. • Process water connection applications and provide water to the communities as quickly as possible. • Observed the recommended maximum distances of 500 metres from houses to water points 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 to promote health and hygiene at water points.	Monthly for water quality analysis and quarterly for sensitization and capacity building initiatives	SRWB District water officer NGOs	9,523,280.00

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene. • Ensure there is adequate and efficient 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 • Provide water at affordable tariff.	Throughout the operation period	SRWB, District Community and Development Office	N/A (Within the operation and maintenance budget of the board)
1.2.5.	Increase in revenue generation	• Sensitize institutions and households to pay bills and on time • Properly manage revenue from the water supply. • Engage the community to identify projects which the Water Board can implement as part of cooperate social responsibility. • Re-invest profits in the improvement and extension of the water supply system. • Regularly review water tariff with consideration of the consumers to avoid overcharging them. • Properly manage water by replacing old pipes, repairing pipes to prevent leakages and extending intake pipes to avoid abstracting polluted water.	Continuously throughout operation phase	SRWB,	N/A (Within the operation and maintenance budget of the board)

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
1.2.6.	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	9,523,280.00
1.2.7.	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
1.2.8.	Increased development	• Provide new water connection applications within the set time • Provide adequate portable water supply to the new areas • Sensitize the communities to report leakages and breakages of pipes.	Throughout operation phase	SRWB	N/A (Within the operation and maintenance budget of the board)

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• The Town Council must ensure that development activities are implemented within Council plans and laws			
2.	**MITIGATION MEASURES FOR ADVERSE IMPACTS**				
2.1.	**Planning and design phase**				
2.1.1.	Loss of 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 the 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	3,662,800.00

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
2.1.2.	Unrealistic expectations regarding lands/compensation/ resettlement negotiations	• Conduct adequate thorough public and sensitization meetings in regard to land laws, land acquisition and compensations. • Value the land and property and pay compensations in a transparent manner. • Conduct sincere and adequate sensitizations with the owners of the land and government officers must avoid dictating unfair and unreasonable compensation amounts.	During the planning and design phase	SRWB, District Land Office	Included 2.1.1
2.2.	**Construction Phase**				
2.2.1.	Dust generation	• 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. • 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.	Gas and particulate matter emission	• Use new or fairly new vehicles and equipment with exhaust gas emissions below permissible emission limits.	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 (MKW)
		• Timely and effectively maintain vehicles and equipment to prevent exhaust gas emissions above permissible emission limits. • Optimize transportation management to avoid needless truck drives. • Control vehicle speeds. • Reduce engine idling time. • Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution.			
2.2.3.	Soil contamination	• Line 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, in line with Waste Management and Sanitation Regulations • 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 activities. The pits must not be near to surface water bodies. • Closely supervise the workforce to avoid or limit waste generation. • Sensitize construction workers to desist from littering the site.	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 (MKW)
2.2.4.	Land degradation and soil erosion	• Provide lined drainage with check dams along access roads. • Plant grass and restore vegetation on disturbed areas, along the access roads and around the tank. • Landscape and concrete surfaces on construction sites and around the tank as appropriate.	Throughout construction	Contractor	To be included in the contractors' bills of quantities
2.2.5.	Loss of vegetation cover, aesthetic scenery and disturbance or loss of wildlife	• 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. • Value and appropriately compensate for all the trees to be cut down during construction. • Provide resources for conservation activities to be done by the Department of Parks and Wildlife. • Construct fire bands to protect the area from fires. • Include elements of ecosystem protection in the Memorandum of Understanding to be signed by the Department of Parks and Wildlife and Southern Region Water Board • For every tree cut down, provide 10 tree seedlings of a similar species to be planted in the adjacent areas. • Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass after construction works and just before the rains to minimise soil erosion.	Throughout construction (but mainly during land preparation)	Contractor SRWB DNPW	9,076,752.00

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Sensitize employees and the community to conserve vegetation. • Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland. • Fence Nkhudzi Hill to ward off animals and sensitise people against making noises that would disturb/ scare away animals. • Relocate endangered species where appropriate • Paint structures in protected area with green colour to blend with environment.			
2.2.6.	Exposure of people and animals to injuries and accidents	• Develop a workplace safety policy and induct workers on OSH requirements and repeat reminders on the same. • Inform and sensitise the public about all open pits and trenches. • Provide appropriate personal protective equipment (PPEs) to construction workers. and ensure that it is always used. • Provide firefighting equipment and training; and reserve fire assembly points. • Train First Aiders and provide first aid kit • Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife. • Avoid making deep pits when extracting construction materials and backfill all excavated	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 (MKW)
		trenches/ areas immediately after pipelaying. Re-fill borrow pits immediately after use. • Barricade all trenches and open pits and place clear signs to protect animals and people from falling into them. • Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife. • Buy construction materials from suppliers that are licensed by the Mangochi Town Council. • Adequately supervise the construction activities and follow recommended procedures			
2.2.7.	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
2.2.8.	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. • Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water.	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 (MKW)
		• 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. • 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.			
2.2.9.	Disturbances and accidental damage to assets	• Provide adequate notice before construction activities at a private or public property. • Provide detours and appropriate traffic signs for vehicles and pedestrians where construction is 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.	Before, during and after construction	Contractor	To be included in the contractors' bills of quantities
2.2.10.	Noise and vibrations	• Use appropriate and well-maintained noise mufflers on vehicles and machinery. • Regularly service and maintain equipment. • Provide ear muffs for the workers in noisy areas. • Use electric motors instead of compressed air driven machinery.	Throughout the construction period	Contractor	2,500,500.00

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• 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 and animal presence on the project surroundings. • Notify the public of upcoming loud events.			
2.2.11.	Potential increase in poaching	• Sensitize the workers and the community against poaching and the applicable laws as well as the penalties • Support and work with the National Parks and Wildlife Rangers to prevent poaching especially during construction and operation. Provide temporary structures (flying camps) for Rangers especially during construction • Liaise and work with the Department of Parks and Wildlife during any clearing of vegetation.	During construction	Contractor SRWB	1,800,000
2.2.12.	Increase in spread of Sexually Transmitted Infections (STIs), HIV and AIDS, unplanned pregnancies and breaking up of families	• Sensitise workers and surrounding communities on the risks of indulging in casual sex. • Sensitise girls on the dangers of getting involved in pre-marital sex. • Provide both male and female condoms to workers. • Develop and implement a workplace policy on HIV and AIDs • Implement and follow-up on grievance redress mechanisms.	Quarterly throughout the construction period	Contractor, District HIV/AIDS Coordinator SRWB, District Gender Office	7,325,600.00

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
2.2.13.	Increased pressure on community health services	• Develop and implement a Health and Safety management plan to protect workers from communicable diseases and injuries. • Conduct public awareness and sensitization on communicable diseases including HIV and AIDS and how these can be prevented. • Sensitise the workers and the communities to follow good sanitation and hygiene practices. • Construct adequate sanitation facilities and provide basic medical services at the work sites. • Provide both male and female condoms to workers for preventive measures for spread of HIV and Aids. • Support the services of the local clinics and the Health Surveillance Assistants.	Quarterly	Contractor SRWB	Cost included I 2.2.10
2.2.14.	Increased COVID – 19 infections and related deaths	• Provide COVID-19 preventive measures including of sanitization products, protective masks/ shields. • Enforce hygiene practices including the wearing of masks and shields, hand washing and hand sanitising. • Divide the workers into shifts to decongest the work area and improve social distancing. • Assist suspected COVID-19 cases to access approved testing centres and hospitals. • Provide continuous communication and awareness on COVID-19 issues.	Throughout the project cycle, as long as the COVID-19 threat exists	Contractor SRWB	To be included in the construction budget by the contractor and by SRWB in the operation budget
2.2.15.	Sexual abuse and harassment	• Sensitise workers and nearby communities to desist from sexual abuse and harassment.	During construction	Contractor SRWB	Included in 2.2.12

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
		• Conduct sensitization and awareness campaigns to encourage affected individuals to report cases of sexual harassment and publicise places for reporting the cases. • 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. • Support the District Gender Welfare Office and Non-Governmental Organisations in the implementation of on-going projects aimed at promoting gender equality, ending sexual harassment and empowering women to be financially independent. • Implement and follow-up on grievance redress mechanisms. • Require the contractor to be responsible and to take necessary measures so his employees do not commit acts of sexual abuse and/ or underage sex.			
2.2.16.	Unequal employment	• Include a clause in the contract specifying that at least 40% of the employees but not more than 60% should be women. • Sensitize and encourage women to build their confidence for applying for in as foremanship, engineers etc.	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 (MKW)
		• Create a good work environment to allow female workers report any case of gender discrimination.			
2.2.17.	Child labour and trafficking	• Employ people who have genuine identification to prove that they are 18 years old and above; • Employ workers through established recruitment agencies; • Maintain an accurate staff register against which employee presence must be checked every day.	Quarterly	SRWB, Contractor, District HIV/AIDS Coordinator, District Gender Office	Included in 2.2.10
2.2.18.	Gender Based Violence (GBV) and Violence Against Children (VAC)	• Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to implementation of the project; • Sensitize the community on the grievance redress mechanism (GRM) before implementation of project; • Ensure that Codes of Conduct are prepared, signed, understood and applied by all contractor's staff; • Provide separate facilities for men and women; • Provide appropriate signage on GBV in local language; and • Provide equal employment to women and men.	Quarterly	SRWB, Contractor, District HIV/AIDS Coordinator, District Gender Office	Included in 2.2.10
2.3.	**DEMOBILISATION PHASE**				

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for implementation	Responsible institution	Implementation cost/year (MKW)
2.3.1.	Loss of jobs and businesses	• Provide alternative employment to employees e.g., as maintenance staff. • Provide adequate notice to employees to prepare themselves and secure alternative employment. • Pay severance benefits to leaving workers in line with the labour regulations. • Provide alternative employment to employees where possible e.g., as maintenance staff.	Twice during the construction phase Once during lay offs	Contractor, SRWB	Included in 1.1.1 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 and prevent overfilling. • Dispose collected waste in an approved disposal site. • Implement sensitization campaigns on consequences of indiscriminate waste disposal.	Throughout the operation period	SRWB	N/A (Within the operation and maintenance budget of the board)
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.	Twice a year	SRWB Environmental Health Officer	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 (MKW)
		• Sensitize people on the benefits (including prevention of cholera) of good the hygiene			
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. • 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.	Throughout the operation period	SRWB	N/A (Within the operation and maintenance budget of the board)

8.2 COST FOR ENVIRONMENTAL AND SOCIAL IMPACTS MANAGEMENT

Table 8.2 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 8.2: Summary of Environmental and Social Management Costs

S/N	Potential Impacts	Implementation cost in MKW/Year
1	Creation of employment opportunities	4,761,640.00
2	Improved sanitation, hygiene and health	9,523,280.00
3	Enhanced gender and women participation in development	9,523,280.00
4	Loss and compensation for land and assets	3,662,800.00
5	Loss of vegetation cover, aesthetic scenery and disturbance or loss of wildlife	9,076,752.00
6	Noise and vibrations	2,500,000.00
7	Occupational incidents and accidents	7,325,600.00
8	Potential increase in poaching	1,800,000.00
9	Increase in spread of Sexually Transmitted Infections	7,325,600.00
	Total	**55,498,952.00**

CHAPTER 9 : ENVIRONMENTAL AND SOCIAL MONITORING PLAN

9.1 ENVIRONMENT AND SOCIAL MONITORING PLAN ACTIVITIES

The Environmental and Social Monitoring Plan, presented in Table 9.1 provides for monitoring to check the implementation of the enhancement and mitigation measures proposed in the Environmental and Social Management Plan (table 8.1).

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 9.1: Environmental and Social Monitoring Plan

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
1.	**ENHANCEMENT MEASURES FOR BENEFICIAL IMPACTS**						
1.1.	**CONSTRUCTION PHASE**						
1.1.1.	Creation of employment opportunities	Inform local communities of job opportunities and prioritise their employment	Number of locals including vulnerable groups employed	Review of employee files	Quarterly	District Labour Officer (DLO), District Social Welfare Officer, District Gender Officer, SRWB's Project Supervisor	293,024.00
		Match responsibilities of the employees with their abilities	Roles of the compared against their abilities	Review of job descriptions			
		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 (MKW)/ Year
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	73,256.00
		Sustain the desired performance of the water supply system through timely preventive maintenance	Number of times maintenance works are conducted				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
			with 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				
		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 practices and payment of water bills in time	Number of times sensitizations are conducted, Number of people sensitized,	Review of sensitization reports, Review of reports on cases of vandalism			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
1.2.2.	Improved access to portable water source	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	Quarterly	SRWB, District Water Development Officer	Included in 1.2.1
		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			
		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			
		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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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	293,024.00
		Promote general sanitation practices amongst	Number of sanitation promotion activities conducted				
		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.	Number of trainings conducted; capacity of the committees				
		Monitor the quality of water and to promote health and hygiene at water points.	Quality of water				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		Support initiatives implemented by community-based organisations to promote health, sanitation and hygiene.	Level of support provided to the community-based organisations				
		Ensure there is adequate drainage within the community water points	Presence of drainage within water sources				
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	293,024.00
		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.	Increased revenue generation	Sensitize institutions and households to pay bills and on time	Number of sensitizations, Percentage of paid bills and	Review of sensitization and engagement reports, Interviews,	Quarterly	SRWB, Southern Region Water Department	N/a

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
			time for payment	Audit of revenue collection, expenditures			
		Properly manage revenue from the water supply through good book keeping, transparency and accountability.	Availability of revenue book, Level of transparency and accountability				
		Engage the community to identify project which the water board can implement as part of cooperate social responsibility	Number of engagement, Level of engagement				
		Re-invest profits in the improvement and extension of the water supply system	Percentage of profits reinvested in extension of the system				
		Regularly review water supply tariffs with consideration of the consumers to avoid overcharging.	Number of times tariffs are reviewed, Level of prices				
		Properly manage water by replacing old pipes, repairing pipes to prevent leakages and extending intake pipes to avoid	Strength of pipes in relation to leakages, Length of intake pipes	Review of maintenance records, Inspections			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		abstracting polluted water					
1.2.6.	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
		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			
1.2.7.	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	Included in 1.2.4
		Provide the necessary support to schools to ensure that they have	Availability of adequate	Review of education statistics			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		adequate resources to ensure the provision of quality of education	resources in the schools			Social Welfare Office	
		Provide scholarships and bursaries to deserving girls who cannot afford to pay the school fees	Number of deserving girls provided with bursaries and support				
		Provide adequate water and appropriate sanitation facilities in schools to support female students	Availability of adequate water supply and sanitation in schools				
1.2.8.	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	293,024.00
		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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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 commence ment of construction	SRWB, District Lands Office, Director of Planning and Development	879,072.00
		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	Number of people to have attended to	Review of the disclosure exercise report and			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		compensations to ensure that there are no conflicts.	the disclosure exercise and to have signed the compensations due	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 before commencement of construction activities.	Percentage of people to have not received compensations and/or with grievances before commencement of construction	Interview, review of grievance redress			
		SRWB through Mangochi District Council must help the affected people to identify replacement land.	Percentage of PAPs helped to find replacement land	Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
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	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	Monthly	Contractor, SRWB, Environmental District Office	879,072.00
		Provide protective gear (dust masks) to workers	Reports of use of protective	Interviews, Visual inspections			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		and ensure that they wear them.	gear during dust generating activities				
		Erect a barrier around the work sites where major construction activities are taking place to break or reduce wind and dust movement	Perimeter with a barrier as compared to the total area that requires a barrier	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			
		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.	Gas and particulate matter emission	Use new or fairly new vehicular equipment with exhaust gas emissions above permissible emission limits.	Number of years equipment has been in use, Level of	Review of procurement records, Inspection, Interviews	Monthly	Contractor, SRWB, Environmental District Office	Cost included in 2.2.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
			emissions from equipment				
		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			
		Optimize transportation management to avoid needless truck drives. Control vehicle speeds.	Number or errands for vehicles per day	Review of vehicle logs			
		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			
2.2.3.	Soil contamination	Surface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent	Size of surfaced areas	Visual inspection, Measurements, Review of waste management records	Monthly	Contractor, SRWB, Environmental District Office	Cost included in 2.2.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		contact of soil with the oils.					
		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				
		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				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		Sensitize construction workers to avoid littering the site	Number of sensitizations; Presence of littered sites				
		Use excavated soils for backfilling and site levelling.	Volume of excavated used for backfilling and levelling				
		Sensitize suppliers to mine sand and source quarry in approved sites and sustainably	Sites and methods for sand mining and quarrying				
		Enforce the use of licenced construction material suppliers through the construction contract(s).	Clause in contracts, and the types of suppliers that are used				
2.2.4.	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				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		Segregate waste (e.g. cartons and paint containers) to encourage reuse	Volume of waste segregated and reused				
		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	Inspections			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
			backfilling and levelling				
		Sensitize suppliers to mine sand and source quarry in approved sites and sustainably	Sites and methods for sand mining and quarrying	Inspection, Interviews			
		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			
2.2.5.	Loss of vegetation cover and wildlife	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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		Rehabilitate affected land by tilling the soils to facilitate natural regeneration of vegetation; and by planting trees, including indigenous trees, and grass immediately after construction works to minimise soil erosion.	Size of rehabilitated sites				
		Sensitize employees and the community to conserve vegetation.	Number of employee and community sensitized	Review of sensitization records			
		Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.	Volume/number of reused plants materials	Interviews, Inspections			
2.2.6.	Exposure of people and animals to injuries and accidents	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				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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				
		Supervise adequately the construction activities and follow recommended procedures.	Number of hours a supervisor is on site				
2.2.7.	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	879,072.00
		Provide alternative means of supplying water such as temporary by-pass piping or water bowsers where appropriate	Availability of alternative means of supplying water				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
2.2.8.	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 Monthly	Contractor SRWB, Environmental District Office	Included in 2.2.5
		Store cement, paints, lubricants, and fuels in lined and covered areas.	Presence and size of cover and surface lining				
		Provide appropriate spill kits when working near water courses.	Availability (and number) of spill kit				
		Provide appropriate facilities for the collection of wastes on site such that they will not come into contact with water.	Availability of facilities used for disposing and collecting of wastes				
		Site all material storage areas at least 10 m from watercourses.	Distance between storage area and watercourse				
		Provide appropriate barriers to separate worksites from water resources in order to prevent accidental	Presence of and size of barrier separating work site and				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		spillage into water courses	water resources				
		Line surfaces where cement, paints and oils will be stored	Percentage of construction material on lined surface				
		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				
2.2.9.	Occupational incidents and accidents	Induct workers on OSH requirements and repeat reminders on the same	Number of workers inducted and reports of reminders	Review of OSH induction records	Daily	Contractor	293,024.00
		Employ an OSH expert to monitor and ensure that appropriate equipment and acceptable codes of practice for various tasks are followed by workers at all times.	Presence of an OSH expert	Review of human resources records, Inspection	Quarterly	District Labour Office, SRWB	

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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			
		Develop a workplace policy.	Availability of a workplace policy				
		Provide firefighting equipment and training.	Presence of firefighting equipment				
		Reserve a fire assembly points	Presence of a fire assembly points				
2.2.10.	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	293,024.00
		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	Percentage of site restored				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		where possible; rehabilitate the sites where it is not possible to restore to the baseline condition.	or rehabilitated				
2.2.11.	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 SRWB, Environmental District Office	Included under 2.2.1
		Regularly service and carry maintenance of equipment	Number of times the equipment is maintained; Condition of equipment	Inspection, Review of maintenance reports			
		Provide ear muffs for the workers in noisy areas	Number of workers are provided with ear muffs	Inspection, Interviews			
		Use electric motors instead of compressed air driven machinery	Use of electric motors against the use air driven machinery	Inspection			
		Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and	Number of complaints during construction	Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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	Number of days and hours of noise activities	Random interviews, Construction reports			
		Notify the public of upcoming loud events	Number of notices sent, and the time when notices are sent	Inspection of records			
2.2.12.	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	293,024.00
		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					

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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 and female condoms	Inspections, Interviews			
		Prepare and implement an STD and HIV and 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 and AIDS prevention programme	Interviews, Review of reports of implementation of STDs and HIV and AIDS program			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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			
		Develop and implement a workplace policy on HIV and	Availability of a workplace policy	Inspection and interviews			
2.2.13.	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				
		Publicise places for reporting gender related violence and sexual harassment.	Availability of places for reporting gender related	Inspections, Interviews			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
			and sexual harassment				
		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-	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 (MKW)/ Year
		going 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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
2.2.14.	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, District Health Offices	293,024.00
		Encourage employees to go for voluntary health screening and receive appropriate treatment where it is required.	Percentage of potential employees screened	Review of recruitment reports			
		Require the workers, sensitize the communities 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			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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 international worker health standards.	Adherence to the international worker health standards	Inspections, Comparisons of the conditions in the 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,	Presence and implementation of an H & S management plan	Inspections, Interviews, review of an H & S management plan			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		even temporary workers (e.g. vaccines, etc.).					
		Support and supplement social services including the Health Surveillance Assistants.	Level of support and supplement to health surveillance system	Interview, Review of support records			
2.2.15.	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 they can also do the work that men do	Number of women sensitized, Number of women doing the work said to be for men				
		Ensure there are also women in important positions such as foreman and engineers	Number of women in important positions				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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			
2.2.16.	Child labour and trafficking	Employ people who have genuine identification to prove that they are 18 years old and above	Age of employees	Inspection, Review of employee files	Quarterly	Contractor, District Labour Office, District Social Welfare Office	Included in 2.2.7
		Employ workers through established recruitment agencies	Number of employees from established recruitment agencies	Interviews			
		Maintain an accurate staff register against which employee presence must be checked every day	Availability of an accurate register	Inspection and interviews			
2.2.17.	Gender Based Violence (GBV) and Violence Against Children (VAC	Sensitize communities on GBV and VAC risks of the project during stakeholders'	Number of sensitization meetings conducted	Review of sensitisation records	Quarterly	Contractor, District Labour Office, District	Included in 2.2.7

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		engagement, prior to implementation of the project				Social Welfare Office	
		Sensitize the community on the grievance redress mechanism (GRM) before implementation of project					
		Ensure that Codes of Conduct are signed, understood and applied by all contractor's staff	Number of employees who signed the CoC	Review of employees records			
		Provide separate facilities for men and women	Presence of male and female facilities	Inspection and interviews			
		Provide appropriate signage on GBV in local language	Presence of signage in local language				
		Provide equal employment to women and men	Number of women employed against men	Head count, Review of employee files			
2.3.	**DEMOBILIZATION PHASE**						
2.3.1.	Loss of jobs and businesses	Provide alternative employment to employees e.g. as maintenance staff	Number of employees allowed to continue working	Review of the employee register	Once during the demobilization phase	Contractor, SRWB, District Labour Officer	73,256.00

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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			
		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 demobilizati on phase	Contractor, SRWB, Environmental District Officer	Included in 2.3.1
		Rehabilitate all work site	Size of area that is rehabilitated after construction				

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		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				
		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,	Included in 2.4.1

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
		Apply lime treatment to dewatered sludge to suppress pathogens and remove odour	Number of times quicklime is used to treat sludge	Interviews		District Health Office	
		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			
2.4.3	Emergencies	Design and implement an emergency response plan.	Presence of a written emergency	Inspections, Interviews	Quarterly	SRWB, Environmental District Office,	

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibility for monitoring	Monitoring cost (MKW)/ Year
			preparedness plan			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			

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

9.2 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 5,127,920.00 Malawi Kwacha per year (1USD is equivalent to 732.56 Malawi Kwacha)). 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 9.2.

Table 9.2: Cost for monitoring activities

S/N	Potential Impact	Cost in Mk per Year
1	Creation of employment opportunities	293,024.00
2	Improved water supply to Mangochi Town and the surrounding areas	73,256.00
3	Improved sanitation, hygiene and health	293,024.00
4	Improved socio-economic situation of the communities	293,024.00
5	Increased development	293,024.00
6	Losses and compensation for land and assets	879,072.00
7	Dust generation, gas and particulate matter emission	879,072.00
8	Disruption of water supply, Water pollution and siltation	879,072.00
9	Occupational incidents and accidents	293,024.00
10	Disturbances and accidental damage to assets	293,024.00
11	Increase in sexual relationships	293,024.00
12	Diseases and increased pressure on community health services	293,024.00
13	Loss of jobs and businesses	73,256.00
	Total	**5,127,920.00**

CHAPTER 10 : ASSESSMENT AND EVALUATION OF CULTURAL HERITAGE IMPACTS

An assessment of Cultural Heritage Impacts (CHIA), for the proposed Extension of Mangochi Potable Water Supply Project was conducted by the Department of Museums and Monuments (DMM) in June 2021; and an independent assessment report was prepared.

The DMM consulted a number of sources at its disposal, conducted a desk-based assessment of documentary records comprising reports, articles, maps, photographs, national inventory of archaeological, historical and cultural sites. They also carried out field surveys and public consultations. Some of the activities performed by the DMM, the relevant legal and regulatory framework and findings of the baseline study are presented in the relevant sections of this ESIA report.

In general, the findings of the Cultural Heritage assessment revealed that Nkhudzi Hill, Namaso Bay and the surroundings of the project area are historically rich. Twelve 12 significant heritage resources were identified after field survey.

10.1. SUMMARY OF THE CULTURAL HERITAGE IMPACTS

The Cultural Heritage Impacts can be summarised as destructive and irreversible effects on the archaeological and cultural/ historical heritage sites, resulting from development of access roads, construction of pipelines, construction of the water tank and clearing of the landscape.

However, the CHIA report notes that it is impossible at this stage to provide a quantitative assessment of the extent of sites that might be damaged during the project implementation, as no subsurface investigations have been conducted.

10.2. MITIGATION MEASURES

To determine the mitigation measures for impacts on the sites within and/or in the proximity of the project area, the threatened cultural heritage sites were classified according to their importance and the required appropriate intervention. The following categories have been defined for the cultural heritage resources identified (each category implies specific mitigation measures to be taken):

- *Low Priority Site*: No further treatment;
- *Medium Priority Site*: Further monitoring during project development and other construction works to ascertain final priority/importance;
- *High Priority Site*: Further treatment warranted.

The prioritization of a site is not a definite measure of its scientific importance but rather a temporary classification regarding potential and further treatment requirements. In this regard, some high priority sites may well be re-evaluated as non-important after further study. The criteria used to define the value of a site are multiple and complex. However, regarding the area's archaeological and historical sites, the aim is to understand both the

history of the region and the way of life of past populations. In this context these criteria would be summarized as follows:

- Age of the finds,
- Density and/or
- variety of the finds,
- Context of the finds,
- Social significance of the finds,
- Precursory archaeological knowledge of the area.

a) ***Age*** the older a site is, the more important it is. Most often, sites more than 15,000 years old (Early or Middle Stone Age) are found during major construction works (dams, roads, mines, and pipelines) because they are buried deep underground.
b) To be considered important, a site must also present a high ***density*** **and/or** ***variety*** of artefacts. Isolated finds are very difficult to interpret since a representative sample of the material is needed to understand the activities carried out by prehistoric peoples.
c) Artefacts must also be in ***primary context*** (i.e., as the prehistoric people left them) in order to be exploitable from a scientific standpoint. Most of the time a site is discovered because part of it is unearthed by erosion or digging; archaeological interventions will, therefore, focus on the part of the site that is still undisturbed.
d) Recent sites (graves/tombstones, monuments, sacred shrines) can be of high ***social significance*** (i.e., be "sacred") to local populations and, in that case, should not be damaged by project development activities unless proper compensation is negotiated. In this regard, burial sites or any other sites considered as sacred by local communities are always classified as 'High priority sites that must not be lost at all costs.
e) ***Prior archaeological knowledge of the area*** where a site is found is also an important criterion. Medium Priority sites could eventually be re-classified as High Priority sites if no High Priority sites are discovered in a region that was previously unexplored.

When taken together, a preliminary site prioritization classification has been is given in table 10.1 below:

Table 10.1: Environmental matrix used in the study

	Table 7.1. Site prioritization classification				
	Old Age	**Primary Context**	**High Artefact Density or variety**	**High Social Significance**	**Priority**
1. MH-Nkhudzi 1 Archaeological Site 36-715711 | 8432028	**Yes**	Yes	Yes	No	High
2. MH-Nkhudzi 2 Archaeological Site 36-715644 | 8432001	**Yes**	Yes	Yes	No	High

3. MH-Nkhudzi 3 Archaeological Site 36-715680 | 8431936	**Yes**	Yes	Yes	No	High
4. MH-Nkhudzi 4 Archaeological Site 36-714092 | 8432352	**No**	Yes	No	No	High
5. MH-Nkhudzi 5. Rock Art Site 36-714092 | 8432352	**Yes**	Yes	No	Yes	High
6. MH-Nkhudzi 6 Namalowe sacred site\potential grave site 36-714682 | 8431255	**No**	No	No	Yes	Medium
7. MH-Nkhudzi 8 Potential Grave Site 36-714657 | 8432031	**No**	No	No	No	Low
8. MH-Nkhudzi 11 Grave site and Sacred site 36-715413 | 8431271	**Yes**	Yes	No	Yes	High
9. MH-Nkhudzi 12 Sacred Site II 36-715473 | 8431940	**Yes**	Yes	No	Yes	High
10. Sacred Site III 36-716213 | 8431323	**Yes**	Yes	Yes	Yes	High
11. MH-Nkhudzi 14 Archaeological Site 36-714372 | 8432499	**Yes**	Yes	No	Yes	High

As no excavations were carried out, it has been difficult to make any preliminary interpretations on age ranges of the identified sites. Furthermore, the pottery found on the surface has shown considerable signs of wear and erosion. This has made it difficult to identify characteristic decoration types, representative of distinct periods. The criteria of Age of Finds is therefore difficult to apply in this preliminary stage of the study. However, the other two criteria such as Primary Context and High Artefact Density or Variety have been /useful to determine whether an archaeological site can be classified as High, Medium or Low Priority.

10.3. ASSESSING CULTURAL SIGNIFICANCE

The following criteria was used to assess sites within the project area:

a. **Site integrity** (or the degree to which an archaeological site has been impaired or disturbed as a result of past land alteration).
b. **Scientific value of Archaeological resources:** The potential to yield information which, if properly recovered, could contribute to scientific research; and/or the potential for relevant contributions to other academic disciplines or to industry.
c. **Public significance**: The potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value.

d. **Ethnic significance**: Applies to archaeological sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site.
e. **Historic archaeological sites**: May relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province.
f. **The economic or monetary value of an archaeological site**; Where calculable, this is also an important indication of significance.

10.4. IMPACTS ON OUV, INTEGRITY, PROTECTION AND MLNP WORLD HERITAGE SITE

According to the nature of the project, negative impacts on the Outstanding Universal Value (OUV), integrity, protection and management of Lake Malawi National Park (LMNP) as a World Heritage Site is minimal and will mainly occur during construction, operation and decommission phases. The impacts are likely to be mitigated through application of appropriate and practical mitigation measures as proposed in the Environmental and Social Management Plan. However, the CHIA report recommends the following measures to be taken:

- Avoidance of construction-related impacts to important cultural resources
- Preparation of a cultural heritage management plan to avoid or limit adverse impacts of the project
- Providing training in cultural heritage management and undertaking possible heritage research programs in the area
- Implementation of internationally recognized practices for the protection of cultural heritage resources.
- Involvement of the relevant government authorities responsible for the protection and management of cultural heritage resources in Malawi, in the implementation of the project's cultural heritage management plan
- Conducting a Contractor Training and Awareness Program
- Selective archaeological monitoring of surface clearing and trenching activities during development in areas with poor surface visibility and/or a high probability for cultural resources buried below the surface
- Rescuing archaeology at sites deemed as of high priority
- Applying Chance Find Procedures to be decided upon and development of the necessary management measures

10.5. BUDGET FOR MITIGATION MEASURES OF HERITAGE RESOURCES

The costs for implementation of the Cultural Heritage Impact (CHIA) mitigation management measures have been summarised in table 10.2.

Table 10.2: Costs for mitigation and monitoring of CHIA Management Measures

BUDGET FOR MITIGATION MEASURES OF HERITAGE RESOURCES AND WORLD HERITAGE ATTRIBUTES	
Contractor Training and Awareness Program	7,000,000.00
Archaeological monitoring of land transformation activities	5,500,000.00
Salvage excavations and subsurface investigation	7,500,000.00
Post excavation laboratory analysis of recovered artefacts	5,000,000.00
Chance Find Procedures	5,000,000.00
Grave exhumation and relocation	4,000,000.00
Monitoring the implementation of mitigation measures of World Heritage Attributes: Planting of trees and grass, provision of drainage systems, fences, rehabilitation of borrow pits,	11,000,000.00
	45,000,000.00

CHAPTER 11 : CONCLUSION AND RECOMMENDATIONS

11.1. 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.

11.2. 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 for corporate 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;
j) Where possible and appropriate, employment of local people from the project area must be prioritised to encourage community ownership and sustainability of the project.

References

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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 Mtakatata 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 Mtakatata 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 colour 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 analysing:
    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

No.	Selection Criteria	Weight Applicable (%)
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 2: KEY STAFF FOR THE ASSIGNMENT

Name	Proposed Position and Qualification	Task Assigned
Kent Kafatia, R. Eng.	Team Leader and ESIA - Master of Science Degree (MSc.) in Water and Waste Engineering - Bachelor of Science Degree (BSc.) in Chemical Engineering - BSc. Degree in Engineering - Post Graduate Diploma - Advanced Certificate in Water and Environmental Management	• Coordinating the whole assignment • Conducting literature gathering and review • Identification and evaluation of project impacts • Conducting stakeholder consultations • Determination of, and evaluation project impacts, enhancement and mitigation measures • Analysis of proposed project alternatives basing on social impacts • Preparation of Environmental and Social Management and Monitoring Plan • Compilation of the ESIA report • Providing quality assurance
Selina Mposa	Sociologist - Master of Business Administration - M.Sc. Psychology of Education - P/Graduate Diploma in Education - Diploma in Education	• Stakeholder mapping and analysis • Designing data collection tools • Conducting stakeholder consultations • Conducting literature gathering and review • Managing the household survey and leading and data analysis • Compiling socioeconomic and baseline information
Jamestone Kamwendo	Ecologist - MSc. Degree in Conservation Biology - BSc. Degree - in Biology and minor Chemistry	• Visual assessment and determination of impacts of the project on surface water sources and other water users downstream • Recommend mitigation measures to the project impacts • Recommend on project alternatives based on project impacts, water resource assessment.

Name	Proposed Position and Qualification	Task Assigned
		• Assist in the preparation of ESIA
William Madalitso Nyirenda	Structural Engineer - Master of Science Infrastructure Management - Bachelor of Science in Civil Engineering	• Review of structural and engineering designs • Analysis of site layout • Assisting with the analysis of project alternatives • Identify environmental and social impacts from the construction activities • Provide analysis of impacts of the construction activities (e.g. drainage) on components of the environment • Assisting with the identification of the mitigation and enhancement measures for the impacts related to the project´s construction activities • Assess construction activities safety and environmental issues • Develop environmental management and monitoring plans

APPENDIX 3: CONSULTATION OUTCOMES

a. Summary of consulted people

No	Name of Stakeholder Consulted	Department/Section	Date of Consultation
1.	Smith Mnenula	Goverrnment- Department of HIV and AIDS	01 August 2019
2.	Metro Ching'ani	Government- Department of Gender	01 August 2019
3.	AMREF Africa Offices	AMREF	01 August 2019
4.	Bett Scott	Government- Fisheries Department	01 August 2019
5.	Noel Nzungu	Government- Education Department	01 August 2019
6.	Fr. Israel Madziakaphwa (Bishops Secretary)	Catholic Bishops Place- Mangochi	3 August, 2019.
7.	Mponda Village	FGD-Mponda Village	1 August, 2019
8.	Chizula Village	Chizula Village-Mtakatata Turn Off	1 August, 2019
9.	Lazarus Kamangadazi Aubrey Chaima Mathews Banda	District Forestry Officer Environmental District Officer Fisheries District Officer	2 August 2019
10.	Edwin Chiza (Wildlife Officer)	Monkey Bay Lake Malawi National Park Offices	2 August 2019
11.	Mr Clement Ntambo	District Director of Public Works	1 August 2019
12.	Dr Kondwani Mamba	District Environmental Health Officer for Mangochi	1 August 2019
13.	WOII J.M. Gama, Soldier	Malawi Defence Force Marine Services offices, Monkey bay	1 August 2019

b. 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 centres 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
	Increased access to clean potable water	Value of water: Cost of water should be affordable to most in the community
	Employment opportunities	Prioritize sourcing skilled and non-skilled workers locally

	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
	Gender inequality issues	Provide equal employment opportunities to both genders where possible	Sensitize community leaders and members.
	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.
	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 community 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 Conflicts:** 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 heard 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 confidence 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 believes project 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
	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
	Water	Worsening	Source is insufficient and population growth	Increase water supply capacity and reliability
	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
	Improved livelihoods for locals	Provide employment opportunities to locals, and better markets for vendors.
	Improved Health: Reduced waterborne diseases due to improved sanitation.	Sensitize communities on sanitary
	Economic Empowerment (Water Kiosks)	Educate aspiring business men and women on money management and business skill-sets

	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
.	Gender-based violence especially from travelling workers	Prioritize hiring locals over travelling workers	Sensitize and educate both local and travelling workers
.	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 versus 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 accessible. 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-Mtakatata 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 Bush fires	Prohibiting illegal poaching Prohibiting deforestation Prohibiting setting of bush fires Mangochi District Council should develop urban plan to regulate construction of infrastructure
	Energy	Improving at a slow rate	Over-dependency on fuelwood (firewood, charcoal)	Train communities on production of more efficient cook-

			Intermittent electricity supply	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
.	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 outside the project footprint areas. The Department of Forestry should also be	Sensitize and educate Client and contractor, including communities on the conservation of biodiversity Plant trees in all disturbed areas. Plant 5 seedlings for every single tree to be

			involved in monitoring of project activities Prohibit construction workers from cutting down trees carelessly in the project area and outside the project areas.	cut down during the project implementation.
	.	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	Ensure both solid and liquid wastes are properly dumped in

		Provide workers with appropriate toilets both at campsite and on work place	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 - Loss of habitats to agricultural	- Prohibit illegal poaching - Prohibit deforestation - Prohibit setting of bush fires

			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 Prohibit construction workers from cutting down trees carelessly in	Sensitize and educate Client and contractor, including communities on the conservation of biodiversity Encourage reforestation.

			the project area and outside the project areas.	
	2.	Loss of wildlife (fauna)	Implement measures to prohibit workers from poaching Avoid disturbing or destroying 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. Provide workers with rubbish/dust bins	Ensure both solid and liquid wastes are properly disposed of Ensure all contaminated sites are cleaned up and

		Provide workers with appropriate toilets both at campsite and at work places	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 adequately 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 that 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 the construction 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 Monkey bay.
    - 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 Mtakatata 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 Monkey bay.
- 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 Mtakatata Turn-off.
- The MDF currently utilizes water supplied by the SRWB, from the Monkey bay 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.

MINUTES FOR THE STAKEHOLDERS' MEETING ON THE PROPOSED EXTENSION OF MANGOCHI POTABLE WATER SUPPLY PROJECT HELD AT THE DEPARTMENT OF PARKS AND WILDLIFE CONFERENCE ROOM IN LILONGWE ON 19th MAY 2021

MEMBERS PRESENT

Name	Institution	Designation	Phone Number	Email address
T.G. Mbale-Luka	EAD	Director	0999957550	tawongam@yahoo.com
B.K. Kumchedwa	DNPW	Director	0999915411	bright.kumchedwa@gmail.com
Friday Njaya	DoF	Director	0999278088	fnjaya@gmail.com
Lovemore Mazibuko	Museums and Monuments	Director	0996954672	lovemoremazibuko@yahoo.com
C.J. Magomelo	National Commission for UNESCO	Senior Assistant Executive Secretary	0880060537	cmagomelo@natcomunesco.mw
W. Mgoola	DNPW	Deputy Director	0888353993	wmgoola@yahoo.co.uk
Potipher M. Kariba	DMM	Deputy Director	0995551309	pmkaliba@yahoo.com
M. Chilimampunga	DNPW	DD (EE)	0999246996	mchilimampunga40@gmail.com
Z.T. Ndhlovu	DNPW	SPWO (RD)	0999953010	zondiwendhlovu@gmail.com
Jacqueline Dias	SRWB	Act DOFD	0888343738	Jackdias13.jd@gmail.com
Oris Malijani	DMM	PGA	0886389777	omalijani@gmail.com
Moses Mkumpha	DMM	PCO	0999111029	mosesmkumpha@yahoo.com
A. Kataya	DNPW	PWO	0993472508	
Biswick Mlaviwa	EAD	PEO	0995666134	bismlaviwa@gmail.com

1.0 Opening

The meeting was called to order at 14:10 PM by the Director of Parks and Wildlife, Mr. B.K. Kumchedwa.

2.0 Self-Introductions

Every member introduced themselves by stating name, institution they represented and designation.

3.0 Welcome Remarks and Agenda

The Director of Environmental Affairs, Mrs Tawonga Mbale-Luka chaired the meeting and started his opening remarks by welcoming all the members present. The chairperson indicated that the meeting had been called for in order for the stakeholders to be briefed, discuss and agree on the way forward regarding the proposed "Extension of Mangochi Potable Water Supply Project" which the Southern Region Water Board (SRWB) intends to implement in Mangochi district. She indicated that the meeting had been necessitated by the concerns which various stakeholders and certain sections of the general public have been raising against the project.

4.0 Background to the Meeting

The chairperson informed the meeting that following the concerns raised by various stakeholders against the proposed water supply extension project by SRWB in Mangochi, particularly that the project has commenced without an Environmental and Social Impact Assessment (ESIA), series of meetings and consultations have happened. Representatives of some agencies visited the proposed project site to have in depth understanding of the scale, extent and significance of the issues and concerns surrounding the project, and to establish possible means of addressing of outstanding issues. However, considering that some key stakeholders were not available during the site visit, it had been resolved that a more inclusive stakeholders meeting should be held so that further input is solicited on the matter.

5.0 Project Scope and Status

The meeting was informed that SRWB through the Malawi Government has sourced financing from the Kuwait Fund for Arab and Economic Development (KFAED) for the proposed project to extend the water supply system to unserved lakeshore areas/centres and the holiday resorts along the lake. The scope of works under the project include:

- Construction of intake structures comprising of three submersible pumps, a suction and raw water DI pipe with a total length of about 800m to the treatment plant.
- Construction of a conventional treatment plant with a capacity of 15,400 m^3/day.
- Construction of a concrete tank (Mass Balance Reservoir) of 4000m^3 on Nkhudzi Hill to gravitate water up to Bishop's house in Mangochi. The estimated required area for the tank on Nkhudzi Hill is 50 m^2
- Construction of an elevated steel tank at Namiasi to supply Namiasi and other surrounding areas.
- Construction of a transmission pipeline from Nkhudzi tank to Bishop's house in Mangochi and the other will branch to Mtakataka turn – off. The distribution lines will branch off the transmission main line to supply to all the areas along the lake shore and all the resorts.
- Construction of auxiliary buildings that include staff houses and an office building at the treatment plant.
- Supplying of materials for household water supply connections and provision of about 10,000 prepaid meters with all its accessories.

SRWB clarified to the meeting that the Nkhudzi Hill where the concrete tank will be constructed is within the Lake Malawi National Park but the rest of the structures will be located outside the park on land which SRWB bought from the communities. In addition, SRWB informed the meeting that the project will be implemented using the Engineering, procurement and construction (EPC) approach whereby the engaged contractor will be responsible for design, procurement and construction works for the proposed project. In

view of that, the contractor needed to be on site for the design and preliminary activities, and unfortunately this reflected as though the construction works have started before the necessary statutory approvals.

The meeting was informed that the current status of the activities under the project was as follows:

- **Site establishment –** The contractor has mobilised on site and carrying out detailed designs.
- **Surveying –** The contractor is in the process of surveying to locate actual position for the tank, access road and pipeline routes.
- **Auxiliary buildings** - The contractor has started construction of staff houses and scheme office.
- **Treatment plant** - Some preliminary investigations including minor excavations for soil testing on treatment plant site are in progress based on the immediate requirements.
- No major works has started i.e. Construction of the concrete tank, intake works and pipelines. These works await the approval of the ESIA report.
- There has been an Environmental and Social Screening exercise to identify the site specific impacts and mitigation measures for the protected area (Nkhudzi Hill), to enable inclusion of the associated environmental and social issues in the ESIA report.

Finally, SRWB informed the meeting that in response to the environmental protection order (EPO) issued by the Malawi Environment Protection Authority (MEPA), the contractor has stopped all construction works but design works are in progress. The contractor has been provided with temporary lodging facilities.

6.0 Plenary Discussion

Following the presentation of the background information, the project scope and status, the meeting discussed the matter and a number of observations and reactions were brought out as follows:

- Lake Malawi National Park is a Heritage Site and Nkhudzi Hill is a Wilderness area with rich archaeological assets, as such developments/projects happening in such sites require careful planning to ensure that outstanding universal values associated with the sites are not compromised in process;
- The prepared ESIA report for the project and submitted to EAD is inadequate with regard to incorporation of biodiversity conservation and cultural heritage concerns in line with legal and policy provisions under the Parks and Wildlife Act, Monuments and Relics Act (1990), and World Heritage Guidelines;
- DNPW was not fully engaged at the initial stages of the project to provide necessary guidance and consent for the project to continue with its operations. As such, the project has cleared part of the protected area without prior consent from DNPW i.e. construction of an access road to the

campsite and creation of survey tracks in the protected area. It was also noted that the officer cited in the ESIA report as an officer from DNPW who was consulted by the ESIA consultant is not from the Department;

- Some key stakeholders were not consulted to provide input during the ESIA process. Going forward, there is need to reach out to as many stakeholders as possible;
- There is need for a comprehensive heritage impact assessment to be undertaken as part of the ESIA process. SRWB can either engage an independent expert to do the assessment or support the Department of Museums and Monuments to do the assessment;
- The Department of Museums and Monuments will need to do a reconnaissance survey at the Nkhudzi Hill. The survey should address aspects relating to the impact of the proposed developments on the protected area in general, as well as impact on cultural heritage property, in order to come up with a Cultural Heritage Management Plan;
- The proposed project needs to be implemented in such a manner as to balance the need to meet water supply needs of people in Mangochi with the biodiversity conservation and cultural heritage interests and commitments of the country;
- ESIA is a very important process and needs to be done and the required approval granted, prior to undertaking any civil works under the project; and
- Proper information about the proposed project and the on-going stakeholder engagements needs to be provided to the media and the general public to avoid misinformation and misrepresentation of facts relating to the project.

7.0 Resolution and Way Forward

Having thoroughly discussed the issue at hand the meeting resolved that the review of the ESIA report for the proposed project which SRWB has submitted to EAD should be pended to allow for the incorporation of comments and addressing of gaps in the report, as identified by key stakeholders and interested parties which will be engaged. In addition, all construction and civil works by the contractor engaged by the SRWB should be pended. However, all project design processes and activities should proceed accordingly. Furthermore, the following action points were agreed:

7.1 The Environmental Affairs Department (EAD) should produce minutes for the meeting and circulate them to all the stakeholders by 20th May, 2021.

7.2 The Department of Parks and Wildlife should immediately grant permission, to the respective stakeholders, for biodiversity, cultural heritage, and project design related assessments to be undertaken within the Lake Malawi National Park area and Nkhudzi Hill specifically.

7.3 With support from SRWB, the Department of Museums and Monuments to undertake, within a month, the reconnaissance survey and all the necessary heritage impact assessments that will feed into the ESIA report.

7.4 SRWB to engage the ESIA consultant to review the ESIA report in order to address the identified gaps and biodiversity concerns, and to incorporate findings from the heritage assessments that will be undertaken.

7.5 With support from SRWB, Environmental Affairs Department should facilitate public hearings on the proposed project.

7.6 With support from SRWB, the Department of Museums and Monuments in collaboration with EAD should disseminate to the media information regarding the status of the project through a press release/public notice. The Press Release should be ready for publishing by 26th May, 2021.

7.7 The Director of Environmental Affairs in collaboration with SRWB and DNPW should brief the Principal Secretary for Forestry and Natural Resources on what has been agreed during the stakeholders meeting.

8.0 Closing Remarks

In closing the chairperson again thanked everyone for coming to the meeting. She underscored the need for prompt action on the identified issues and action points by all stakeholders so that project implementation is not delayed. The meeting was closed at 15:56 PM.

THE DEPARTMENT OF PARKS AND WILDLIFE CONFERENCE ROOM IN LILONGWE ON 23 JUNE 2021

MEMBERS PRESENT

Name	Institution	Designation	Phone Number
Tawonga Mbale-Luka	EAD	Director	0999957550
Duncan Chambamba	SRWB	Ag CEO (SRWB)	0999644239
William Mgoola	DNPW	Deputy Director (RD)	0888353993
Potiphar M. Kaliba	DMM	Deputy Director	0995551309
Davis Kalima	DNPW	Deputy Director (WMU)	
Zondiwe Ndhlovu	DNPW	SPWO (RD)	0999953010
Jacqueline Dias	SRWB	DOID	0888343738
Rajab Janah	DNPW	PWO (RD)	0999318407
Mc Phillip Mwithokona	DNPW	DM (LMNP)	0997580503
Talandira Kasapila	DNPW	PM (LMNP)	0884938692
Kent Kafatia	WWEC	Consultant	0999831595
Biswick Mlaviwa	EAD	PEO	0995666134

2.0 Opening

The meeting was called to order at 13:50 PM by the Director of Environmental Affairs, Mrs. Tawonga Mbale-Luka

3.0 Self-Introductions

Every member introduced themselves by stating name, institution they represented and designation.

3.0 Introductory Remarks

The Director of Environmental Affairs, Mrs Tawonga Mbale-Luka started his opening remarks by welcoming all the members present. The chairperson indicated that the meeting was a follow up to the meeting that was held on 19th May, 2021. The meeting was to review the progress made regarding the resolutions and action areas agreed during the previous meeting and map a way forward.

4.0 Review of minutes of previous meeting

The meeting reviewed minutes of the previous meeting and made a few amendments before adopting the minutes. The amendments included correcting the spellings for names of Messrs. Ndhlovu and Kaliba, and inserting Mr. Duncan Chambamba (Acting Chief Executive Officer for Southern Region Water Board) who had been missed in the minutes.

5.0 Matters arising from minutes of previous meeting

The meeting was informed that the Department of Museums and Monuments had carried out the reconnaissance survey and heritage impact assessments and that a report had been submitted to SRWB so that the ESIA consultant should integrate the findings and mitigation

measures into the ESIA report. The studies had found archaeological sites (rock shelter and lone graveyard) at Nkhudzi Hill.

6.0 Plenary Discussion

With respect to the studies conducted by the Department of Museums and Monuments, some observations and clarifications were made during the meeting as follows:

- Outstanding universal values (OUVs) will not be directly affected by the project, as the proposed project activities will not be done in the core zone;
- Development on a wilderness area like Nkhudzi Hill needs to be limited;
- The criteria for establishing Lake Malawi National Park as a protected area and World Heritage site included: natural beauty of the hills, presence of the cichlids, species diversity of the area;
- The proposed project was likely to have impact on biodiversity due to clearing activities. Therefore, habitat restoration measures need to be considered by the ESIA consultant;
- The Lake Malawi National Park comprised terrestrial and aquatic elements (13 islands and all aquatic areas within 100 metres of the islands);
- Lodge owners had expressed concerns regarding soil erosion from the project site;
- Water will be drawn 300 metres inside the lake and the design has provided for bridge, pipes and pump setting that would enable passage through the water intake area;
- Park management and the Mangochi district officers conducted an assessment at Nkhudzi Hill and recommended some mitigation measures which the ESIA consultant needs to consider;
- The ESIA consultant needs to engage the project design consultant to consider the project designs and site plans so as to determine their implications on the environment;

The meeting also raised critical issues that need to be carefully considered by both the ESIA consultant and project design consultant. These included:

- Clearing and cutting of trees (Loss of vegetation);
- Road siting and its implications on soil erosion;
- Loss biodiversity;
- Rock blasting and flying rocks from Nkhudzi Hill;
- Siting of the water intake and its implications on endemic species;
- Risk of increased incidences of poaching;
- Increased deforestation due to use of firewood by construction workers;
- Need for a Memorandum of Understanding (MoU) between SRWB and DNPW during the operation phase of the project to ensure proper management of the Nkhudzi Hill area.

The meeting noted that the relationship between the communities in the proposed project area in Mangochi and DPNW officials had soured since the project was stopped pending completion of ESIA processes. Therefore, it was recommended that regular provision of feedback to the communities and local leaders was necessary for effective management of public relations.

7.0 Way Forward

Going forward the meeting agree on the following actions and timelines:

No	Action	Responsibility	Timeline/Deadline
1	Finalize ESIA consultations and ESIA report	ESIA Consultant	4th July, 2021
2	Share ESIA report with EAD/MEPA and Mangochi District Council	SRWB CEO	5th July, 2021
3	Conduct public hearings	SRWB & all stakeholders	12th to 17th July, 2021
4	Technical review of ESIA report	EAD/MEPA	4th to 12th July, 2021
5	Approval of ESIA report	MEPA Board	By End July, 2021
6	Provide feedback to local leaders in Mangochi	SRWB, DMM, EAD	By 1st July, 2021
7	Update PS on progress made	CEO SRWB & DEA	As soon as possible
8	Review press release	MEPA/EAD	By 25th June, 2021

8.0 Closing Remarks

In closing the chairperson again thanked everyone for coming to the meeting. She urged the ESIA consultant to ensure that all key issues and their mitigation measures are integrated into the ESIA report. She expressed hope that all key stakeholders will be engaged and that the process will be expedited. The meeting was closed at 16:30 PM with a prayer offer by Mr. Zondiwe Ndhlovu.

APPENDIX 4: 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 Macaula	PNHAO	0999 731781	
Francisco Mwamutole	EO	0995242700	
Metro Ching'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 Malenga	Junior consultant	0992125015	P.M
Beck Scott	Mangochi Fisheries office	0996648699	
Fr. Israel Madzakaphura	Bishop's Secretary	0999556612	
Petros Kamanga	Project Assistant/EHO	0999702265	
Noel Nunge	SHN Coordinator	0888526060	
Michael Mwenifumbo	ACDO/Comm. Dept	0881527683	

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	
Kandiani Mambo	DEHO - MANGOCHI	0995858623	
Morson Magombo	DPD ~~MACHINGA~~	0999881401	

APPENDIX 5: 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 6: 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) 5. Boreholes/tube well 6. Rain water

SECTION 9: 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 5. >MK16000

SECTION 9: WATER	
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)