



GOVERNMENT OF MALAWI

SOUTHERN REGION WATER BOARD

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

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

10 December 2021

ACKNOWLEDGEMENTS

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

EXECUTIVE SUMMARY

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. In 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 submersible 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. Distribution pipe network will extend up to Mtakatata Turnoff.
- Construction of auxiliary buildings
- Construction of two concrete service reservoirs, one at Nkhudzi Hill and another at Namiasi.
- Procurement of materials for new water connection
- Construction of 15 Communal Water Points (CWPs). The number of CWPs will increase with time.
- 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 more than 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 and those accessing water through Communal Water Points (CWP) 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 affordable water (i.e. at the communal water points) will be available within a reasonable distance and of required water quality standards. The cost of water at the communal water point is estimated at 11 tambala per litre which is 2 Kwacha per 20 litres pail. Water from hand operated boreholes in the area has high salinity levels making unpalatable for domestic use.

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 System is inline and in full compliance with the ZAMCOM agreement. The project will see an increased amount of water of 15,400 m³/day extracted from Lake Malawi. This water volume is an equivalent of 0.178 m³/sec or 0.00488km³ per year. This means that the amount of water to 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 7,804km³ (Department of Water Resources). The Mangochi Water Supply Project will, therefore, benefit Malawi in general and the target communities in particular, from the shared watercourse system of Lake Malawi-Shire River-Zambezi River; while 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 has facilitated the identification of beneficial impacts, which have been outlined in the ESMP for this ESIA report.

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) Increased and 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 (including at WCPs) 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.

a) Improved access to portable and affordable 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.

b) 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

c) 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.

d) 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.

e) 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

f) 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.

g) 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

Adverse impacts during planning and designing phase:

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

Pave the access road and 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; For every tree cut down, provide 10 tree seedlings of a similar species to be planted in the adjacent areas. The SRWB in consultations with the communities and district council should mobilise the communities for annual tree planting events; 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; 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; Paint structures in protected area with green colour to blend with environment; The Department of Parks and Wildlife must patrol Nkhudzi Bay area as part of their routine activities; Southern Region Water Board, the Departments of Parks and Wildlife, Fisheries and Forestry, Water; and the District Technical Team must sign Memorandums of Understanding (MOU) for an integrated approach to resources and ecosystems management; and conservation which shall include preparation of by-laws for protection of the project site to avoid further destruction.

Mitigation measures for fauna related impacts

Construct the water intake 300 metres outside the required 100 metres by the park; Cage the pump to protect the fish from getting inside; Pave the 300 metre access road to prevent soil erosion into the breeding grounds for fish species; For birds, study and identify nesting period, so that project activities should not disturb birds breeding; Conduct a non-intrusive area search for presence or evidence of nesting/nests before the land clearing activities. In case they are found, put appropriate buffers around the nests and clearly mark and rope off until the birds have left the nests; and Erect a barrier around the work sites and barricade all trenches and open pits and place clear signs to protect animals and people from falling into them.

f) Generation of Waste

Proposed Mitigation Measures

Provide waste collection bins where they may be needed; Sensitise workers on proper waste collection and management; Dispose waste in designated sites, in collaboration with the District Council; Provide mobile latrines and encourage the workers to be using them; Train workers on the importance of good sanitation practices; and Develop a Construction Waste Management Plan.

g) 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; The Department of Parks and Wildlife must patrol the Nkhudzi Bay area as part of their routine activities; Report accidents of people to the Department of Labour and animal injuries to Department of National Parks and Wildlife; Southern Region Water Board and the Departments of Parks and Wildlife, Fisheries and Forestry must sign Memorandums of Understanding (MOU) for resources and ecosystems management and conservation; Buy construction materials from suppliers that are licensed by the Mangochi Town Council; and Adequately supervise the construction activities and follow recommended procedures.

h) 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

i) 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.

j) 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.

k) 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.

I) 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.

m) 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.

n) 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; and Support the services of the local clinics and the Health Surveillance Assistants.

o) 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.

p) 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

q) 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.

r) 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; Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to implementation of the project;

s) 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.

t) 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 and from climate change impacts

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 **67,074,472.00 Malawi Kwacha** (1 USD is equivalent to 732.56 Malawi kwacha) **per year**; and the costs for monitoring are estimated to be**10,970,000.00 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.

TABLE OF CONTENTS

ΑϹΚΝΟΫ	NLEDGEMENTS	i
EXECUTI	IVE SUMMARY	ii
LIST OF 1	TABLES	xix
LIST OF F	FIGURES	xx
LIST OF A	ACRONYMS	xxi
Chapter	1 : BACKGROUND AND INTRODUCTION	1
1.1.	PROJECT BACKGROUND	1
1.2.	EXISTING MANGOCHI WATER SUPPLY SYSTEM	2
1.2.1	Water Source	2
1.2.2	Water Treatment plant	2
1.2.3	Storage Facilities	2
124		3
1.2.4	Water Quality Assessments	J
1.2.5		····· 5
1.3.		3
1.4.	PROJECT LOCATION	3
1.5.	PROJECT JUSTIFICATION	5
1.6.	PROJECT PROPONENT	5
1.7.	PURPOSE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	5
1.8.	SCOPE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	6
1.9.	METHODOLOGY FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSME	NT 7
1.10.	STRUCTURE OF THE REPORT	9
Chapter	2 : DESCRIPTION OF THE PROPOSED PROJECT	11
2.1.	PROJECT ACTIVITIES FOR THE PLANNING PHASE	11
2.2.	MAIN PROJECT COMPONENTS AND ACTIVITIES FOR THE CONSTRUCTION PH	ASE
	12	_
2.2.	.1 Construction of a new water intake structure, raw water pumps and auxil	iary
2.2	 Construction of the new water treatment plant 	12
2.2.	.3 Construction of water storage/service reservoirs	12
2.2.	.4 Construction of pipeline networks	14
2.2.	.5 Construction of communal water points	16
2.2.	.6 Construction of auxiliary buildings	16
2.2.	.7 Construction of access roads	16
2.3.	PROJECT COMPONENTS AND ACTIVITIES FOR DEMOBILISATION AND OPERA	TION
2.3.	.1. Components and activities during demobilization phase	16
	- •	

2.3.2	2. Extraction Volumes for Mangochi Water Supply Project	17
2.4.	LABOUR AND MATERIAL REQUIREMENTS FOR PROJECT ACTIVITIES	18
2.5.	PROJECT COST	20
2.6.	ENVIRONMENTAL CONSIDERATIONS	21
2.7.	WASTE MANAGEMENT	22
Chapter 3	3 : PROJECT ALTERNATIVES CONSIDERED	24
3.1.	THE "NO ACTION" OPTION	24
3.2.	FCONOMIC ALTERNATIVES	25
33		25
Chaptor		23
chapter 2	A PROJECT RELEVANT POLICT, LEGAL AND ADMINISTRATIVE FRAMEWORK	54 24
4.1.	Constitution of the Republic of Malawi (1966)	34
4.2.	ENVIRONMENTAL MANAGEMENT IN MALAWI	34
4.3.	POLICY FRAMEWORK	35
4.3.1	1. The National Water Policy (2005)	35
4.3.2	2. The National Environmental Policy (NEP, 2004)	35
4.3.3	3. The National Gender Policy (2005)	36
4.3.4	4. The National HIV and AIDS Policy	36
4.3.5	5. The Malawi National Land Policy (2002)	36
4.3.6	5. National Sanitation Policy 2006	37
4.3.7	7. The National Forestry Policy of 2016	37
4.3.8	 National Parks and Wildlife Policy (2000) 	38
4.3.9	National Cultural Policy (2005)	38
4.4.	LEGAL FRAMEWORK	39
4.4.1	 The Environment Management Act (EMA, 2017) 	39
4.4.2	2. Land Act (2016)	39
4.4.3	3. Water Works Act (1995)	40
4.4.4	4. The Water Resources Act (2013)	40
4.4.5	5. Local Government Act (1998)	40
4.4.6	The Occupational Safety Health and Welfare Act (1997)	41
4.4.7	7. Forestry Act (1997)	41
4.4.8	3. Gender Equality Act (2013)	41
4.4.9	 National Parks and Wildlife (Amendment) Act, 2017 	42
4.4.1	10. Monuments and Relics Act (1990)	42
4.5.	SUBSIDIARY LEGISLATION	43
4.5.1	1. Guidelines for Environmental Impact Assessment (1997)	43
4.5.2	2. EIA Guidelines for Water Sector Projects (2006)	43
4.5.3	3. The Malawi Growth and Development Strategy III (MGDS III)	43
4.5.4	 Environment Management (Waste Management and Sanitation) Regulations, 	
2015	5 44	
4.5.5	 Environment Management (Waste Management (Plastics) Regulations, 2015. 	44

4.7.	ENVIRONMENTAL STANDARDS IN MALAWI	45
4.8.	1972 WORLD HERITAGE CONVENTION	46
4.9.	WORLD HERITAGE IMPACT ASSESSMENT PRINCIPLES	46
4.10.	RELEVANT INTERNATIONAL ENVIRONMENTAL/SOCIAL AGREEMENTS	48
Chapter 5	5 : DESCRIPTION OF THE PROJECT ENVIRONMENT	51
5.1.	PHYSICAL CHARACTERISTICS OF THE PROJECT AREA	51
5.1.1	1. Spatial location	51
5.1.2	2. Climate (rainfall and temperature)	51
5.1.3	3. Topography and soils	51
5.1.4	4. Land use patterns	52
5.1.5	5. Settlement patterns	52
5.1.6	5. Geology	52
5.1.7	7. Seismicity	52
5.1.8	8. Hydrology	53
БЭ		E /
5.2.	BIOLOGICAL CHARACTERISTICS OF THE AREA	54 E /
5.2.1	Flora of the Project Area	54 E /
5.2.2	2. Flora of the Project Area	54 E /
5.2.3	 Threatened and endemic nora species of the project area Protected tree energies 	54
5.Z.4	For the species of the project area	54
5.2.5	5. Invasive Allen Species (IAS) of the project area	54
5.2.6	5. Tree Density Estimates	50
5.2.7	7. Fauna of Wangochi District	57
5.2.7	7.1. Mammais	57
5.2.7	7.2. Biras	58
5.2.7	7.3. Inreatened, endemic and invasive bird species recorded from the project	
area	60	
5.2.7	7.4. Reptiles	60
5.2.7 area	 Threatened, endemic and Invasive reptile species recorded from the projec 61 	t
5.2.7	7.6. Amphibians	61
5.2.7	7.7. Threatened, endemic and invasive reptile species recorded in the project	-
area	is 62	
5.2.7	7.8. Fish	62
5.2.7	7.9. Threatened and endemic fish species	62
5.3	SOCIO-ECONOMIC SETTING	64
5.3.1	1 Population Characteristic	64
5.3.2	2 Ethnicity and Language	64
5.3.3	3 Religion	65
5.3.4	4 Culture	65
5.3.5	5 Livelihood and Income	67
5.3.6	6 Education	67
5.3.7	7 Health situation for the project area	69
5.3.8	3 Agriculture	70
5.3.9	9 Tourism	71

5.3.	.10 Trade and Commerce	71
5.3.	.11 Transport, Telecommunication and other services	72
5.3.	.12 Energy	72
5.3.	14 Access to Water	
5.3	15 Gender and Sustainable Development	
5.3.	.16 Degree of Gender Mainstreaming	
Chapter	6 PUBLIC CONSULTATIONS	
6.1.	OBJECTIVES OF THE PUBLIC CONSULTATIONS	
6.2.	APPROACH, TARGET GROUPS AND ENGAGEMENT METHODS	77
6.3.	CONSULTATION OUTCOMES	
6.4.	PUBLIC HEARING CONSULTATION OUTCOMES	
Chapter	7 : ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACT	
7.1.	METHODS FOR IMPACT IDENTIFICATION	
7.2.	ANALYSIS OF POTENTIAL BENEFICIAL IMPACTS	
7.3.	ANALYSIS OF POTENTIAL ADVERSE IMPACTS	
7.4.	Significance rating of the Environmental and Social impacts	103
7.5.	IMPACT SIGNIFICANCE RATING FOR THE IDENTIFIED IMPACTS	106
Chapter	8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN	109
8.1	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN TABLE	109
8.2	COST FOR ENVIRONMENTAL AND SOCIAL IMPACTS MANAGEMENT	130
Chapter	9 : ENVIRONMENTAL AND SOCIAL MONITORING PLAN	131
9.1.	ENVIRONMENT AND SOCIAL MONITORING PLAN ACTIVITIES	131
9.2.	SUMMARY OF MONITORING COST	175
9.3.	INSTITUTIONAL RESPONSIBILITY FOR MONITORING	175
9.3.	.1. National level monitoring	
9.3.	.2. Southern Region Water Board	
9.3.	One of the set of	1//
9.3.	5 Schedule of reporting	178
9.3.	.6. Gender mainstreaming and inclusion of vulnerable groups	
9.3.	.7. Monitoring by the construction contractor	
Chapter MANAG	10 : WORLD HERITAGE AND VISUAL IMPACT: OUV, INTEGRITY, PROTE MEMENT OF LMNP WORLD HERITAGE SITE	CTION AND
10.1.	KEY ISSUES ADDRESSED	
10.2.	METHODOLOGY FOR ASSESSMENT OF WORLD HERITAGE AND VISUA 181	L IMPACT
10.3.	OUV OF LAKE MALAWI NATIONAL PARK WORLD HERITAGE SITE	

10.4.	Wo	rld Heritage Attributes and Sensitivity to Change	182
10.5.	AES	THETICS IMPACT ASSESSMENT	184
10.	5.1.	Visual Character	185
10.	5.2.	Thresholds of Significance	185
10.	5.3. E 1	Visual Character and Compatibility	185 106
10.	5.4. 5.5.	Signage	186
10.6.	LEV	EL OF SIGNIFICANCE AFTER MITIGATION	186
10.7.	REC	OMMENDED WORLD HERITAGE MITIGATION MEASURES	186
10.8. MITIG	ASS iATIO	ESSMENT AND EVALUATION OF CULTURAL HERITAGE IMPACTS AND THEII N MEASURES	R 187
10.8.1	. Sun	nmary of the Cultural Heritage Impacts	187
10.8.2	2. Mit	igation Measures	188
10.8.3	8. Det	ermination of Site Cultural Significance and Values	188
10.9.	ASS	ESSING CULTURAL SIGNIFICANCE	190
10.10	. BUC	OGET FOR MITIGATION MEASURES OF HERITAGE RESOURCES	191
Chapter	11 : 0	CONCLUSION AND RECOMMENDATIONS	192
11.1.	CON	ICLUSION	192
11.2.	REC	OMMENDATIONS	192
Refer	ences		194
APPE	NDIX	1: TERMS OF REFERENCE	195
APPE	NDIX	2: THE INTAKE STRUCTURE AND AUXILIARY FACILITIES	204
APPEI INFRA	NDIX STRU	3: NEW WATER TREATMENT PLANT AND OTHER SUPPOTING ICTURE	206
APPE	NDIX	4: WATER STORAGE/SERVICE RESERVOIR AT NKHUDZI HILL	207
APPE	NDIX	5: PROPOSED PIPELINE AND ACCESS ROAD TO THE MAIN WATER TANKS	208
APPE	NDIX	6: ZAMCOM'S POSISITION TO EXTRACTION OF WATER.	209
APPE	NDIX	7: CONSULTATION COOMENTS/ OUTCOMES	211
APPE	NDIX	8: LIST OF PEOPLE CONSULTED	246
APPE	NDIX	9: LOCAL NAMES FOR FLORA AND FAUNA IN THE PROJECT AREA	260
APPE	NDIX	10: HOUSEHOLD SOCIO-ECONOMIC SURVEY QUESTIONNAIRE	263
APPE	NDIX:	11: KEY STAFF FOR THE ASSIGNMENT	272

LIST OF TABLES

Table 2-1: Pipelines to be laid for distribution systems under the project	15
Table 2-2: Major equipment and materials	18
Table 2-3: Cost estimate for the proposed project	20
Table 2-4: Management of wastes generated from the proposed project	22
Table 3-1: Comparison of costs for tank location alternatives	26
Table 3-2: Comparison of costs for tank location alternatives	28
Table 4-1: Regulatory licences and approvals relevant for the project	44
Table 4-2: Relevant Environmental Standards	45
Table 4-3: Relevant Conventions or Treaties	50
Table 5-1: Flora species recorded from the project area and their conservation stat	: us. 55
Table 5-2: Estimated total number of trees to be removed	57
Table 5-3: Bird species recorded from the project area and their conservation state	ıs 59
Table 5-4: Reptile species recorded from the project area and their conservation st	atus61
Table 5-5: Amphibian species found in the project area and their conservation stat	us 62
Table 5-6: Fish species found in the project area and their conservation status	63
Table 5-7: Recorded cultural heritage sites	66
Table 7-1: Environmental matrix used in the study	81
Table .7-2: Climate change effects and impacts	101
Table 7-3: Criteria for Ranking Factors for Consequences and Probability	104
Table 7-3: Significance Rating of the Impacts	106
Table 7-4: Impact significance rating before the mitigation measures are applied	106
Table 8-1: Environmental and Social Management Plan for the Project	110
Table 8-2: Summary of Environmental and Social Management Costs	130
Table 9-1: Environmental and Social Monitoring Plan	132
Table 9-2: Cost for monitoring activities	175
Table 10-1: World Heritage Impact Assessment Matrix (Positive or Negative)	181
Table 10-2: World Heritage OUV and Sensitivity to Change	183
Table 10-3: Impact Assessment on World Heritage Resources	184
Table 10-4: preliminary site prioritization classification	189
Table 10-5: Costs for mitigation and monitoring of CHIA Management Measures	191

LIST OF FIGURES

Figure 1.1: Location for Mangochi water supply system extension project in Malawi	4
Figure 5.1: Ethnicity (Household Survey August, 2019)	65
Figure 5.2: Composition of the religions (Household Survey August, 2019).	65
Figure 5.3: Income sources in the project area (HH survey, August 2019)	67
Figure 5.4: Income per month (Household survey, August 2019)	67
Figure 5.5: Education levels for Mangochi Town (Household survey, August 2019)	68
Figure 5.6: Challenges in accessing education.	69
Figure 5.7: Common diseases the project area	69
Figure 5.8: distance to health care services	70
Figure 5.9: Agricultural Challenges	71
Figure 5.10: Types of fuel used for cooking	72
Figure 5.11: Sources of Lighting	73
Figure 5.12: Types of toilets in the project area	73
Figure 5.13: Water Sources	74
Figure 5.14: Water Supply Challenges-Mangochi Town	75
Figure 5.15: distance to water sources	75
Figure 5.16: Water Treatment	75
Figure 5.17: Willingness to Pay	76

RATE OF EXCHANGE: US\$= MK 813

LIST OF ACRONYMS

	Acquired Immune -Deficiency Syndrome
BOO	Bills of Quantities
	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
	Late Iron Age
LSA	Late Stone Age
MBS	Malawi Bureau of Standards
MDUS	Malawi Development Growth Strategy
	Manitoring Information and Evaluation Officer
MDC	Malawi Dostal Corporation
mPV/C	Modified polyginyl chloride
MTI	Malawi Telecommunications Limited
ΝΑΡΑ	National Adaptation Programme of Action
NFAP	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
OUV	Outstanding Universal Value
SEP	Social Economic Profile
SIIS	Sexually Transmitted Infections
	Telesem Networks of Malawi
	Telecom Networks of Middwi United Nations for Education, Scientific and Cultural Organization
	United Nations for Education, Scientific and Cultural Organization
UPVC USS or S	United States Dollars
	Village Natural Resource Management Committee
VSCS	Village Sanitation Committee
VSI	Village Savings and Ioan
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 socioeconomic 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 cost of water at the communal water point is estimated at 11 tambala per litre which is 2 Kwacha per 20 litres pail.

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 11.

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 Aluminium 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 250m³ tank. Water from the 250m³ 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.



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

1.5. PROJECT JUSTIFICATION

As detailed in the Feasibility Study report for Water Supply to Mangochi Town, water demand for the project depends on the size of the population served, their standard of living, activities carried out and the cost of water supplied. It also depends on the existence and level of institutional, social and economic establishments and water supply service. The water demand for the project has been determined for different user categories considering the present and future development of the areas of which population growth and tourism are part. It implies that the amount of water to be extracted will still be 15,400 m³/day as it already encompasses both population growth and development.

The proposed extension of Mangochi Water Supply Project is inline and in full compliance with the ZAMCOM agreement. The project will see an increased amount of water of 15,400 m³/day extracted from Lake Malawi. This water volume to be extracted is an equivalent of 0.178 m³/sec or 0.00488km³ 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 7,804km³ (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; while ensuring adequate protection of the watercourse system.

Through consultation with the Water Resources Authority, it was confirmed that the quantity of water to be abstracted and to be used for this project is quite and will not affect the lake's water flow. The project is in compliance with the requirements of both the Water Resources Authority and the Zambezi Watercourse Commission (ZAMCOM), of which Malawi is a member. ZAMCOM is a group of 8 countries who share water resources. In line with the ZAMCOM procedures, a notification for the project was sent to the Commission for their consent and the response from ZAMCOM is provided in appendix 6.

1.6. 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

1.7. 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.

1.8. 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 are incorporated and evidence of the consultations is provided in Appendix 8.

- 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 that the water supply project would have on the Outstanding Universal Value (OUV) of Lake Malawi National Park as a World Heritage Site, its integrity, 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:** Determining costs for implementing the recommended mitigation measures. The cost estimates were based on similar works implemented recently in Malawi.

1.9. 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 Southern Region Water Board (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; the project's feasibility study reports and baseline heritage profile reports relevant 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 field 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 is located); and other various stakeholders. Consultations were also carried out at the national, regional and district levels. The outcomes of these consultations are provided in Appendix 7; while the list of people consulted is given in Appendix 8. 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. 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 Council, 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 Questionnaires

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 10.

• Focus Group Discussions (FDGs)

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.

1.10. 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 physical, biological, socioeconomic, cultural and world heritage aspects of the project area. Biological aspects include flora and fauna. Socioeconomic aspects cover population characteristics, health situations, agriculture and degree of gender mainstreaming among others. Cultural and World Heritage aspects include the archaeological heritage resources and other cultural sites 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 : 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 ESIA, 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:** Water Waste and Environment Consultants (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 and auxiliary facilities (Appendix 2) shall consist of the following four main components:

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 80m³/hour at a delivery head of 30m and will be submerged to a depth of 3m below the lake water level.

b) <u>Pier Bridge</u>

A pier bridge shall be constructed 300m into the Lake. This is to provide access for repair/maintenance and operation needs of the submersible pumps. The bridge shall be constructed of stainless steel. The depth at which the bridge will be constructed 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) <u>Control Room</u>

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 and Appendix 3).



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

The plant will consist of the following facilities:

a) <u>A Mixing chamber</u>

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) <u>Two Clarifiers/sedimentation tanks</u>

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

c) <u>Three pressure filtration cylinders</u>

3 pressure filters each with a filtration capacity 1,88m³ 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) <u>Standby generators for power failure emergency procedures</u>

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) <u>A balancing tank which will also serve as a clear water storage reservoir</u>

A reinforced concrete tank of 600m³ 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) <u>A high lift clear water pumping station</u>

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 80m³/hr, at a pumping head of 170 m from the clear water balancing tank at the treatment plant to a service reservoir to be placed at Nkhudzi Hill.

2.2.3 Construction of water storage/service reservoirs

Two service reservoirs will be constructed; one of reinforced concrete with a capacity of 4,000 m³ to be built at Nkhudzi Hill (UTM coordinate location 36L 715111E and 8432239N), and another of 300m³ capacity which will be an elevated steel tank to be erected on steel columns at Namiasi. The tank at Nkudzi Hill (Appendix 4) 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.

Item	Areas/sections to	Pipeline	Pipe	Pipe	Pipe
	be covered by	length	diameter	material	pressure
	pipeline	(m)	(mm)		class
	ſ	MAIN LINES			
1	Nkudzi Reservoir to	600	360	DI	
	Nkhudzi T/Off				
		1950	360	PVC	12
2	Nkudzi T/Off to	5500	260	PVC	12
	Mtakataka				
3	Nkudzi to Sun 'n'	16750	315	PVC	12
	Sand				
		200	300	GI	
4	Sun 'n' Sand to	19850	260	PVC	12
	Sawa Camp				
		200	250	GI	
5	Sawa to Bishops	3250	260	PVC	12
	House				
Subtotal length		48300			
of mains					
	SECONDA	RY LINES-BRA	ANCHES		
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	650	90	PVC	6
	Resort				
18	Maldeco	700	110	PVC	6
19	Pamadzi Hotel	1500	160	PVC	6
20	Andrews	550	90	PVC	6
Subtotal length		27000			
secondary lines					
	TERTIARY LINES				

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
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

SWRB plans to construct 15 kiosks/CWPs for a start; and additional ones will be constructed at a later stage. The 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. Southern Region Water Board is planning on meeting members from Koche Water Users Association (WUA) to come up with ways on how the WUAs can co-exist in the area.

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 see Appendix 5. 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 bo15th 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 m³/day will be abstracted from Lake Malawi. This volume of water is equivalent to 0.157 m³/sec or 0.00491km³ 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 7,804km³ (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 m³/sec and 120 m³/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 29,600km². The average evaporation rate from Lake Malawi is 1,500m³/s which is far greater than the 0.157m³/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 0.157m³/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. The number of communal water

points is planned to increase with time. 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.

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

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
				foundation bases,
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 could be sourced from nearby quarries	Completed structures
10.	River sand and gravel	For concrete formulation and other construction works including use in filters for treatment of water	To be bought from suppliers	Completed structures including filters for water treatment,
11.	Cement	For concrete formulation and other construction works	To be sourced locally or outside the country depending on quantity, quality and cost factors.	Completed concrete/brick structures
12.	Water	For concrete formulation and other construction works	To be sourced from approved suppliers	Potable water Polluted water

SN	Equipment or material	Use of the equipment or material	Source of the material	Output or product/ by-product
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.

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	221,912.00	162,563,854.72
	construction		
3	Construction of new water treatment plant at	3,924,258.00	2,874,754,440.48
	Nkudzi Bay (of capacity 13,452m ³ /day)		
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	1,494,091.00	1,094,511,302.96
	capacities)		
7	Construction of distribution pipelines Including	5,921,399.00	4,337,780,051.44
	Communal Water Points and provision of		
	10,000 prepaid meters		
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

No	ITEM	COST (US\$)	COST (MWK)
11	Construction of auxiliary buildings i.e. pump- houses, operators buildings, staff houses,	195,131.00	142,945,165.36
	stores, and office block		
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.

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).	
Saw Dust	✓ Saw dust will be used as an absorber where leaking oils will be made to fall to avoid soil contamination	
	\checkmark 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	I hese will be recycled where possible. Otherwise they will be put in bins	
Papers	then thrown into waste collection skips and arrangements will be put in	
and other	place to get the collected waste disposed at waste disposal sites for the	
plastics	Mangochi Town Council.	
Diffice	 Office papers will be recycled where possible. Otherwise, they will be pu in bins then thrown into waste collection skips and arrangements will be 	τ
rapers	nut in place to get the collected waste disposed at waste disposal sites	;
	for the Mangochi Town Council.	

Table 2-4: Management of wastes generated from the proposed project

Waste type	Management
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	✓ Pit latrines will be constructed at construction sites to allow for proper
waste	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

Several factors are considered when determining location of water supply system infrastructure. Some of these include supply area, elevation, distance from power lines, economic viability and sustainability of the system in term of operation and maintenance. The preferred option has to meet these and other criteria.

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 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 salty taste. 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.

3.3.2. 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 than 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 favourable 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

3.3.3. The intake structure

Two types of intake structures (a floating bridge and a bridge platform onto which the raw water pipeline can be anchored were considered). A comparison of the two is as follows:

Floating Bridge	Bridge Platform
Complete blockage of access along	The bridge platform onto which the raw water
the whole 300m span	pipeline is to be anchored will be accessible to
	tourists.
Disturbances to the marine life and	The bridge would avoid disturbance of activities
aquatic life	along the beach.
High vulnerability to vandalism as the	A dry tower design, with screened inlet to protect
floating blocks can be used by the	aquatic life (fish), from entering into the pump
fishermen for their fishing activities.	
	The minimum height of the intake bridge will be
	4m above the maximum water level. This height
	is sufficient for the local fishermen to sail through
	the bridge.
	The intake bridge will add value to the lake
	scenery since tourists can walk over for a better
	view of the lake.
	Low velocity through the screen (0.08 m/s.) such
	that the smallest fish that find its way into the cage
	can easily swim back.

Table 3-1:	Comparison	of costs for	r tank location	alternatives
I able J-I.	Companson	01 00303 101		allematives

In the assessment, it was found that in view of the nature of the area, a floating structure had a lot of disadvantages in comparison with the bridge platform. The design of the proposed intake structure is attached in Appendix 2.

3.3.4. Alternatives for tank location

Namakoma and Nkope Hill were surveyed for alternative tank locations. It was discovered that Namakoma Hill (10km away from the proposed water treatment plant) was not suitable to generate the required head for supply of water to reach all the areas proposed for the water supply improvement. It was also noted that the cost of the project would be higher than positioning the tank at Nkhudzi Hill due to intricacies of long pipeline from the water

treatment plant. This would also result in high hydraulic losses and increased maintenance costs. Other disadvantages would include more excavation for pipe laying, high cost for pipes and fittings which form a substantial part of the project cost; high costs for larger pumps, electricity and solar equipment. These costs are estimated at US\$8,460,232.

The operational costs would increase (power consumption would increase from 180kw to 305kw, translating into additional operating costs of \$26,051 .29 (MK21,179,700).

Nkope Hill, which is 14km away from the Nkhudzi treatment plant (customary land) was also surveyed as an alternative site for tank installation. It was found that the cost of implementation will increase with an additional cost of \$11,075,108.00 (refer to table 3.1).

3.3.5. Pumping costs for the tank location alternatives

Pumping to Nkhudzi Hill requires 180kW pumping power capacity (540kW for 3 pumps). The water will fully gravitate to Ntakataka Turn-off and to the Bishop's House.

Pumping water to Nkope Hill will require 350kW pumping power capacity (1050kW for 3 pumps). There shall be need to add in-line pumping for the water to reach Ntakataka Turn-Off. The cost of operation for the Nkope Hill option will be more than double the cost of operation for the Nkhudzi Hill option.

In reference to table 3.1, using Nkope Hill would mean an additional operating cost of \$35,429.76 (MK28,804,392.00) per month or \$425,157.08 (MK345,652,704) per year.

Therefore, based on the construction costs and operation costs analysis, the ideal tank is Nkhudzi Hill.

3.3.6. Impacts on the Ecosystem in alternative sites

The proposed area for the access road and tank is 0.16 ha (0.21 ha including working area around the tank). This area will be required for the construction of the two features whether the project will be on Nkhudzi Hill, Namakoma or Nkope. The loss of some trees and associated vegetation will have to be replanted as a mitigation measure in all cases. On birds, it has to be noted that they exhibit long distance dispersal as such in the three sites we might encounter same species and similar populations whose impact on the project by site would be similar. Animals such as antelopes, Rock Hyrax and others their range will have minimal impact considering the area required by the project.

On fish, the breeding shorelines will be protected from siltation considering that the access road will be paved effectively minimizing ecological destruction regardless of the site.

Ecological impacts to the three alternative sites i.e. Nkhudzi, Namakoma and Nkope, by the project may not be very different but Nkhudzi Hill is at an advantage because of its World Heritage status which goes further by ensuring that other detailed assessments are carried out in terms of the Outstanding Universal Value which proposes stringent mitigation measures and management plans to prevent ecological destruction unlike Namakoma and Nkope Hills making Nkhudzi Hill a potential site for the project.

	КW	NO. Pumps	Hrs Pumping	POWER USAGE (kw hr)	30 Days Pumping	COST OF POWER (MK)/ 24hr	COST OF POWER (MK)/ 30 days	ADDITIONAL COSTS OPERATIONAL COST, MK
OPTION B PUMPS POSSIBLE								
POWER RATING	305	2	24	14,640.00	439,200.00	1,736,595.60	52,097,868.00	
OPTION A NKHUZI HILL PUMPS POWER RATING	180	2	24	8,640.00	259,200.00	1,030,605.60	30,918,168.00	
				,	.,	, , , , , , , , , , , , , , , , , , , ,	, , , ,	21,179,700.00

TABLE 3.1 A: COST OF PUMPING DURING OPERATIONS FOR NKHUZI HILL AND NAMAKOMA OPTION B

TABLE 3.1B : COST OF PUMPING DURING OPERATIONS FOR NKHUZI HILL AND NKOPE OPTION C

	KW	NO. Pumps	Hrs Pumping	POWER USAGE (kw hr)	30 Days Pumping	COST OF POWER (MK)/ 24hr	COST OF POWER (MK)/ 30 days	ADDITIONAL COSTS OPERATIONAL COST, MK
NKOPE HILL								
	350	2	24	16,800.00	504,000.00	1,990,752.00	59,722,560.00	
NKHUZI HILL PUMPS POWER RATING	190	2	24	8 6 40 00	250 200 00	1 020 605 60	20.018.168.00	
	180	2	24	8,640.00	259,200.00	1,030,605.60	30,918,168.00	
								28,804,392.00

Table 3-2: Comparison of costs for tank location alternatives

·			OPTION A		OPTION B		OPTION C	
			NKHUDZI HILL		NAMAKOMA HILL		NKC	OPE HILL
ITEM DESCRIPTION	UNIT	RATE (US\$)	QUANTITY	AMOUNT	QUANTITY	AMOUNT	QUANTITY	AMOUNT
Excavations	m3	28.13	1,293.60	36,388.97	11,400.00	320,682.00	12,600.00	354,438.00
Transmission pipeline	m	156	2,156.00	336,336.00	10,000.00	1,560,000.00	14,000.00	2,184,000.00
Distribution pipeline		96	395.00	37,920.00	9,000.00	864,000.00	12,000.00	1,152,000.00
Rehabilitation of gravel road	m	185.78	2,000.00	371,560.00	10,000.00	1,857,800.00	14,000.00	2,600,920.00
Design, supply and installation of valves Nkhudzi System	LS	130,500.00	1.00	130,500.00	_	_	-	_
Design, supply and installation of valves for Namakoma/ Nkope	LS	201,750.00	-		1.00	201,750.00	1.00	201,750.00
Installation of pumps with capacity of 321 m ³ /hr and head of 170m for Nkhudzi while head for Namakoma is 252m	No	54,657.00	3.00	163,971.00		_		-
Installation of pumps with capacity of 321 m ³ /hr and head of 252m for Namakoma	No	150,000.00	_		3.00			450,000.00

			OPTION A		OPTION B		OPTION C	
			NKHUDZI HILL		NAMAKOMA HILL		NKC	OPE HILL
ITEM DESCRIPTION	UNIT	RATE (US\$)	QUANTITY	AMOUNT	QUANTITY	AMOUNT	QUANTITY	AMOUNT
Electricals i.e. ESCOM connection, control panels, distribution boards etc. for Nkudzi Hill etc.	LS	476,355.00	1.00	476,355.00	-	-	_	-
Electricals i.e. ESCOM connection, control panels. Distribution boards etc. for Nkope	LS	2,332,000.00					1.00	2,332,000.00
Solar Power with all accessories including cables for Nkhudzi	LS	475,418.00	1.00	475,418.00		-		-
accessories including cables for Nkope	LS	1,800,000.00					1.00	1,800,000.00
TOTALS US\$				2,028,448.97		8,460,232.00		11,075,108.00

3.3.7. 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.

3.3.8. Alternatives for energy sources

Southern Region Water Board plans to install back-up solar power for pumping water to ensure that there is continuous supply of water during ESCOM power supply breakdown.

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 MolWD, 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.

Southern 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.

No	Regulations/	Regulations/ Description		Issuing
	Standards/Approvals			Institution
1.	Environmental	The certificate is provided	EMA, 1996 and	EAD
	Certificate	after approval of the ESIA	EIA Guidelines	
		report.	1997	

Table 4-1: Regulatory licences and approvals relevant for the project

No	Regulations/	Description	Reference	Issuing
	Standards/Approvals			Institution
2.	Water Abstraction	Allows the abstraction of	Water Resources	National Water
	Permit	groundwater or surface	Act (year)	Resource
		water		Authority
3.	Approval of the	Approval of project	Mangochi District	Mangochi
	project design	design, where applicable,	Council by-laws;	District Council
		will be required where	and the Physical	
		construction is to take	Planning Act	
		place in planned areas	(2016)	
4.	Planning permit	To ensure that project is	Local government	Mangochi
		implemented within the		District Council
		District Council		
		development plans.		
5.	Workplace	This regulates workers	Occupational	Ministry of
	Registration	safety and health	Safety Health and	Labour Youth
	Certificate		Welfare Act	Sports
			(1997)	Manpower
				Development
6.	National Parks and	Controls the use of	National parks	Ministry of
	Wildlife permit	national parks and wildlife	and wildlife	Forestry and
			(Amendment Act,	Natural
			2017)	Resources
7.	Title deeds	Offered as a proof for	Lands Act 2016	Ministry of
		land ownership before		Lands
		project implementation		
8.	Antiquities Clearance	Offered as proof that	Monuments and	Department of
	Certificate	Cultural Heritage Impact	Relics Act and	Museums and
		Assessment was	Antiquities Policy	Monuments
		completely carried out		
		and Rescue Archaeology		
		conducted		

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.

Standard	Title	Year of	
		Implementation	
MS 214:2013 (second	Drinking Water – Specification	2013	
Revision)			
MS 714:2005	Occupational Safety and Health	2005	
	Management Systems -		
	Specification		

Table 4-2: Relevant Environmental Standards

Standard	Title	Year of	
		Implementation	
MS 719:2005	Hazardous Waste – Management,	2005	
	Classification and		
	Disposal – Code of Practice		
MS 59:2002	Solid waste – handling, transportation and	2002	
	disposal – code of practice		
MS 730:2005	Solid waste disposal sites, guidelines for	2005	
	design		
MS 539:2013	Industrial effluents- Tolerance limits for	2013	
	discharge into inland surface waters		

4.8. 1972 WORLD HERITAGE CONVENTION

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.

According to the 1972 UNESCO World Heritage Convention, all development proposals and/or concessions that could lead to development proposals which may affect the Outstanding Universal Value of a World Heritage Site should be submitted by States Parties to the World Heritage Committee via the UNESCO World Heritage Centre (the Secretariat to the Convention) before a decision on their funding, permitting or implementation is taken by the State Party, in line with Paragraph 172 of the Operational Guidelines of the World Heritage.

Paragraph 172 of the Operational Guidelines

"The World Heritage Committee invites the States Parties to the Convention to inform the Committee, through the Secretariat, of their intention to undertake or to authorize in an area protected under the Convention major restorations or new constructions which may affect the Outstanding Universal Value of the property. Notice should be given as soon as possible (for instance, before drafting basic documents for specific projects) and before making any decisions that would be difficult to reverse, so that the Committee may assist in seeking appropriate solutions to ensure that the outstanding universal value of the property is fully preserved."

4.9. WORLD HERITAGE IMPACT ASSESSMENT PRINCIPLES

According to the International Union for the Conservation of Nature (IUCN), it recommends that Environmental Assessments for development proposals affecting natural World Heritage Sites should, as a minimum, meet the eight World Heritage Impact Assessment Principles outlined below. Any Environmental Assessments which do not meet these basic criteria are

unlikely to constitute an adequate basis for decision-making. Environmental Assessments for proposals affecting natural World Heritage Sites should:

- Principle 1: Take place as early as possible in the decision-making process in order to provide effective input to decision-makers and anticipate, avoid, and/or minimize negative impacts on the site's Outstanding Universal Value, or to stop a particular project as appropriate.
- **Principle 2:** Identify and evaluate reasonable alternatives to the proposal in order to enable the selection of the option that is the least likely to damage the site's Outstanding Universal Value, including the 'no project' option.
- Principle 3: Assess the likely environmental and social effects of the development proposal(s) on the Outstanding Universal Value of the site, including direct, indirect and cumulative effects. This assessment should consider the site's values, integrity and protection and management, as well as its connection to the wider landscape.
- Principle 4: Identify adequate mitigation measures for any residual negative impacts on Outstanding Universal Value that cannot be further reduced and indicate how these measures will be implemented, who will implement them within what timeframe, and what resources are secured for their implementation.
- Principle 5: Include a separate chapter on World Heritage impacts in the Environmental Assessment report, presenting clear conclusions on the proposal's potential negative impacts on Outstanding Universal Value.
- Principle 6: Be publicly disclosed and subject to thorough public consultation in order to ensure that the relevant stakeholders are involved, including local communities, scientists, relevant government agencies, and nongovernmental organizations. Feedback from consultation must be fully considered in the assessment of the project proposal.
- Principle 7: Propose, implement and independently audit an environmental management plan detailing designing, operating, monitoring and restoration conditions, in relation to the site's Outstanding Universal Value. The developer must set aside funds from the outset to cover the costs of independent auditing of the implementation of the Environmental Management Plan at regular intervals.
- Principle 8: Effectively integrate the conclusions of the assessment into the decisionmaking process, in order to ensure that the potential impacts of a development proposal(s) on a site's Outstanding Universal Value, as well as alternatives to the proposal(s), are fully considered in land-use planning decisions with the objective of preserving these exceptional sites for future generations.

4.10. AFRICAN DEVELOPMENT BANK BIODIVERSITY, RENEWABLE RESOURCES AND ECOSYSTEM SERVICES POLICY (Operational Safeguard 3)

The principal objective of this safeguard is to conserve biological diversity and promote the sustainable use of natural resources. It reflects and reinforces the Bank's commitments to its

policy on integrated water resources management and to the UN Convention on Biological Diversity. The safeguard reflects the importance of biodiversity on the African continent and the value of key ecosystems to the population; emphasizing the need to "respect, conserve and maintain the knowledge, innovations and practices of indigenous and local communities and to protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements.

The project (if not implemented in accordance with the designs and recommendations of this ESIA) will have significant impacts on the ecosystems and ecosystem services of the project area; with some losses of biodiversity and possible destruction of natural habitats and forests from land clearing activities. The design and mitigation measures are targeted to reinstate and/or restore any lost biodiversity through replanting of trees and rehabilitation of cleared land; hence adhering to one of the specific objectives of this operational safeguard. A number of measures have been proposed in this ESIA, to ensure that potentially harmful impacts on biodiversity are avoided, where possible, or reduced; and to ensure that the biodiversity and ecosystem restoration activities are effectively implemented for minimal loss or damage.

4.11. INTERNATIONAL FINANCE CORPORATION BIODIVERSITY CONSERVATION AND SUSTAINABLE MANAGEMENT OF LIVING NATURAL RESOURCES PERFORMANCE STANDARD

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part"; this includes diversity within species, between species, and of ecosystems.

This performance standard recognises that ecosystem services valued by humans are often underpinned by biodiversity. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services. Hence, this Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle to:

- ✓ protect and conserve biodiversity
- ✓ maintain the benefits from ecosystem services.
- ✓ promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities

This Performance Standard states that where a project is likely to adversely impact ecosystem services, as determined by the risks and impacts identification process, the client will conduct a systematic review to identify priority ecosystem services, which are two-fold: (i) those services on which project operations are most likely to have an impact and, therefore, result in adverse impacts to Affected Communities; and/or (ii) those services on which the project is directly dependent for its operations (e.g., water). When Affected Communities are likely to be impacted, they should participate in the determination of priority ecosystem services.

The performance standard stresses that as a matter of priority, clients should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. The water supply project will be developed in a protected area where there are protected, rare and endangered tree species. Hence, this ESIA study has recommended mitigation measures for reducing ecosystems interaction impacts and has also involved assessments on systems functions such as ecological, biophysical and socioeconomic environments including cultural factors. The ESIA report has been supplemented by other independent assessments and reports prepared by specialists such as Cultural Heritage Report prepared by Department of Museums and Monuments; the Environmental Audit Report on Nkhudzi Hill for the Extension of Mangochi Potable Water Supply Project at Nkhudzi Bay, prepared by the Geological Survey Department. This is to ensure that all components of the ecosystem and all impacts are considered and integrated during project implementation.

4.12. INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE ENVIRONMENTAL & SOCIAL MANAGEMENT SYSTEM (ESMS): STANDARD ON BIODIVERSITY CONSERVATION AND SUSTAINABLE USE OF NATURAL RESOURCES

The Environmental and Social Management System (ESMS) is an intrinsic part of IUCN's project cycle. It provides systematic steps and operational tools for managing the environmental and social performance of projects implemented or supported by IUCN. The system allows IUCN to identify potential negative environmental or social impacts and develop suitable measures to avoid, minimise, or compensate for these impacts. It also ensures that the implementation and effectiveness of mitigation measures are monitored and that any impacts arising during execution of the project are addressed.

The ESMS is based on 8 principles and 4 standards of which the standard on Biodiversity Conservation and Sustainable Use of Natural Resources is a component.

As a conservation organisation, it is IUCN's overall objective "to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. <u>IUCN</u> recognises that because competition is increasing for natural resources, such as water, land and biodiversity, IUCN projects often address a complex array of multiple needs for natural resources, where some needs might have to be given priority over others with the risk of causing negative impacts on some elements of biodiversity.

The purpose of this standard is to add an extra safety step to the IUCN project design process allowing for a systematic check to ascertain that IUCN projects: (i) do not adversely impact biodiversity, ecosystem services and natural resources or, *if avoidance is not possible, that impacts are minimised to a negligible or acceptable level*; (ii) adopt an integrated approach that considers the entire ecosystem with its multiple functions, goods and services and the complex interactions between humans and the living and non-living environment; (iii) ensure the integration of the rights of people, different
societal visions and choices in nature conservation strategies; and (iv) sustain ecosystem services to maintain their benefits to communities who depend on them for their livelihoods.

The standard also states that where project activities are located within a legally protected area or an internationally recognised area, the project must assure that activities are consistent with existing protected area management plans and that relevant stakeholders (protected area sponsors and managers, local communities, indigenous peoples and other key stakeholders, as relevant) are appropriately consulted.

4.13. 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

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 1968 and Natural Resources		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.

Table 4-3: Relevant Conventions or Treaties

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 14⁰23'34.66" S and longitude 35⁰20'47.69" 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. Seismicity

According to the Geological Surveys Department, Mangochi District is within the 'Makanjila Bilila Area', which is characterized by low magnitude and low probability for earthquakes (except for the 1989 moderate earthquake which occurred in Salima, with a magnitude of 5.3 and 6.3 respectively). The closest faults to the proposed construction site are Mwanjage (approximately 95km long) on the eastern side of Lake Malawi and the Bilila-Mtakataka (approximately 100km long) on the western side of the lake. The Bilila-Mtakataka fault is about 42km on the western part of Mangochi district. Recurrence period for Bilila-Mtakataka has a return period of 3400 years. All other alternative hills (including the Nkope Hill) are

within the Makanjila Bilila Area. These hills have similar formation, rock and seismicity characteristics.

5.1.8. 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).

5.2.2. Flora of the Project Area

A total of 73 flora species (table 5.1 and appendix 9 for local names) were recorded from the proposed project area comprising Mangochi Town, Mtakatata Turn-off, Lakeshore resorts of Lake Malawi and Nkhuzi Bay near Monkey Bay. 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).

5.2.3. 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.

5.2.4. 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.

5.2.5. 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

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

Table 5-1: Flora species recorded from the project area and their conservation status.

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

5.2.6. Tree Density Estimates

The majority of flora species in the proposed project area belonged to the *genera Brachystegia, Combretum and Uapacca.* The tree density estimated during the field assessment of the Nkhudzi hill project area shows an average of 23 natural trees per hectare. The tree 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

On the other hand, the tree density estimates, as determined by the Department of National Parks and Wildlife for the wider Nkhudzi area is 32. Hence, using this higher tree density, it is estimated that the total number of trees to be lost will be 17, broken down per project activity site on Nkhudzi Hill and outside Nkhudzi Hill as presented in table 5.2. below:

	Length	Width	Area		Number of		
	(m)	(m)	(m²)	Area (ha)	Trees		
ESTIMATED NUMBER	OF TREES T	O BE REM	IOVED FRO	OM NKHUDZI	HILL		
Access road at Nkhudzi Hill	300	5	1500	0.15	5		
Required area for the tank	5	10	50	0.01	1		
Working area around the tank	15	30	450	0.05	1		
ESTIMATED NUMBER OF T	REES TO BE	REMOVE	D FROM C	UTSIDE NKHU	JDZI HILL		
Pipeline to the treatment	Pipeline to the treatment						
plant	550	3	1650	0.17	5		
3 Staff houses/ offices	30	50	1500	0.15	5		
ESTIMATED TOTALS FOR THE WHOLE PROJECT 1.87 17							

Table 5-2: Estimated total number of trees to be removed.

5.2.7. 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.

5.2.7.1. Mammals

The mammal species in Lake Malawi National Park commonest seen include baboon (*Papio ursinus*), vervet monkey (*Cercopithecus alboqularis*), rock hyrax (*Procavia capensis*) and squirrel (*Paraxerus cepapi*). Antelopes include klipspringer (*Oreotraqus oreotraqus*), bushbuck (*Tragelaphus scriptus*), grysbok (*Raphicerus sharpie*) and Common duiker (*Silvicapra grimmia*) on all mainland hills. There are records for leopards (*Panthera pardus*) and hyena (*Crocuta crocuta*) on the mainland of Cape Maclear. However, the common species

of mammals in the study area sited are rock hyrax (*Procavia capensis*), baboon (*Papio ursinus*), monkeys (*Cercopithecus alboqularis*) and squirrels (*Paraxerus cepapi*). Pangolins (*Smutsia gigantean*) are recorded to be sited outside the National Park in the cultivated field at Malembo area.

The large mammal species for the property are Hippo (*Hippopotamus amphibious*) and once the Elephant (*Loxodonta africana*) before being translocated in 2008 to Majete Wildlife Reserve. The Elephants were not resident in the Park but occasionally visited from Phirilongwe coming down to the lake between Mwenya and Nkhudzi Hill. These elephants were translocated from Phirilongwe to Majete Wildlife Reserve in 2008 following the frequent deadly conflicts with the communities in the Nankumba Peninsula where human lives and property have been lost. All the 83 elephants were translocated to Majete Wildlife Reserve where the population now has significantly increased which is now supplying other protected areas in Malawi.

The other large mammal, the Hippo, which commonly occurs at Nkhudzi Spit which is about 7km from Nkhudzi Hill, the site for the proposed tank. Hippos in the Nankumba Peninsula are concentrated in the marshes at the base of the south-end arm of Lake Malawi and around the mouth of the Lisangadzi River, as well in the Monkey Bay Dambo and rarely visit Nkhudzi Hill the proposed project site. Therefore, the project will have minimal impact on breeding of the animals.

5.2.7.2. 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).

According to the Department of National Parks and Wildlife, Lake Malawi National Park has about 360 bird species. The common species being the African Fish Eagle (*Haliaeetus vocifer*), Hammerkop (*Scopus umbretta*), White-winged Black Tern (*Chlidonias leucopterus*) Pied Kingfisher (*Ceryle rudis*), White breasted Cormorant (*Phalacrocorax lucidus*), Reed Cormorants (*Microcarbo africanus*), Grey Headed Gull (*Chroicocephalus cirrocephalus*) and African Pied Wagtail (*Motacilla aguimp*).

Information on avifauna or birds was obtained through literature review and 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.

During the survey 56 species were recorded as presented in table 5.3. The habitat of these species will not be significantly affected, as the project area where the tank and the access road will be constructed as well the working area in the National Park occupies only 0.21 hectares.

LOCAL NAME	SCIENTIFIC NAME	IUCN RED-LIST
Richard's Pipit	Anthus richardi	Least Concern
Grey Heron	Ardea Cinerea	Least Concern
Hammerkop	Scopus umbrette	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 delegorquei	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
African Pied Wagtail	Motacilla aguimp	Least Concern

 Table 5-3: Bird species recorded from the project area and their conservation status

Yellow-fronted Canary	Serinus mosambicus	Least Concern
Bronze Manikin	Spermestes cucullate	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
White-winged Black Tern	Chlidonias leucopterus	Least Concern
White breasted Cormorant	Phalacrocorax lucidus	Least Concern
Reed Cormorants	Microcarbo africanus	Least Concern
Grey Headed Gull	Chroicocephalus cirrocephalus	Least Concern
Pin-tailed Whydah	Vidua macroura	Least Concern
Village Indigo Bird	Vidua chalybeate	Least Concern

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

No threatened or endemic bird species were recorded from the proposed project area of Nkhudzi Bay. 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. Birds have longer dispersal distances thus the area of the project taken by the access road and tank will not affect many nesting sites as such the project will have minimal impact on their breeding.

5.2.7.4. 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.

According to information from the Department of National Parks, 20 species of snake are available in the park. However, in the project areas they were not encountered but the possibility of availability is there. Crocodiles and Water Monitors are the common species that can be found along the lake. This habitat is away from the project area.

During the survey, a total of seventeen (17) reptile species were recorded from the study area, as presented in Table 5.5.

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

Table 5-4: Reptile species recorded from the project area and their conservation status

5.2.7.5. 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.

5.2.7.6. 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 recorded from the study area are presented in table 5.6.

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

Table 5-5: Amphibian species found in the project area and their conservation status

5.2.7.7. 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.

5.2.7.8. 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.

According to information from the Department of National Parks and Wildlife, 47 species of Mbuna (cichlids) are available around Nkhudzi Bay water shore line (table 5.6). During the survey, fish species that were also encountered included: *Labeo mesops* (Ntchila), *Oreochromis lidole* (Chambo), *O. karongae* (Chambo), *Tilapia shirensis* (Makumba), *Haprochronis* sp., (Kambuzi), *Barbus paludinosus* (Matemba) and *Claris liocephalus* (Mulamba).

5.2.7.9. Threatened and endemic fish species

Mbuna (cichlids) is a protected and endemic species for Lake Malawi. Another species, *Oreochromis karongae* (chambo) was recorded from the waters of Nkhudzi Bay. This species is classified as Critically Endangered.

The status of the endangered or endemic fish species would not be further exacerbated by the project activities because:

• The intake will be at 300 metres which is outside the required 100 metres by the park.

- The pumps will be caged to protect the fish from getting inside, and in the event that the fish gets inside the pumps have been designed to pump water at a very low velocity of 0.08 metres/second to allow the fish to swim out.
- Soil erosion will be prevented by paving the 300 metre access road thus breeding grounds for fish species will be protected from siltation.

Pseudotropheus zebra	Least Concern
P. livingstonii	Least Concern
P. zebra 'mazinzi'	N/A
P. elegans	Least Concern
P. zebra 'fusco'	N/A
P. zebra 'masinje'	N/A
P. cf gracilior	N/A
P. tropheops 'orange chest'	N/A
P. tropheops 'boad mouth'	N/A
P. cf. novemfasciatus	N/A
P. tropheops 'boadzulu'	N/A
P. tropheops 'black dorsal'	N/A
P. tropheops 'yellow gular'	N/A
P. willamsi 'nkudzi'	Near threatened
P. willamsi 'makanjila'	Near threatened
P. elongatus 'aggressive'	N/A
P. elongatus 'yellow tail'	N/A
P. elongatus 'boadzulu'	N/A
P. elongatus 'reef'	N/A
P. elongatus 'brown'	N/A
P. lucerna 'brown'	Least Concern
Melanochromis melanopterus	Least concern
M. auratus	Least concern
M. vermivorus	Near threatened
M. simulans	Least concern
M. johanni	N/A
M. 'blotch'	N/A
M. 'lepidophage'	N/A
M. cf. Brevis	N/A
M. crabro	N/A
Petrotilapia tridentriger	Least concern
P. genalutea	Least concern
P. nigra	Least concern
P. yellow 'chin'	N/A

Table 5-6: Fish species found in the project area and their conservation status

Labidochromis vellicans	Least concern
L. shiranus	Least concern
L. heterodon	Least concern
Labeotropheus fuelleborni	Least concern
L. trewavasae	Least concern
Genyochromis mento	Least concern
Iodotropheus sprengerae	Near threatened
Cyathocromis obliquidens	Least concern
M. labrosus	N/A
P. elegans 'boadzulu'	N/A
Melanochromis brevis	N/A
P. novemfasciatus	N/A
P. zebra 'yellow top' (dorsal)	N/A

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.





5.3.4 Culture

5.3.4.1. 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.

5.3.4.2. 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.

No	Name of site	Description	Northings	Easting
1	MH-Nkhudzi 1	Potential Iron Age site, with	36-715711	8432028
	Archaeological	concentration of potsherds, some		
	Site	decorated with rims intact. Situated near		
		Flanzilo cottage.		
2	MH-Nkhudzi 2	Potential historical site with scatters of	36-715644	8432001
	Archaeological	embedded weathered pottery and iron		
	Site	implements.		
3	MH-Nkhudzi 3	Potential iron age settlement with	36-715680	8431936
	Archaeological	concentration of embedded decorated		
	Site	pottery.		
4	MH-Nkhudzi 4	Iron Age site along a pathway with	36-715633	8431924
	Archaeological	embedded decorated potsherds.		
	Site			
5	MH-Nkhudzi 5.	A massive rock shelter with ancient rock	36-714092	8432352
	Rock Art Site	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		
6	MH-Nkhudzi 6	This site is located in a cluster of hills	36-714682	8431255
	Namalowe sacred	near Mwanyama Village. According to		
	site\potential	local informants, the site was used to		
	grave site	bury dead people from the Mwanyama		
		village.		
7	MH-Nkhudzi 8	This is a potential burial place along the	36-714657	8432031
	Potential Grave	proposed access road to the water tank.		
	Site	Recommended for test excavation with		
•		This site is under Ndendus tree and	20 71 5 4 1 2	0421271
ð	MH-NKNUdzi II	This site is under Ndondwa tree and	36-715413	8431271
	Sacrad cita I	where the first Chief. Croup Village		
	Sacred Sile I	Headman Mwanyama was buried		
		Adjacent to this grave site is a second site		
		Aujacent to this grave site is a sacred site,		
		traditional sacrificos usod to bannon		
	Grave site and Sacred site I	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		

 Table 5-7: Recorded cultural heritage sites

9	MH-Nkhudzi 12	A sacred site where in the past local	36-715473	8431940
	Sacred Site II	people used to offer sacrifices. The site no		
		longer used for traditional practices		
10	Sacred Site III	A sacred site where local used to offer	36-716213	8431323
		sacrifices under a Nsangu tree. The site		
		no longer used for traditional practices		
11	MH-Nkhudzi 14	Potential iron age site, with scatters of	36-714372	8432499
	Archaeological	potsherds. Need further subsurface		
	Site	investigations.		

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.





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, tin smithing, 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, manifested in the unpalatable taste, is the major problem in the project area, especially for people that use 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 the lake. 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 MK1 to MK2000. 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 consultations undertaken by WWEC, including the people consulted, dates of consultations and the issues discussed are presented in Appendix 7 and 8. Key issues established from the consultations are as follows:

- World Heritage Convention Secretariat and UNESCO should be adequately engaged regarding the proposed project and the ESIA process
- 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 should 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. Quickly cover excavated trenches for new pipes to avoid inconveniencing people using the roadsides 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 should be prepared for construction camp sites and clearly presented in the Contractor's Environmental Management Plans.
 - e. Minimise the hiring of migrant workers to avoid cases of influx of people into the local communities, avoid disturbances of the locals and to avoid increase of crimes such as thefts.

6.4. PUBLIC HEARING CONSULTATION OUTCOMES

Public hearings for this project, facilitated by the Malawi Environmental Protection Authority (MEPA), were conducted from the 21st to 23rd of July, 2021 at Mangochi District offices, Maldeco Fisheries and Capital Hotel in Lilongwe. The aims of the public hearings were to present the Draft ESIA report to the public and gather comments, concerns and issues to improve the ESIA report. Key issues raised during the public hearings are as follows:

- The project should consider using the Namaso Hill as an alternative site to the Nkhudzi Hill for the water tank because Nkhudzi Hill is in the Malawi National Park which has to be protected;
- During project implementation, unskilled labour force should be sourced from the project affected communities;
- The ESIA report should be improved on the number of fauna and flora present at the project site; there are more fish species in Lake Malawi National Park than what has

been presented in the report. There are also Pangolins at Nkhudzi Hill, which are rare species and have to be protected. This has not been indicated in the ESIA report. Hence, it was recommended that consultations should be done with Fisheries and Parks and Wildlife departments to improve the ESIA report. Alternatively, a separate assessment has to be conducted by the Departments of Fisheries and Parks and Wildlife to compliment the ESIA report.

- Concerns over delays in project implementation were expressed by local leaders.
- Inform local communities and the nation as a whole on the importance of the project through sensitization meetings. The sensitization meetings have to be ongoing particularly to the project affected communities.
- The project developer should ensure that the measures proposed in the management plan are implemented on the ground as the problem in similar projects has been implementation.
- Loose soils from the construction activities should be managed properly to prevent deposition into Lake Malawi.
- Water abstraction levels in Lake Malawi for the project should be considered as ESCOM also uses water from the lake for generation of electricity.

Record of the Public Hearings and a list of people who attended are attached in Appendix 7 and 8 respectively.

CHAPTER 7 : ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACT

Environmental and social impacts are defined as the alteration to environmental and socioeconomic 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 7.

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		Air Water		er	Soil	Biological Components					Socio components								
Potential sources of impacts	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														х					
Construction phase																			
Presence of workers		x	Х			х							х	х	х	х	x		
Site preparation	х	x	Х	Х	х	х	х	Х	х	х	х	х	х		х	х	x		
Purchase of materials, goods and services			х										x	x	x	x	х		
Transportation and circulation	х	х	Х	Х	х		х							х	х		х	х	
Construction of facility and associated structures	x	x	х	х	x	x	x	х	x	x		x	x	x	x	x	x		
Waste management			х	Х											х				
Demobilization phase																			
Removal of temporary structures	x	x	х		x								x	x	x	x		x	
Worksites restoration	x	х		Х	x	x		х			x	x	x		x		х	х	

Environmental Components		ir Water		Soil	Biological Components					Socio components								
Potential sources of impacts	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					Х					x	x				
Maintenance and repair	х	х											х	х	х	х	х	
Presence of workers						х	х	Х	х	х			х	х	х	х	х	x
Transportation and circulation																		
Purchase of materials, goods and services													x	x	x	x	х	

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

b) 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.

c) Improved access to portable and affordable 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 that Koche WUA and the proposed CWPs by SRWB have co-exist in the areas
- vi. Ensure water is available all the time at the water points.

d) 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

e) 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.

f) 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.

g) 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

h) 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.

i) 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) 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 some loss of vegetation cover. Loss of vegetative cover is also possible from bush fires and the need for fuel wood by workers. It is estimated that a total of 17 trees will be lost at Nkhudzi Hill as a result of implementation of the project. Some of these tree species are threatened and endemic; protected; and alien and invasive species. 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.

Loss of vegetation cover leads to loss of habitat for wildlife species and land degradation due to increased soil erosion. The project site is a habitat for various wildlife including birds, mammals and reptiles; including snakes; among others. These might be affected mainly during the construction phase due to noise and presence of people at the project site. Trenches that will be excavated at the site, may also disturb wildlife movement around the project area. Through consultations with the Nankumba Area Development Committee (ADC), the Fisheries Assistant for Nkhudzi area, fishing community, the Fisheries Department and review of the report prepared by the Department of National Parks and Wildlife, it is noted that the project will not affect fish breeding grounds

Loss of trees and disturbance of wildlife in Nkhudzi Hill will not impact the community's access to firewood and timber as the hill is a protected site and the local communities are restricted from using these resources. In addition, the project will not affect the community's access to water from Lake Malawi, since a water intake structure will be constructed at 4 metres above the water. Therefore, the project will not directly affect ecosystems interaction between community people and natural resources.

Proposed mitigation measures for loss of vegetation

- i. Limit vegetation clearing and excavations to only those areas specified in the designs to avoid unwarranted clearance of vegetation
- ii. For every tree cut down, provide 10 tree seedlings of a similar species to be planted in the adjacent areas. The SRWB in consultations with the communities and District Council should mobilise the communities for annual tree planting events
- 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. 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.
- vii. Sensitize employees and the community to conserve vegetation.
- viii. Salvage vegetation (hollow logs, seedlings, seeds, etc.) affected by the project and reuse in areas to be planted with forest woodland.
- ix. Fence Nkhudzi Hill to ward off animals and sensitise people against making noises that would disturb/ scare away animals.
- x. Relocate endangered species where appropriate
- xi. Paint structures in protected area with green colour to blend with environment.
- xii. The Department of Parks and Wildlife must patrol the Nkhudzi Bay area as part of their routine activities.
- xiii. Southern Region Water Board, the Departments of Parks and Wildlife, Fisheries and Forestry, Water and the District Technical Team must sign Memorandums of Understanding (MOU) for an integrated approach to resources and ecosystems management and conservation which shall include by-laws for protection of the project site to avoid further destruction.

Mitigation measures for fauna related impacts

- Construct the water intake 300 metres outside the required 100 metres by the park.
- Cage the pump to protect the fish from getting inside.
- Pave the 300 metre access road to prevent soil erosion into the breeding grounds for fish species.
- For birds, study and identify nesting period, so that project activities should not disturb birds breeding
- Conduct a non-intrusive area search for presence or evidence of nesting/nests before the land clearing activities. In case they are found, put appropriate buffers around the nests and clearly mark and rope off until the birds have left the nests.
- Erect a barrier around the work sites and barricade all trenches and open pits and place clear signs to protect animals and people from falling into them.

e) Generation of Waste

Solid waste generated will consist of household wastes in form of paper and food waste, left-over construction materials; including sand and quarry stone; and human waste is also expected especially where there are no toilet facilities at the construction site.

Mitigation measures:

- Provide waste collection bins where they may be needed;
- Sensitise workers in the proper collection and management of wastes;
- Dispose waste in designated sites, in collaboration with the local council;
- Provide mobile latrines and encourage the workers to be using them;
- Train workers on the importance of good sanitation practices; and
- Develop a Construction Waste Management Plan.

f) 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 Species. However, the effect would be moderate to minimal.

Proposed Mitigation Measures

- i. Pave the access road and 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.

g) 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 (PPE) 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. The Department of Parks and Wildlife must patrol the Nkhudzi Bay area as part of their routine activities.
- xii. Southern Region Water Board and the Departments of Parks and Wildlife, Fisheries and Forestry must sign Memorandums of Understanding (MOU) for resources and ecosystems management and conservation
- xiii. Southern Region Water Board and the Departments of Parks and Wildlife, Fisheries and Forestry must sign Memorandums of Understanding (MOU) for resources and ecosystems management and conservation
- xiv. Buy construction materials from suppliers that are licensed by the Mangochi Town Council.
- xv. Adequately supervise the construction activities and follow recommended procedures.

h) 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

i) Water 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. Water treatment chemicals to be utilized are aluminium sulphate for coagulation and granulated chlorine for disinfection. These chemicals are prepared within the treatment plant and are not expected to cause any pollution of nearby water courses and there have been no such cases reported anywhere in Malawi. It is in the interest of SRWB to avoid any spills as such occurrences will contribute to high operational costs. Also considering the small amounts to be used, the distance from the lake (550m away) and the type of chemicals to be used (which are in powder form) the possibility of chemicals spilling into the Lake is zero.

Construction debris, dirt, silt and soil may run into natural waterways, causing pollution and siltation. Siltation of the lake will negatively affect bleeding grounds for fish species. It will

also affect the water quality which will affect the people that use the water for consumption and domestic purposes. Siltation and pollution of the lake will also affect lodges and hotels around the project site particularly those that extract and treat water from the lake (though it is illegal) to supply to their lodges and hotels in that it will increase the cost for treating the water. Poor water quality has a potential of affecting the tourism industry which will affect the livelihood of communities and hotel and lodge owners in the area.

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.

j) 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.

k) 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. Considering that houses are far from the project area, the probability of houses being affected is minimal. However, loud noise can result in permanent ear damage and can disturb animals.

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.

I) 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 trespassing and 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.

m) 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.

n) 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.

o) 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.

p) 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.

q) 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.

r) 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.
- iv. Sensitize communities on child labour and trafficking risks of the project during stakeholders' engagement, prior to implementation of the project;

s) 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.

t) Loss of Cultural Heritage Sites and World Heritage Attributes.

The project will destroy the archaeological and other cultural heritage sites found on the surface and subsurface of the project area. The land clearing activities will permanently alter the integrity of the natural landscape and disturb the cultural relics buried in the ground. The project will also affect the Outstanding Universal Value (OUV) of the area, its integrity, and protection and management as a UNESCO World Heritage Site. These impacts will be minimized if suggested mitigation measures recommended in this report are adequately addressed.

Proposed mitigation measures

- i. Avoidance of construction-related impacts to important cultural resources;
- ii. Preparation of a cultural heritage management plan to avoid or limit adverse impacts of the project;
- iii. Provide training in cultural heritage management and undertake possible heritage research programs in the area;
- iv. Implement internationally recognized practices for the protection of cultural heritage resources;
- v. 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;
- vi. Conduct a Contractor Training and Awareness Program;
- vii. 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;
- viii. 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

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

- ix. Provide alternative employment to employees e.g., as maintenance staff.
- x. Provide adequate notice to employees to prepare themselves and secure alternative employment.
- xi. Pay severance benefits to leaving workers in line with the labour regulations.
- xii. 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 to respond to emergencies iclusding flooding.
- 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 and from climate change impacts

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.

Malawi is highly vulnerable to climate change under even modest temperature increases. More than 15 per cent of the population was affected by floods in the 2012/13 rainy season. In addition to floods, in the last few decades Malawi experienced droughts during the 1978/79, 1981/82, 1991/92 and 1993/94 crop growing seasons.

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 and maintain the pipeline infrastructure.
- viii. Include the people from the local area in the work force.
- ix. Provide adequate and effective storm water drainage to protect infrastructure from flooding
- x. Liaise with the Meteorological Department for early warning on flood occurrences.

e) Risk from seismic activity (earthquakes/ tremors)

There may be some fears or concerns that Nkhudzi Hill is not safe due to possible earthquakes or tremors. The fears or concerns are that should the 4,000m³ concrete tank to be constructed on top of Nkhudzi Hill fail due earth tremors or earthquakes, there may be fatalities. However, to ascertain the seismology of the Nkhudzi area, *SRWB engaged the Geological Surveys Department on earthquakes around Nkhudzi Bay.* The findings were that the concerns of the Nkhudzi Tank bursting in any incident of earth tremors should not raise any fears. Even though the slopes of the Nkhudzi Hill are made of boulders, the top flat part selected for the tank is more stable and there are no rocks. There will be no blasting during tank construction. Any blasting during construction of the access road will be minimal since the road will bypass rocks on the Namaso side; and in the rare event that blasting is inevitable, controlled blasting will be employed, as per the guidelines.

Proposed mitigation measures

Despite the low probability of having a similar earthquake event as that of 1989 in Salima, SRWB took into consideration the recommendations by the Geological Survey Department. Therefore to mitigate the potential impact:

- i. Design the structures to withstand maximum earthquakes of the region (magnitude of 8).
- ii. Adhere to proper building/ construction codes and standards throughout the design process and during implementation phase.
- iii. Involve experts from the Geological Survey Department throughout the project implementation

f) Climate change impacts

Climate change impacts from external factors/ activities will generally exacerbate the environmental and social impacts that have been determined, assessed and are included in the ESMP for the proposed project. Climate change impacts will be less predictable and will need a concerted institutional and sectoral management approach as they are likely to be long term and their sources are anticipated to be expansive or nonlocalized.

On the other hand, climate change impacts from the proposed project will be localised, moderate and more manageable as long as the impact management measures prescribed in this report are adhered to.

Data across Malawi (Trocaire, 2013) indicates an increase in temperatures of 0.9°C between 1960 and 2006 at an average rate of 0.21°C per decade. The increase in temperature has been

most rapid in December-February (mid-summer) and slowest during September-November (early summer).

Table 7.2, developed from literature review and consultations, provides the anticipated climate change impacts and the proposed management measures.

IMPACTS	MANAGEMENT MEASURES
Malawi is highly vulnerable to climate change under even modest temperature increases. More than 15 percent of the population was affected by floods in the 2012/13 rainy season. In addition to floods, in the last few decades Malawi experienced droughts during the 1978/79, 1981/82, 1991/92 and 1993/94 crop growing seasons.	Provide adequate storm water drainage Mitigation measure 7.3.4c, d(ix and x)
Most regions have experienced decreasing but non-significant rainfall trends over the period 1960-2006. Decreases are evident for annual and seasonal rainfall and for the months of March to December, while slight increases are evident for the highest rainfall months of January and February. This points to negative impacts for food production and <u>access to water</u> . Decreases in annual runoff and increases in evaporation losses have also been found over the period 1971-2000 indicating that	This impact is in line with Section 5.3.14b which explains the challenges of access to water in the project area The entire project is
decreasing rainfall has practical significance in that Malawi has become more water limited in recent decades.	aimed at improving water accessibility
While there are large uncertainties in future rainfall projections, decreases in rainfall are likely, particularly by the end of the century. Greater decreases are associated with higher greenhouse gas emissions. Substantial increases in <u>drought are</u> <u>expected</u> under a business as usual scenario.	This impact is in line with Section 5.3.14b which explains the challenges of access to water in the project area
	The entire project is aimed at improving water accessibility
With more climate change impacts, water sources are likely to be very far and fetching water will continue to be a heavy burden for the girl child. This will mean increased chances of neck and back pains, more time spent on fetching water and long waiting queues, less or shorter hours for school work	This impact is in line with Section 5.3.14b which explains the challenges of access to water in the project area

Table 7-2: Climate change effects and impacts

	The entire project is aimed at improving water accessibility Section 7.2.2h
Increased water scarcity will lead to more people drinking contaminated and unsafe water that is not treated, shared with animals (dogs, pigs, goats; all drink from the water) and contaminated by animal and human waste. This will cause water related sickness forcing people to seek medical treatment for dysentery, cholera etc. The water contamination, infection, medical treatment cycle will be difficult to cure/ break as people go back and drink the same water.	This impact is in line with Section 5.3.14b which explains the challenges of access to water in the project area The entire project is aimed at improving water accessibility Section 7.2.2d
Currently 92 per cent of Malawians rely largely on water sources that are dependent on rainfall recharge and are highly impacted by projected droughts and floods. For example, the 2012/2013 floods in Karonga and other districts were reported to have damaged water pipe networks and boreholes. <u>Water sources</u> <u>such as unprotected boreholes, springs, ponds, streams and</u> <u>rivers were contaminated</u> .	Section 7.3.4c
In addition to droughts, <u>soil erosion</u> due to surface run-off is a serious environmental problem causing sedimentation. Increases in rainfall intensity following longer dry spells are likely to increase erosion and sedimentation rates.	Section 7.3.2d
With reductions in rainfall, reductions in surface runoff are likely to impact negatively on groundwater recharge and consequently contribute to drying of boreholes across the district . Currently Malawi is losing about MKW8.8 billion due to water connected economic losses and these losses are likely to be exacerbated by climate variability and change over the coming decades.	Section 7.3.2d Section 2.3.2
Climate change is expected to impact negatively on water resources through rising temperatures, associated increases in evaporation losses and changes in rainfall, together with increases in the frequency and magnitude of extremes events. In Malawi projected water supplies are affected by increases in temperature and local variability of precipitation.	

For the Shire catchment, increases in extremes of flooding and	This impact is
drought are likely to increase the vulnerability of river basin	universal, affecting all
communities and river- based infrastructure such as hydro-	sectors and locations.
electric power and drinking water plants. Droughts are expected	Hence the proposed
to have greater impacts on the changing water levels on Lake	mitigation measures
Malawi and the Shire River. For Lake Malawi, it is estimated that	e.g. Section 7.3.2d
water levels will drop in tandem with decreases in rainfall and	and e must be strictly
increases in evaporation. Consequently water supply and hydro-	adhered to by all
electric power generation in southern Malawi, especially Blantyre	stakeholder
city and surrounding districts are likely to be negatively impacted.	institutions.

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	=	consequence x probability
of the		
impact		
where:		
Consequence	=	severity + reversibility + duration +

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 7-3: Criteria for Ranking Factors for Consequences and Probability

Table 7-4: Impact severity IUCN rating

Severity	Reversibility	Duration/	Areal extent	Environmental	Probability
		frequency		context	
Severe (5)	5 –	5 – Permanent	5 -	5 – highly	5 – Definite
Adverse impacts on people and/or environment of very	Irreversible	and/or	International	sensitive or	/ don't
high magnitude, including very large scale and/or spatial		continuous		very rare	know
extent (large geographic area, large number of people,		impact		environmental	
trans boundary impacts), cumulative, long-term				component	
(permanent and irreversible); receptors are considered					
highly sensitive; examples are severe adverse impacts on					
areas with high biodiversity value; severe adverse impacts					
to lands, resources and territories of indigenous peoples;					
significant levels of displacement or resettlement with					
long-term consequences on peoples' livelihood; impacts					
give rise to severe and cumulative social conflicts with					
long-term consequence					
Major (4)		4 – Long term	4 – National	4 – sensitive or	4 – High
Adverse impacts on people and/or environment of high		(impact ceases		rare	probability
magnitude, including large scale and/or spatial extent		after		environmental	
(large geographic area, large number of people, trans		operational		component	
boundary impacts), of certain duration but still reversible if		life) and/or			
sufficient effort is provided for mitigation; receptors are		very frequent			
considered sensitive; examples are adverse impacts on		impact			
areas with high biodiversity value; adverse impacts to					
lands, resources and territories of indigenous peoples;					
significant levels of displacement or resettlement with					
temporary consequences on peoples' livelihood; impacts					

give rise to social conflicts which are expected to be of					
limited duration					
Medium (3)	3 -	3 – Medium	3 – Regional	3 –	3 –
Adverse impacts of medium magnitude, limited in scale	Recoverable	term (2 – 7		moderately	Medium
(small area and low number of people affected), limited in	(needs	years) and/or		sensitive or	probability
duration (temporary), impacts are relatively predictable	human	frequent		uncommon	
and can be avoided, managed and/or mitigated with	input)	impact		environmental	
known solutions and straight forward measures.				component	
Minor (2)	??????	2 – Short term	2 – Local	2 – non-	2 – Low
Adverse impacts of minor magnitude, very small scale (e.g.		(0 – 2 years)		sensitive or	probability
very small affected area, very low number of people		and/or		common	
affected) and only short duration, may be easily avoided,		infrequent		environmental	
managed, mitigated.		impact		component	
Negligible (1)	1-	1 – Immediate	1 – Site only	1 – non-	1 –
Negligible or no adverse impacts on communities,	Reversible	and/or unique		sensitive and	Improbable
individuals, and/or on the environment.	(regenerates	impact		widely	
	naturally)			dispersed	
				environmental	
				component	

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 7-3 following.

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

 Table 7-5: Significance Rating of the Impacts

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 7-4.

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									

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ enhancement	Significance with mitigation/ Enhancement
1.2.1.	Improved water supply to									
	Mangochi Town and the	5	3	5	2	4	4	76	High	High
	surrounding areas									
1.2.2.	Improved access to	4	3	5	2	4	4	72	Moderate	High
	portable water source		-		-	•	•	<i>,</i> _		
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.	Increased in revenue generation									
1.2.6.	Enhanced gender and participation in development	2	3	3	2	5	3	45	Low	High
1.2.7.	Education benefits to girl child	2	3	З	2	5	4	60	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		I					n		
2.2.1.	Losses and compensation for land and assets	3	5	5	2	4	3	57	Moderate	Low
2.2.2.	Unrealistic expectations with regard to lands/compensation/reset tlement negotiations	4	3	2	2	4	3	45	Low	Low
2.2.	Construction Phase	1						1		
2.2.1.	Dust generation, gas and particulate matter emission	3	1	2	1	3	4	40	Low	Very low
2.2.2.	Soil contamination and land degradation	3	3	2	1	3	3	36	Low	Very low
2.2.3.	Loss of vegetation cover	4	3	3	4	4	4	72	Moderate	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

ID	Potential Environmental and Social impacts	Severity	Reversibility	Duration	Areal Extent	Environmental Context	Probability	Total	Significance without mitigation/ enhancement	Significance with mitigation/ Enhancement
2.2.7.	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 and from climate change impacts	2	3	4	1	3	3	39	Low	Very low

From table 7-4, 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.

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	cost/year (MKW)
1.	ENHANCEMENT MEAS	SURES FOR BENEFICIAL IMPACTS			
1.1.	Construction phase			F	
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 for informing local communities
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

Table 8-1: Environmental and Social Management Plan for the Project

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
1.2.2.	Improved access to portable and affordable water	 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. Adequately treat water at the treatment plant. Regularly conduct water quality tests at the water treatment plant, in the distribution lines and in the 	implementation Continuously throughout the operation period	Institution	cost/year (MKW) N/A (Within the operation and maintenance
	source	 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. 			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 for sensitisations and trainings

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
		 Support initiatives implemented by community- based organisations to promote health, sanitation 	Implementation	Institution	cost/year (WKW)
		 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	Cost for sensitisation meetings included in 1.2.3 .
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 MEASU	RES 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 for conducting assessments, disclosure and verification exercises

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			I	
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	6,500,000 for protective wear, barrier erection and spraying water
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	3,300,000 for regular medical check-ups for skilled labour force

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	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	1,500,000 for securing waste oil containers, construction of waste disposal pits and sensitisation of workers

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible institution	Implementation cost/year (MKW)
2.2.4.	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 For every tree cut down, provide 10 tree seedlings of a similar species to be planted in the adjacent areas. The SRWB in consultations with the communities and district council should mobilise the communities for annual tree planting events 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. 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 	Throughout construction (but mainly during land preparation)	Contractor SRWB DNPW	9,076,752 for paving access roads, tree planting and landscaping

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	cost/year (MKW)
		 Paint structures in protected area with green colour to blend with environment. The Department of Parks and Wildlife must patrol the Nkhudzi Bay area as part of their routine activities. Southern Region Water Board and the Departments of Parks and Wildlife, Fisheries and Forestry, Water and the District Technical Team must sign Memorandums of Understanding (MO) for an integrated approach to resources and ecosystems management and conservation which shall include by-laws for protection of the project site to avoid further destruction. 	Throughout	Contractor	
		 Construct the intake 300 metres outside the required 100 metres by the park. Cage the pump to protect the fish from getting inside. Pave the 300 metre access road to prevent soil erosion into the breeding grounds for fish species. For birds, study and identify nesting period, such the project activities should not disturb birds breeding Conduct a non-intrusive area search for presence or evidence of nesting/nests before the land clearing activities. In case they are found, put appropriate buffers around the nest and clearly mark and rope off until the bird has left the nest. 	Inrougnout construction (but mainly during land preparation)	Contractor SRWB DNPW	

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	cost/year (MKW)
		• Erect a barrier around the work sites and barricade			
		all trenches and open pits and place clear signs to			
		protect animals and people from falling into them.			
2.2.5.	Generation of waste	 Provide waste collection bins where they may be needed; Sensitise workers in the proper collection and management of wastes; 	During construction	Contractor	Cost included in 2.2.5
		• Dispose waste in designated sites, in collaboration with the local council;			
		• Provide mobile latrines and encourage the workers to be using them;			
		• Train workers on the importance of good sanitation practices; and			
		Develop a Construction Waste Management Plan			
2.2.6.	Land degradation	Pave the access road and provide lined drainage	Throughout	Contractor	Cost included in
	and soil erosion	with check dams along access roads.	construction		2.2.4
		 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.			
2.2.7.	Exposure of people	Develop a workplace safety policy and induct	Throughout	Contractor	Cost for PPEs,
	and animals to	workers on OSH requirements and repeat	construction		barrier erection
	injuries and	reminders on the same.			and sensitisations
	accidents	 Inform and sensitise the public about all open pits 			Included in 2.2.1
		and trenches.			600 000 for
		 Provide appropriate personal protective equipment (DDFa) to construction user loss and consume that it 			securing first aid
		(PPES) to construction workers, and ensure that it			kits and training
		is aiways useu.			provision

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
2.2.8.	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	Not applicable
2.2.9.	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. 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. 	construction	Contractor	Cost for waste disposal facilities included in 2.2.3 500,000 for construction of pit latrines.
ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
---------	--	---	---	--------------------	--
			implementation	institution	cost/year (MKW)
2.2.10.	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 	Before, during and after construction	Contractor	Cost for restoration of working site included in 2.2.4 200,000 for detours and road
		the sites where it is not possible to restore to the baseline condition.			traffic signs
2.2.11.	 2.11. 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 area Use electric motors instead of compressed air driven machinery. Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates an pads on large sheet metal surfaces. Limit the number of days of operation; restrict hours of operation and schedule noisy tasks fo periods of low occupancy and animal presence the project surroundings. 		Throughout the construction period	Contractor	Cost for PPEs included in 2.2.1
2.2.12.	Potential increase in poaching	 Sensitize the workers and the community against trespassing and 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	Contractor SRWB	1,200,000 for provision of temporary structures

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	cost/year (MKW)
		 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. 			
2.2.13.	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	2,300,000 for provision of condoms
2.2.14.	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. 	Quarterly	Contractor SRWB	Cost included I 2.2.10 and 2.2.12

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
		 Support the services of the local clinics and the Health Surveillance Assistants. 	Implementation	Institution	
2.2.15.	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	3,250,000 for provision of COVID 19 preventive products
2.2.16.	Sexual abuse and harassment	 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 	During construction	Contractor SRWB	Cost for sensitisations Included in 2.2.12

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
2.2.17.	Unequal employment	 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. Include a clause in the contract specifying that at least 40% of the employees but not more than 60% should be women 	Yearly	Contractor District social welfare officer	Cost for sensitisations
		 Sensitize and encourage women to build their confidence for applying for in as foremanship, engineers etc. Create a good work environment to allow female workers report any case of gender discrimination. 		wenare officer	
2.2.18.	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. Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to implementation of the project; 	Quarterly	SRWB, Contractor, District HIV/AIDS Coordinator, District Gender Office	Cost for sensitisations Included in 2.2.12

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
2.2.19.	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	Cost for sensitisations Included in 2.2.12
2.2.20.	Loss of Cultural Heritage Sites and World Heritage Attributes.	 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; 	Throughout the construction period	Contractor, Client, DMM	Priced in the Cultural Heritage budget

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	cost/year (MKW)
		 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 			
2.3.	DEMOBILISATION PHA	ASE			
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 	Throughout the operation period	SRWB	N/A (Within the operation and maintenance

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
		Provide solid waste storage bins and skips and	Implementation	institution	budget of the
		prevent overfilling.			board)
		site.			
		Implement sensitization campaigns on			
2.4.2.	Increased pollution	 Enforce proper excreta and wastewater 	Twice a year	SRWB	N/A (Within the
	from wastewater	management especially in the town.		Environmental	operation and
	and sludge	Apply lime treatment to dewatered sludge to		Health Officer	maintenance
		 Enforce the use of licensed liquid waste handlers 			board)
		for liquid waste.			
		 Sensitize people on the benefits (including prevention of cholera) of good the bygiene 			
2.4.3.	Emergencies	 Design and implement an emergency response 	Monthly	SRWB	N/A (Within the
		 Install fire hydrants within the proposed 			maintenance
		development.			budget of the
		 Regularly monitor and maintain the water supply system including the CWP. 			board)
		 Install a fire extinguisher at the plant and train workers on how use. 			
2.4.4.	Potential risks of	SRWB must periodically conduct consultations and sensitizations with villages and group village heads	Throughout the	SRWB	N/A (Within the
	flooding from theft	and security personnel.	operation period		maintenance
	and vandalism and	• Provide security at the intake, treatment plant and			budget of the
	from climate change impacts	water reservoir sites.			board)

ID	Potential Impact	Recommended enhancement/mitigation measure	Schedule for	Responsible	Implementation
			implementation	institution	cost/year (MKW)
		 Support activities of the neighbourhood watch (community policing) e.g. through provision of torches, uniforms and shoes. Support economic activities in the area as part of corporate social responsibilities. Reward for reports of vandalism and theft that may lead to capture. Theft and vandalism cases must be reported to the police. Regularly monitor and maintain the pipeline infrastructure. Include the people from the local area in the work force. Provide adequate and effective storm water drainage to protect infrastructure from flooding Liaise with the Meteorological Department for early warning on flood occurrences. 			
2.4.5.	Risk from seismic activity (earthquakes/ tremors)	 Design the structures to withstand the maximum earthquakes of the region (magnitude of 8). Adhere to proper building/ construction codes and standards throughout the design process and during implementation phase. Involve experts from the Geological Survey Department throughout the project implementation 	During planning and design and during construction	Consultant Client Contractor	Included in the Consultant's and Contractor's pricing

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).

S/N	Potential Impacts	Implementation cost in MKW/Year
1.	Creation of employment opportunities (informing local communities)	4,761,640.00
2.	Improved sanitation, hygiene and health (sensitisations and trainings)	9,523,280.00
3.	Loss and compensation for land and assets(conducting assessments, disclosure and verification exercises)	3,662,800.00
4.	Dust generation (protective wear, barrier erection and spraying water)	6,500,000.00
5.	Gas and particulate matter emission (regular medical check- ups for skilled labour force)	3,300,000.00
6.	Soil contamination (securing waste oil containers, construction of waste disposal pits and sensitisation of workers)	1,500,000.00
7.	Loss of vegetation cover, aesthetic scenery and disturbance or loss of wildlife (paving access roads, tree planting and landscaping)	9,076,752.00
8.	Exposure of people and animals to injuries and accidents (for securing first aid kits and training provision)	600,000.00
9.	Water pollution and siltation (construction of pit latrines)	500,000.00
10.	Disturbances and accidental damage to assets (detours and road traffic signs)	200,000.00
11.	Potential increase in poaching (provision of temporary structures)	1,200,000.00
12.	Increase in spread of Sexually Transmitted Infections (provision of condoms)	2,3000,000.00
13.	Increased COVID – 19 infections and related deaths (provision of COVID 19 preventive products)	3,250,000.00
	Total	67,074,472.00

Table 8-2: Summary of Environmental and Social Management Costs

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	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
1.		ENHA	NCEMENT MEASURE	ES FOR BENEFICIAL I	MPACTS		
1.1.	CONSTRUCTION	PHASE					
1.1.1.	Creation of	Inform local communities of	Number of locals	Review of	Quarterly	District	520,000 for
	employment	job opportunities and	including	employee files		Labour	allowances and
	opportunities	prioritise their employment	vulnerable groups			Officer (DLO),	transportation
			employed			District Social	
		Match responsibilities of the	Roles of the	Review of job		Welfare	
		employees with their abilities	compared against	descriptions		Officer,	
			their abilities			District	
		Workers must be treated and	Number of cases	Interviews		Gender	
		paid fairly for the services	of unfair			Officer,	
		rendered	treatment			SRWB's	
		Provide equal employment	Number of	Head count,		Project	
		to women and men	women employed	Review of		Supervisor	
			against men	employee files			
		Wages must be above the	Amount paid as	Interviews,			
		minimum wage and overtime	wages including	Review of			
		must be paid on time	for over time	payment records			
		Sensitize workers to save and	Number of	Interviews			
		invest during project	Workers				
		implementation.	sensitized,				
			number of				
			workers saving				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
1.1.2.	Increase in	Pay building material	Time for paying	Review of	Quarterly	Director of	Included in 1.1.1
	trade	suppliers within the agreed	suppliers	procurement	during	Planning and	
	opportunities	times		records,	construction	Development,	
		Source materials from	Percentage of	Interviews		District	
		approved licenced suppliers	licenced suppliers			Community	
			used			Development	
		Support and promote of	Number of people			Office,	
		entrepreneurship skills	engaged			SRWB's	
		amongst communities and				Project	
		business people in the				Supervisor	
		project area by engaging					
		them where appropriate.					
		Promote village savings and	Number of				
		loan (VSL) schemes during	workers				
		project implementation.	participating in				
			VSL				
1.2.			OPERATI	ON PHASE			
1.2.1.	Improved water	Ensure water reservoir tanks	Duration and	Interviews,	Quarterly	District Water	90,000.00
	supply to	have adequate water all the	number of times	Review of water		Development	
	Mangochi Town	time to cover for periods of	of no water	supply reports,		Officer, SRWB	
	and the	no water pumping	supply to the	Review of			
	surrounding		consumers	maintenance			
	areas	Sustain the desired	Number of times	works schedule			
		performance of the water	maintenance	and reports			
		supply system through timely	works are				
		preventive maintenance	conducted with				

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
		measure				monitoring	Year
			respect to set				
			dates				
		Quickly carry maintenance	Duration taken to				
		works and restore water	carry				
		supply when there is	maintenance				
		problem	work and restore				
			water supply				
		Employ adequate staff and	Number of staffs	Review of			
		ensure that they provide	with respect to	employee			
		appropriate work inputs	the required staff;	records, Review			
		through proper work	Presence and	of work			
		schedules	reports of	schedules,			
			following the	Interviews			
			work schedule				
		Sensitize water users on	Number of times	Review of			
		proper water management	sensitizations are	sensitization			
		practices and payment of	conducted,	reports, Review of			
		water bills in time	Number of people	reports on cases			
			sensitized,	of vandalism			
1.2.2.	Improved	Adequately treat water at	Quality of water	Review of water	Quarterly	SRWB,	Included in 1.2.1
	access to	the treatment plant and	at the point of	quality test		District Water	
	portable and	encourage water users to	use, Number of	results,		Development	
	affordable	add chlorine or any	water points with	Inspections,		Officer	
	water source	disinfectants at the point of	chlorine	Interviews			
		use.					
		Regularly conduct water	Number of times	Review of water			
		quality tests at the water	water quality	tests results			

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		treatment plant, in the	tests are				
		distribution lines and in the	conducted,				
		supply point and implement	Reports of				
		control measures where	appropriate				
		results are below safe water	action when there				
		standards	are traces of				
			unwanted				
			elements in the				
			water		-		
		Process water connection	Duration taken	Review of new			
		applications and provide	for water	water connection			
		water to the communities	applications to be	reports,			
		within set time	processed	Interviews			
		Ensure that the	Distance between	Site visits,			
		recommended maximum	houses to a kiosk	Interviews,			
		distances of 500 metres from		Review of kiosks			
		houses to a water point is		management			
		observed when constructing		reports			
		communal water points.					
		Ensure water is available all	Percentage time				
		the time at the water points	water is available				
			at the water				
			points				
1.2.3.	Improved	Sensitise communities on	Number of times	Review of health	Quarterly	SRWB,	520,000.00
	sanitation,	hygienic practices for	sensitizations are	records from		District	
	hygiene and	handling water to avoid	conducted;	Mangochi District		Health	
	health	secondary contamination	Number of	Hospital, Visual		Officer,	

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
		measure				monitoring	Year
			reported secondary contamination	inspections, Review of water quality tests		Environmenta I Health Office	
		practices amongst	sanitation promotion activities conducted	results			
		Conduct trainings aimed at building the capacity of water kiosks committee monitor. the quality of water and to promote health and	Number of trainings conducted; capacity of the committees				
		hygiene at water points. Monitor the quality of water and to promote health and hygiene at water points.	Quality of water				
		Support initiatives implemented by community- based organisations to promote health, sanitation and hygiene.	Level of support provided to the community-based organisations				
		Ensure there is adequate drainage within the community water points	Presence of drainage within water sources				
1.2.4.	Improved socio- economic	Provide quality water, with minimal loss of supply,	Water quality results, Average	Review of water supply reports,	Quarterly	SRWB, District Social	520,000.00

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit v for	Monitoring cost (MKW)/
	•••••	measure		0		monitoring	Year
	situation of the communities	through system monitoring and regular maintenance Support women and other vulnerable groups to start and operate business	duration for loss of supply Number of women and vulnerable groups	Review of water quality tests results Review of reports for supports with start-up capital		Welfare Office, District Water Office, District Community	
		through appropriate training and start-up capital Make water costs affordable	supported to start businesses Cost of water compared to income levels	Review of water tariffs and social- economic profile	-	Office	
1.2.5.	Increased revenue generation	Sensitize institutions and households to pay bills and on time	Number of sensitizations, Percentage of paid bills and time for payment	Review of sensitization and engagement reports, Interviews, Audit	Quarterly	SRWB, Southern Region Water Department	N/a
		Properly manage revenue from the water supply through good book keeping, transparency and accountability. Engage the community to identify project which the water board can implement as part of cooperate social responsibility	Availability of revenue book, Level of transparency and accountability Number of engagement, Level of engagement	of revenue collection, expenditures			

ID	Potential Impact	Recommended enhancement/mitigation measure	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for monitoring	Monitoring cost (MKW)/ Year
		Re-invest profits in the improvement and extension of the water supply system	Percentage of profits reinvested in extension of the system				
		Regularly review water supply tariffs with consideration of the consumers to avoid overcharging.	Number of times tariffs are reviewed, Level of prices				
		Properly manage water by replacing old pipes, repairing pipes to prevent leakages and extending intake pipes to avoid abstracting polluted water	Strength of pipes in relation to leakages, Length of intake pipes	Review of maintenance records, Inspections			
1.2.6.	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	Included in 1.2.4
		Ensure there are also women in important positions	Number of women in important positions	Review of employee records		Development Office, SRWB	

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Promote the involvement of	Number of	Review of			
		women in development	women involved	sensitization			
		activities through	in development	records, Review			
		sensitization, advocacy and	activities	of development			
		awareness.		activities records			
		Economically empower	Number of	Review of			
		women within affected	women linked to	economic			
		communities by linking them	economic	empowerment			
		with District Councils	empowerment	programme			
		Community Service	programmes	reports			
		Investment Programme					
		(COMSIP)					
1.2.7.	Education	Conduct sensitizations aimed	Number of	Review of	Quarterly	District	Included in 1.2.4
	benefits to girl	at encouraging girls to enrol	sensitization	sensitization		Monitoring	
	child	in schools	meetings	reports		Information	
			conducted		-	and	
		Provide the necessary	Availability of	Review of		Evaluation	
		support to schools to ensure	adequate	education		Office,	
		that they have adequate	resources in the	statistics		District	
		resources to ensure the	schools			Education	
		provision of quality of				Office,	
		education		-		District Social	
		Provide scholarships and	Number of			Welfare	
		bursaries to deserving girls	deserving girls			Office	
		who cannot afford to pay the	provided with				
		school fees	bursaries and				
			support				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Provide adequate water and	Availability of				
		appropriate sanitation	adequate water				
		facilities in schools to support	supply and				
		female students	sanitation in				
			schools				
1.2.8.	Increased	New water connection	Duration for	Review of water	Quarterly	SRWB,	160,000
	development	applications must be	processing	connection		District Water	allowance for
		processed within set time	applications	records		Development	DPD
		Provide adequate portable	Volume of water	Interview, Review		Office,	
		water supply to the new	supplied	of water supply		Director of	
		areas	compared to the	records		Planning and	Cost for water
			demand			Development	development
		Sensitize the communities to	Number of	Review of			office included
		report leakages and	sensitizations	sensitization			in 1.2.4
		breakages of pipes	conducted;	reports, Review of			
			Number of	maintenance			
			leakage and	records			
			breakage reports				
			received				
		The Town Council must	Percentage of	Review of water			
		ensure that development	time water is	supply reports,			
		activities are implemented	available and	Interviews, Visual			
		within Council plans and laws	adequacy of	inspection on			
			sanitation	sanitation			
2.	MITIGATION ME	EASURES FOR ADVERSE IMPACTS	i				
2.1.	PLANNING AND	DESIGN PHASE					

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
2.2.1.	Losses and	Locate transmission and	Percentage of	Review of	Monthly	SRWB,	
	compensation	distribution pipe lines within	distribution line	construction	before	District Lands	1,560,000.00 for
	for land and	existing road reserves, as	located in road	designs	commenceme	Office,	allowances and
	assets	much as possible.	reserve area		nt of	Director of	transportation
		Conduct sensitization and	Number of	Review of	construction	Planning and	
		awareness on the need for	sensitizations	sensitization		Development	
		land for the project and	conducted,	reports/records			
		compensation process.	Number of people				
			sensitized				
		Plan, prepare and implement	Number of times	Review of land			
		all compensations in	the District	acquisition and			
		coordination with the	Council and	compensation			
		Mangochi District	Department of	reports,			
		Commissioner and the	Lands are	Interviews			
		Department of Lands.	involved and level				
			of involvement				
		Conduct a disclosure and	Number of people	Review of the			
		verification exercise before	to have attended	disclosure			
		payment of compensations	to the disclosure	exercise report			
		to ensure that there are no	exercise and to	and			
		conflicts.	have signed the	compensation			
			compensations	schedule			
			due				
		Strengthen the Grievance	Strength of the	Audit of the			
		Redress Mechanism used in	Grievance	Grievance			
		Local Development Fund	Redress	Redress			
			Mechanism	Mechanism			

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit v for	Monitoring cost (MKW)/
		measure			,	monitoring	Year
		Projects for use in this project					
		Sensitize the affected people	Number of PAPs	Review of			
		Redress Mechanism	sensitised	reports			
		Compensate and resolve any	Percentage of	Interview, review			
		grievances before handing	people to have	of grievance			
		over the land before	not received	redress			
		commencement of	compensations				
		construction activities.	and/or with				
			grievances before				
			commencement				
			of construction				
		SRWB through Mangochi	Percentage of	Interviews			
		District Council must help the	PAPs helped to				
		affected people to identify	find replacement				
		replacement land.	land				
2.2.2.	Unrealistic	Conduct adequate thorough	Number of	Audit of the land	Monthly	SRWB,	Included in 2.1.1
	expectations	public and sensitization	awareness and	acquisition	before	District Lands	
	with regard to	meetings in regard to land	sensitization	process	commenceme	Office,	
	lands/compens	laws, land acquisition and	meetings		nt of	Director of	
	ation/resettlem	compensations.	conducted		construction	Planning and	
	ent	Observe transparency and	Degree of			Development	
	negotiations	accountability when	transparency and				
		evaluating the land and	accountability				
		property and paying the	when evaluating				
		compensations.	land				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Proper consultation has to be	Number of				
		carried out with the owners	consultations				
		of the land and government	conducted				
		officers must avoid dictating					
		unfair and unreasonable					
		compensation amounts.					
2.2.	CONSTRUCTION	PHASE	r	1	P		
2.2.1.	Dust generation	Apply water sprays when	Number of times	Interviews, Visual	Monthly	Contractor,	1,560,000.00 for
		dust is being generated or at	the site is sprayed	inspection		SRWB,	allowances and
		times of strong wind.	with water to			Environmenta	transportation
			control dust, Dust			l District	
			complaints			Office	
		Provide protective gear (dust	Reports of use of	Interviews, Visual			
		masks) to workers and	protective gear	inspections			
		ensure that they wear them.	during dust				
			generating				
			activities				
		Erect a barrier around the	Perimeter with a	Visual inspection			
		work sites where major	barrier as				
		construction activities are	compared to the				
		taking place to break or	total area that				
		reduce wind and dust	requires a barrier				
		movement					
		Store and handle sand and	Reports of proper	Interviews, Visual			
		cement properly to limit dust	handling and	inspections			
		generation	storage of sand				

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
		measure				monitoring	Year
			and cement, Presence of dust				
		Provide or facilitate regular	Number of times	Review of human			
		medical check-ups for	workers go for	resources			
		construction workers to	check-up	records/employee			
		timely treat any occupational		records			
		safety illnesses and disorders					
		related to air pollution.					
2.2.2.	Gas and	Use new or fairly new	Number of years	Review of	Monthly	Contractor,	Cost included in
	particulate	vehicular equipment with	equipment has	procurement		SRWB,	2.2.1
	matter emission	exhaust gas emissions above	been in use, Level	records,		Environmenta	
		permissible emission limits.	of emissions from	Inspection,		l District	
			equipment	Interviews		Office	
		Timely and effectively	Dates for	Review of			
		maintain vehicles and	servicing vehicles	maintenance			
		equipment to prevent	and equipment in	records			
		exhaust gas emissions above	respect to set				
		permissible emission limits.	dates for service				
		Optimize transportation	Number or	Review of vehicle			
		management to avoid	errands for	logs			
		needless truck drives.	vehicles per day				
		Control vehicle speeds.					
		Reduce engine idling time.	Time period	Random checks,			
			vehicles remain	interviews			
			on idling				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/ Voar
2.2.3.	Soil	Provide or facilitate regular medical check-ups for construction workers to timely treat any occupational safety illnesses and disorders related to air pollution Surface all vehicle servicing	Number of times workers go for check-up Size of surfaced	Review of human resources records/employee records	Monthly	Contractor,	Cost included in
	contamination	and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils. Discard waste oil containers in approved disposal sites as	Volume of waste	Measurements, Review of waste management records		SRWB, Environmenta I District Office	2.2.1
		recommended by Mangochi Town Council.	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	Presence of waste disposal pits and distance to water bodies				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	measure	Indicator	monitoring	Trequency	monitoring	(IVIK VV)/ Year
		must not be near to surface 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				
		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				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	ennancement/mitigation	Indicator	monitoring	Trequency	y for monitoring	(IVIKW)/ Year
2.2.4.	Land degradation	measureSurface all vehicle servicing and fuel /oil storage areas with an appropriate impervious material to prevent contact of soil with the oils.Discard waste oil containers in approved disposal sites, as recommended by Mangochi	Size of surfaced areas Volume of waste disposed in approved sites	Visual inspection, Measurements, Review of waste management records	Monthly	Contractor, SRWB, Environmenta I District Office	Year Included in 2.2.1
		Town Council. Segregate waste (e.g. cartons and paint containers) to encourage reuse Provide all structures required for effective water drainage.	Volume of waste segregated and reused Presence of adequate drainage				
		Construct waste disposal pits and bury the wastes after the construction period. The pits must not be near to surface water bodies. Closely supervise the workforce to avoid or limit waste generation.	Presence of waste disposal pits and distance to water bodies Volume of generated waste				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Store and contain	Percentage of				
		construction materials on	construction				
		lined surfaces and in covered	materials stored				
		areas.	and contained on				
			lined surface				
		Sensitize construction	Number of	Inspections,			
		workers to avoid littering the	sensitizations;	Review of			
		site	Presence of	sensitization			
			littered sites	records			
		Use excavated soils for	Volume of	Inspections			
		backfilling and site levelling.	excavated used				
			for backfilling and				
			levelling				
		Sensitize suppliers to mine	Sites and	Inspection,			
		sand and source quarry in	methods for sand	Interviews			
		approved sites and	mining and				
		sustainably	quarrying				
		Enforce the use of licenced	Clause in	Review of			
		construction material	contracts, and the	contracts and			
		suppliers through the	types of suppliers	suppliers used			
		construction contract(s).	that are used				
2.2.5.	Loss of	Limit vegetation clearing and	Size of cleared	Inspection,	Monthly	Contractor,	480,000
	vegetation	excavations to only those	areas in relation	measurement		SRWB,	allowance for
	cover and	areas specified in the designs	to required space			Environmenta	officer from the
	wildlife	Plant appropriate trees and	Size of affected			l District	DNPW
		grasses in all disturbed areas.	area planted with			Office	
			trees and grass				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Cost and appropriately	Percentage of	Review of		Department	
		compensate for all the trees	trees	compensation		of National	
		to be cut down during	compensated for	records		Parks and	
		construction			_	Wildlife	
		Ensure that for every single	Number of	Inspection,			
		tree to be cut down, 10 tree	seedlings planted	Counting,			
		seedlings of a similar species	in adjacent areas	Measurement			
		should be planted in the					
		adjacent areas.					
		Rehabilitate affected land by	Size of				
		tilling the soils to facilitate	rehabilitated sites				
		natural regeneration of					
		vegetation; and by planting					
		trees, including indigenous					
		trees, and grass immediately					
		after construction works to					
		minimise soil erosion.			_		
		Sensitize employees and the	Number of	Review of			
		community to conserve	employee and	sensitization			
		vegetation.	community	records			
			sensitized		_		
		Salvage vegetation (hollow	Volume/number	Interviews,			
		logs, seedlings, seeds, etc.)	of reused plants	Inspections			
		affected by the project and	materials				
		reuse in areas to be planted					
		with forest woodland.					

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Construct the intake 300	Distance from the				
		metres outside the required	100m required by				
		100 metres by the park.	the park				
		Cage the pump to protect the	Presences of a				
		fish from getting inside.	cage				
		Pave the 300 metre access	Presence of a				
		road to prevent soil erosion	paved road				
		into the breeding grounds for					
		fish species.					
		For birds, study and identify	Presence of				
		nesting period, such the	report				
		project activities should not					
		disturb birds breeding					
		Conduct a non-intrusive area	Presence of a				
		search for presence or	report				
		evidence of nesting/nests					
		before the land clearing					
		activities. In case they are					
		found, put appropriate					
		buffers around the nest and					
		clearly mark and rope off until					
		the bird has left the nest.					
		Erect a barrier around the	Presence of a				
		work sites and barricade all	barrier				
		trenches and open pits and					
		place clear signs to protect					

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit v for	Monitoring cost (MKW)/
	•	measure		5	. ,	monitoring	Year
		animals and people from falling into them.					
2.2.6.	Generation of Waste	Provide waste collection bins where they may be needed	Number of waste disposal bins	Interviews, Inspections,	Monthly	Contractor, SRWB,	Cost included in 2.2.5
		Sensitise workers in the proper collection and management of wastes	Number of sensitisation meetings conducted	Review of sensitisation records		Environmenta I District Office	
		Dispose waste in designated sites, in collaboration with the local council	Volume of waste disposed in approved sites				
		Provide mobile latrines and encourage the workers to be using them;	Number of mobile latrines at the project site				
		Promote hygienic conditions in lavatories and other sanitary infrastructure etc					
		Train workers on the importance of good sanitation practices	Number of trainings conducted				
		Develop a Construction Waste Management Plan.	Presence of a Construction Waste Management Plan				
2.2.7.	Exposure of people and animals to	Use construction material suppliers that are licensed by the Mangochi Town Council	Size of rehabilitated sites	Inspection, Measurement	Monthly	Contractor, SRWB, Environmenta	Included in 2.2.1

ID	Potential	Recommended	Monitoring	Means of monitoring	Monitoring	Responsibilit	Monitoring cost
	Inpact	measure	Indicator	monitoring	nequency	monitoring	Year
	injuries and accidents	Avoid making deep pits when extracting construction materials.	Depths of pits	Review of sensitization reports		l District Office	
		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. The Department of Parks and Wildlife must patrol the Nkhudzi Bay area as part of their routine activities. Southern Region Water Board and the Departments	Presence of barricades, and appropriate signs, around trenches				
		of Parks and Wildlife, Fisheries and Forestry must sign Memorandums of Understanding (MO) for resources and ecosystems management and conservation					

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Inform and sensitize the	Number of people				
		public about all open pits and	sensitized				
		trenches					
		Supervise adequately the	Number of hours				
		construction activities and	a supervisor is on				
		follow recommended	site				
		procedures.					
2.2.8.	Disruption of	Give adequate notice of	Number of times	Review of	Monthly	Contractor,	1,560,000.00 for
	water supply	potential water disruption to	water supply is	construction		SRWB,	allowances and
		the water users that could be	disrupted without	reports,		District Water	transportation
		affected	notice	Interviews		Office	
		Provide alternative means of	Availability of				
		supplying water such as	alternative means				
		temporary by-pass piping or	of supplying				
		water bowsers where	water				
		appropriate					
2.2.9.	Water pollution	Mix cement in areas, which	Distance to	Visual inspection,	Daily	Contractor	Included in 2.2.5
	and siltation	are not connected to natural	natural drainage	Interview,			
		drainage systems.	of areas for	Measurement of			
			cement and paint	distance			
			mixing		Monthly	SRWB,	
		Store cement, paints,	Presence and size			Environmenta	
		lubricants, and fuels in lined	of cover and			l District	
		and covered areas.	surface lining			Office	
		Provide appropriate spill kits	Availability (and				
		when working near water	number) of spill				
		courses.	kit				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Provide appropriate facilities	Availability of				
		for the collection of wastes	facilities used for				
		on site such that they will not	disposing and				
		come into contact with	collecting of				
		water.	wastes				
		Site all material storage areas	Distance between				
		at least 10 m from	storage area and				
		watercourses.	watercourse				
		Provide appropriate barriers	Presence of and				
		to separate worksites from	size of barrier				
		water resources in order to	separating work				
		prevent accidental spillage	site and water				
		into water courses	resources				
		Line surfaces where cement,	Percentage of				
		paints and oils will be stored	construction				
			material on lined				
			surface				
		Collect and dispose wastes in	Percentage of				
		designated disposal sites as	wastes collected				
		required by the Local	and disposed in				
		Authority.	approved sites				
		Construct a pit latrine that is	Specification of				
		at least 1.5 meters deep,	pit latrines				
		lined at the base and 30					
		metres from a water body.					

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
2.2.10.	Occupational	Induct workers on OSH	Number of	Review of OSH	Daily	Contractor	520,000 for
	incidents and	requirements and repeat	workers inducted	induction records			allowances and
	accidents	reminders on the same	and reports of				transport
			reminders				
		Employ an OSH expert to	Presence of an	Review of human	Quarterly	District	
		monitor and ensure that	OSH expert	resources records,		Labour Office,	
		appropriate equipment and		Inspection		SRWB	
		acceptable codes of practice					
		for various tasks are followed					
		by workers at all times.					
		Provide appropriate personal	Availability and	Inspection,			
		protective equipment (PPEs)	evidence of use of	Interview			
		to construction workers; and	appropriate PPEs				
		to ensure that it is used at all					
		times.					
		Develop a workplace policy.	Availability of a				
			workplace policy				
		Provide firefighting	Presence of				
		equipment and training.	firefighting				
			equipment				
		Reserve a fire assembly	Presence of a fire				
		points	assembly points				
2.2.11.	Disturbances	Provide adequate notice	Notice period	Interviews	Daily	Contractor	1,560,000.00 for
	and accidental	before conducting					allowances and
	damage to	construction activities at a					transportation
	assets	private or public property.			Monthly		

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
		measure				monitoring	Year
		Provide detours and appropriate traffic signs for vehicles and pedestrians where constructions are being conducted across a road. Restore work sites to their state before construction activities where possible; rehabilitate the sites where it is not possible to restore to the baseline condition.	Presence of detours and traffic signs Percentage of site restored or rehabilitated	Inspections, Interviews, Review of construction records		SRWB, District Director of Planning and Development, Director of Public Works	
2.2.12.	Noise and vibrations	Use appropriate and well- maintained noise mufflers on vehicles and machinery Regularly service and carry maintenance of equipment	Types and number of times noise mufflers are used and maintained Number of times the equipment is maintained;	Inspections and Interviews Inspection, Review of maintenance	Daily Monthly	Contractor SRWB, Environmenta I District Office	Included under 2.2.1
		Provide ear muffs for the workers in noisy areas	Condition of equipment Number of workers are provided with ear muffs	reports Inspection, Interviews			

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	impact	measure	Indicator	monitoring	irequency	monitoring	(IVIK VV)/ Year
		Use electric motors instead of compressed air driven machinery	Use of electric motors against the use air driven machinery	Inspection			
		Reduce noise by using plastic or rubber liners, noise control covers, and dampening plates and pads on large sheet metal surfaces.	Number of complaints during construction	Interviews			
		Limit the number of days of operation; restrict hours of operation and schedule noisy tasks for periods of low occupancy on the project surroundings	Number of days and hours of noise activities	Random interviews, Construction reports			
		Notify the public of upcoming loud events	Number of notices sent, and the time when notices are sent	Inspection of records			
2.2.13.	Potential increase in poaching	Sensitize the workers and the community against trespassing and poaching and the applicable laws as well as	Number of sensitisation meetings conducted	Interviews, Inspection, Review of meeting minutes	Daily Monthly	Contractor SRWB, Environmenta	Cost included in 2.2.5
		Support and work with the National Parks and Wildlife	Presence of flying camps			Office, Department	
ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
---------	--	--	---	---	------------	--	--
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		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.	Number of meetings conducted			of National Parks and Wildlife	Tear
2.2.14.	Increase in sexual relationships, unplanned pregnancies, breaking up of families	Sensitise communities on the disadvantages of indulging in extra-marital affairs Sensitise girls on the dangers of getting involved in pre- marital sex at a tender age. Sensitize all contractors, workers and communities on the STD and HIV/AIDS program, including explanations on risks posed by STDs, sanctions, etc. as well as on grievance mechanisms in place	Number of sensitization meetings conducted Number of people sensitized	Review of sensitization records/minutes	Quarterly	Contractor, SRWB, District Social Welfare Office, District Gender Office	740,000 for allowances and transport

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Enforce punitive and	Number of	Review of human			
		disciplinary measures,	workers	resources/discipli			
		including dismissal from	disciplined for	nary records			
		employment, on any project	engaging in illicit				
		workers involved in any	sex with school				
		social malpractices with	going girls				
		surrounding communities.					
		Engage stakeholders in	Number of	Review of			
		encouraging and	stakeholders	stakeholders (e.g.			
		empowering women to be	engaged in	NGO and CBO)			
		financially independent	empowering	activities records			
			women				
		Provide both male and	Availability and	Inspections,			
		female condoms to workers	number of male	Interviews			
		for appropriate use.	and female				
			condoms				
		Prepare and implement an	Presence and	Interviews,			
		STD and HIV and AIDS	implementation	Review of reports			
		prevention program	of an STD and HIV	of			
		including a strict prohibition	and AIDS	implementation			
		of sexual abuse and sexual	prevention	of STDs and HIV			
		intercourse with partners	programme	and AIDS program			
		younger than 18 years of age					
		(underage sex).					
		Support the District Social	Level of support	Interviews, review			
		Welfare Office and the		of reports			
		Community Development		indicating			

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Office and Non-		activities for			
		Governmental Organisations		supporting			
		in the implementation of on-		various District			
		going projects aimed at		Council Offices			
		assisting pupils to go back to		and NGO			
		school.					
		Develop and implement a	Availability of a	Inspection and			
		workplace policy on HIV and	workplace policy	interviews			
2.2.15.	Sexual abuse	Sensitise workers and	Number of	Review of	Quarterly	SRWB,	Included in
	and harassment	surrounding communities to	sensitizations	sensitization		Environmenta	2.2.10
		avoid sexual abuse and	conducted	records		l District	
		harassment				Office,	
		Conduct sensitization and	Number of			District	
		awareness campaigns to	sensitizations			Health	
		encourage affected	conducted;			Offices,	
		individuals to report cases of	Number of			District	
		sexual harassment in the	reports received			Gender	
		homes.	on sexual			Office,	
			harassment			District	
		Publicise places for reporting	Availability of	Inspections,		Labour Office	
		gender related violence and	places for	Interviews			
		sexual harassment.	reporting gender				
			related and				
			sexual				
			harassment				

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

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		Implement and follow-up on	Number of times	Audit of the			
		grievance redress	the grievance	grievance redress			
		mechanisms.	redress	mechanism,			
			mechanism and	Review of			
			follow ups	grievance redress			
				records			
		Prepare and implement an	Availability of an	Audit of the			
		STD and HIV/AIDS prevention	STD and HIV/AIDS	implementation			
		program including a strict	prevention	of the STD and			
		prohibition of sexual abuse	programme	HIV/AIDS			
		and sexual intercourse with		prevention			
		partners younger than 18		programme			
		years of age (underage sex).					
		Require the contractor to be	Availability of a	Review of the			
		responsible and to take	clause in the	contract			
		necessary measures so his	contract requiring				
		employees do not commit	the contractor to				
		acts of sexual abuse and/or	take measures for				
		underage sex.	avoiding sexual				
			abuse and				
			underage sex				
2.2.16.	Diseases and	Conduct public awareness	Number of	Review of	Quarterly	Contractor,	160,000
	increased	and sensitization on	awareness and	sensitization		SRWB,	allowance for
	pressure on	community health, HIV and	sensitizations	records		Environmenta	the District
		AIDS.	conducted				Health Office

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
	community	Encourage employees to go	Percentage of	Review of		l District	
	health services	for voluntary health	potential	recruitment		Office,	Cost for EDO
		screening and receive	employees	reports		District	provided in
		appropriate treatment where	screened			Health Offices	2.2.1
		it is required.					
		Require the workers,	Percentage of	Inspections,			
		sensitize the communities to	workers and	Interviews			
		follow recommended	communities				
		environmental and water	following				
		management practices.	recommended				
			water resources				
			and environment				
			management				
			practices				
		Construct adequate	Number of	Visual			
		sanitation facilities at the	sanitation	inspections,			
		work sites and surrounding	facilities	Counting			
		area.	constructed,				
			compared to the				
			population to use				
			them				
		Provide both male and	Number of	Interviews,			
		female condoms to workers	condoms	Inspections			
		for appropriate use.	provided				
		Locate worker camps at a	Distance between	Inspection,			
		minimum distance of 1 km	workers camp	Measurement			
		from towns and villages in	and community				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		order to limit worker –					
		community interactions.					
		Maintain construction camps	Adherence to the	Inspections,			
		in clean and healthy	international	Comparisons of			
		condition as prescribed by	worker health	the conditions in			
		international worker health	standards	the camps to the			
		standards.		international			
				standards			
		Develop and implement an	Presence of a	Review of			
		H&S management plan to	clause in the	contract			
		protect every worker	contract requiring				
		involved in construction	the contractor to				
		activities, even temporary	comply with				
		workers (e.g. vaccines, etc.).	health and safety				
			standards				
		Develop and implement an	Presence and	Inspections,			
		H&S management plan to	implementation	Interviews, review			
		protect every worker	of an H & S	of an H & S			
		involved in construction	management plan	management plan			
		activities, even temporary					
		workers (e.g. vaccines, etc.).					
		Support and supplement	Level of support	Interview, Review			
		social services including the	and supplement	of support			
		Health Surveillance	to health	records			
		Assistants.	surveillance				
			system				

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
2.2.17.	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	Number of women employed versus the number of men	Head count, Review of employee files, Head count, Review of	Quarterly	Contractor, District Labour Office, District Social	Included in 2.2.7
		employees should be		sensitization		Office	
		women.		records		onnee	
		Conduct gender meetings to encourage women and to instil confidence that they can also do the work that men do Ensure there are also women in important positions such as foreman and engineers	Number of women sensitized, Number of women doing the work said to be for men Number of women in important positions				
		Economically empower women within affected communities by linking them with the District Council's Community Service Investment Programme (COMSIP)	Number of women linked to COMSIP	Review of COMSIP records			

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
	•	measure				monitoring	Year
		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			
2.2.18.	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	Included in 2.2.7
		Employ workers through established recruitment agencies	Number of employees from established recruitment agencies	Interviews		Welfare Office	
		Maintain an accurate staff register against which employee presence must be checked every day	Availability of an accurate register	Inspection and interviews			
		Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to implementation of the project;	Number of sensitization meetings conducted	Review of sensitization records	Quarterly	Contractor, District Labour Office, District Social Welfare Office	Included in 2.2.7
2.2.19.	Gender Based Violence (GBV) and Violence	Sensitize communities on GBV and VAC risks of the project during stakeholders' engagement, prior to	Number of sensitization meetings conducted	Review of sensitization records	Quarterly	Contractor, District Labour Office, District Social	Included in 2.2.7

ID	Potential	Recommended	Monitoring	Means of monitoring	Monitoring	Responsibilit	Monitoring cost
	inpact	measure	malcator	monitoring	nequency	monitoring	Year
	Against Children (VAC	implementation of the project				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			
2.2.20.	Loss of Cultural Heritage Sites and World Heritage Attributes	 Avoid construction- related impacts to important cultural resources; Preparation of a cultural heritage management plan; 	Adherence to cultural heritage management plan	Cultural heritage management plan	Monthly during construction	DMM, Client	Included in the Cultural Assessment budget

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
		iii. Provide training in					
		cultural heritage					
		management;					
		iv. Implement					
		internationally					
		recognized practices for					
		the protection of cultural					
		heritage resources;					
		v. Involve relevant					
		government authorities					
		responsible for the					
		protection and					
		management of cultural					
		heritage resources;					
		vi. Conduct a Contractor					
		Training and Awareness					
		Program;					
		vii. Selective archaeological					
		monitoring of surface					
		clearing and trenching					
		activities;					
		viii. Rescuing archaeology at					
		sites deemed as of high					
		priority; and					
		ix. Applying Chance Find					
		Procedures					
2.3.	DEMOBILIZATIO	N PHASE					

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
2.3.1.	Loss of jobs and	Provide alternative	Number of	Review of the	Once during	Contractor,	90,000 for
	businesses	employment to employees	employees	employee register	the	SRWB,	allowances
		e.g. as maintenance staff	allowed to		demobilizatio	District	
			continue working		n phase	Labour	
		Provide adequate notice to	The notice period	Interviews,		Officer	
		employees to prepare	before layoffs	Review of			
		themselves and secure		employee files			
		alternative employment					
		Pay severance benefits to	Number of	Interviews,			
		leaving workers in line with	labourers to have	Review of			
		the labour regulations	received	severance pay			
			severance pay	records			
			and amounts				
		Sensitize the workers and the	Number of	Interviews, review			
		general community to be	workers saving	of records of			
		saving	from their pay;	sensitizations			
			Number of people				
			sensitized				
		Sensitize the business	Reports of	Interviews			
		persons to diversify and find	business				
		alternative markets	diversification				
			and opening of				
			new markets				
2.3.2.	Abandonment	Fill up and close pits after the	Presence and	Visual inspection,	Once during	Contractor,	90,000 for
	of excavated	construction works	number of filled	Review of	the	SRWB,	allowances
			pits after	procurement		Environmenta	

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
		measure				monitoring	Year
	areas for raw materials		construction works	records, Interviews	demobilizatio n phase	l District Officer	
		Rehabilitate all work site	Size of area that is rehabilitated after construction				
		Construction materials e.g. sand and clay soils should be sourced from licensed	Type of suppliers used for construction				
		suppliers	materials				
2.4.			OPERAT	ON PHASE	1		
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, Environmenta I District	680,000 for allowances and transport
		Provide solid waste storage bins and skips	Number of storage bins and skips at the sites			Office <i>,</i> District Health Office	
		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				
		campaigns on consequences of indiscriminate waste disposal.	sensitizations are conducted				

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
		measure			. ,	monitoring	Year
2.4.2	Increased	Enforce proper excreta and	Evidence of	Inspections	Quarterly	SRWB,	Included in 2.4.1
	pollution from	wastewater management	proper waste			Environmenta	
	wastewater and		management			l District	
	sludge	Apply lime treatment to	Number of times	Interviews		Office,	
		dewatered sludge to	quicklime is used			District	
		suppress pathogens and	to treat sludge			Health Office	
		remove odour					
		Enforce the use of licensed	Number of times	Review of waste			
		liquid waste handlers for	licensed liquid	collection records,			
		liquid waste.	waste handlers	Interview			
			are used	-			
		Dry sludge on drying beds	Volume of waste				
		before disposing off in a	dried before				
		dedicated disposal site.	disposing				
		Prepare and enforce	Availability and	Review of the			
		operational guidelines for	reports of	operational			
		sludge treatment and	enforcement of	guidelines,			
		management.	operational	Interviews,			
			guidelines for	Inspection			
			sludge treatment				
		Conduct WASH activities to	Number of	Review of			
		sensitize people on the	sensitizations;	diseases statistics			
		benefits (including	Number of				
		prevention of cholera) of	reported cholera				
		good the hygiene.	cases				
2.4.3	Emergencies	Design and implement an	Presence of a	Inspections,	Quarterly	SRWB,	160,000
		emergency response plan.	written	Interviews		Environmenta	allowance for

ID	Potential Impact	Recommended enhancement/mitigation	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for	Monitoring cost (MKW)/
	-	measure				monitoring	Year
		Install fire hydrants within the proposed development. Regularly monitor and maintain the water supply	emergency preparedness plan Presence and number of fire hydrants Number of times monitoring is			l District Office, District Water Development Office	District Water Development Office Cost for EDO included in 2.4.1
		system, including CWPs. Install a fire extinguisher at the plant and train workers on how use.	conducted Presence and number of fire extinguishers				
2.4.4	Potential risks of water leakage and flooding from theft and	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 2.4.3
	vandalism and from climate change impacts	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	Monitoring indicator	Means of monitoring	Monitoring frequency	Responsibilit y for monitoring	Monitoring cost (MKW)/
		Support economic activities in the area as part of corporate social responsibilities.	Reports of implementation of cooperate social responsibility			monitoring	
		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 and maintain 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			
		Provide adequate and effective storm water drainage to protect infrastructure from flooding	Size, state and location of stormwater drains	Visual inspection	Annually just before the rains	SRWB	N/A
		Liaise with the Meteorological Department for early warning on flood occurrences.	Weather data	Weather records	Daily during the rainy season	SRWB	N/A

ID	Potential	Recommended	Monitoring	Means of	Monitoring	Responsibilit	Monitoring cost
	Impact	enhancement/mitigation	indicator	monitoring	frequency	y for	(MKW)/
		measure				monitoring	Year
2.3.3.	Risk from seismic activity (earthquakes/	 Design the structures to withstand the maximum earthquakes of the region 	Design specifications	Check design reports	During scrutiny of draft designs	SRWB Consultant Contractor	Included in Consultant's and Contractor's
	tremors)	 (magnitude of 8). Adhere to proper building/ construction codes and standards throughout the design process and during implementation phase. Involve experts from the Geological Survey Department throughout the project implementation 	Building/ construction codes and standards	Check construction methods and practices	During scrutiny of final designs Monthly during construction	Geological Surveys Department	fees and in 2.2.1

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.

S/N	Potential Impact	Cost in Mk per Year
1	Creation of employment opportunities	520,000.00
2	Improved water supply to Mangochi Town and the	
	surrounding areas	90,000.00
3	Improved sanitation, hygiene and health	520,000.00
4	Improved socio-economic situation of the communities	520,000.00
5	Increased development	160000.00
6	Losses and compensation for land and assets	1,560,000.00
7	Dust generation, gas and particulate matter emission	1,560,000.00
	Loss of vegetation cover and wildlife	480,000.00
0	Disruption of water supply, Water pollution and	
0	siltation	1,560,000.00
9	Occupational incidents and accidents	520,000.00
10	Disturbances and accidental damage to assets	1,560,000.00
11	Increase in sexual relationships	740,000.00
12	Diseases and increased pressure on community health	
12	services	160,000.00
13	Loss of jobs and businesses	90,000.00
	Abandonment of excavated areas for raw materials	90,000.00
	Solid waste generation	680,000.00
	Emergencies	160,000
	Total	10,970,000.00

Table 9-2: Cost for monitoring activities

9.3. INSTITUTIONAL RESPONSIBILITY FOR MONITORING

Monitoring will be implemented through the existing local and national institutional arrangements, the project developer (SRWB) and the construction contractor as follow:

9.3.1. National level monitoring

- a. The Environmental Affairs Department will be responsible for overseeing the implementation of the Environmental and Social Management Plan (ESMP). and will be responsible for reporting to the Ministry of Forestry and Natural Resources and also to the National Council for the Environment. The Environmental Affairs Department in liaison with the Department of Climate Change will monitor effects of climate change including flooding and rise in temperature of waters of the lake for fish protection. They will provide leadership in coordinating data dissemination and the monitoring activities.
- b. **The Forestry Department** will monitor the protection of flora in the project area. They will coordinate with the SRWB to monitor protection of trees and vegetation and also to monitor and provide guidance to the contractor and the communities on revegetation activities.
- c. **The Department of Museums and Monuments** will be responsible for monitoring protection of World Heritage and Cultural Heritage values; and will coordinate with the UNESO secretariat on these matters. They will also monitor the contractor to ensure that the project activities are implemented In such a way that they do not compromise cultural heritage and aesthetic values.
- d. **The Department of National Parks and Wildlife** will be responsible for monitoring protection of wildlife to ensure that there is no animal disturbances, accidents, deaths and no poaching.
- e. **The Department of Fisheries** will be responsible for monitoring fisheries protection and ensuring that the interests of fishermen and the local communities are protected within the applicable laws.
- f. **The Department of Water** will be responsible for monitoring water resources use (abstraction) and water quality

Through a memorandum of understanding with the SRWB, the departments of Forestry, Museums and Monuments, National Parks and Wildlife, Fisheries and Water will work together to monitor natural resources (water resources and biodiversity) protection and conservation.

- g. **The Ministry of Labour** through the Occupational Safety and Health Department, will monitor the protection of workers from occupational hazards and will also monitor employment issues
- h. **Ministries responsible for Gender** will monitor issues related to potential increase in unwanted pregnancies and school dropouts, amongst girls, due to the influx of workers in the area.

These institutions will work through their respective district officers.

9.3.2. Southern Region Water Board

Currently, Southern Region Water Board (SRWB) collaborates (through Mangochi District Council) with Ward Councillors, Mangochi District Council officers (such as the Environmental District Officer, District Forestry Officer, District Lands Officer etc.) and the local chiefs in project planning and environmental protection activities. SRWB will monitor the technical, environmental and social design aspects of the scheme construction and extension works. They will regularly report and provide feedback to the Environmental Affairs department (EAD). They will work closely in liaison with the Departments of Parks and Wildlife, Museums and Monuments, Water, Forestry, Fisheries and ministries responsible for Labour, Lands, Education and Gender as well as district and community level stakeholders in monitoring of the project.

9.3.3. District level monitoring

At district level, the District Environmental Subcommittee will lead the monitoring process in liaison with the Monitoring and Evaluation Officer. The Director of Planning and Development (DPD) will be actively involved in providing critical information on technical issues of the extension works of the scheme. He will be the focal point for the District Council on all monitoring issues and will, in turn, report to the District Executive Committee (DEC).

Mangochi District Council will also monitor the performance of the contractor. The Council will, through the Environmental District Officer, make recommendations to the SRWB on steps needed to rectify any identified problems in the implementation of the Environmental and Social Management Plan (ESMP).

For the project, the Environmental District Officer will be responsible for coordinating ESMP monitoring activities and reviewing progress reports for the ESMP implementation, in order to align the activities with the provisions of the Environment Management Act and any other applicable legislation and policies. S/he will also make appropriate recommendations to the SRWB, with copies to the District Council and the Environmental Affairs Department.

The District Forestry Officer will assist with technical advice on re-afforestation activities as part of the mitigation measures and catchment protection activities; while the District Lands Officer will provide guidance during assessment of any compensation requirements for land and field crops, where appropriate.

The Counsellors and Local Chiefs will facilitate community mobilization and sensitization in all the project areas; including waste management, sanitation and catchment protection.

At district level all the departmental representatives including for the Departments of National Parks and Wildlife, Water, Social Welfare, Gender and all other departments will be responsible for monitoring mitigation measures of their field of work.

9.3.4. Community level monitoring

The staff to be involved in monitoring at community level will be key extension staff of the relevant sectors including forestry, social and gender, water, health, agriculture, public works and others. These will work in collaboration with the local leaders at Traditional Authority and committees at village level, particularly the village headmen, political leaders and others. They will also work closely with the District Environmental Subcommittee and the District Coordinating Team. Monitoring at community level will include sensitization to the general public on the dangers of vandalizing the water supply infrastructure

Procedures for providing information on progress, including reporting schedules and results of mitigation and monitoring measures, will be communicated to stakeholders by the SRWB. Recipients of such reports will include all those with responsibility for ensuring timely implementation of mitigation measures and for undertaking remedial actions such as:

9.3.5. Schedule of reporting

The frequency for reporting is determined by the schedule for project activities. Construction and environmental rehabilitation works are expected to take a relatively short period of time. Therefore, monthly monitoring reports will generally be expected from the District Council and the national key stakeholder institutions.

9.3.6. Gender mainstreaming and inclusion of vulnerable groups

Various stakeholders at district level will be involved in monitoring gender activities and gender mainstreaming throughout the project construction and operational phases. The Social Welfare Office as well as the Community Development Office will work together with various NGOs in monitoring.

The project will have to be monitored for inclusion of vulnerable groups by the contractor, who should also provide for a conducive working environment in which people with disabilities and those living with HIV and AIDS feel welcomed and supported. Members of vulnerable group should also be considered for top positions, as part of project management staff, where they meet the required needs and qualifications.

Gender activities cannot be monitored by themselves and have to be seen as cross-cutting issues in relation with HIV and AIDS, amongst others. A mix of both qualitative as well as quantitative methods are needed to provide for thorough overview of achievements. Quantitative methods alone will not suffice. Sex-aggregated data needs to be collected to account for differences in experiences of affected people. Monitoring the impacts of the extension of Mangochi Water Supply Scheme should hence include both women's and men's voices.

9.3.7. Monitoring by the construction contractor

The contractor will have an internal monitoring system for impact mitigation during the construction phase of the project. In addition, internal monitoring will be managed and implemented by the Environmental Social Safeguards Expert of SRWB, who will regularly review the status of project impacts and make recommendations to the contractor to

rectify any failure in meeting environmental obligations. The contractor will provide one full time Health, Safety and Environmental Liaison Officer (HSE Officer) to be responsible for implementation of all mitigation measures. He will also liaise with local community leaders and ensure that he complies with the requirements of the Environmental Affairs Department (EAD), Mangochi District Council and other relevant authorities in connection with environmental and social recommendations of the ESMP.

CHAPTER 10 : WORLD HERITAGE AND VISUAL IMPACT: OUV, INTEGRITY, PROTECTION AND MANAGEMENT OF LMNP WORLD HERITAGE SITE

The objective of the World Heritage and visual impact assessment for Nkhudzi Hill, as part of the UNESCO World Heritage Site, is to identify the affected World Heritage attributes and Outstanding Universal Value of the property and provide an evaluation of the impacts and mitigation measures. The assessment covered the Nkhudzi Hill and the surrounding area. This assessment addressed the main concerns from the visual and World Heritage point of view in order to derive mitigation measures to minimize the adverse impacts on the natural attributes of the Lake Malawi World Heritage Sites.

In setting the scope of the World Heritage and visual impact assessment for the proposed water project, the following aspects were considered:

- Key Issues
- Methodology for Assessment of World Heritage and Visual Impact
- World Heritage Impact Assessment Matrix
- Project Impact on OUV, Integrity and Inscription Criteria used for World Heritage Nomination
- World Heritage OUV and Sensitivity to Change
- System to be used for judging significance of impact;
- Aesthetics Impact Assessment
- Thresholds of Significance
- Visual Character and Compatibility
- Level of detail required for baseline studies;
- Recommended World Heritage Mitigation Measures

10.1. KEY ISSUES ADDRESSED

The assessment identified the impacts of the proposed water supply project on the Outstanding Universal Value (OUV), site integrity and inscription criteria used for World Heritage nomination as a natural site, and the visual and aesthetic character of the surrounding World Heritage area. The Lake Malawi National Park has its distinctive character and unique natural attributes that convey its Outstanding Universal Value (OUV) as a World Heritage property. The alteration of the existing World Heritage elements, such as trees and rock boulders would be vulnerable to the existing World Heritage character.

World Heritage resources considered included the fresh lake water, fish and animal species, topography, woodland, and other vegetation, island form, land use, scenic spots and details of surrounding hills. World Heritage affected attributes were identified in accordance with the World Heritage Value Mapping of Malawi. These were rated based on the quality of element, their sensitivity to change, and their importance at various geographical levels.

10.2. METHODOLOGY FOR ASSESSMENT OF WORLD HERITAGE AND VISUAL IMPACT

World Heritage impacts can be positive or negative. They are assessed at two levels:

- Impacts upon individual World Heritage features and resources; and
- Impacts upon World Heritage character.

World Heritage impacts are assessed as a function of the sensitivity and magnitude of change of the OUV, integrity and protection management of the World Heritage resources or World Heritage character. World Heritage sensitivity is assessed as high, medium or low, and magnitude of change is assessed as large, intermediate, small or negligible. World Heritage impacts are assessed subsequent to the implementation of prescribed mitigation measures at both the construction and operational phases.

World Heritage sensitivity is the ability of the World Heritage resource or character to accommodate change without prejudice to the quality of that resource. While the magnitude of change is the degree of degradation or intrusion on the World Heritage element, which it may be possible to affect through World Heritage or environment enhancement. Impacts are assessed as substantial, moderate and slight (positive or negative). Insignificant impacts are termed negligible. The matrix used to assess World Heritage impacts is shown in table 10.1 below:

Magnitude of Change	Sensitivity of World Heritage Resource / Character						
	High	Medium I					
Large	Substantial	Substantial /	Moderate				
	Moderate						
Intermediate	Substantial /	Moderate	Moderate / Slight				
	Moderate						
Small	Moderate	Moderate / Slight	Slight				
Negligible	Negligible	Negligible	Negligible				

 Table 10-1: World Heritage Impact Assessment Matrix (Positive or Negative)

Substantial - Adverse / Beneficial impact where the proposed project would cause significant degradation or improvement in existing World Heritage baseline conditions.

Moderate - Adverse / Beneficial impact where the proposed project would cause noticeable degradation or improvement in existing World Heritage baseline conditions.

Slight - Adverse / Beneficial impact where the proposed project would cause a barely noticeable degradation or improvement in existing World Heritage conditions or where the changes brought about by the project would not be apparent in visual terms.

Negligible - The proposed project does not perceptibly affect the existing World Heritage baseline conditions.

10.3. OUV OF LAKE MALAWI NATIONAL PARK WORLD HERITAGE SITE

The project is partly located within the Lake Malawi National Park World Heritage Site. The property is of global importance for biodiversity conservation due particularly to its fish diversity. Lying within the Western Rift Valley, Lake Malawi is one of the deepest lakes in the world. The property is an area of exceptional natural beauty with the rugged landscapes around it, contrasting with the remarkably clear waters of the lake. The property is home to many hundreds of cichlid fish, nearly all of which are endemic to Lake Malawi, and are known locally as "mbuna". The mbuna fishes display a significant example of biological evolution. Due to the isolation of Lake Malawi from other water bodies, its fish have developed impressive adaptive radiation and speciation, and are an outstanding example of the ecological processes. The area was inscribed using the following criteria:

Criterion (vii): The property as an area of exceptional natural beauty with its islands and clear waters set against the background of the Great African Rift Valley escarpment. Habitat types vary from rocky shorelines to sandy beaches and from wooded hillsides to swamps and lagoons. Granitic hills rise steeply from lakeshore and there are a number of sandy bays.

Criterion (ix): The property as an outstanding example of biological evolution. Adaptive radiation and speciation are particularly noteworthy in the small brightly coloured rocky-shore tilapine cichlids (rockfish), known locally as mbuna. All but five of over 350 species of mbuna are endemic to Lake Malawi and represented in the park. Lake Malawi's cichlids are considered of equal value to science as the finches of the Galapagos Islands remarked on by Charles Darwin or the honeycreepers of Hawaii.

Criterion (x): Lake Malawi as a globally important area for biodiversity conservation due to its outstanding diversity of its fresh water fishes. The property is considered to be a separate bio-geographical province with estimates of up to c.1000 species of fish half occurring within the property: estimated as the largest number of fish species of any lake in the world. Endemism is very high: of particular significance are the cichlid fish, of which all but 5 of over 350 species are endemic. The lake contains 30% of all known cichlids species in the world. The property is also rich in other fauna including mammals, birds and reptiles.

The property is sufficiently large (94.1 km² of which 7km² is aquatic zone) to adequately represent the water features and processes that are of importance for long term conservation of the lake's rich biodiversity and exceptional natural beauty. The water area within the national park protects the most important elements of the lake's biodiversity. It also protects all major underwater vegetation types and important breeding sites for the cichlids.

10.4. World Heritage Attributes and Sensitivity to Change

An assessment was done on the project actions and change that might have an impact on the above Lake Malawi National Park World Heritage attributes and significance, and identified how sensitive to change a range of these values and significance might be. The envisaged action and change included, introducing new built elements within the natural environment like proposed water tank reservoir, access road and transmission pipelines, and removing or altering original environment. It was noted that different actions will have different potential impacts on LMNP World Heritage attributes and significance, depending on the nature of the values of the particular element of the World Heritage Area. It is therefore useful to indicate the degree of sensitivity that the components of the Nkhudzi Hill might have to changes in their conservation, use or management. The level of sensitivity to change is based on the vulnerability of the component to loss of the stipulated World Heritage natural attributes and values through change.

The LMNP World Heritage natural attributes sensitivity to change has been rated from moderate to low as presented in tables 10.2 and 10.3 below. The sensitivity to change has been defined as follows:

High sensitivity to change occurs where a change would pose a major threat to a specific LMNP World Heritage value of the component affected or the WHS as a whole. A major threat is one that would lead to substantial or total loss of the World Heritage value.

Moderate Sensitivity to change occurs where a change would pose a moderate threat to a specific World Heritage value of the component affected, or would pose a threat to a component of heritage significance in another part of the WHS. A moderate threat is one that would diminish the World Heritage value, or diminish the ability of the observer to appreciate the value.

Low sensitivity to change occurs where a change would pose no appreciable threat to a specific World Heritage vale of the component affected, and would pose no appreciable threat to heritage significance in another part of the WHS. Components of the WHS with no individual identified heritage values are likely to have a low sensitivity to change.

If a proposal to develop the water project is to go ahead, the area would have moderate sensitivity to change in relation to terrestrial environment covering Nkhudzi Hill and the vegetation within it, low sensitivity to change in relation to the aquatic environment comprising the fresh water lake and low sensitivity to change in relation to endemic cichlids fish and diversity of fish species; and finally low sensitivity to change in relation to the existing islands within the lake with exceptional natural beauty and clear waters around it.

	World Heritage Resources								
No	LMNP World	Description and OUV+	Sensitivity						
	Heritage Natural		to Change						
	Attributes Resources								
1	Terrestrial Environment	Existing wooded area comprising of	Moderate						
	-Nkhudzi hill and the	predominantly wooded hillsides of							
	vegetation cover	Nkhudzi and Namiasi.							
2	Aquatic Environment -	Existing fresh water from Lake Malawi.	Low						
	Fresh Water Lake								

Table 10-2: World Heritage OUV and Sensitivity to Change

3	Endemic cichlids fish and diversity of fish species	Endemic cichlids fish species. Lake Malawi is globally important for biodiversity conservation due to its outstanding diversity of its fresh water fishes.	Low
4	Islands and ecosystems	Existing islands within the lake with exceptional natural beauty and clear waters around it.	Low

Table 10-3: Impact Assessment on World Heritage Resources

	World Heritage Impact (Without Mitigation Measures)								
				Constructior	n Phase	Operational Phase			
				Magnitude	Significance	Magnitude	Significance		
Im	pact on OUV of	Disturbed	Quantity/	of Change	Threshold	of Change	Threshold of		
LΜ	INP World		Sensitivity	and Source	of World		Residual		
He	ritage Resources	Alea	of Change	of World	Heritage		World		
				Heritage	Impact		Heritage		
	-			Impact			Impact		
1	Terrestrial	Access	Moderate	Moderate					
	Environment -	road =		(Site					
	Nkhudzi hill and	Tank		formation	Substantial	Moderate	Substantial		
	the vegetation	Space=		and	Substantial	wouerate	Substantial		
	cover			construction					
				works)					
2	Aquatic	Nil	Low/Low	Negligible	Negligible	Negligible	Negligible		
	Environment -								
	Fresh Water								
	Lake								
3	Endemic	Nil	Low/Low	Negligible	Negligible	Negligible	Negligible		
	cichlids fish and								
	diversity of fish								
	species								
4	Islands and	Nil	Low/Low	Negligible	Negligible	Negligible	Negligible		
	ecosystems								

10.5. AESTHETICS IMPACT ASSESSMENT

The potential impacts to aesthetics and perceptions on the exceptional natural beauty of different habitat types of Lake Malawi National Park World Heritage Site has been addressed under this section. One of the criterion for the inscription of Lake Malawi as World Heritage Site is criterion (vii), which valued the property as an area of exceptional natural beauty with its islands and clear waters. The analysis of aesthetics, therefore was necessary, focusing on the visual relationship of the proposed project with existing land uses in the surrounding area.

Aesthetics refer to visual resources and the quality of what can be seen or overall visual perception of the environment and may include such elements as hill-scape, landscape, lake-scape and open areas, as well as the relationships between these elements. Aesthetic features often consist of unique or prominent natural or man-made attributes or several small features that, when viewed together, create a whole that is visually interesting or appealing. The degree of visual access to an aesthetic resource contributes to the value of aesthetic features.

10.5.1. Visual Character

Aesthetic impact assessments addresses the issue of visual character which refers to the quality of what can be seen or the overall visual perception of the environment, and may include such characteristics as building height and mass, development density, design character, and landscaping. Aesthetic impact assessment generally deals with the issue of contrast, or the degree to which elements of the environment differ visually. Adverse visual character effects can include the loss of natural features or areas, the removal of landscape features with aesthetic value, or the introduction of contrasting features into natural areas and settings.

10.5.2. Thresholds of Significance

In accordance with the Malawi EIA Guidelines, a project could have a potentially significant impact related to aesthetics if it were to:

- a) Have a substantial adverse effect on a scenic view;
- b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic resources within the project impact zone;
- c) Substantially degrade the existing visual character or quality of the site and its surroundings; or

10.5.3. Visual Character and Compatibility

Construction activities at the Water Supply Project Site would be mostly visible from the surrounding uses, and are estimated to occur over a period of approximately 18 months. Construction of the Project would involve four basic activities: (1) intake structure and transmission pipelines (2) conventional water treatment plant and auxiliary buildings, (3) storage tanks and water service reservoirs (4) access service road.

Construction activities would vary on a weekly basis, depending largely on the number of workers and construction trucks needed for the activities during each time period. Temporary fencing would be installed around the Project Site during construction, which would partially shield views of construction activities and equipment. Though construction activities under the Project would be visible from adjacent public and private vantage points, changes to the appearance of the Project Site would be temporary in nature. Temporary construction changes are necessary for the development of the Site and would not rise to the level of a change that would substantially degrade the existing visual

character. Therefore, aesthetic impacts during Project construction would be less than significant.

10.5.4. Height and Massing

As discussed earlier, the maximum height of the tank reservoir is 25m and a diameter of 8m, with a capacity of 4,000 m³ will be built at Nkhudzi Hill. This 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 site at Nkhudzi Hills has a a minimum elevation of about 610m, significantly at a higher altitude than sorrounding areas.

The massing of the water tank at Nkhudzi Hill will be softened by varying cover-ups and concealment to blend with the natural environment. In addition, the perimeter vegetation and landscaping, including along the access road, would soften the appearance from surrounding areas, particularly when viewed from a far. As is the case with visual character, the panoply of diverse development in the immediate vicinity of the project area means that no single type of structural height and/or massing predominates. Given this environment, the water tank, while it would be taller than surrounding features, cannot be concluded to represent a substantial degradation of the existing visual character or quality of the area with regard to structural height and massing. Overall, development of the water tank would result in a less than significant impact with respect to height and massing and visual character compatibility.

10.5.5. Signage

Project exterior signage is proposed to be minimal and would not include any illuminated animated LED displays. Therefore, there would be no potential visual character impacts related to signage.

10.6. LEVEL OF SIGNIFICANCE AFTER MITIGATION

Project impacts on the environment related to scenic views, aesthetics and visual character are anticipated to be less than significant. Therefore, no significant environmental impact or significant unavoidable environmental impact associated with these issues would result from the development of the proposed project.

10.7. RECOMMENDED WORLD HERITAGE MITIGATION MEASURES

The key source of World Heritage impact arises from removal of existing vegetation and blasting of rock boulders to construct a water tank reservoir and access road. The key source of visual impact is the permanent intrusion of intake structure and water tank reservoir on top of Nkhudzi Hill. The impact upon World Heritage character is predicted to be substantial to slight due to the rock blasting and disturbance to existing vegetated

hillslopes for road development on top of the Nkhudzi Hill where the tank will be constructed.

The following mitigation measures are therefore recommended:

- 1. Fewer trees are required to be removed during construction.
- 2. Preservation of existing trees to be retained on areas not affected by the proposed Project
- 3. Demarcation of the tree protection zone for retention of trees.
- 4. Selection of fast-growing mix of native trees and shrubs in compensation for vegetation removal and disturbance.
- 5. World Heritage treatment such as green roof, vertical greening and screen planting, including climber plants to screen and soften surface of built structures and mitigate the World Heritage and visual impact.
- 6. Staggered built form with building height of the water tank corresponding to the natural sloping landform to enhance visual quality.
- 7. Sensitive treatment and design to external finishes of the water tank built structure to ensure elements with color, texture and tonal quality being compatible and blending to the existing World Heritage context and natural environment.
- 8. Maintenance of planting works upon completion

10.8. ASSESSMENT AND EVALUATION OF CULTURAL HERITAGE IMPACTS AND THEIR MITIGATION MEASURES

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.

10.8.1. 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.

10.8.2. 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
- Applying Chance Find Procedures to be decided upon and development of the necessary management measures

10.8.3. Determination of Site Cultural Significance and Values

In order to define the mitigation measures of the sites located within and/or in the proximity of the project area, the threatened cultural heritage sites need to be classified according to their importance and the required appropriate intervention. The following categories have been defined for the cultural heritage resources identified in this project area (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** is a self-explanatory criterion: the older a site is, the more important it is. This is because old sites are rare and finding one is an opportunity to understand the distant past of an area. 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 in order to be able to understand the activities carried out at the site 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. If natural (erosion, digging animals) or anthropological phenomena have disturbed a site too heavily, the association and position of artefacts cannot be interpreted. 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 10-4 below:

	Old Age	Primary Context	High Artefact Density or variety	High Social Significance	Priority
1. MH-Nkhudzi 1 Archaeological	Yes	Yes	Yes	No	High
Site					
36-715711 8432028					
2. MH-Nkhudzi 2 Archaeological	Yes	Yes	Yes	No	High
Site					
36-715644 8432001					
3. MH-Nkhudzi 3 Archaeological	Yes	Yes	Yes	No	High
Site					
36-715680 8431936					
4. MH-Nkhudzi 4 Archaeological	No	Yes	No	No	High
Site 36-714092 8432352					

Table 10-4: preliminary site prioritization classification

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

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.

10.9. 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.

10.10. 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 10.5.

Table 10-5: 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, in liaison with Mangochi District Council, has already started community engagement. This must continue through to operational phase of the project. The ESIA report has recommended specific community sensitization as part of proposed mitigation measures to social impact issues. These and any additional measures must be adhered to.
- g) SRWB must allocate additional funds for corporate social responsibilities (including construction and management of Communal Water Points) to improve its image among the communities,
- h) During construction, the contractor should avoid clearing any protected or endangered plant species. Where they are removed, they must be replanted.

- i) Adequate and fair compensation must be given to all the affected people before construction activities start;
- SRWB and the respective key stakeholders should support and facilitate employment of women, the youth and vulnerable groups to eliminate potential gender and social imbalances;
- Where possible and appropriate, employment of local people from the project area must be prioritised to encourage community ownership and sustainability of the project.
- It is recommended that SRWB should follow all the mitigation and enhancement measures specified in this report. In addition, all important stakeholders should be engaged in the implementation of the project.
References

GOVERNMENT LEGISLATIONS

Government of Malawi (2001). Constitution of the Republic of Malawi 1995. Lilongwe Government of Malawi (1997). Forestry Act 1997. Lilongwe Government of Malawi (2013). The Environmental Management Act (1996). Lilongwe Government of Malawi (2013). Gender Equality Act 2013. Lilongwe Government of Malawi (1998). Local Government Act 1998. Lilongwe Government of Malawi (1997). Occupational Safety, Health and Welfare Act 1997. Lilongwe Government of Malawi (2013). Water Resources Act 2013. Lilongwe Government of Malawi (1995). Water Works Act 1995. Lilongwe Government of Malawi (2016). Land Act 2016. Lilongwe

Government of Malawi (2016). Land Acquisition (Amendment Act 2016). Lilongwe

GOVERNMENT POLICY AND OTHER DOCUMENTS

Government of Malawi (1997). Guidelines for Environmental Impact Assessment 1997, Lilongwe

Government of Malawi (2006). **EIA Guidelines for Water Sector Projects (2006)** Lilongwe Government of Malawi (2017). **Malawi Growth and Development Strategy II 2017 – 2022**, Lilongwe

Government of Malawi (2002). Malawi National Land Policy 2002, Lilongwe Government of Malawi (2006). Malawi National Sanitation Policy 2002, Lilongwe Government of Malawi (2010). Malawi State of Environment and Outlook Report 2010, Lilongwe

Government of Malawi (2002). Malawi HIV and AIDS Policy 2002, Lilongwe

Government of Malawi (2004). National Environmental Policy 2004, Lilongwe

Government of Malawi (2003). National Forestry Policy 2003, Lilongwe

Government of Malawi (2005). National Gender Policy 2005-2008, Lilongwe

Government of Malawi (2005). National Water Policy 2005, Lilongwe

Government of Malawi: Ministry of Agriculture, Irrigation and Water Development.

(2014). Indicators Concepts and Definitions for Irrigation, Water and Sanitation, Lilongwe

Trocaire, 2013; Malawi Climate Change Study

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 socioeconomic 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:
 - 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.
- I. 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: THE INTAKE STRUCTURE AND AUXILIARY FACILITIES











APPENDIX 5: PROPOSED PIPELINE AND ACCESS ROAD TO THE MAIN WATER TANKS

APPENDIX 6: ZAMCOM'S POSISITION TO EXTRACTION OF WATER.



18 July 2019

Secretary for Agriculture, Irrigation and Water Development P.O. Box 30134 Lilongwe 3 Republic of Malawi

Dear Mr. Gray S.V.K. Nyandule-Phiri

RE: ZAMCOM's Position to Execution of Planned Mangochi and Karonga Potable Water Supply Projects

Reference is made to the above captioned subject.

As you may be aware, the ZAMCOM Council of Ministers at its seating 28 February, 2017 in Tete, Mozambique made a landmark adoption of Procedures for Notification of Planned Measures for planned projects with potential transboundary implications.

In recognition of the provisions of the adopted Notification of Procedures, the Republic of Malawi accordingly presented the notification for planned measures for the Karonga and the Mangochi Potable Water Supply Projects to the following Zambezi Watercourse Member States: Angola; Botswana; Mozambique; Namibia; Tanzania; Zambia; and Zimbabwe. Subsequently, none of the Member States thus far registered objections to any of the two planned measures during the preliminary and technical notification stages. Backed by the recommendation emanating from the ZAMCOM Technical Committee's 7th Meeting of 20-21 November, 2018 in Victoria Falls, Zimbabwe, I am pleased to inform you that, at the recently held 6th Meeting in Dar es Salaam, Tanzania, the ZAMCOM Council of MinIsters (CoM) considered and endorsed Malawi's proposal, in accordance with paragraph 22(a) of the Procedures for a "No Objection."

However, please note that this ZAMCOM consent for the two projects in Malawi is an exception as it is largely premised on the spirit of humanitarian and good neighbourliness, considering the prevailing Malawi's status of "Observer," pending the completion of the accession to the ZAMCOM Agreement. Otherwise, the rights, benefits and spirit of an observer status is provided under Article 8(2)(b) of the ZAMCOM Agreement and, ideally, an endorsement to a no objection is only applicable to Members States.

Please be informed that this consent has been accorded on condition that future projects will not be recognised as long as Malawi's status remains of an observer. In this respect, the Republic of Malawi is kindly urged to consider completing the ZAMCOM Agreement accession and fully enjoy the rights and benefits that accrue to a Member State, accordingly.

Yours sincerely,

l

Michael Mutale EXECUTIVE SECRETARY

Cc: ZAMCOM Council Chair Hon. Dr. Dennis M. Wanchinga, MP Minister of Water Development, Sanitation and Environmental Protection Republic of Zambia

APPENDIX 7: CONSULTATION COOMENTS/ OUTCOMES

UNESCO/IUCN COMMENTS ON THE DRAFT ESIA



Mr. Christopher Julio Magomelo Senior Assistant Executive Secretary (Culture) Malawi National Commission for UNESCO P.O. Box 30278 Lilongwe 3 Malawi

27 July 2021

Culture Sector World Heritage Centre

Ref.: CLT/WHC/AFR/21/153

Dear Mr Magomelo,

At the outset, I wish to thank you for the submission on 19 July last of the draft Environmental and Social Impact Assessment (ESIA) conducted for the proposed Mangochi Potable Water Supply project within Lake Malawi National Park World Heritage property. I would also like to commend the State Party of Malawi for its effort to ensure broad stakeholder consultation with this project, despite the tight timeframe.

The purpose of my letter today is to share with you the IUCN review of the draft ESIA (see annex). In summary, IUCN recommends the revision of the ESIA to address several important points highlighted in view of adequately addressing the Outstanding Universal Value (OUV) of the property, and for the State Party to submit the revised ESIA to the World Heritage Centre before taking a final decision on the project. Noting that this consultation period was very short, IUCN also strongly recommends that the State Party factors in a reasonable timeframe for its consultation processes.

Given the IUCN analysis and the potential negative impacts of the proposed project on the property referred to in the ESIA and in various expert inputs shared with the World Heritage Centre, I would like to recommend that alternative locations to this project are considered in order to allow these services to be provided to people while avoiding any potential impacts on the World Heritage property.

I take this opportunity to recall that in accordance with the *Operational Guidelines for the implementation of the World Heritage Convention,* all projects with potential impact on the

OUV of World Heritage properties should be subject to an environmental impact assessment, undertaken in accordance with the IUCN World Heritage advice note on Environmental Assessments

(<u>https://www.iucn.org/sites/dev/files/import/downloads/iucn_advice_note_environmenta</u> <u>l_assessment_18_11_13_iucn_template.pdf</u>) and submitted to the World Heritage Centre for review by IUCN, before taking any decision or undertaking any activities that may be difficult to reverse. In the case of culture properties, ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties

(https://www.iccrom.org/sites/default/files/2018-

<u>07/icomos guidance on heritage impact assessments for cultural world heritage</u> <u>properties.pdf</u>) should be used. It may also be helpful with impact assessments

United Nations Educational, Scientific and Cultural Organization 7, Place de Fontenoy 75352 Paris 07 SP France T: +33 (0)1 45 68 11 04

concerning natural properties with important cultural values, such as Lake Malawi National Park.

Finally, and in conformity with the provisions of Paragraph 172 of the *Operational Guidelines*, we would appreciate if you could kindly inform us before undertaking any activities that may have irreversible impacts on the World Heritage property. This request is made in order for the World Heritage Committee to assist in seeking appropriate solutions to ensure that the OUV of the property is fully preserved.

The World Heritage Centre looks forward to receiving the revised ESIA for this project.

Should you have any question or require further information, please do not hesitate to contact my colleagues of the Africa Unit, Mr Muhammad Juma Muhammad (<u>mj.muhammad@unesco.org</u>) and Ms Enathe Hasabwamariya (<u>e.hasabwamariya@unesco.org</u>).

Thanking you for your co-operation and continued support in the implementation of the World Heritage Convention, I remain,

Yours sincerely,

M. Rössler

Mechtild Rössler Director

Enc.

cc: Permanent Delegation of the Republic of Malawi to UNESCO Malawi Department of National Parks and Wildlife Malawi Department of Museums and Monuments UNESCO Office in Harare IUCN

Annex

a. Summary of consulted people

No	Name of Stakeholder	Department/Section	Date of
	Consulted		Consultation
1.	Smith Mnenula	Government- Department of HIV and	01 August 2019
		AIDS	
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	Catholic Bishops Place- Mangochi	3 August, 2019.
	(Bishops Secretary)		
7.	Mponda Village	FGD-Mponda Village	1 August, 2019
8.	Chizula Village	Chizula Village-Mtakatata Turn Off	1 August, 2019
9.	Lazarus Kamangadazi	District Forestry Officer	2 August 2019
	Aubrey Chaima	Environmental District Officer	
	Mathews Banda	Fisheries District Officer	
10.	Mr Clement Ntambo	District Director of Public Works	1 August 2019
11.	Dr Kondwani Mamba	District Environmental Health Officer	1 August 2019
		for Mangochi	
12.	WOII J.M. Gama,	Malawi Defence Force Marine Services	1 August 2019
	Soldier	offices, Monkey bay	

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.
1	

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 affected exists barren area	planting to replace sting vegetation or s	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	SUGGESTED MEASURE
		TO AVOID IMPACT	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 local 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.
leevee	

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	s 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 Coordinator)	
	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 amount 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.

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

• Compensation for property loss such as land and trees.

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 faecal 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 faecal 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 selfemployment 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 Image:	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
	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	areas which are not on the project 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	stoves and to use	
		electricity supply	briquettes and gas	
			from wastes	1
Land	Worsening due to	Poor agricultural	Continue sensitizing	1
	soil erosion and	practices	farmers on good	1
	degradation	Soil erosion	agricultural practices	1
			Train more farmers	1
			on Climate-smart	1
			conservation	1
			agriculture	1
Waste	Worsening	High illiteracy rate	Sensitize and	1
		Lack of designated	educate local	1
		waste dumping site	communities on	1
			proper waste	1
			management.	1
			Council should	1
			designated proper	1
			site for waste	1
			dumping	1
HIV/AIDS	Worsening	Prostitution	Continue sensitizing	1
		High poverty level	the general public	1
			on dangers of	1
			HIV/AIDS including	1
			STIS	1
			Increase access to	1
			condoms	1
			Economically	
			empower locals	

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

	IMPACT	SUGGESTED MEASURE	SUGGESTED MEASURE
		TO AVOID IMPACT	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 and educate Client and contractor, including communities on the conservation of biodiversity
		Sensitize workers not to cut down trees from outside the project footprint areas. The Department of Forestry should also be	Plant trees in all disturbed areas. Plant 5 seedlings for every single tree to be

		involved in monitoring of project activities	cut down during the project implementation.
		Prohibit construction workers from cutting down trees carelessly in the project area and outside the project areas.	
	Loss of wildlife (fauna)	Prohibit workers from poaching Avoid clearing habitats	All law breakers must be prosecuted before the court of land
		for wildlife unnecessary	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:

Com	ponent	Status (improving/	Ca	use	Suggestion to tackle
1	Forosts	Worsening)		Over	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
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	 the project Prohibit illegal poaching Prohibit deforestation Prohibit setting of bush fires

			expansion and		
			Bush fires		
3.	Land	Worsening	High population growth	Continue sensitizing on reproductive	
			0	health issues	
4.	Waste	Worsening	High illiteracy rate and	Sensitize and educate local	
			Lack of designated	communities on	
			waste dumping site	proper waste	
				management.	
				Council should	
				designated proper	
				site for waste	
				dumping	
5.	HIV/AIDS	Worsening	Prostitution and	Continue sensitizing	
			High poverty level	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	SUGGESTED MEASURE
	TO AVOID IMPACT	TO MITIGATE IMPACT
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.	Sensitize and educate Client and contractor, including communities on the conservation of biodiversity Encourage reforestation.
	Avoid encroaching the Lake Malawi National Park Prohibit construction workers from cutting down trees carelessly in	
	the project area and outside the project areas	
------------------------------	---	--
Loss of wildlife (fauna)	Implement measures to prohibit workers from poaching	All law breakers must be prosecuted before the court of the land
	Avoid disturbing or destroying wildlife unnecessarily	Rehabilitate and restore all damaged habitats
Spread of HIV and AIDS	Sensitize and educate	Provide contraceptives
	locals, the project team and travelling workers prior to the start of the	such as condoms to community members.
	project	
Loss of land for cultivation	Ensure only project footprint areas are used for this project	Fairly compensate project-affected persons (PAPs) so that they can
	Campsites and	of land elsewhere for
	workshops should not	cultivation
	be constructed on arable land	
Soil erosion	Continue sensitizing farmers on good agricultural practices	Plant more trees outside and within the gardens
	Train more farmers on Climate-smart conservation agriculture	Plant grass on all disturbed areas to stabilize soil
		Apply agricultural land compost manure
		Rehabilitate and restore vegetation in all disturbed areas
Poor waste management	Continue sensitizing the general public on good hygiene practices.	Ensure both solid and liquid wastes are properly disposed of
	Provide workers with rubbish/dust bins	Ensure all contaminated sites are cleaned up and

	Provide workers with	waste dumped in
	appropriate toilets both	designated sites.
	at campsite and at work	_
	places	

- **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 better 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	Email address
			Number	
T.G. Mbale-	EAD	Director	0999957550	tawongam@yahoo.com
Luka				
B.K.	DNPW	Director	0999915411	bright.kumchedwa@gmail.com
Kumchedwa				
Friday Njaya	DoF	Director	0999278088	fnjaya@gmail.com
Lovemore	Museums	Director	0996954672	lovemoremazibuko@yahoo.com
Mazibuko	and			
	Monuments			
C.J. Magomelo	National	Senior	0880060537	cmagomelo@natcomunesco.mw
	Commission	Assistant		
	for UNESCO	Executive		
		Secretary		
W. Mgoola	DNPW	Deputy	0888353993	wmgoola@yahoo.co.uk
		Director		
Potipher M.	DMM	Deputy	0995551309	pmkaliba@yahoo.com
Kariba		Director		
M.	DNPW	DD (EE)	0999246996	mchilimampunga40@gmail.com
Chilimampunga				
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	DMM	РСО	0999111029	mosesmkumpha@yahoo.com
Mkumpha				
A. Kataya	DNPW	PWO	0993472508	
Biswick	EAD	PEO	0995666134	bismlaviwa@gmail.com
Mlaviwa				

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 m³/day.
- Construction of a concrete tank (Mass Balance Reservoir) of 4000m³ 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 m²
- 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. Construction of 15 Communal Water Points (CWP). The number of CWPs will increase with time
- 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.

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 23 JUNE 2021

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

MEMBERS PRESENT

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	4 th July, 2021
2	Share ESIA report with EAD/MEPA and Mangochi District Council	SRWB CEO	5 th July, 2021
3	Conduct public hearings	SRWB & all stakeholders	12 th to 17 th July, 2021
4	Technical review of ESIA report	EAD/MEPA	4 th to 12 th 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 1 st July, 2021
7	Update PS on progress made	CEO SRWB & DEA	As soon as possible
8	Review press release	MEPA/EAD	By 25 th 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.

SUMMARIES FOR PUBLIC HEARING ON ESIA FOR MANGOCHI WATER SUPPLY SCHEME

Date		21.07.2	2021	
Pla	ace	Mango	chi Municipal Council Hall	
Со	mments			
1.	Improve the mitigation measure "limiting working hours" for noise and vibration			
	impacts.			
2.	Consider cha	anging tl	ne rating for impacts on cultural site from 'LOW/MODERATE' to	
	'HIGH' as Nk	hudzi Hi	l is a protected site and a UNESCO World Heritage site.	
3.	The ESIA rep	ort is m	ore focused on the social impacts, rather environmental impacts.	
	This has to b	e consid	ered when preparing the final report.	
4.	Water abstra	action le	vels in Lake Malawi for the project should not be demeaned as	
	ESCOM also	uses the	same water for generation of electricity.	
5.	Improve the	assessm	ent of wildlife in consultation with officials from the Department	
	of Wildlife. I	nclude th	ne Mbuna fish which is a rare/ protected species.	
6.	Children less	than 18	years old should not be allowed to work at the sites. Accidents at	
	the sites sho	uld be re	ported to the District Labour Office. The district council should be	
	involved in a	ll the ph	ases of the project.	
7.	Local comm	unity m	embers should be considered for employment as part of the	
	unskilled lab	our force	e, as one way of improving their live and also for the communities	
	to have a ser	nse of ov	vnership for the project. Sensitisation should be ongoing to reduce	
	crime and vandalism which contribute to project delays.			
8.	. Alternative sites for tank installation should be explored and a cost benefit analysis			
	conducted			
9.	. UNESCO Guidelines for protection of Word Heritage sites require a thorough			
	assessment including preparation of an ESIA to be conducted to identify project			
	impacts. UNESCO also inspects the site after an assessment to verify the report and			
	recommend if a project should go ahead or not according to their findings. The			
	standards also allow for rescuing activities and store of hostility if a project will have			
	impacts on cultural sites.			
1.	1. Koche WUA and the proposed CWPs by SRWB have co-exist in the areas			
Date 21.07.2021		21.07.2021		
Pla	ace		Maldeco- La Riviera Lodge	
1.	The commu	nity repr	esentatives commended SRWB for the project and for consulting	
	them before project implementation. They also commended the presentation of th			
	report findin	gs as thi	s helped people to understand the project and the current project	
	stage.			
2.	Confirm that	the pro	posed intake point has been assessed and is not a breeding ground	
	for fish particularly the Mbuna. Consult the Fisheries Department on this.			
2	Improvo on	the image	sate of LINV and AIDS particularly during the construction as	

- 3. Improve on the impacts of HIV and AIDS, particularly during the construction, as Mangochi is one of the districts with high HIV and AIDs prevalence rates.
- 4. Sensitise the communities on the GRM and its implementation modalities before project implementation.
- 5. Loose soils may be eroded into the lake causing siltation.

- 6. Community representatives observed that the proposed 15 Communal Water Points (CWPs) were not enough for the proposed areas as the population is high. They wanted to know the relationship between Koche WUA and SWRB kiosks or CWPs and the measures put in place to ensure that all the 15 CWPs will be sustainably managed.
- 7. Community leaders complained that the project implementation was delaying. According to their knowledge of the project area, impacts on wildlife were not considered to be high. They commended the assessment done by the Department of Museums and Monuments which indicated that no cultural site will be affected by the project.
- 8. The ESIA report should be improved on the number of fauna and flora present on the project site. For example, there are 40 species of fish at the water intake and not 12 species and that there are also Pangolins at Nkhudzi Hill, which are endangered species.
- 9. How much will water at the communal water points costs?

Date	21.07.2021
Place	Monkeybay- Lisumbwi Secondary School

Comments

- 1. The community representatives requested that the villagers should be given an opportunity for employment where possible.
- 2. The community representatives stated that the natural resources clubs that already exist in the project area will help in replacing the lost trees, provided they are given tree seedlings.
- 3. The village leaders stated that the ESIA report should also be shared with the local communities so that they should help in monitoring of the project.
- 4. The project should find an alternative site to Nkhudzi Hill for tank installation to protect the hill as a World Heritage Site. Concerns over impacts on endangered species like Pangolin and Mbuna fish species were also mentioned.
- 5. There were concerns by the village leaders that the project is delaying in implementation.
- 6. Care should be taken at Nkhudzi Hill, so that blasting of rocks does not affect people's houses
- 7. Will SRWB provide ground water or tap water? And how will the less privileged people be helped to access the water to be provided by SRWB? Will the project limit people to access lake water?
- 8. The project should have adequate funds for implementation so that it will not be stopped along the way. The project should be expanded beyond Mtakataka.
- 9. When is the project starting?
- 10. Size of area to be affected at Nkhudzi hill?

Date	23.07.2021
Place	Capital Hotel- Lilongwe
Comments	

Comments

- 1. The levels of calcium in borehole water is descriptive, figures should be provided in the report and compare with the Malawi Bureau of Standards.
- 2. The need for portable water supply in the area should not outweigh the need for the World Heritage site preservation. A cost benefit analysis should be conducted for the

site to compare the tourism returns and the 11 million USD which will be saved when Nkhudzi Hill is used.

- 3. The 300 metres distance from the shore to the intake point has not considered fish species particularly the Mbuna which is a rare/ endangered species. In addition, fish breeding grounds have to be considered when determining the distance from the shore to the water intake point in the lake.
- 4. What is affecting tourism in the area is not the destruction of the Nkhudzi Hill. It is the lack of portable water in the district. Portable water supply will benefit more than the mentioned 92,000 people as it will also supply water in the trading centres and lodges/hotels where there are a lot of people. Hence, the project is vital in terms of tourism and improvement of livelihood of people in Mangochi District. If the Department of Museum and Monuments conducted an assessment and discovered that not any cultural sites will be affected by the project, then the project should continue so that the benefits are realised. It is not feasible for the government to wait until concerned people raise the additional 11 million as that will affect project implementation and loan repayment duration. According to the funder, delays in loan repayment and project implementation will attract additional interest.
- 5. Implementation of the project can also help in safeguarding Nkhudzi Hill. A case in point is Dzalanyama Forest Reserve in Lilongwe where Lilongwe Water Board (LWB) is heavily involved in restoration and conservation activities. LWB is protecting the Dzalanyama Forest Reserve.
- 6. Sensitisations on the importance of the project should be ongoing for the public and the local communities as well.
- 7. The project developer should ensure that the measures proposed in the Management Plan are implemented on the ground, as the problem has been implementation of such measures to protect the environment
- 8. If it is suggested that wildlife should be relocated, the report should be clear on the type of wildlife to be relocated and the place for relocation.

APPENDIX 8: 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

ano chi August 1,2019 PLACE OF THE MEETING: DATE OF THE MEETING: 5 Name Position/Occupation Phone number Signature Kabhuka Planning o Dieda 0858 142 981 Earnor Maluk 0888 579 362 100 Oha 0999731781 mH MACONI PNHAD ED 0995242700 Francisco Moron LOSTRICT GENDEROFFICE NUD CHENG'A-NI METRO 0799104011



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: MEETING: AT MANGENETH & MEHNADATE OF THE MEETING: 01/08/2019-DC OFFICES AND MARINE SERVICES (MALKEY CAN)

Name	Position/Occupation	Phone number	Signature
WOI J.M. GAMA	SOLDIER SONIC	099.5580011	all ma;
dement Ntambs	NPW - MANGOCHI	0888 320 588	
Kardwan' Manse	DEHD-MANGOCHI	079.5658 623	Hand
Morson Magambo	APD - HANGE	0999381101	all
,	Cl - thin	0,	



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:	MANGO CHI	
-----------------------	-----------	--

DATE OF THE MEETING: _

Name	Position/Occupation	Phone number	Signature
Priver Malenge	Funcon concertant	0992125015	Pin
Beck Scott	Mangoli Ficheres of	100 0996648699	TREEL
Fr. Lovel Madriakaphin	Bishops Secretary	0999556612	ETTH ASE.
etros Kamana	Rojed Assistend / Etc	0999702265	AST-
Noel Nampe	SH XI COORDINATE	088826060	and the second
Michael Muenifumbo	ACDO/romm. Dert	0881527683	O Altube
	10		00

MANGOCHI WATER SUPPLY ESIA PUBLIC HEARING SIGNING SHEETS

PUBLIC HEARING MEETING FOR THE EXTENSION OF MANGOCHI PORTABLE WATER SUPPLY PROJECT - ATTENDANCE REGISTER

DATE: 21st JULY 2021

VENUE: LA RIVIERA LODGE

	ENANI
SPLEZ729	EMAIL
956661210	him hange @ yshor, co.
10066104	bismavivae grad com
27644239	dehamana genalles
199879956	15hmatola @ yaliv, con
1812282	marchomber eyabor ce
1995750	Eurongan Cighood
844 80380	pringlegge grail. on
99831395	kentkatatia E yahoo. Co
888383 O44	Con liwing
95243877	then
3660121	Koncmalunga@yabo.con
95551309	purkalike prahos. Om
F110 437	oswald. nsamali Comail. con
81372478	
845000	Shamiso-baundingo- an
92355164	Crit maturs i incolar made
2671226	in the and - front
6867117	benekus kara and la
6123167	Canor eller
0867631	Pompieladaux E Com
10375017	time in comes egan
1120341	Usa keperemitis tegenail-e
5844179 1	butter 92 @ gmail con / and rea-1
79262	Sruberni
\$8820077	NIColombal Yalhoo. &
72715556115	no Kohenyanfalodgelou
	17456728 15666134 27644237 99879956 27644237 9987950 299750 299750 299750 299750 299750 299750 299750 298383044 15243877 3660121 9551309 2110 437 3660121 9551309 2110 437 3660121 9551309 2110 437 36671226 68671226 686717 6123167 2857531 19120547 5844179 5844179 5844179 5844179 5844179 584530077 584530077 58535155155

22	JOSEPH LIYONSE Acting DOF	SRWB	0805897974	lingent Hund Quest
23	Yothan Mbale Fore Managel	(1) (Q. 20)	099999999	esche lugence Eusrus mu
24	LOZANI WITHFES ZANE ACCOUNTED	Contil E Right	100000010386	yothan-mbaleosrub.
25	Heale Mainatch Man (B.	Kent Supars	DITIBLEST	102-m- usituessessens
26	Margaret Service Namaro Why	Ball	0051079740	
27	MEAT SALANIE / ALT SILANIA	1 Party	agg625000	P
28	How o've Rail Washar Con Man	11 File	0999992540	Vakeshephender protos mas!
29	RECORD CLUDE HOLLE LOUA MANAGE	nocie aua	75-28221550	herdnickberde Ognaigen
30	BUBUE RUNGIQUOCLE WUG Chais	Koche Mug	0888074100	-
31	acquelone Das Ading DO ID	OKUDP	0888343738	Jackdias 13.jd Game
22	VICTORA Ringstone Member of Partian	est partiament	D99986866C	Notonakingtone gorda
24	Mussa Chinamon SITE ENGINEER	'SRWB'	0834417154	mussachingan ballowail.
34	FIGHASS MOAWA SITE ENLINGER	SRWB	DR814460I4	hashnasmbawa Campy /. 1m
35	Cathy Musa ED	ÉAD	0999346466	cataling soa mila.
36	Linda Kaldlebre Of	EAD	2599937777	undallalala large a social am
3/	VIH Namaso namaso	M. MPSIME	1006121811	mendeletononeze (29 mgu. Com
38	Slenny ELiyera mwanyama	GI.V.H	DAASSLIGE	Ed e
39	FRANCO JANATHAN LARC SHEARI	Member.	099942155 24	FI
40	Arthing Hepen Tone Manger (28	COR	N88321(16)	attens have seed a la
41	Bridd Pup Zone Manager	TO REDIDE	D921 197 TIL	and the share and the
42	father wylard Spinis Anomber	Spuip	00000000000	pigne pigole supernin -
43	Smi Churt Alcore & Duis Macmil	SAME	019720000	Q
45	Pastor E. M. Kazimur Muinaur	DEM D	00995401505	
46	STEVEN J. MINDRAFFILIRDIGUN WTO NOVO	STRIP	0411681450	the is a company them
47	langerria zanea met traince a a		0199749864	steven minoral ca
48	Nicholos Niching have	SAUG	0944386265	Inno pencia - Zanera p sno
49	Choice chart Macange (mr. Ag Ez Cor	110 0 0 200	0999758735	46.
50	MEPLUL Muntules Mala 2 Andrew	aves annosa	0880460537	magomeloeunesconation. Mu
	AISHA CHINER DECOLOGICASO	DNIN	0997580503	phillipnw/shomment ffm
	KEPUTTY	KADID ISLAM	0999210197	aishasiwers 600 gmail.com
	CHARGERERT JSURMALST	THE MADON	0088-21117A	
	Earlene Climan 1 100	0 /1 0 1	08.00001419	
	fournelist	Cypiful radio	0888725715	eaclenechimoyob97 equa

PUBLIC HEARING MEETING FOR THE EXTENSION OF MANGOCHI PORTABLE WATER SUPPLY PROJECT - ATTENDANCE REGISTER

DATE: 22nd JULY 2021

VEN	UE: COMMUNITY DEVELOPMENT (ICEIDA) LISUMBOI	SECONDART S	SCHOOL HAL	L
	NAME DESIGNATION	ORGANISATION	PHONE NUMBER	FMAIL
1	Oswald Muangan ARED	NURA	0999110427	2Sula W. MSGMCL BC
2	ir. Willer Kamandani Director	SAWB	0999850675	wall shi Vi 2-70
3	Sprur Chief Neoola Director	SEWB	0993469503	
4	Kent Kafatia MD	WWEC	099983195	Kentkafotra arela
5	pisca Malenga consultant	WINEC	12854480380	Pondlan Quandi an
6	Snr chief nankymba		0997401911	in the group of the com
7	BRUNO KAMANGA HIE-DE EDO	MH-DC	0999656728	brundismania @ yehra C.
8	EMMA MBALAME DWSS	MOFNR	29999857831	emmalance
9	Jacqueline Birs Ad DOLD	ORUB	0886343738	packdrages ide
10	HURLIAM ROPDORAL SGT	POLICE	DASSOBILIS	
11	REAGAN KUVERE INSP	POLICE	0993576557	
12	BISWICK MLAVINA PEO	EXD/MEPA	0995666134	bismlaviwa@gmail.com
13	WILLIAM MGOOLA Deputy Director	PARKS AND WILDLIFE	0888353993	Wingoolal 49 Doo-10. UK
14	Christophe J. Magomele Snr Ass. Ex Sec	UNESCO Commission	0880060537	mago melo curesco hate
15	Oris Malijani PEA	DMM	0886389777	omalijani@qmail.con
10	MSPhill, Muschshere &M(USD)	DNPW	0997580503	philly muthe Squall.
10	Bright Figo Zone Manager	SRWB	0881280946	ppharry Damael Com
10	lawonga mbale-Ruka DEA	EAD	0999957550	tawonan@ughosicom
19	Makenombers M. Deputy Drecher	ZAD	0999812282	Makonomberseyahor 'Con
20	BRLAHIM MATOLA BOARD CHAIR	SRWB	0949879956	ibumatola a valor, con
21	Stent- ELitza Mwan-Jama	G.V.H	0995566507	
22	MADIA SIA CHIMALO	SIA CHIWALO	0993862367	

24 El 2a MSILLE Chais Ade 09961259480 metu 25 ECSCHE MPERSO CHALS Adde 0997559480 metu 26 Great Katende Chars Adde 0997559480 metu 27 Dr. Susan (Likowa-Malinga Bond Member MEPA 0993660121 Kenonalungan) jabor (C 28 TENSKA Katender Constitute Children Member MEPA 0993600 Shamiso begasor (C 29 Michael Mauria Connellor Citizen 1000 CO9551400 Shamiso begasor (C 29 Michael Mauria Connellor Citizen 1000 CO9551400 Shamiso begasor (C 29 Michael Mauria Connellor Citizen 1000 CO9551400 Shamiso begasor (C 30 Shamiso haju'a David Director Citizen 1000 CO9551400 Shamiso begasor (C 31 Pastor E.M. Kazimi Sine Gruineer Reveal Connellor (C 32 Nicholos Mtsinge Meter Charles Kille 0999753135 Nr. Mitsinger 33 Maa Chirdrand Sine Gruineer Shill Mache Carl Shall (C 34 Helings Maa Sine Gruineer Shill (C 35 Maa Chirdrand Sine Gruineer Shill (C 36 Catty Musa Sine Gruineer Shill (C 37 Linda Vasaves) End El tendo 09997753135 Nr. Mitsinger 38 Adda Chirdrand Sine Gruineer Shill (C 39 Victor 1000 Man (C 30 Shamiso Director Carl Mache Carl Shill (C 39 Victor 1000 Man (C 30 Shamiso Director Carl Mache Carl Shill (C 30 Shama Director Carl Man (C 31 Endi Maa (C 32 Nictor 1000 Man (C 33 Adda (C 34 Adda (C 35 Maa (C 36 Catty Musa ED EN Officer (C 37 Linda Vasaves) Endo El tendo Officer (C 38 Adda (C 39 Victor 1000 Man (C 39 Victor 1000 Man (C 39 Victor 1000 Man (C 30 State 1000 Man (C 30 State 1000 Man (C 31 State 1000 Man (C 32 Control 1000 State 1000 Man (C 33 Adda (C 34 Adda (C 35 Maa (C 35 Maa (C 36 Catty Musa ED El tendo (C 37 Linda Vasaves) Endo El tendo (C 38 Adda (C 39 Victor 1000 Man (C 39 Victor 1000 Man (C 30 State 1000 Man (C 30 State 1000 Man (C 31 Char Mar (C 33 Maa (C 34 Adda (C 35 Maa (C 35 Maa (C 36 Catty Musa ED (C 37 Linda (C 38 Adda (C 39 Victor 1000 Man (C 39 Victor 1000 Man (C 30 Catty Musa ED (C 30 Catty Musa ED (C 30 State 1000 Man (C 30 Catty Maa	23	Blessings Nephyala	Rev.	Sath Lender	0994152526	
25 taised Maria Ade 09915591128 Mail 26 Jenning Citizen 0994470015 Mail 27 Dr. Susan (Likagua-Mallunga Board Member MEPA 0993660121 Kentonalunga (Jahos S) 0999120317 Hisukageslander S) 28 Timbeled Kazuhuuken Piketse of ottation S SRUB 0999120317 Hisukageslander SIE 0999120317 Hisukageslander SIE 0999120317 29 Michael Mauren Dieterse of ottation S SRUB 0999120317 Hisukageslander SIE 099 30 Jammi So Wairz Daug Durch Director Citizen Dieter 0995210022 Sham So begeles in 30 Jammi So Wairz Daug Durch Director Citizen Dieter 0995210022 Sham So begeles in 31 Pastor E. M. Kazimu Michael Mauren O9997581000 Sham So begeles in Sham So begeles in 32 Nicholas Meture Sine Grunneer Skille Michael Bitter State Dieter 109 Sham So begeles in Sham So begeles in 33 Mace Chinesantes Erre takinger Skille Districtor 109 Sham So begeles in Sine Grunneerre 34 Historis Mean Sham So B Offstates States in Sineskellon and Sinesin Sineskelon	24	Eliza MSUku	chais	Ade	0996123167	Emor.
28 Carrall Kazenbe C1 Hizen 09944700 15 27 Dr. Suson Quikague-Malunga Board Member MEPA 0993660121 Kencindunga ga g	25	FCISCHE, MASASO	CARA	Ade	0995591630	T LARL
27 Dr. Susan (Likagua-Malanga Board Member MEPA 0993660121 Kontinalungan) yahas i a 28 The MARKE KARIMUMER DIRECTOR OF OPERATIONS SRIMB 0999120317 Hisukapsiamula 8189 29 Milichaed Mauria Councillor Citizen) leader 0995314052 2000 sham 80. bey due in 30 Shami so Najira Daput, Director EAD 09992315000 sham 80. bey due in 31 Pastor E.M. Kazimu Muanyama 0999681438 PAMMA 29 Nicholes Mtsinge Mulaneta she endinetic shame of 9975314052 2000 sham 80. bey due in 30 Nicholes Mtsinge Mulaneta She Endinetic Shame of 9975314052 2000 sham 80. bey due in 31 Pastor E.M. Kazimu Muanyama 0999681438 PAMMA 32 Nicholes Mtsinge Mulaneta She Endinetic Shame of 9979758735 N. Mitsinge 34 Holman Milana She Endinetic Shub 0999346466 atalinguite gradinet egenal is 36 Catty Muso ED ET Dahmark Guns of 9999376466 atalinguite graditice and 37 Linga Vanjoussa EAD EI EAD 0999376466 atalinguite graditice shall be and 38 Avita un Heale Done Manger (14) Shab 0999376466 atalinguite graditice shall be and 39 Vathan Milale Done Manger (14) Shab 0999376436 yother-hepart Conditioned 40 Steven 5. Minger E O Stable Shab 0999396436 yother-hepart Conditioned 41 Zaha Manger Plo Shab 098383836 No Athur hepart Conditioned 42 Chimmenne Unorme Pho Conditioned Stable Offenses Stable On Manger 2000 Conditioned Stable Offenses	26	Gerald Kozembe	7.1	Citizen	0994470015	
28 Tenter Haufferst Director of OPERations SR-MB 0999120317 Hisukapstermul & & & & & & & & & & & & & & & & & & &	27	Dr Susan Guikagwa-Mal	inga Board Member	MEPA	0993660121	Kenconalitara a sur a a sca
 Michael Manual Councillor Citizen leder 0995314052 Shami so Najia Daput Director EAD 29981500 shamiso begas in Pastor E.M. Kazim Mwanyama 0999681438 Atum Pastor E.M. Kazim Mwanyama 0999681438 Atum Nicholas Mtsinze Mwanyama 099973535 N. Mtsinje Michael Chines Mtsinze Mwanyama 099973535 N. Mtsinje Michael Chines Mtsinze Mwanyama 099973535 N. Mtsinje Michael Chines Mtsinze ED EAD 099937573 N. Mtsinje Michael Chines Mtsize ED EAD 099937573 Invelience egradion of a star and a star and an algorithmeter of the star and a star	28	II SUNEANE KARALAMULAENA	DIRECTOR OF OPERATION S	SRWB	0999120317	Filulkarelanule el @ email
30 Shami so higin Davity Director EAD Dagg295000 Shamiso_beytwo.in 31 Pastor E.M. Kg2/min Mwanyama 0999681458 Phumon 32 Nicholas Mtsinge Mwanyama 0999681458 Phumon 34 Helpings Million Million 0999681458 Phumon 34 Helpings Million 099975375 No Mtsinke 34 Helpings Million 0999681458 Phumon 34 Helpings Million 0999681458 Phumon 35 Million Inte Grulineer SRWB D881446034 Phumon Phumon 35 Million Chingambe Phumon 099346466 catalin muscle gradition Phumon 36 Catus Musc END END 099937601 Inreli we killologe mellicer 37 Linga Masselle Date Phot EL END 099937601 Inreli we killologe mellicer 38 Avitar Helpingen SRWB D883866100 Aritar-mellicer Srwb 39 Vothan Meangen <td< th=""><th>29</th><th>Michael Manna</th><th>Conneillor</th><th>Cifizen) loodr</th><th>0995211052</th><th>and sterring sterring</th></td<>	29	Michael Manna	Conneillor	Cifizen) loodr	0995211052	and sterring sterring
31 Pastor E.M. Kazimi Mwanyana 0999681438 Atuman 32 Nicholas Mtsinze Mwanyana 0999681438 Atuman 34 Halings Maux Ine Enlineer Rive 0999681438 Atuman 34 Halings Maux Ine Enlineer SRive D81446034 halingamber gerradi.com 35 Mua Chingamber Girts ER SRive D81446034 halingamber gerradi.com 36 Catty Muso ED ED O199376466 odalinnustae gail.com 37 Linga Valoaves, EAD EL EAD 099957273 lineli we haloege gail.com 37 Linga Valoaves, EAD EL EAD 099957273 lineli we haloege gail.com 38 Antrur Hepent Zone Manafer (H) SRoß 0888866102 Atthur-hepot Escience 39 Voltaan Maale Done Manafer (H) SRoß 09883866102 Atthur-hepot Escience 40 Steven S. Minoa E Seven S. Minoa Escience Seven Mula Escience Nu 41 Lak Maugets Pho B Coo Seven S. Minoa Escience Seven Mula Escience 42 Inmula Mine Indira PA B Coo Seven S. Mino	30	Shami so Najin	Deputy Director	EAD	0995895000	shamis-bayes a. con
32 Nicholas Mtsinge MURnytema 0999758735 N. Mtsinge 34 Hernis Mikava sine Gruineer SRWB D88 1446034 haingenbourge grand.com 35 Much Chineants EFE Pakinger Gruss 999758735 N. Mtsinger egrand.com 36 Catty Nuss ED ED ED Ogg346466 catalingue opil.com 37 Linge Vasouesse, EAD EI END 0999376203 Intel werkelde opil.com 38 Anthor Hepenni Zonu Mancper(Linger SRWB 0888866100 Arthur-hepenni C scult 39 Vathan Medale Done Manager(Ling SRWB 03939966366 yothcam minorae szwb-mu 40 Steven 5: Minipart EO SRWB 03888385850 inte-malear scultare 41 Laka Mature Kunting Pro os cod SRWB 0884158157 minorae szwb-mu 42 Mithur Me Unting Pro os cod SRWB 0884158157 minorae szwb-mu 43 Andrea Alauete Mature Aliko Srwb SRWB 0997826262 communicate scultare 45 Locan Linees Srwb Srwb 09978425157 minoraeszwb-mu minees	31	Pastor E.M. Kgzimu		Mwanyama	0999681438	the man ()
 134 Helpings Mibaux Int GWAINTER SRUB D88 1946034 haltingamber egradicer 135 March Chinegantes ATT Bahinter CRUB 299451503 mycsachingamber egradicer 136 Catty Nuss ED ET EALINER CRUB 299937620 intermediate gradicer 137 Linga Valaboulssa EAD ET TEND 099937620 intermediate gradicer 138 Anthon I tepenne Zone Manager (111 SRUB 09883866100 Arthur-hepont e scul 140 Steven 5. Minora E O SRUB 09883866100 Arthur-hepont e scul 141 Lala Manger PRO SRUB 08863850 mither manager (111 SRUB 150 C minora scub mu) 141 Lala Manger PRO SRUB 08863850 mither manager (111 SRUB 150 C minora scub mu) 142 Andrea Acuete Mat. Rate Alibo SRUB 0884138150 mither maturgual e estaber of minora scub mu) 143 Andrea Acuete Mat. Rube Alibo SRUB 0999418352 intermediate estaber of minora scub mu) 143 Andrea Acuete Mat. Rube Alibo SRUB 09994183257 intermediate estaber of minora scub mu) 144 Andrea Acuete Mat. Rube Alibo SRUB 0999445251 intermediate estaber of minora scub mu) 145 Istan Himbers Concentration and trainee CC SRUB 0999644233 durates concein concencia concein and trainee CC SRUB 0999644233 durates concein concencia estaber 148 Duncan dombanda Ad CED SRUB 0999644233 durates concein concencia estaber 	32	Nicholas Mtsinge	-	Muandama	0499975978	t DL, NOtsinDe
 Muce chinedwitts ETE Pakinger Chins off4515057 myssechingener 90mm is Catty Nuss ED ET 0199376466 catalinaviae goal. Ch. Inga Unisovers ED ET EHD 0999375273 Intelination of Constraints of C	34	Herhngs Mibava	SHE GNGINEER	SRIJB	D881446034	hashrounberg & amail. com
 36 Catty Nues ED EN 099346466 catalinguise mail catalinguise mail. 37 Linga Valsovesa EAD ET ET EAD 099957200 lineti we valoe mail. 38 Avthur Hepavi Zone Manager (14) SROB 0883866102 Arthur-hepavi C sriet 39 Voltaan Maale Done Manager (14) SRUB 0883866102 Arthur-hepavi C sriet 40 STEVEN 5. MINDRA E O SRUB 08838865105 steven-minoresseve. 41 Rik Maugela PRO SEWS 088385850 rith-maturgeval Catogram C 42 Chimmember Interes A avete Mat. Raws Asile SRUB 0884158150 chimmember - kadage Const. 43 Andrea Marte Mat. Raws Asile SRUB 0884158150 chimmember - kadage Const. 44 Andrea Marte Mat. Raws Asile SRUB 09974586265 zone in macroscia Os 45 Isrami Himses Zone mat. Const. Marte SRUB 09974586265 zone in macroscia Os 47 ALLI Muthanap Counciller Mare C SRUB 0999644239 duran - wate @ mail.con 48 Duncan Jambama Ad CED SRUB 0999644239 duran - chambamite Builton 	35.	Much Chirequits	GIFT BALINGER	RWB	8994315057	mal Salling comp 9 Bon 11
 Antra University, EAD ET TEAD OPPOSITED Intelline university of all controls Antran I teppent Zone Manager (1) SRUB OBB 0888866102 Antra-heppit C srute Yothan Milale Jone Manager (1) SRUB OBB 98996336 yothan-malen ru Teuen 5. MINDRA E O SRUB OBB 08838866102 Antra-heppit C srute Teuen S. MINDRA E O SRUB OBB 0884158150 philamente control of a srute Andrea Navete Mit Rank Asilo SRUB 0884158150 philamente control of a srute Andrea Navete Mit Rank Asilo SRUB 0991 844.179 antrange cost on Interest Andrea Navete Mit Rank Asilo SRUB 0991 844.179 antrange cost on Interest Andrea Navete Mit Rank Asilo SRUB 0991 844.179 antrange cost on Interest Tomocencia canea most trainee C.C SRUB 0991 844.179 antrange cost on Interest Andrea Alle Mit Mark Asile SRUB 0991 844.179 antrange cost on Interest Tenocencia canea most trainee C.C SRUB 0991 844.179 antrange cost of control of a control of a control of a control of the second of a sec	36	Catty Muss	Ð	FAN	0999346466	atolia misage in a contraction in
Avita un It epern Zone Mansper (14) SROB OBBABAGOD Arthur-heponi C Sruit 39 Vothan Milale Zone Manager (14) SRUB OBBABAGODE Arthur-heponi C Sruit 40 STEVEN 5. MINDRA E O SRUB OBBABAGODE Votham-moderation 41 Lak Nawalla Plo SRUB OBBABAGODE Votham-moderation 42 Chimmemile Knows PA B COO SRUB OBBABASSE nut - manager Brub. Mu 42 Chimmemile Knows PA B COO SRUB OBBABASSE Nut - manager Brub. Mu 43 Andra Nawete Mat. Rature ASRO SRUB OBBABASSE Chimmemile - Kadager (C 43 Andra Nawete Mat. Rature ASRO SRUB OBASSESSI nut - malanger Brub. Mu 45 Iscani Limess Zone Accontenti (MAT. SRUB ORNE OG 99984158150 Chimmemile - Kadager (C 46 Innocencia Zanera mgt trainee CC SRUB OG 99985265 zanere innocencia Os 47 ALLI Muthamap Counciller Meare Marpe Marpe Lange Og 94586265 zanere innocencia Os 48 Duncan Jambama Ad CED SRUB OG 9996442 39 durson - chambamas Bu	37	Linta Valobuesta,	EAD EI	V TE HD	099937777	byrlingt ile stope and la
 39 Voltran Milale Jone Manager (199) Shub 098839626 Million - model of some 40 STEVEN 5. MINDRAFE O 41 Dilk Mangelia PRO 42 ChIMMARMAE KOOMAN PA B COO 43 Anchea Marete Mat. RANKE ASIRO SRUB 44 Jaine Marete Mat. RANKE ASIRO SRUB 45 Locani Himsess Zone Accontationt (1994) SRUB 46 Innocencia canera mgt trainee C.C. SRUB 47 ALLI Muthanap Councillor Mkope W Mkope WARD 09996442.39 durcon - chambando Roll 48 Duncan chambands Ad CED 49 SRUB 	38	Avitaur Itepen	Lone Mansper 24	1 SROB	088381(100	Actorica home 2 B Sail
40 STEVEN 5. MINDRA E O SRUB CHUSSED UNDER CONTROLOGIONE STEVEN - MINDRAGENDE MUL 41 Rith Natural PRO SRUB D8863585W Mith-makinguah estub. Mul 42 Chimiwemile knows PA B COO SRUB O88415815C Chimien en 1000 estub. Mul 43 Andrea Navete Mit. IRANE ASIRO SRUB 0995 844.199 andreanance estub. Mul 45 Locani Liness Zont Accontant (and SRUB 0995 844.199 andreanance estub. Mul 46 Innocencia zanera mgt trainee C.C. SRUB 09994586265 zanere innocencia Os 47 ALLI Muthanap counciller Marche Mikope Makope board 09991632237 bab hande @ mail. Con 48 Duncan dambants Ad CED SRUB 09991644239 duncan - chambanile Ba	39	Yothan Mbale	Jone Managard	1) SRIVA	0494291196	yetter and a contraction
41 Jahr Naturela Plo Slub Destant inter-many while suborner interesting while inter-many inter-	40	STEVEN 5. MINDRA	EO gal	SRUB	094521574	Steven-mining a cruito and
42 ChIMMURMER KNOWS PAGECOG JELLE ORALISE ChIMMENTE - Kadage Com 43 Andrea Navete MGT. TRANKE ASTED SRUB 0995 844.179 andrenausse Oscib.mu/nueses 45 Locani Linness Zont Accontant (and SRUB 0995 844.179 andrenausse Oscib.mu/nueses 46 Innocencia zanera mgt trainee C.C. SRUB 09994586265 zanereinnocencia Os 47 ALLI Muthanap counciller Mkope W Mkope board 0999183287 bab hande @mail.con 48 Duncan chambants Ad CED SRUB 0999644239 duncan - chambantorea	41	Ritz Naturation	PRO	SRWB	D 8283525W	rite-mainpaink@enh.m
43 Andrea Mayete Mat. IRANKE ASIRO SRUB 0995 844.179 andreanande Osrib. m. / number 45 Locani Linvess Zone accontant (and SRUB 0995 844.179 andreanande Osrib. m. / number 46 Innocencia zanera mgt trainee C.C. SRUB 09974586265 zanerainnocencia Os 47 ALLI Muthanaa councillor mere Marope Marope Marab 0999183287 barb sounde @ mail. Con 48 Duncan chambamba Ad CED SRUB 0999644239 duncan - chambambara	42	chimmer knowso	PAGE COO	SENB	ORAITSIE	Chimpenly - Lictore (OS
45 Locani Himites Zont Accontant (MA) SPLITS COPPILOZZI 1 lozani-with SPC Months 46 Innocencia Zanera mgt trainee C.C. SRIDB Ogg94586268 zanerainnocencia Os 47 ALLI Muthanaab counciller Mkope W MKope WARD 0999183287 bab hande @mail.con 48 Duncan chambamba Ad CED SRIDB 0999644239 duncan - chambamba Ba	43	Andrea Nawete	MGT. TRAINER AGRED	RWR	NOGT 240 199	alless de Diex will about
46 Innocencia zanera mgt trainee C.C. SRIDB 0994586265 zanereinnocencia Os 47 ALLI Muttanas councillor mkope W MKOPE WORB 0999183287 book bande @mail.con 48 Duncan chambamba Ad CED SRIDB 0999644239 duncan - chambamba	45	LOCANI WITWESS	ZONE ACCONTANT (AHH)	SRUTS	0999162231	Hond away constants me mutage
47 ALLI MUTTANAAD COUNCILLOR MKOPE WARDE WARD 0999183287 book sande @ mail. Con 48 Duncan chambamba Ad CED SRIDB 0999644239 duncan - chambamba	46	Innocencia zanera	mat trainee c.c	SRIDA	0994586762	2 Contraction of the state .v
48 Duncan chambamba Ad CED SRIDB 0999644239 duncan - chambamba	47	ALLI MUTANAAD	councillor Mkopp w	MKOPE WARK	0999183242	ball ball
	48	Duncan dambamb	5 Ad CED	SRIOB	109996442 30	the hande (e) may - Con
49	49				UT OT	WY LUID - Champanying BSI
50	50					

PUBLIC HEARING MEETING FOR THE EXTENSION OF MANGOCHI PORTABLE WATER SUPPLY PROJECT - ATTENDANCE REGISTER

DATE: 23rd JULY 2021

VENUE: CAPITAL HOTEL

NAME DESIGNATION ORGANISATION PHONE NUMBER EMAIL	
1 Nelson Gonjani Reporter Miningertrade public 0994064066 gapianols	1
2 Stanley Madam Coordinator Youth For Change 0884274060 moraniste	alenging melling
3 Lloyd Misherra Journauss Marayd Polt 082423024 112 include	inan it agricult
4 Cathy Musa ED EAD PAGAZYULU at	Gibii Posmai
5 Charles Mala Secretary General AEL 0499252469 Contailed	Sala gual 1. com
6 Jakonomber of Drach Dreit SAN SATS STREET	gmail Corri
7 Stephing Chi-020 Many Carly Carly ACCEPTION	mber eyay
8 Estir Mushimus Robert	- Si
9 Auspin Kahman Torcolit Mort Clist C. SSIS22727	imbargna
10 Reserve Makunia Jarmanet Jai Pare I'm Balle (72 minute)	55046 grail . Ce
11 How CAI OH Tooma MP my marker () social and	lessings 812 annal 1
12 De Const Const Oggy 9211 rooma 2	oiregnal-
13 6 a Cliff ala la Kanga Doura Member MEPA 0993660121 Koncmaliu	nga@yahoc. con
14 To all his sen or Klangolin 0197401911	
15 in the Day Dist - Di	sidegmail.
16 Child On JAGOOLA DEPUT DIRECTOR JARKS and WILd UFP 0888553993 WMg 00/a	2 Jahoo. 100 K
17 Pati al 11 1 agometer HS. the secretary UNESCO Commission 0880060537 anagomet	o cunesconatio:
18 19 phorm. Kaliba Deputy Director Museumi + Monument 0995951309 pm kalibe	e Cyahoo. co
10 Price Telenga consultant WINEC 0992125015 PANAngleros	@mail.com
19 Kent Kataha WD NWEC 0999831595 Kent Kata	they also con
20 Jawanga Made Luka DEAS END OFFA957550 tewangan	rectahoora
121 Hilda Kazembe Board member SRWB 0888205023 kazembe	09 cu gmail.
12 By Here NWarred 4 4 1 1 19 1999950369 Stymwarre	Qamail.com

23	Emily Mkandaws	Board Mermha	Souther Pil Road	80011206000	
24	Shamist Najira	Deputy Director	& AD/MEPA	0999 895000	shamist baughoo an
25	IBRAHIM MATO	LA BOARD CHAIR	SRWB	AGGARIAGO	Spannoe Se gande and
26	DHRUVESH PATEL	Director	Select Accir and CO	0909644211/4/6/01	1 Brinaso la Wyalwordon
27	Topvor Kandore	Managence Contultar	The conter	019101921941568	answesh patel USEgna, 1. Co.
28	Ochanka ba	As cao	PROX CEPTE	0939 (1014368	Joscentre equica - ouline
29	BISWICK MLANIWA	AFO.	MERA/EAN	Descuirzu	datasante aquina
30	Oswald Muscusousli	AED	NULEA	0193666137	bismlar wieg mart, cor
31	BRING KATANG	AND AND	Magazelihatita	0799 110 457	oswald, msamali Egmail. Co
32	ALBERT PILEIE	SAMB ABOUT	Paulo Paulo	0997636728	brunkamanga eyzhoo. Co
34	MILLING ISAN A GICTA	GEO DINA	F SILWB	0998000283	athert-phine & South. m
35	ANDREL MATIMA	CO. VR COMMUNE THE	Mender (SO	0199575737	adsonnine@gghoo. Com
36	WHEN WACHETO	MUNANA GER	SYLW IS	0888216719	andrew-kachegoe Stub.
27	Jothan Mbale	Zone Manager (M	H) SRWB	0888896326	yothan-mbale @ srub
20	Mussa Chingampa	SITE ENGINEER	SRWB	0884417104	Myssachinganba962ama
20	Hestings Monwh	SITE ENGINEER	SRWB	0881446034	hashingsombawa @ 5 mail. cm
39	STEVER J. MINORA	E0	SRUTZ	8495745216	steven - moura otrub. mu
40	INNOCENCIA ZANO	ERA MGIT TRAINER	SPLOB	0855057440	innecessia -7 anera@sr
41	Andrea Mawetz	MGT. TRATNER	SRWB	0995 \$44 179	Doustan Damallan lander
42	chimicence (Lashy 1	PAPS ÉEO	SEEM	0880132100	don ton Dans
43	Tankho Zembere	Network Adnin	SRUBB	091991,96539	Ya Kinza Jane Par
45	Rith Makumunala	PRD	SRIVB	(788835857)	vitamati mainchaama, Din
46			-	000000000	interesting of the form.



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

PUBLIC HEARING MEETING

List of Participants:	
-----------------------	--

Place of Meeting: MUNICIPAL COUNCIL HALL Date:

Date	Name	Position/Occupation		1
		rostion/Occupation	Phone Number and Email Address	Signature
			1000 1 M99758125	
21 107 12021	Nicholas nisipii	NKyzibay	emil	-
	SI.		phane Degesshare	A
	Stenny GLI-18-20	Akhydzi baz	email:	Hen
	Savie Bulla	MARASTO	phone!	P
/		Conform	email: 0-19959856	
V	BRUNO KAMAIGA	MH - Ka	Phone 0999656728	Adding
/	רוט בוזיז זיין ייין	111 05	Email brunckanage & yahoo. co	uk MA 4
	MATRO CHORING	RC D Course	Phone	at the a
		DETU-SENSEIZ-NH	Email Com	NOR BY
	50000		Phone	
	V. H. Namaso	Namaso	Email 0996171811	D
	ST17- 12-9.		Phone 0996123167	C
	and Morker	Namaloms	Email	Emoner
		- 0	Phone 6852571 624	A. 4
	Collins Katholica	Education - Domis	Email tarscal@amail. (ma	AR
	Kulham Kulala	NG R I	Phone Dag6115411	
\checkmark	Minum Abdullah	NGO Board-MH	Email Led Lunch O	0
			Mabay liah Ongoboard mus	ahung

PUBLIC HEARING MEETING FOR THE EXTENSION OF MANGOCHI PORTABLE WATER SUPPLY PROJECT - ATTENDANCE REGISTER

DATE: 21st JULY 2021

VENUE: MUNICIPAL COUNCIL HALL

-	NAME	DESIGNATION	ORGANISATION	PHONE NUMBER	FMAIL	ILG DATUS
1	Alteralas miande	NAMIDZ: bacy		09997585	5	1 and 1 are
2	Jothan Mbale	Done Manager (m)	+) SRWR	0888896196	yothan - Mbala	
4	Arthur ITepeni	Zone Manager (2A)	SRWB	0888866102	Guttur-hepeni@Srw	PINOMW
5	SIEVEN S'MINORA	ENVIRONMENTAL Office	SRWB	0995745266	steven minor oquigit - com	to N.
6	HECTURE MARTA	SITE ENGINEER	SRWB	0884417154	Myssachinganbag@gmail-	1 Dus
7	TESTINGS MISAWK	SITE ENGINEER	SRWB	D881446034	hashngsmbawa egmail.	in them
8	Mergia C Kampanikiza	C A B C	GCK Cameras	0881475504	Ghampanihiza Ognaila	by DT
9	Mc Phill-Mwithsha	Diden Mr. Ch Section	MNESCO Commission	0980060537	magomelo euneco nato	pri mus de
10	Donume Millandara	O t A	DNPW - LMNO	605 0824150	phillipmulke I gm hic	- And
11	chimeenne 1/1 ping	5 A (b) m	MHDC	0 888 353 788	dominicmwandia Pgma	RICIM DAust
12	Rita Makermarine	OPP SPIR	Counts	0884158154	chimwenne - Vada	5. 05826 m
13	ANNIE E. PHIRI	AS SPLIB	CRUB	088835850	ritte-makernenle@	Srub.mu
14	Innocencia Zanez	mot trainage c.c	SILAD	0888395556	annie-phiriesrubimu	
15	Andrea Nourtz	MCI TRANSE POD	SRIUB	077458668	znnocencia - Zanera Osi	rd ma szanz
16	LOZANI WITNESS	ZONE ACCOUNTINT (M	IL SPILLE	0795 844 179	nawetg92@gnail lom. and	tranawta@s
17	Roxy Haridi	Aeroso	Water	0911162251	102ani-witnesse \$5	ern , dru
18	Enlene Chimayo	dournalio-	Croib l Radio	1885275215	nanelroxyegmil.com	B-du
19	C. LHIYEMB SILENT	foundth	The Alaba	AJAREZILLAN	Parlenechimoyo 6970gma	d. com
20	Eric NJobun	Journalist	URULY RANG	0888607195	Chikondi chi yenpekeen	egmilian
21	WESLEY KATHUMBA	EAHO	MARGOCHT TOWN ALWING	0882258561	Wight al Rain and	Com

	22	FLORENCE MWALE JOMONALIST	Carillel TOA	056	
	23	WNOLEDT HPULONGOLD , WILL ARE ICE	Copital FIVI	0884499915	mwaleflorena 05@gmail.com
	24	TUNCHA MUL PAL SPACACHICI	TIMOS C THE	0999397951	innomphongolo e gray an
. [25	Kubod Altomoone Council	TIMES Group	0682357217	jamkeszer Camalkon
t	26	and will No 2 To a lat	Imes group	0994417958	apinkangama@amail.com
$\sqrt{1}$	27	Shear Working Journahur	NYASA TIMES	0999915711	Snavengh @ great (or
ł	28	Light Manyimbo DAENR	MH-DC	0992748445	ekanyimboleyahoo.com
	29	12 Machande Journahst	Zochak	0886 079 992	muschandehamitter Eramail. Lom
~	30	Dessingo Michels DLO (Lands) MH-DC	0881519355	mahat blessmi Bucha com
+	21	uswala Mwamsamal, AgED	NWRA	0999110437	aswald as same li Bamail dan
+	22				eginativem
+	52				
	34			1	

PUBLIC HEARING ON ESIA FOR PROPOSED EXTENSION OF MANGOCHI POTABLE WATER SUPPLY PROJECT

ATTENDANCE REGISTER

No.	Name	Institution	Designation	Phone Number	Email Address
	Dr Susan Grikagwa-Malu	MEPA	Board Member	0993660121	Konanalungabyahoo (com
\checkmark	Dr. Raphael Pingu	MH-DC	De	D998213411	raphaelpiñgui @ yahos. Com
\checkmark	Kondwai Mego	MH - DAO	ABO	89993270 30	Knyego Egmail, Com

Ant of Partici	mane As below	PUBLIC DEARING MEET	NER STANDER DE FRANKER EN DE SERVICE EN D
Place of folcoid	has Marshell an anniest	HARLE Ball	07/21
Telle	TN	Postdania (, item	The Continues of the NEAN AND
11	F. Welled Kennuden Tis scale killionialoos Joseph Liyonde Bright Pilips Christiphe Teiler	Aginector Director Mg Derector of Mar Zone Migr. MJ Folice-SFDD	Auna april 250 6 15 Construction april 250 6 15 Construction april 200 17 Prove Pins 1200 17 Prove Joseph Lynch & Sinking XLG Prove Joseph Lynch & Sinking XLG Prove DESERVICE Prince 200 Prove DESERVICE Prince 200 Prince 200 Princ
K	Dis Malijani	Minsure of Monards	Phone
11	ANSVEW KACHETO	PLANNING & DEVEND	Tomtemacrowalances products and a second sec



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

PUBLIC HEARING MEETING

List of Participants: Ad below Place of Meeting: MULAICOME FOLINDIE FACE Date: 21/07/2021

Date	Narie	Position/Occupation	Phone Needler and Ennel Addeuse	S'ganter.
A log las as	Reports manage	AND THERE AN	Hoose 1 (1991-156-1-245	
V	Store GLACE	Nikuahi bar	Ana 0115566507	Here
11	Shorte Bridla		and to a transferra	
11	BRING KATADOGA	HH - Ba	Burne 69136 56 7 28	
11	Matine Clincol Mal	BOYO - SELENCE - WAY	Phone Limit Vieldt of Charapterial of the Phone Characteria	动物
(1	VANAMASS	Neuwerta	Phone Small 1977 Charter Start L	the -
(ł	Bits makes	DEDAS DAMAS	Phone Services 1997	a the states
ų	Callins Kathoka	Folucation - DEMIN	Phane (5 882-571 (584) Timil Brock Carl Connect Connect	Alk
(Kathana Astallan	NGO BERRA HAL	Phone (1984-1867) 11	

APPENDIX 9: LOCAL NAMES FOR FLORA AND FAUNA IN THE PROJECT AREA

FLORA SPECIES
SCIENTIFIC NAME

Hyphaene petersian Pterocarpus angolensis Adansonia digitata Albizia spp Azadirachta indica Trichilia emetica Acacia tortilis Prosopis grandilosa Prosopis cineraria Albizia lebbeck Azadirachta indica Acacia seyal Tecomaria nyassae Colophospermum mopane Brasilettia mollis Hardiwickia binata Tamarix articulata Cassia siamea Eucalyptus camandulensis Eucalyptus hybrid Leucaena leucocephala Cenchrus ciliaris Cenchrus setigerus Zizyphus mauritiana Punica granatum Psidium guajava Phoenix dactylifera Feronia limonia Annona squamosa Tamarindus indica Salvadoro persica Cordia myxa *Syzygium quineense* Embelia schimperi Carissa edulis Faidherbia albida Ipomeo batatus Mangifera indica Zea mays Musa paradisiaca

LOCAL NAME Chiwale Mlombwa Malambe Mtangatanga Neem Msikidzi Nchongwe Mtcheza Mtcheza Mtangatanga Nimu or Neem Chisawani Masasa Sanya Mbumbi Mswaswa Chiombo Kadate Bluegum Bluegum Mtengo wa feteleza Udzu Udzu Masawo Jamu Gwava Kanjedza Mlunguchulu Mpoza wa chizungu Bwemba Mswache Mpefu Mpeuma Nakonda Mkangamwazi Msangu Mbatata Mango Chimanga Nthochi

Musa livingstoniana Carica papaya Manihot esculenta Eucalyptust ereticornis Gmelia arborea Toona ciliate Bauhinia petersiana Senna siamea Senna spectabilis Persea americana Citrus limon Citrus sinensis Prunus Persia Pterocarpus angolensis

FAUNA SPECIES

Haliaeetus vocifer Corythornis cristatus Ceryle rudis Cinnyris jugularis Bycanistes buccinator Bycanistes brevis Phacochoerus africanus Cercopithecus albogularisnyassae Papio cynocephalus Crocuta crocuta Geochelone sulcata Lepus microtis Mus spp

BIRD SPECIES

Francolinus afer Streptopelia semitorquata Myioparus griseigularis Pyconotus barbatus Tauraco corythaix

FISH SPECIES

Oreochromis karonagae Oreochromis squampinis Opsaridium macrocephalum Engraulicypris sardella Copadichromis spp Rhamphocromis spp Nthochi Papaya Chinangwa Bluegum Malayina Sindilera Chitimbe Kesha Kesha Kesha Mapeyala Lemon Orange Peach/Pichesi Mlombwa

Fish Eagle Malachite kingfisher Pied kingfisher Sunbird Trumpeter hornbill Slivery Cheeked hornbill Warthog Blue Monkey Baboon Spotted Hyena African spurred tortoise African common hare Mice

Red-necked Francolin Red-eyed Dove Grey throated Tit-flycatcher Black-eyed Bulbul Knysna Turaco

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

APPENDIX 10: 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	
Manager A. P. Sala	

Mangochi = 1 Liwonde = 2 Balaka = 3

C. IDENTIFICATION OF HEAD OF HOUSEHOLD/RESPONDENT								
Head of household name	1a.	First	1b. 9	Surname(s):				
(only if respondent is not the head of the household)	name(s):							
Gender	Male	Femal	e lo	lentified as other				
Age (estimate or actual if known): Enter in number format.								
Name of respondent	4a. Fir	st name	e (s):	4b. Surname (s):				

SECTION 2: DEMOGRAPHIC DETAILS

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

Α.	Member (name of HH members starting with HoH name)	 B. Relation Head of 1. Spouse 2. Child of 3. Grand c 4. Spouse HoH 5. Parent c 6. Relative 7. Worker 8. Other 	nship to the f Household HoH child of child of of HoH	C. 1. 2.	Gender Male Female	D. Age: (enter in number format)	E. N 1. 2. 3. 4. 5. 6. 7.	Marital Status Single Married Monogamou s Married Polygamous Separated Widowed Cohabiting 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 \Box No \Box 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 \Box No

S	ECTION 3 : EDUCATION		
Α.	Where do children in this household go	1.	Within this community
	to school?	2.	Other communities
		3.	Outside the district
		4.	Don't go to school
		5.	Other (specify)
В.	How do children of this household go to	1.	Walking
	school?	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	1.	Less than 30 minutes
	of this household to get to school?	2.	31 -60 minutes
		3.	61-90 minutes
		4.	More than 90 minutes
D.	Do children of this household meet any	1.	Yes
	challenges in order to access education?	2.	No \rightarrow skip to section 4
Ε.	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	1. Fishing
this household	2. Informal employment (piece work
	including agricultural day labour)
	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	1. Less than MK 10,000
(Combined)	
	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	1. Government Hospital
your village/area?	2. Private Hospital
	3. Mission Hospital
B. How long does it take you to reach	1. Less than 30 minutes
nearest health facility (the nearest)?	2. 30 minutes to 1 hour
	3. 1 hour to 2 hours
	4. More than 2 hours
C. Has anyone from the household	1. Malaria
suffered from the following?	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	1. 1-2 times
visited the healthy facility in the last 3	2. 3-4 times
months?	3. 5-6 times
	4 More than 6 times
SECTION 6: HEALTH (SANITATION AND HY	(GIENE)
A. Do you have a toilet/latrine?	1. Yes \rightarrow skip to D
	2. No
B If no what do you use?	1 Bush
b. If no, what do you use:	2 Water source (lake river)
	3 Neighbors toilet
	4 Other (specify)
C What are the reasons that inhibit you	4. Other (specify)
from owning a toilet/latrine?	1. COSt
\rightarrow Skip to 6F	
·	3. No reason
	4. POOR SOII (I.e. sandy soils)
	5. Other (specify)
D. What type of toilet facility does your	1. Iraditional pit latrine
household use?	2. Improved traditional pit latrine

		3.	Flush toilet
		4.	Ventilated improved pit latrine
		5.	Composting toilet
E.	Does your toilet have a hand washing	1.	Yes
	facility?	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)
SE	CTION 7: MAIN LAND USE		
Α.	Does any member of this household	1.	Yes
	own any agricultural land?	2.	No \rightarrow skip to section 8
В.	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
L		7.	Others (specify)
D.	What is the size of your land? (Acres)	1.	Less than 5 Acres
No	ote: 1 Acre = a football pitch	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	1. 01% - 25%
selling?	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	1. MK0 – MK 100,000
generated from selling yields of last	2. MK101 000- MK500,000
growing season?	3. MK 501,000- MK 1,000,000
	4. >MK1,000,000
G. Do you meet any challenges in	1. Yes
farming?	2. No \rightarrow skip to section 9
H. What kind of farming challenges do	1. Lack of enough labour
you meet?	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)

SE	SECTION 9: WATER			
Α.	What is the main source of drinking	1.	Lake/river/streams	
	water for members of your household?	2.	Unprotected wells/spring	
		3.	Protected wells/springs	
		4.	Piped water(tap)	
		5.	Boreholes/tube well	
		6.	Rain water	

П

SE	CTION 9: WATER		
		7.	Piped from the lake
		8.	Other (specify)
В.	Where is the water source located?	1.	In own dwelling $ ightarrow$ skip to 9E
		2.	In own yard/plot →skip to 9E
		3.	Elsewhere
C.	How far is the source of drinking water	1.	0-15 min
	from the dwelling? (to and from)	2.	16-30 min
		3.	31-60 min
		4.	> 60 min
D.	When you get to the water sources,	1.	<5 min
	how long do you take to fetch water?	2.	6-10 min
		3.	11-15 min
		4.	>15 min
Ε.	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)
Н.	Do people pay for the water?	1.	Yes
		2.	No \rightarrow skip to K
1.	If yes, what is the frequency of	1.	Daily
	payment?	2.	Monthly
		3	Yearly
		۵. ۵	When need arise
	How much do people pay for water on	1	MK01 – MK 2000
5.	monthly basis?	2	MK2001 – MK4000
		2.	MK2001 – MK8000
		J. ∧	MK8001 - MK16000
		4. 5	NIK16000
	Are year willing to new for the works of). 1	
к.	Are you willing to pay for the water?	1.	res

SECTION 9: WATER	
	2. No \rightarrow Skip to O
L. How much are you willing to pay per	1. MK01 – MK 2000
month?	2. MK2001 – MK4000
	3. MK4001 – MK8000
	4. MK8001 – MK16000
	5. >MK16000
M. Do you have challenges with your water	1. Yes
supply from time to time?	2. No \rightarrow 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	1. Yes
from this source unavailable for at least	2. No
one full day?	3. Don't know

SE	CTION 10: BASIC INFRASTRUCTURE		
Α.	Observe the main material of the floor	1.	Earth floor
	of the dwelling.	2.	Wood planks
		3.	Cement
		4.	Ceramic tiles
		5.	Carpet
		6.	Other (specify)
В.	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	1.	Palm leaf/grass
	exterior walls of the dwelling.	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	1. None		
for your household?	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	1. Gas		
cooking?	2. Charcoal		
	3. Kerosene		
	4. Electricity		
	5. Saw dust		
	6. Firewood		
	7. Other (specify)		
C. If firewood, how do you obtain this?	1. Collect within 1km of village		
(Multiple response)	2. Collect over 1km from village		
	3. Buy \rightarrow skip to E		
D. Who in the household mainly	1. Adult female (>16)		
collects firewood?	2. Adult male (>16)		
	3. Children (<15)		
E. What challenges do you face in	1. Distance		
obtaining firewood?	2. Cost		
	3. Accessibility		
	4. Availability		
	5. Other (specify)		
F. Do you have electricity in this	1. Yes		
household?	2. No		
G. If yes, what kind of electricity?	1. Supplied by ESCOM		
	2. Solar Electricity		
	3. Biogas		
	4. Generator		
	5. Other (specify)		

APPENDIX: 11: 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 	 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
	Engineering - Post Graduate Diploma - Advanced Certificate in Water and Environmental Management	 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. 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

Name	Proposed Position and Qualification	Task Assigned
		 the impacts related to the project's construction activities Assess construction activities safety and environmental issues Develop environmental management and monitoring plans
	AND INVOLVEMENT	
Department of Museums and Monuments	Specialist assessment	 Assessment of World Heritage and Visual Impact: OUV, Integrity, Protection and Management of LMNP World Heritage Site
Department of National Parks and Wildlife and Department Fisheries	Biological Characteristics of the Project area	 Facilitation and provision of specialist data on flora and fauna; and fish of the project area