



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR RUMPHI WATER SUPPLY AND SANITATION SERVICES IMPROVEMENT PROJECT



EXECUTIVE SUMMARY

Introduction

This is an Environmental and Social Impact Assessment (ESIA) study report for proposed Rumphi Water Supply and Sanitation Services Improvement Project (RWSSIP) to be implemented by Northern Region Water Board (NRWB) in Rumphi District and parts of Mzimba North District. The ESIA has been undertaken in accordance with Malawian Legislation and the African Development Bank (AfDB) Operational Safeguards.

The project seeks to contribute to the socio-economic growth of Rumphi Town and surrounding areas by improving the health and livelihoods of the residents through access to potable and sustainable water supply and improved sanitation services. This will be achieved by upgrading and expanding existing Rumphi water supply scheme to unserved areas and improving sanitation services. The project, upon completion, is expected to serve population of 158,085 by year 2040 and is projected to cost **USD 29.8 million (MK 30.9 billion, USD 1 = MK 1,036.25)**.

Project Location

The proposed project sites are located in Rumphi District and parts of Mzimba North District. The extents of the project are Bwengu to the East; Thumbi, Luzi, Chinyolo, Mkombezi, Phwezi and Bula to the Northeast; Chikwawa, Bolero, Luviri, Mwazisi, Lusani, Bembe, Kamphenda, Chanyoli through Luhono, Nkhamanga to the West; Vongo including Lumemo to the South; and Kacheche and Enukweni to the Southeast of Rumphi Town.

Nature and Scope of the Project

The proposed project has been designed to provide potable water and improved sanitation services for an estimated population of 158,085 by the year 2040. The source for the water supply system will be the South Rumphi river where a concrete intake weir will be constructed. The capacity of the existing water treatment plant at Rumphi Boma will be upgraded from 1,500 m³/day to 19,415 m³/day. New transmission mains and associated pumping stations complete with solar power will be constructed at Bolero, Luviri, Mwazisi and Thumbi. The project will also involve rehabilitating, upgrading, and extension of water supply to Kamphenda, Bula, Enukweni and Phwezi by installing 323 km of pipelines with diameters ranging from 90 mm to 500 mm. In addition, concrete reservoirs with a total capacity of 7,350 m³ will be constructed at Rumphi Water Treatment Plant, Jaghala Hill, Bolero, Luviri, Mwazisi, Kacheche and Thumbi.

The project will also improve sanitation services by constructing new sanitation facilities such as ventilated improved latrines at selected schools and public places, commuter toilet facilities at Mzokoto, sewerage conveyance pipe networks at Rumphi Boma, wastewater treatment plant with

a capacity of 148 m^3 /day at Rumphi Boma, solid waste landfill for solid waste management with a capacity of 52,798 m^3 at Thulwe and purchasing of associated equipment such as waste collection vehicles.

Lastly, the project will also carry out a number of climate change adaptation and watershed management activities to mitigate human activities which have the potential to deplete and degrade water resources within the South Rumphi River catchment area.

Project Alternatives

During the planning phase of the project, several alternatives such as the source of water, water supply and sewer pipeline routes, location of wastewater and solid waste treatment facilities and materials to be used were analysed.

The raw water sources were analysed based on the amount of available water for abstraction and supply to the project area, water quality and operational costs which are critical in ensuring provision of sustainable and safe water supply.

Water supply and sewer pipelines routes were analysed to ensure that the selected routes did not result in involuntary resettlement of Project Affected Persons (PAPs). The routes were also selected to minimise total length of pipelines installed whilst not compromising coverage. This was done to optimise investment costs.

The proposed location of facilities such as wastewater and solid waste treatment facilities were analysed based on suitability criteria, risk of pollution and/or contamination, existing land use and settlements and acceptance of the facilities by communities. The locations proposed in this report are the preferred based on minimal impacts on the environment and communities. In addition, cost effective and technologically appropriate treatment methods have been selected to promote sustainability of the treatment facilities.

The materials to be used on the project have been recommended based on the lifespan, ease of acquisition, ease of installation and maintenance, performance, interaction with the environment, risk to third party damage and chemical resistance.

Justification of the Project

The proposed water supply and sanitation project will help to ensure that residents of Rumphi town and surrounding areas have access to adequate potable water and improved sanitation thereby fulfilling the country's goals as outlined in the Malawi 2063, and Malawi 2063 first 10-year

Implementation Plan (MIP-1). Furthermore, provision of potable water and improved sanitation facilities will contribute to reduction of common waterborne diseases and improve standard of living in the area. This will reduce expenditure on health-related costs which could be utilized in other economic activities.

Objective of the ESIA Study

As a requirement by Malawi Government by Environment Management Act No. 19 of 2017, before embarking on a project of this nature, the following tasks need to be fulfilled:

- To identify and predict both negative and positive environmental and social impacts.
- To propose mitigation measures to minimise the negative impacts and enhance the positive impacts by preparing Environmental and Social Management Plans (ESMPs).
- To ensure compliance with Government of Malawi (GoM) and AfDB environment and social safeguards standards.

Methodology

The ESIA study was conducted in accordance with Environment and Impact Assessment (EIA) guidelines of 1997 and AfDB Operational Safeguards. The study involved desk studies, reconnaissance surveys, public consultations and field investigations to determine the existing conditions in the project area. The data was then processed and used to identify the positive and negative impacts of the project on the environmental and social aspects within the project areas. The study also identified appropriate mitigation measures for the predicted impacts and preparation of management and monitoring plans for addressing the environmental and social impacts.

Policy, legal and Implementing framework

The implementation of the project will be guided by several national policies, laws, regulations, guidelines and standards as presented below.

- The Malawi 2063: Articulates the national goals that will facilitate the realization of the aspirations of the people of Malawi. Promotes sustainable management of the environment such as adequate waste disposal, treatment and recycling; air and water pollution management; and prudent water resource management.
- **Policy Framework:** The National Fisheries and Aquaculture policy (2016), The National Environmental Policy (2004), The Malawi National Water Policy (Malawi Government, 2005), The National Environmental Action Plan (NEAP, 2002) and the Malawi Government Environmental Impact Assessment Guidelines (1997) form the basic framework within which the ESIA was conducted.

• Legal Framework: The Constitution of the Republic of Malawi is supreme over any legal policy or Act in Malawi. The project will comply with Section 13 (d) addresses the need 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.

The project will also comply with the Environment Management Act (EMA, 2017) which is an overarching legislation for environmental management in Malawi. It accords specific responsibilities to various sectoral authorities on matters pertaining to environmental planning and management. The provisions of the Land Act (2016) which was enacted to provide for land administration and management will be adhered to. The project will also comply with the Land Acquisition Act (2017) which must be followed by developers when acquiring land of any tenure in the country. These procedures will be followed as provided under this Act. Section 3 of the Act provides for the payment of fair compensation on acquisition of land by compulsory or by agreement.

In addition to the above, the project will also comply with the provisions of Water Resources Act (2013), Water Works Act (1995), Local Government Act (1998), Occupational Safety Health and Welfare Act (1997), Forestry Act (Amendment) (2019), National Parks and Wildlife (Amendment) Act (2017), Physical Planning Act (2016), Employment Act (1999), Public Health Act 1948 (Amended,1992), Monuments and Relics Act (1991), National Gender Equality Act (2013), Public Road Act (2015) and Public Health (Corona virus and Covid-19) Prevention, Containment and Management Rules of 2020

The project will also be guided by the AfDB's Integrated Safeguard Systems (ISS) which are a tool for identifying risks, lowering development costs and improving project sustainability, thus benefiting affected communities and helping to preserve the environment.

Implementing Framework

The Northern Region Water Board (NRWB), the Executing Agency of the Project, is a Malawi Government parastatal organization under the Ministry of Water and Sanitation (MoWS) which provides overall policy direction and oversight function. NRWB is responsible for provision of potable water supply and waterborne sanitation services in the urban centres of the Northern Region of Malawi. The Board was established in 1996 under the Laws of Malawi Chapter 72:01. NRWB currently supplies potable water 10 water supply schemes which Rumphi Town is one of the schemes. To improve sanitation as a package that include Solid Waste Management in the project area, NRWB will implement the project in collaboration with Rumphi District Council (RDC) and M'mbelwa District Council (MDC) who are local area authorities mandated for solid waste management.

This project shall be implemented as a component under the Blantyre and Rumphi Water and Sanitation Services Improvement Project in which Blantyre Water Board (BWB) shall be implementation entity for Blantyre Water Supply and Sanitation Service Improvement Project.

A Project Management Unit (PMU) will be established to oversee planning and implementation of the project. The PMU shall be virtually coordinated to ensure smooth implementation of the project in the two areas. Quarterly physical meeting shall also be conducted, in addition to fortnight virtual meetings. The PMU will report to the CEOs of the two Water Boards. The PMU shall consist of the Project Management Unit Manager (PMUM), Project Accountant, Monitoring and Evaluation Expert and Environmental and Social Safeguards Expert (ESSE).

Under the PMU, there is an Project Implementation Unit (PIUs) for implementing project activies. The PIUs shall consist of the Project Implementation Unit Manager (PIUM), the Project Coordinator (PC), Project Engineer (Water Supply), Project Engineer (Sanitation), Project Accountant (PA), Procurement Specialist (PS), Monitoring and Evaluation Officer (MEO), Environmental and Social Safeguards Expert (ESSE), Project Quantity Surveyor (QS), Environmental and Social Safeguards Social (ESSO), Sanitation & Hygiene Officer (SHO), Gender Officer (GO).

The PIUs shall be supported by Zone Managers (ZM), Zone Engineers/Scheme Coordinators (ZE/SC), Information and Communications Technology Manager (ICTM), Public Relations Manager (PRM), Customer Service Manager/ Commercial and Revenue Manager (CSM/CRM), Human Resources and Administration Officer (HRAO) and Internal Audit Manager (IAM).

The Project Coordinator/Team Leader will report to the PIU Manager. In turn, the PIU Manager will report to the PMU Manager. The PMU Manager will be appointed by BWB and shall report to the CEOs through NRWB CEO. The PMUM will liaise with the financiers on issues which will require consultation with them.

Summary of impacts

The proposed water supply and sanitation services improvement project will have both positive and negative impacts whose mitigation measures are proposed as follows:

Planning phase

- i. Negative Impacts
 - Loss of property such as buildings, crops, trees.

Construction phase

i. Positive Impacts

- Opportunities for employment.
- Increased opportunities for business.
- ii. Negative Impacts
 - Loss of vegetation and fauna.
 - Accident and injuries.
 - Pollution of surface water and groundwater.
 - Dust emissions.
 - Noise and vibrations.
 - Increased cases of teenage pregnancies, early marriages and school dropout.
 - Gender Based Violence (GBV)/Sexual Exploitation, Abuse and Harassment (SEAH).

Operation Phase

- i. Positive Impacts
 - Improved access to water supply services.
 - Improved sanitation services.
- ii. Negative Impacts
 - Pollution of surface and groundwater.
 - Increase pests and vector infestation.

Decommissioning Phase

- i. Positive Impacts
 - Reduced leachate release into environment.
 - Reduced accidents after closing burrow pits.
 - Improved scenery and landscape.
- ii. Negative Impacts
 - Leachate emission and groundwater contamination.
 - Pollution due to improper disposal of solar accessories batteries.
 - Open borrow pit and quarry mining sites.

Consultations

Extensive consultations were undertaken from 20th September - 2nd October, 2022. The consultations targeted Ministries of Lands and Labour, National Water Resources Authority (NWRA), Electricity Supply Corporation of Malawi (ESCOM) and Malawi Environment Protection Authority (MEPA), Rumphi and M'mbelwa District Councils, Local Leaders, Village

Development Committees (VDC), Area Development Committee (ADC), Communities, Civil Society Organisations (CSOs) and Non-Governmental Organisations (NGOs).

Through these consultations, all relevant stakeholders were engaged, and their feedback gathered. Chapter 6 describes the stakeholder engagement undertaken to date. Some of the key issues raised by the stakeholders and the commitments from NRWB are presented below:

- **Procedures for Compensation for crops and other assets:** All assets to be affected will be compensated according to the laws of Malawi and AfDB Operational Safeguards.
- **Procedures for Land acquisition and Resettlement:** Acquisition of land will be according to laws of Malawi. The project will not trigger physical displacement of people..
- **Increased Gender based violence and SEAH:** Sensitisation of communities and project workers on prevention of GBV/SEAH. Grievance redress mechanisms for reporting and resolving grievances will be developed and implemented.
- **Grievance Redress Mechanism:** The grievance redress mechanism will be implemented through Grievance Redress Committees. Where there are existing GRM committees they will be strengthened through training. For areas where there are no established committees, these will be established and trained.
- **Negative impacts because of project activities:** The project will prepare an Environmental and Social Impact Management Plan (ESMP) to mitigate the negative impacts.
- **Buffer zone establishment for Landfill:** NRWB and Rumphi District council would consider the establishment of the buffer zone.
- Foul odour from wastewater treatment plant: NRWB to ensure efficient operation of the facility which would reduce foul odours.

Environmental and Social Management Plan (ESMP)

The ESMP has been prepared in accordance with national and AfDB operational safeguards requirements. The ESMP outlines the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts.

Summary of Enhancement/ Mitigation Measures

The proposed enhancement and mitigation measures for positive and negative impacts above are provided below:

Planning phase

- i. Mitigation Measure
 - NRWB to work with the District Councils and Traditional Authorities in acquisition of assets. Loss of land: Provide appropriate compensation according to the laws of Malawi and AfDB operational safeguards.

Construction phase

- i. Enhancement Measures
 - Ensure women and other vulnerable groups are employment.
 - Ensure that women and youth have opportunities for business such as supplier of construction of materials
- ii. Mitigation Measures
 - Confine land clearing to just designated working sites.
 - Sensitise communities, barricading construction sites, provide PPEs, erect appropriate signages.
 - Use of sediments filter pads to clear run-off before it reaches water course.
 - Employ dust suppression measures, provide speed limit controls for construction vehicles
 - Schedule activities with high noise and vibrations to day time
 - Sensitize communities and workers
 - Include GBV/SEAH requirements in the bid documents, integrate measures for prevention and handling Gender Based Violence (GBV) and SEAH in the C-ESMP, set up grievance redress mechanism with clear referral pathways.

Operation Phase

- i. Enhancement Measures
 - Implement Government free water connection policy.
 - Promote sanitation as a business, Conduct regular inspections of sanitation facilities
- ii. Mitigation Measures
 - Monitor quality of effluent discharges from plants.
 - Sensitise communities on proper waste management such as waste segregation, regular inspection of waste management facilities.

Decommissioning Phase

- i. Enhancement Measures
 - Leachate monitoring.
 - Community sensitisation

- Replant with more vegetation.
- ii. Mitigation Measures
 - Proper covering of landfill sites, and Installation of monitoring wells.
 - Follow guidelines for disposal and pollution control management plan for this project.
 - Backfill with construction rubbles and disposed soils, and replant vegetation

An ESMP matrix for the project is provided below.

CODE	Impact	Proposed mitigation measures	Responsibility	Monitoring/	Period	КРІ	Estimated cost
				Oversight			(MK)
1	Loss of property such as buildings, crops, tree, etc.	 NRWB to work with the District Councils and Traditional Authorities Payment of compensation before commencement of works 	NRWB and District Council	District Council/ Lands Office	Before commenceme nt of construction works	No of People Compensated	914, 759,100
2	Pollution of surface and ground water	 Use sediment filter bags Fuel vehicles at impermeable containment structures that are not prone to surface runoff Service construction equipment regularly Minimize construction works during heavy rains to minimize issues of siltation 	Contractor	District Environmental Office, District Water Office	Throughout construction phase	Level of pollutants according standards	20,000,000
3	Occurrence of accidents and injuries	 Mark all construction sites with visible tape and erect appropriate safety signs to warn workers and visitors Provide workers with appropriate PPE Use fall protection equipment when working at heights Ensure that first aid services are put in place to ensure quick response from emergency Maintain work areas to minimize slipping and tripping hazards Implement fire and explosion prevention measures 	Contractor	Labour Office	Throughout the construction phase	No of Accidents among workers No of Accidents among community members	10,000,000

CODE	Impact	Proposed mitigation measures	Responsibility	Monitoring/	Period	KPI	Estimated cost
				Oversight			(MK)
		• Introduce humps on the roads to help reduce the speed of the vehicles					
4	Increased incidence of teenage pregnancies	 Supply of condoms at the construction site Development of a Code of Conduct / rules for worker-community interaction and onsite behaviour 	NRWB	Director Gender and Social Service, and District Gender and Social Office	Throughout	No of teenage Pregnancies	1,000,000
5	Sexual Exploitation, Abuse and Harassment	 Include GBV/SEAH requirements in the bid documents Integrate measures for prevention and handling Gender Based Violence (GBV) and SEAH in the C- ESMP All workers should sign code of conduct which include specific clauses on GBV/SEAH prevention Include GBV/SEAH prevention in the induction programme Conduct awareness raising to neighbouring communities regarding SEAH and reporting mechanism Including receiving and handling channel of SEAH allegations within the GRM 	NRWB and Contractor	Gender and Social Welfare office, and Police Victim Support	Throughout	No of cases/Complaints	5,000,000

CODE	Impact	Proposed mitigation measures	Responsibility	Monitoring/	Period	KPI	Estimated cost
				Oversight			(MK)
		and training responsible GRC members on handling the of allegations					
14	Increase in incidence	• Employ dust suppression	Contractor	District	During	Concentration of	10,000,000
	of dust emission	measures like application of		Environmental	construction	dust in the air	
		water		Office			
		• Reduce speed by construction					
		vehicles					
17	Noise and vibration	• Servicing of vehicles and	Contractor	District	During	Level of Noise	5,000,000
	around construction	plants		Environmental	construction	emission	
	sites	• Provide earplugs to workers		Office			
		Sensitizing communities					
19	Leachate emission and	Proper coverage of landfill	NRWB and	District	Throughout	Concentration	5,000,000
	groundwater	sites	District Council	Environmental	the	pollutants	
	contamination	Provision of drainage		Office, and	decommission		
		• Installation of monitoring		District water	period		
		wells		office			
25	Increased pest and	Community sensitization	NRWB and	Director	Throughout	No of pest related	10,000,000
	vector infestations in	Provide solid waste	District Council	Health and		outbreaks	
	the district	management facilities to avoid		Social Service			
		formation of waste dumpsites					
33	pollution due to	Follow guidelines for disposal and	NRWB	District	Throughout	No of case of	3,000,000
	improper disposal of	pollution control management plan		Environmental	the	improper battery	
	solar batteries	for this project		Office	decommission	disposal	
					period		

Environmental and Social Monitoring Plan

The Environmental and Social Monitoring Plan will help in assessing the effectiveness of the proposed mitigation measures and protection of the environment by comparing monitored data against the baseline data collected during the ESIA study.

The key indicators to be monitored include:

- Number of PAPs compensated
- Number of complaints recorded in the GRM records
- Noise and vibration levels
- Number of accidents and injuries among workers and community members
- Number of cases/complaints on SEAH

Grievance Redress Mechanism (GRM)

A Grievance Redress Mechanism (GRM) has been developed to act as a tool for receiving, processing, and redressing issues and complaints from either internal source, for example, workers of the project, or external sources such a project Affected Person Persons (PAP), the communities and public, and stakeholders on different issues affecting them that may affect the project implementation.

The GRM will work within existing legal and cultural frameworks and that it will follow community level, project District level and NRWB level structure redress channels. Communities will be thoroughly sensitised on these channels to follow.

Implementation Arrangement of ESMP

The successful implementation of the project ESMP shall require seamless interaction and coordination from different stakeholders involved in the project including AfDB, NRWB, Engineering Consultant, Contractor, Government Regulatory Agencies such as MEPA, Ministry of Lands, District Environmental Office, and District Councils among others.

NRWB as the implementing entity shall incorporate Environmental and Social Safeguards in procurement documents and ensure compliance by bidders, supervision of implementation of ESMP by contractor, ensuring swift grievances redress, inspection and Monitoring ESMP implementation, and reporting to MEPA and AfDB. The NRWB will perform the roles in collaboration with the Ministry of Lands, District Project Monitoring Team (DPMT) and Engineering Consultant.

MEPA shall be responsible for inspection of project sites to ensure compliance with approved ESIA and ESMP conditions.

The AfDB shall provide oversight to the implementing entity, NRWB, to ensure compliance with ESMP and Bank's E & S safeguards standards during implementation of the project.

ESMP Implementation Budget

The total cost of implementing the ESMP including compensations for all project affected persons in the RAP is **USD 1.3 million (MK 1.3 billion, USD 1 = MK 1,036.25).**

Conclusions and Recommendations

The ESIA study extensively analysed potential positive and negative impacts of the project. The process found that the project upon completion shall significantly improve access to potable water by reducing distance and time people take to fetch water. In terms of sanitation, improved sanitation will help reduce sanitation related diseases through proper solid waste management and wastewater treatment. However, the project will have negative impacts emanating from construction activities. The management plans have been proposed to contain the severity of the impacts. It is recommended to involve all stakeholders during the early stages of implementation phase to ensure that social-cultural impacts are minimized. In addition, locals should be considered for unskilled labour during construction, and adequate information on negative impacts associated with construction should be disseminated to the public. Therefore, with recommended management plans the project is recommended for approval as it will result in substantial health and economic benefits for the people of Rumphi and surrounding areas.

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ADC Area Development Committees AEC Area Executive Committees **AfDB** African Development Bank AHP Analytic Hierarchy Process AIDS Acquired Immune Deficiency Syndrome ARAP Abbreviated Resettlement Action Plan **BADEA** Arab Bank for Development in Africa **CBD** Convention on Biological Diversity **CBO Community Based Organization** CHS Community Health & Safety Contractor Environmental and Social Management Plan CESMP CFP **Chance Find Procedures** CITES Convention on International Trade in Endangered Species DC **District Council** DEM **Digital Elevation Model** DESC **District Environmental Sub-Committees** DRM **Disaster Risk Management** DSIP **District Sanitation Investment Plan** EIA **Environmental Impact Assessment** EIB European Investment Bank **EMA Environment Management Act ESCOM** Electricity Supply Corporation of Malawi **ESIA** Environmental and Social Impact Assessment ESMP Environmental and Social Management Plan ESIS Environmental and Social Impact Screening FAO Food and Agriculture Organization FRAP Full Resettlement Action Plan FRIM Forestry Research Institute of Malawi GBV Gender-Based Violence GIS **Geographical Information Systems** GPS **Global Positioning System** GoM Government of Malawi GRM Grievances Redress Mechanism **GVH** Group Village Headmen HAND Height Above Nearest Drainage HHH House Hold Head HMP Hazard Management Program

ACRONYMS AND ABBREVIATIONS

HIV	Human Immunodeficiency Virus				
IEC	Information, Education and Communication				
IPPC	International Plant Protection Convention				
ISS	Integrated Safeguard System				
IUCN	International Union for Conservation of Nature				
LULC	Land Use Land Cover				
MCDM	Multi-Criteria Decision Model				
MIP-1	The Malawi 2063 First 10-year Implementation Plan				
MEPA	Malawi Environment Protection Authority				
NAPA	National Adaptation Programme of Action				
NEP	National Environmental Policy				
NEAP	National Environmental Action Plan				
NGO	Non-Governmental Organization				
NRWB	Northern Region Water Board				
NSO	National Statistical Office				
OHS	Occupational Health & Safety				
ODS	Ozone Depleting Substances				
OPEC Fund	OPEC Fund for International Development				
OSHW	Occupational Safety Health Welfare				
PAPs	Project Affected Persons				
PIU	Project Implementation Unit				
PPE	Personal Protective Equipment				
RAP	Resettlement Action Plan				
RR	Road Reserve				
RRB	Road Reserve Boundaries				
SASS	South African Scoring System				
SDGs	Sustainable Development Goals				
SRTM	Shuttle Radar Topography Mission				
STA	Sub Traditional Authority				
ТА	Traditional Authority				
ToRs	Terms of Reference				
UN	United Nation				
VDC	Village Development Committees				
VNRMC	Village Natural Resource Management Committee				
VIP	Ventilated Improved Pit				
WASH	Water Sanitation and Hygiene				
WTP	Water Treatment Plant				
WUA	Water Users Association				

1 INTRODUCTION

1.1 BACKGROUND

The Northern Region Water Board (NRWB) was established under the Water Works Act No.17 to provide potable water and waterborne sanitation services in all urban and peri-urban centres of the Northern Region of Malawi. Rumphi Water Supply scheme is one of the ten schemes which are within the mandate of the NRWB. To fulfil this mandate, NRWB is planning to implement Rumphi Water Supply and Sanitation Services Improvement Project to improve availability and access to potable water and sanitation services in Rumphi District and some areas in Mzimba District. This will be achieved by upgrading and expanding existing Rumphi water supply scheme to unserved areas, constructing a sewage system, wastewater treatment plant, and landfill for solid waste management. It will also construct a public commuter toilets facilities and improved pit latrines at selected public schools and market centres.

The main objective of the proposed project is to improve the health and livelihoods of the residents of Rumphi Town and surrounding areas through the provision of potable water supply and improved sanitation service facilities. The estimated total project cost is US\$29.8 million (30.9 billion Malawi Kwacha, USD 1 = MK 1036.25). The project is expected to start in August 2023 and to be completed in August 2027 (4 years implementation period). To implement the project, 320 people will be employed out of which 50% of workers will be youths and at least 40% of either gender.

1.2 EXISTING WATER INFRASTRUCTURE

1.2.1 The Water Source

The water supply source for Rumphi is South Rumphi River flowing from the north and joining South Rukuru River at the east entrance of the town. South Rumphi River originates in the southern slopes of Nyika Plateau and is perennial with a considerable dry season base flow. The Water Resources Development Plan (NIRAS – 2001) estimated the available minimum flow with a return period of 20 years as high as 77,700 m³/day, which can easily satisfy any future increase of the demand for Rumphi town. The present abstraction amount is about 1,500 m³/d and takes place through an intake structure situated 3 km upstream of Rumphi town. The intake elevation is 1129 masl and it is located at 595808 E and 8784262 N.

1.2.2 Water Treatment

The water treatment plant is located at a distance of about 2 km northeast of Rumphi Town centre in the Mayembe Hills. The elevation at the water treatment plant is 1118 masl. The treatment plant comprises one sedimentation basin with two chambers, three vertical pressure filters, backwash tank, dosing system for coagulant and another one for chlorine, air blowers, backwash water lift pump and clear water tank. Figures 1-1 and 1-2 show location of water abstraction, existing and proposed service reservoirs; and Water Treatment Plant site respectively.



Figure 1-1: Location of Existing Infrastructure (Intake, Water Treatment Plant and Tank)



Figure 1-2: Water Treatment Plant and ancillary structures

1.2.3 Existing Storage

There are two tanks servicing two pressure Zones for the existing Rumphi Water Supply Scheme. The first tank is located at the treatment plant. Clear water is transmitted from the pressure filters through a 200 mm pipeline to the clear water underground reinforced concrete tank which has a capacity of 500 m3. The clear water tank has three functions: to allow adequate chlorine contact time, supplying the town (80 % of current demand) and also functions as a wet well for the booster station located at the plant which feeds a 220 m3 capacity reinforced concrete ground tank located at Jaghala near Our Future School to the north which supplies water to Pressure Zone 2 of the town. The inlet and outlet elevation to the clear water tank are 1119 masl and 1115 masl whereas inlet and outlet elevations for Our Future tank are 1144 masl and 1140 masl.

1.2.4 The Distribution Pipeline Network

The water distribution network has a 42 km length of pipeline with diameters ranging from 50 mm to 200 mm pipes where majority of the pipelines are uPVC and only few are GI and asbestos pipes as summarized in table 1. There are 2,505 individual connections, 21 communal water points, 97 commercials and 53 institutional connections. Majority of the customers are connected through 20 mm diameter pipelines resulting in very low pressures.

The lower zone is supplied through a 3.085 km 200mm uPVC pipeline which is reduced to 160 mm in Rumphi Town. On the other hand, the upper zone is supplied through a 6.7 km 160 mm uPVC pipeline which is reduced to 110mm and 90mm at Rumphi Town.

Diameter (mm) and	Transmission	Transmission	Distribution	Total (m)
material	intake WTP	Tank 1 – Tank	(m)	
	(m)	2 (m)		
200 GI	1,600			1,600
200 uPVC			2,595	2,595
160 uPVC		2,550	4,840	7,390
110 uPVC			13,240	13,240
90 uPVC			4,720	4,720
63 uPVC			8,490	8,490
50 uPVC			3,883	3,883
Total	1,600	2,550	37,768	41,918

Table 1: Inventory of existing pipelines for Rumphi (in m)

1.3 LOCATION OF THE PROJECT AREA

Rumphi town is the commercial and administrative centre of Rumphi District located between latitude 623470E and 631711E; and longitudes 868465N and 8695143N in the Northern Region of Malawi. Rumphi is located in the South Rukuru Valley on the northern bank of South Rukuru River that boarders with Mzimba District. Rumphi town is at a distance of 67 km North of Mzuzu City, a commercial and administrative centre of the Northern Region of Malawi. The proposed project extents are Phwezi to the North East; Mwazisi to the West; Vongo, Enukwenu, Bwengu and Thumbi to the South (Figure 1-3).

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Figure 1-3: Location of the proposed water supply and sanitation project areas

NOTE: Project location maps at 1: 50 000 and 1: 10 000 scales are presented in Appendix XIII.

1.4 PROPOSED WATER SUPPLY AND SANITATION INFRASTRUCTURE

To implement the proposed project, the following works among others will be carried in Mzimba North, Rumphi East and Rumphi West areas as shown in Figure 1-4:

- Construction of an intake weir on South Rumphi River and installation of gravity main raw water pipeline,
- Increase the capacity of the treatment plant for Rumphi from the current 1,500m³/day to 19,415m³/day,
- Construction of pumping stations and installation of clear water pumps to convey water to Jaghala, Bolero, Luviri, Mwazisi, Kacheche and Thumbi reservoirs,
- Installation of pumping mains and transmission mains to Jaghala, Bolero, Luviri, Mwazisi, Thumbi and Kacheche reservoirs,

- Increasing water storage capacity by construction of reservoirs at Rumphi Treatment Plant, Jaghala (Our future), Bolero, Luviri, Mwazisi, Kacheche and Thumbi,
- Upgrading and expansion of the distribution Pipe Network in proposed areas in Rumphi and Mzimba, and
- Implementation of climate change adaptation and mitigation activities especially in catchment areas.



Figure 1-4: Location of water supply project in Rumphi and Mzimba districts

Furthermore, the project will construct wastewater treatment and sewer network for public institutions and surrounding households at Rumphi Boma, and a solid waste landfill planned to be placed at Thulwe in Sub Traditional Authority (STA) Kazamawe in Rumphi to service Rumphi and Bolero. Figure 1-5 shows proposed waste water treatment sites and sewer line at Rumphi town.
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Figure 1-5: Proposed sewer line and location of public institutions at Rumphi town

1.5 RATIONALE OF THE PROJECT

Currently, Rumphi Water Supply system has many challenges because no major rehabilitation nor upgrading works have been carried out since 2004. Some of the challenges include the following:

- i. The existing raw water pipeline can only transmit 69 m³/h which is less than current demand of 215m³/hr as well as projected future demand, i.e., year 2040 maximum day demand of 882.5m³/hr.
- The designed capacity of the water treatment plant at 1,500m³/day is not adequate for the current demand of 4,500m³/day. However, the raw water source (South Rumphi) has an abundant quantity of water, which can supply the town of Rumphi and surrounding areas (estimated at 158,085 people by the year 2040) for many years provided the intake structure and treatment plant are upgraded to the desired production capacity.

- iii. The system has very small diameter pipes and inadequate capacity facilities such that some consumers receive water only during some hours of the day.
- iv. The system has very old pipes which leak badly that non-revenue water is as high as 15.6%.
- v. Newly developed areas are not supplied with potable water as there is no water supply infrastructure. Communities in those areas use unsafe water.
- vi. The cost of maintenance of existing facilities is very high as the facilities are very old.
- vii. There is limited storage capacity for water such that water stops running at consumer taps immediately there is a pipe breakdown or power outage.
- viii. Most of the Gravity Fed Water Supply systems in the area are very old and experience many challenges.

In addition, Rumphi District Council does not have wastewater emptying and collection vehicles hence residents have to hire from Mzuzu city that is at 67 km distance from the city which results in increased costs especially for large institutions (with large volumes of wastewater) like Rumphi Hospital and Prison and Secondary school. In addition, Rumphi district has no wastewater treatment plant to treat the sludge emptied from on-site facilities. Most households, therefore, prefer to abandon a pit latrine when full and construct a new facility.

Similarly, the lack of a solid waste management facility in the district results in rubbish lying around especially in market centres during market days. Households with earth dug disposal pits abandon these pits when full.

It is anticipated that the demand for sanitation services in Rumphi Town will grow at high rates, in relation to the population growth. In addition, part of the urban population is considered to be squatting, due to inadequate low-cost houses and serviced plots. Hence demand for sanitation services is likely to be high in these squatter areas due to overcrowding and lack of sanitation services.

Therefore, there is a strong need to improve the health and livelihoods of the residents through access to potable and sustainable water supply and improved sanitation services.

1.6 JUSTIFICATION OF THE PROJECT

1.6.1 Technical Justification

The proposed project is technically justified as the design has considered the current and future water demand for Rumphi Town and the surrounding areas. The selected source of water (Rumphi

River) has an abundant quantity of water, which will satisfy the current and future water demand. The capacities, locations and elevations of the designed water supply facilities are such that all the people of Rumphi Town and the surrounding areas will be provided with adequate potable water throughout the project life i.e., up to year 2040.

Similarly, the design for the sanitation facilities has considered anticipated demand for sanitation services in Rumphi Town and surrounding areas.

1.6.2 Health Justification

Rumphi is one of the most affected districts with cholera in 2022 (Ministry of Health, 2022). This may probably be attributed to unsafe water and poor sanitation services such as poor liquid and solid waste management in the district. The project interventions will promote improved sanitation and hygiene practices such as ending open defecation and promoting hand washing. Furthermore, the sanitation facilities will contribute to reduction in prevalence of waterborne diseases especially in the previously unserved areas resulting in improved health and increased productivity for the residents. Thus, the Government would have a reduced expenditure on health-related costs which could be utilized in other economic activities.

1.6.3 Economic Justification

Currently, people travel long distances and spend hours fetching water and in return the water that they collect is not even potable. Therefore, the project is important because primarily it will ensure that people have access to adequate potable water until 2040. The existing water supply system supplies water to 23% of the population in the proposed project area (i.e., 20,736 people). However, there will be a need for more water to serve the increased population from growth rate and to the unserved areas of the town (estimated at 158,085 people by the year 2040). Water will also be made available for commercial and industrial activities for growth of the economy of the country. Figure 1-6 shows population in Enumeration Areas (EAs) and projected population that will benefit (projected population covered) per each area by the proposed water supply project.



Figure 1-6: Projected population to be served by the proposed water supply project per Enumeration Area

Furthermore, the population which is not connected to the potable water supply system within the proposed project areas spend a lot of time fetching water for domestic purposes due to long distances and queues, especially women and children. Hence more productivity time is wasted in ensuring that the households have water in their homes. An expanded network water distribution would greatly reduce this time and the saved time could be used to engage in economic activities, generating revenue and ensure that girls are not disturbed from attending school due to the need to fetch water for their household.

Implementation of the project will also have positive impacts on local providers of equipment, works and services. The project will create about 320 jobs during the construction phase. Those to be employed will include at 50% youth and at least 40% women as most of the artisans and casual labourers will be sourced locally in Malawi and from areas surrounding the project site. As such, social wellbeing of the communities within the project areas will improve through direct employment by the project contractors and created business opportunities.

1.7 RATIONALE OF THE ESIA STUDY

The ESIA study is aimed at achieving the following two main tasks:

- To identify and predict both negative and positive environmental and social impacts by carrying out Environmental and Social Impact Assessment (ESIA;
- To propose mitigation measures to minimise the negative impacts and enhance the positive impacts by preparing Environmental and Social Management Plans (ESMPs);
- To ensure compliance with Government of Malawi (GoM) and AfDB environment and social safeguards standards by preparing Environmental and Social Monitoring Plans.

1.8 POTENTIAL USERS OF ESIA REPORT

The ESIA report for Rumphi Water Supply and Sanitation Services Improvement Project has been prepared for use by stakeholders to be involved in all phases of the project.

They key users are listed below:

- Northern Region Water Board,
- Contractors and Consultants involved in implementing the works,
- Rumphi and M'mbelwa District Councils,
- District Environmental Subcommittees in Rumphi and Mzimba,
- Department of Water Resources,
- Department Water Supply and Sanitation
- Department of Occupational Safety, Health and Welfare,
- Malawi Environment Protection Authority (MEPA),
- National Water Resources Authority (NWRA),
- Non-Governmental Organizations (NGOs), Civil Society Organisations (CSOs) and Community-Based Organizations,
- Members of the Village Natural Resources Management Committees (VNRMCs), Catchment Management Committees (CMCs) and Water Users Association (WUAs),
- Project beneficiaries,
- Project Financiers.

1.9 METHODOLOGY

The ESIA study was conducted in accordance with the Malawi Environment Impact Assessment (EIA) guidelines (1997). This assessment was aimed identifying the baseline bio-physical and social-economic conditions in the project areas, possible interactions with proposed project activities, and propose their mitigation and enhancement measures. To achieve that, the following step and methods were used.

1.9.1 Kick-Off Meeting

The ESIA process started with a Kick-Off meeting on 16th August 2022, held at Northern Region Waterboard Headquarters, Kawiluwilu House Boardroom - Mzuzu. The meeting aimed at getting a detailed understanding of the project outline and associated activities. Minutes of this meeting are provided in Appendix II.

1.9.2 Desk Studies

This involved reviewing various literatures applicable to project. The literature reviewed included Project Dossier document. Malawi Agenda 2063, Water Works Act (1995), Environmental Management Act (2017), Water Resources Act (2013), AfDB Environmental and Social Safeguards standards, Drinking Water and Effluent Standards among others literature.

1.9.3 Reconnaissance Survey

A reconnaissance survey was done from 17th August to 18th August 2022, covering both Mzimba and Rumphi districts. This was a scoping visit to the project area. The survey was aimed at gaining an understanding of the type of land use, structures, nature and type of impacts likely to be found in the project area. This preliminary visit also helped in establishing boundaries of the study areas, evaluating extra data sets that might be needed and refining the methodologies in the planned assessment where applicable.

During the preliminary survey, project personnel from the NRWB led the field visits and about 15 project sites were visited as shown in Figure1-7. These areas include water abstraction area and treatment infrastructure at Group Village head (GVH) Teleka at Rumphi town; Jaghala tank site near Our Future Private Secondary School at Rumphi Town; proposed service tank at Mwazisi near Bowe Turn off; the furthest water network point at Walilo in Mwazisi; a booster station, satellite office and staff houses site at Mwazisi near Khankha bridge; Luviri service tank and booster station site near Bembe; Bolero booster station site; proposed landfill site at Thulwe in STA Kazamawe area; current landfill site near Rukuru Private School at Rumphi Town; a proposed wastewater treatment site at Rumphi Town; proposed satellite offices site at Enukweni and Bwengu in Mzimba district; Kacheche service tank and booster station sites; Thumbi storage tank site; commuter sanitation facility site at Phwezi and a furthest water network point in Chisokolo, Mhuju area. To get an understanding of various issues, the consultant held on-site discussions with engineers from NRWB (Figures 1-8 a, b, c and d).



Figure 1-7: Proposed water supply and sanitation project sites visited during reconnaissance survey



Figure 1-8: (a) NRWB & ENVIROCONSULT visiting proposed Enukweni office site (b) teams enroute to the water intake at Rumphi town (c) Experts discussing land acquisition issues at one of the project areas in Mwazisi (d) current landfill at Rumphi town

1.9.4 Field Surveys

Field data collection was done in all proposed water supply and sanitation infrastructure sites and indirect impact areas from its ancillary structures. Information on biophysical, socio-economic and environmental aspects was collected through engaging communities and local government authorities using various scientific methodologies as well as tools for assessing socio-economic impacts of the proposed water supply and sanitation project. The impact was analysed and weighed using three 3-step procedure which involved:

- Step 1: Description of base line situation
- Step 2: Assessment of magnitude of impacts according to duration, extent, and severity
- Step 3: Combination magnitude with environmental and social value

The Leopold Matrix was developed to assess interaction between project activities and environmental and social receptor.

1.9.5 Public Consultation

Public consultation with various stakeholder were done to get their input on issues relevant to the implementation project. The consultations aimed at highlighting project activities and soliciting their reactions and concerns about the project. The project stakeholders were identified according to the level at which they are operating, their interest in the project, their influence in the project and how they can affected/impacted by project component. The details of the project consultation are outlined in Chapter 6.

1.10 STRUCTURE OF THE REPORT

The report has been organized into the following chapters:

Chapter 1: Introduction - The chapter provides project background, describes existing water infrastructure, the proposed water supply and sanitation improvements and project extents, rationale of the project, justification of the project and methodology for the ESIA study.

Chapter 2: Project Description - The chapter describes the main project activities by phase, equipment and materials to be used during construction and the environmental considerations.

Chapter 3: Alternative Analysis - The chapter reviews project alternatives based on technical aspects, pipeline routes and construction materials to be used.

Chapter 4: Environmental and Social Setting - The chapter describes the existing environmental and social conditions including physical, sanitation, biological and socioeconomic aspects.

Chapter 5: Policy and Legal Framework – The chapter describes the Malawi development vision and policy and legal framework. The chapter also outlines the AfDB's environmental and social safeguards as well international conventions and agreements. The chapter also discusses the relevant permits and licenses required for the project proponent.

Chapter 6: Public Consultation – The chapter introduces the process of public consultations, the objectives of the consultation and the consultation methods. The chapter also analyses the project stakeholders.

Chapter 7: Assessments of Environmental and Social Impacts - The Chapter describes the approach and methodology for impact identification. It also outlines project interactions with receptors based on the proposed project activities. Further, it discusses overall impact assessment and determination of mitigation measures.

Chapter 8: Environmental and Social Management and Monitoring Plans – The chapter provides tabulated plans for managing and monitoring the identified impacts. It also provides a summary of costs for managing and monitoring the identified impacts due to the proposed project.

Chapter 9: Conclusion and Recommendations – The chapter provides the summary of the findings of the study as well as proposed mitigation and enhancement measures. The Chapter also outlines the recommendations to be considered during project implementation.

Chapter 10: Budget – The chapter presents the estimate cost for implementation of the mitigating, enhancing and monitoring measures.

2 PROJECT DESCRIPTION

2.1 **Project Overview**

The Rumphi Water Supply and Sanitation Services Improvement Project has been designed to provide adequate potable water and improved sanitation to 158,085 people in Rumphi Town and surrounding areas in the year 2040. The project will involve the rehabilitating, upgrading and expanding of the existing Rumphi town water supply systems. In addition, the project will improve sanitation services by constructing new sanitation facilities such public latrines, commuter facilities, liquid and solid waste management facilities. The Consultant assessed the impacts of all project activities outlined in the detailed design report and in the terms of reference (Appendix I). The following are the detailed phases and components of the proposed water supply and sanitation project:

2.2 Project Phases

2.2.1 Planning and Design Phase

The Project is currently in the project planning and design phase and the following activities have been undertaken:

Feasibility studies: NRWB carried out the study to determine the viability of the proposed project. The study involved preparation of conceptual designs; cost estimates; affordability and willingness of potential customers to pay; financial and economic analyses; Implementation strategy and schedule of the proposed water supply system and sanitation facilities.

Preliminary designs: NRWB prepared preliminary designs and updated the cost estimates; affordability and willingness of potential customers to pay; financial and economic analyses; Implementation strategy and schedule of the proposed water supply system and sanitation facilities prepared during the feasibility study.

Site Identification and Land acquisition: NRWB has the completed the identification and acquired land based on the preliminary designs.

The ESIA and RAP studies being undertaken under this assignment are part of the planning phase. The studies include the following activities: conducting baseline and socioeconomic surveys, desk studies, map preparations and public consultations.

NRWB will engage another Consultant to review and update the preliminary designs, prepare tender documents and supervise the construction works.

2.2.2 Construction Phase

This phase will commence after the detailed designs are completed and a contractor is procured to implement the works. The main activities during this phase will include:

- Clearance of vegetation
- Establishment of camp sites
- Creation of access roads
- Excavation and backfilling of trenches
- Laying of pipes (water supply and sewer systems)
- Earthworks
- Concrete works
- Laying of cables
- Installation of solar panels
- Construction of transformer stations

The facilities under the project have been designed to serve the population in the year 2040. The main components to be implemented under the project are detailed below and the locations are shown in the map in figure 1-7. A total of 320 people will be employed out of which 50% of workers will be youths and at least 40% of either gender.

2.2.2.1 Construction of an Intake Weir

A reinforced concrete weir will be constructed across the existing location of the South Rumphi River with a width and height of 25m and 1.5m respectively with provision of silt scouring drainpipes for cleaning the reservoir as well as riprap and protection works. Water will flow from this channel by gravity to the treatment plant through a 1,600 m long and 500mm diameter DI pipe to transmit water at 634 m³/hr (year 2040 maximum demand).

2.2.2.2 Upgrading and expansion of the water treatment plant

The capacity existing treatment plant at Mayembe Hills in Rumphi will be upgraded from the current $1,500 \text{ m}^3/\text{day}$ to $19,415 \text{ m}^3/\text{day}$ by:

- Installation of 2 No. units of pre-sedimentation tanks,
- Rapid mixing basin 1 No,
- Installation of 8 No. units of sedimentation tanks,
- 4 No. rapid gravity filters,

- Clear water tank 2,500 m³,
- Installation of coagulant and disinfection dosing systems,
- Constructing backwash tank 100 m³,
- Installation of backwash pumps and blowers.

2.2.2.3 Construction of pumping stations and installation of pump sets

The water supply system will be upgraded/constructed by:

- Constructing a pump house at the treatment plant at Mayembe Hills and installing two clear water pumps (one duty and one standby) to convey water to Jaghala Tank each with discharge capacity of 320 m³/hour,
- Constructing pump house at Bolero and installing two clear water pumps (one duty and one standby) to supply water to Bolero Booster Tank each with discharge capacity of 126 m³/hour,
- Constructing pump house at Bolero and installing two pumps (one duty and one standby) to convey 72 m³/hour of water from Bolero Booster station to the service tanks at Luviri,
- Constructing pump house at Luviri and installing two pumps (one duty and one standby) to convey 62 m³/hour of water from Luviri Booster station to the service tank at Mwazisi,
- Constructing pump house at Kacheche and installing two pumps (one duty and one standby) to convey 97 m³/hour of water from Treatment Plant tank to the service tank at Kacheche,
- Constructing pump house at Thumbi and installing two pumps (one duty and one standby) to convey 160 m³/hour of water from Treatment Plant tank to the service tank at Thumbi.

2.2.2.4 Upgrading of Transmission System Covering Pumps, Pipelines and Installation of Solar Power

Transmission system will be upgraded and extended by:

- Laying a 2,439 m long and 300 mm diameter DI pipeline from treatment plant to Jaghala Tank,
- Laying a 6,394 m long and 250 mm diameter DI pipeline from Jaghala Tank to Bolero Tank,
- Laying a 1,773 m long and 150 mm DI pipeline from Luviri Booster Station to Luviri Tank,
- Laying a 3,103 m and 150mm diameter DI pipeline from Mwazisi Booster Station to Mwazisi Tank,
- Laying a 268 m long and 150 mm diameter uPVC and DI pipeline from Kacheche Booster Station to Kacheche Tank,
- Laying a 1,200m long and 110mm diameter uPVC and DI pipeline from Thumbi Booster Station to Thumbi Tank.

2.2.2.5 Design and Installation of Solar Power

The main power source shall be solar power at all locations such as at the treatment plant, booster stations and tank sites. Works under solar power supply shall include supply, install and commission solar power of 775 kW complete with panels, invertors, grid connected battery storage and associated electrical fittings control rooms. ESCOM power will be installed as backup power from the existing power lines.

2.2.2.6 Construction of Storage Tanks

The water storage capacity will be increased by:

- Constructing a service reservoir at Rumphi Treatment Plant with storage capacity of 2,500 m³ to supply water to Rumphi Low Lying Town Areas, Vongo, Lumemo, Njakwa, Bwengu, Kacheche areas,
- Constructing a service reservoir at Jaghala with storage capacity of 2,500 m³ to supply water to Rumphi Upper Lying Town Areas, Chikwawa, Bolero areas,
- Constructing additional service reservoir at Bolero with storage capacity of 750 m³ to supply water to high-lying areas of Rumphi Town, Pundu, Mkondezi, Chombe and Sanga areas,
- Constructing a service reservoir at Luviri with storage capacity of 100 m³ to supply water to Luviri and Chirambo areas,
- Constructing a service reservoir at Mwazisi with storage capacity of 750 m³ to supply water to Mwazisi, Lusani, Bembe, Kamphenda, Chanyoli through Luhono areas,
- Constructing a service reservoir at Kacheche with storage capacity of 750 m³ to supply water to Kacheche and Enukweni areas,
- Constructing a service reservoir at Thumbi with storage capacity of 750 m³ to supply water to Luzi, Chinyolo, Mkombezi, Phwezi and Bula.

2.2.2.7 Upgrading and Expansion of the Distribution Pipe Network

A total of 323 km pipelines will be installed to supply water to seven (7) pressure zones. The extent of the new distribution system will be to Bwengu to the east; Thumbi, Luzi, Chinyolo, Mkombezi, Phwezi and Bula to the Northeast; Chikwawa, Bolero, Luviri, Mwazisi, Lusani, Bembe, Kamphenda, Chanyoli through Luhono, Nkhamanga to the west; Vongo including Lumemo to the South; and Kacheche and Enukweni to the Southeast of Rumphi Town. The pipelines will range from 63mm to 400mm in diameter of uPVC and DI materials. 200 communal water points will be constructed.

2.2.2.8 Solid Waste Management Facilities

A sanitary landfill constructed at Thulwe will be constructed to allow wastes collected in Rumphi Town and surrounding areas to decompose in a setting isolated from the environment. The proposed landfill is at a distance of 720 m from the nearest residential area. In addition, the Landfill is 3.8 km and 5.9 km away from Lunyina and South Rukuru rivers. The proposed site is 28 km away from the nearest airstrip at Katumbi in Hewe.

The sanitary landfill has been designed for the year 2040 population and will have a capacity of 52,798 m³. In addition, a solid waste collection and disposing vehicle will be procured and handed over to Rumphi District Council.

The solid waste management component shall have the following facilities:

- Landfill trenches or cells (No1.)
- Off-loading area/ Secondary sorting (No.1)
- Incinerator- Paper/ Plastic (No.1)
- Leachate Lagoon/ Sludge beds (No.1)
- Groundwater monitoring system
- Gas monitoring system
- Temporary waste holding sheds in market centres
- Construction of solid waste receptor bins in public places

2.2.2.9 Wastewater Management Facilities

A wastewater collection vehicle will be procured to collect faecal sludge from on-site sanitation facilities. The faecal sludge collected will be treated at a wastewater treatment facility at Rumphi Boma with a capacity of 148 m^3 /day. A sewerage system will also be constructed to collect wastewater from some of the major institutions at Rumphi Town for treatment at the facility.

The wastewater management component shall have the following facilities:

- Sludge Reception Chamber (No.1)
- Unplanted Drying Bed (No.3)
- Facultative pond lagoon (No.1)
- Maturation Ponds (No.1)
- Bio-Solid Shelter (No1)

2.2.2.10 Commuter Toilet Drop Facility

A commuter toilet drop facility will be constructed to address the challenge of open defecation and improve access to decent and safe sanitation services for commuters. The facility will be constructed at Mzokoto in Rumphi. The facilities will have the following features:

- Female toilets (5 No.)
- Male toilets (5 No.)
- Male Urinals (5 No.)
- Handwashing basins (10 No.)
- Sanitary Bins (7 No.)

2.2.2.11 Construction of VIP Toilets

VIP toilets will be constructed to address the challenge of inadequate sanitation facilities in schools, health centres, market centres and other public institutions. The project shall construct 15 No. VIP toilets.

2.2.2.12 Auxiliary buildings

Auxiliary buildings will be constructed to facilitate smooth operation of some of the proposed facilities. The buildings will include offices, stores buildings, operator buildings, guard houses and a water quality laboratory.

2.2.2.13 Water Resources Monitoring

Two new water monitoring stations will be installed on the South Rumphi River, upstream and downstream of the proposed intake weir.

Other activities that will be undertaken include:

- Recruitment and training of gauge readers:
- Development of rating curves for the gauge stations

2.2.2.14 Catchment Management and Climate Adaptation

The Project will carry out a number of watershed management activities to mitigate human activities which have the potential to deplete and degrade water resources within the river basin. The activities to be carried out are as follows:

• Promotion of landscape restoration activities: This intervention is intended to promote good land husbandry practices such as contour and box ridges, check dams and planting of

vetiver along the riverine (buffer zones) and planting of indigenous tree species within the river catchment areas

• Improve community resilience through livelihoods' enhancement: This intervention will support communities with income generating activities such as exotic and fruit tree planting. Communities will also be provided with beehives for honey production. The climate change adaptation interventions will special focus on women, the youth and other vulnerable groups.

2.2.3 Operation and Maintenance Phase

After the construction works, the Contractor will demobilise from site. This will involve the removal of all temporary structures such as site hoarding, camp sites, work signage, material stockpiles, clearing of construction sites and restoration of sites.

The water supply and wastewater treatment facilities will be operated by NRWB whilst the sanitary landfill will be operated by Rumphi District Council. The operational activities will include:

- Water abstraction and treatment,
- Transmission, storage and distribution of water to customers,
- Collection and treatment of wastewater,
- Collection and treatment of solid waste,
- Maintenance of equipment and infrastructure.

It is expected that there will be up to 34 permanent skilled staff will be employed, out of which 50% of workers will be youths and either gender shall be at least 40%, to operate the facilities. In addition, there will be up to 12 unskilled temporary staff for general groundskeeping and cleaning.

2.2.4 Decommissioning phase

The proposed project is expected to be operated for at least 18 years i.e., to the year 2040. Once the facilities reach the end of their life, some equipment and infrastructure maybe upgraded, rehabilitated or replaced. Wherever possible, the equipment that has been replaced will be recycled otherwise the equipment will disposed of in accordance with local regulations and international best practices.

The sanitary landfill will have to be decommissioned when it reaches the design capacity. The landfill will be decommissioned in line with local regulations and international best practices to ensure that there is no potential contamination to air, groundwater, surface water and soil.

The activities to be carried out will include:

• Installation of geotextile layer, sealing layer and drainage layer.

- Installation of gas collection system
- Aftercare and monitoring of leachate, gas and groundwater.

2.3 Construction Equipment

The project will require the use of different types of equipment during the construction phase. The table below lists some of the major equipment that will be required:

- Graders
- Compaction machines
- Dozers, loaders and excavators
- Tipper trucks
- Concrete mixers
- Cranes
- Water bowsers
- Welding and power generators
- Compressors
- Vibratory pokers

2.4 Construction Materials

The project will require the use of different types of materials during the construction phase. The major materials that will be required are summarised in Table 2 below:

No.	Туре	Use	Unit	Quantity
1	Soil	Earthworks, access roads	m ³	65,145
2	Rocks	Foundations	m ³	126
3	Coarse and fine aggregate	Mortar, Concrete, Pipe bedding, sand, blinding	m ³	57,112
4	Cement	Mortar, Concrete	m ³	5,134
5	Steel	Concrete	Kgs	608,073
6	Pipes and fittings (uPVC, DI, GI etc.)	Pipe laying	km	440
7	Timber	Roof elements	m	230
8	Paints	Building finishes	L	890
9	Water	Solvent for various works, dust suppression, consumption on site	m ³	26,724

Table 2: Material to be used during construction

2.5 Construction Wastes

The project will generate different types of waste during the construction phase. All the wastes generated will be managed according to the subsidiary Waste Management Plan developed for the project. The table below lists some of the major wastes that will be generated:

No.	Туре	Unit	Quantity
1.	Leftover Concrete	m ³	6,284
2.	Excess Soil	m ³	215,600
3.	Steel chips	Kgs	572
4.	Damaged blocks	No.	500
5.	Vegetation	m ³	34,274
6.	Pieces of Pipes and fittings (uPVC, DI, GI etc.)	km	0.44
7.	Timber	m	45
8.	Food waste	Kg/day	8
9.	Water	m ³	26,724

Table 3: Waste generation

2.6 Project Cost

The cost estimate for project is USD 29.8 million or MK 30.9 billion (using the RBM exchange rate of USD 1 = MK 1,036.25 on 26^{th} October 2022) as detailed below:

No.	Description	Cost (USD)	Cost (MK)
1	Water Supply Infrastructure Development	22,491,964.94	23,307,264,932.14
1.1	Construction of Intake Weir	855,489	886,499,247
1.2	Construction of Treatment Plant	2,356,376	2,441,791,087
1.3	Pipelaying Works	10,992,277	11,390,730,615
1.4	Construction of Storage Reservoirs, booster stations and electromechanical works	3,896,739	4,037,990,413
1.5	Construction of auxiliary buildings (office block, stores, staff houses)	1,825,913	1,892,100,006
1.6	Design Supply and Installation of Solar PV Systems	1,000,000	1,036,248,500
1.7	Supply and delivery of 15mm Water Meters	850,000	880,811,225
1.8	Supply and delivery of materials for new water connections	350,000	362,686,975

Table 4: Cost Estimate

No.	Description	Cost (USD)	Cost (MK)	
1.9	Procurement of seedlings, Landscape restoration activities, improving community resilience through livelihoods' enhancement	218,000	225,902,173	
1.10	Water Resources Monitoring Activities	47,170	48,879,842	
1.11	Studies on Climate Change Adaptation and Mitigation	100,000	103,624,850	
2	Sanitation Improvement	2,844,867.89	2,947,990,080.58	
2.1	Solid Waste management facilities	383,798	397,710,579	
2.2	Wastewater management facilities	846,817	877,513,119	
2.3	Construction of VIP Toilets	787,408	815,950,628	
2.4	Reviewing and Updating of the WASH DSIP	120,000	124,349,820	
2.5	Sanitation and hygiene awareness campaign + production of IEC materials	300,000	310,874,550	
2.6	Procurement of waste management equipment	406,844	421,591,384	
3	Project Management, Quality Assurance and Capacity Building Activities	2,815,354.37	2,917,406,741.77	
Subtotal		28,152,187	29,172,661,755	
Contingency		1,689,131	1,750,359,705	
Tota	1	29,841,318.43	30,923,021,459.77	

3 ALTERNATIVE ANALYSIS

Alternative analysis is an evaluation of different options to achieve a particular objective. This section provides different options which were considered by NRWB during the feasibility, screening and scoping stages of the ESIA. The best alternative (Proposed Project Option) is the one that has minimum negative environmental and social impacts, is cost effective and allows the objective of the project to be met. In this project, a range of alternatives were considered as follows:

3.1 NO PROJECT OPTION

The "no project option" means that NRWB must not implement the proposed project. This was used to compare with the other options available to assess the impacts that would be caused as a result of the project. This option would have the advantage of having no adverse environmental and social impacts associated with development of new infrastructure. However, the disadvantages of "no project option" are as follows:

- No access to potable water and improved sanitation
- Increased cases of waterborne diseases
- Accumulation of unsightly poorly managed solid wastes and associated vectors.

3.2 THE PROJECT OPTION

The current water supply system only supplies water to 23% of the population in the proposed project area (i.e., 20,736 people). However, there will be need for improved infrastructure to serve areas that do not have access to water supply and improved sanitation. The infrastructure will serve the population in Rumphi town and surrounding areas which is estimated to grow to 158,085 people by the year 2040. The advantages of implementing the project are as follows:

- Increased access to potable water and improved sanitation services
- Reduced cases of waterborne diseases
- Improved solid waste management and reduction of associated vectors
- Creation of Jobs
- Improved economic opportunities in the area
- Improved school attendance especially for girls

However, the implementation of the project would have some environmental and social impacts which will require mitigation measures.

3.2.1 Technical Alternatives

Various alternatives such as source of water, pipeline routes, location of facilities and construction materials to be used were analysed as presented below:

3.2.1.1 Sources of Water

Lunyina River: Lunyina River runs throughout the year; however, the River is already supporting large and small-scale irrigation agriculture in the area including mega farms in Nkhozo and Thulwe areas. In addition, the system would require 11,218 m3/day of water to be pumped 17 km from a treatment plant at an elevation of around 1145 masl to Jaghala (Our Future) Tank at an elevation of 1173 masl to serve Rumphi Town, Chikwawa, Njakwa, Bwengu and Kacheche. The system would also require 8,565 m3/day of water to be pumped 6.3 km from a treatment plant at an elevation of around 1145 masl to Bolero Tank at an elevation of 1280 masl to serve Chirambo, Nkhamanga, Luviri and Mwazisi. The system would therefore result in high pumping costs to serve all the targeted areas. Based on these disadvantages it was decided that Lunyina River was not a viable option.

Development of groundwater sources: This option would involve the exploration and development of high yielding groundwater sources to meet the demand of 19,415 m^3 /day in the year 2040. The development of groundwater sources has the following advantages:

• Would not require construction of water abstraction infrastructure on surface water sources which may affect downstream water users.

However, the option has the following disadvantages:

- Most of the boreholes drilled in the area are low yielding hence they would not be able to meet the required demand.
- Groundwater in the area has high salinity which would require costly and complex treatment processes.

Based on the advantage and disadvantages of this option, it was decided that Groundwater is not a viable option.

South Rumphi River: South Rumphi River flows throughout the year and has an estimated available minimum flow with a return period of 20 years of 77,700 m^3 /day (Water Resources Development Plan, NIRAS – 2001). There are currently no other major water users on the river hence available flow would be adequate for the 19,415 m^3 /day demand in 2040 for Rumphi town and surrounding areas.

However, the system would require $8,521 \text{ m}^3/\text{day}$ of water to be pumped from the treatment plant at an elevation of 1118.31 masl to Jaghala (Our Future) Tank at an elevation of 1173 masl to serve

upper lying Rumphi Town areas, Chikwawa and Bolero. The remaining $11,262 \text{ m}^3/\text{ day}$ of water would be gravitated from the treatment plant to low-lying areas at Rumphi Town, Njakwa, Bwengu and Kacheche. The pumping costs for the Rumphi river are therefore lower than Lunyina River.

Based on the analysis above, South Rumphi river is the best source of the water supply project.

3.2.1.2 Alternative Routes of the Pipeline

Spatial analysis and field surveys were carried out to identify alternative alignment of water and sewer pipelines in the project area. Although the proposed pipelines are mostly planned to be placed along public land such as road reserves, the initial pipe route was reviewed and alternative pipe routes were suggested to ensure that the pipe network does not heavily cross private property which might result in involuntary resettlement whilst still supporting gravity aided water and sewage flow as shown in figures 3-1 to 3-5. In some instances, Euclidean distance was considered to align pipelines with locations of booster stations and service reservoir (figure 3-3).



Figure 3-1: Suggested alternative alignment for some proposed distribution pipes in Enukweni



Figure 3-2: suggested alternative layout for distribution pipeline before proposed satellite office at Bwengu



Figure 3-3: alternative pipe alignment at Thumbi booster station



Figure 3-4: suggested alternative pipe layout near a cemetery opposite to Phwezi Women Training Centre

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Figure 3-5: alternative alignment for distribution pipes around Rumphi stadium

3.2.1.3 Alternative Siting for Sewer Network and Wastewater Treatment Facility

Two wastewater management facilities site alternatives were identified namely Site 1 and Site 2. Site 1 is upstream of Site 2 and closer to Rumphi Boma. The proposed sewer networks to the 2 sites are shown in figure 3-8.

The consultant's methodology and technique consisted of multiple works such as site visits to collect environmental data, GIS and Remote Sensing for mapping and modelling. A Multi-Criteria Decision Model (MCDM) and statistical analysis to solve the model was used. Factors that were considered in the selection methodology are: (1) Susceptibility to flooding, (2) Slope, (3) Land use and Land Cover (LULC), (4) Population per Enumeration Area as a proxy to social acceptability and (5) Distance to green lands (Riparian buffer along main rivers).

Restrictions factors that were used in the model are: (1) The wastewater treatment facility cannot be in river course; (2) The minimum distance of possible areas is at least 10 m away from surrounding buildings (Colorado, 2017) and (3) The wastewater treatment facility site should not be within areas of high flood susceptibility (4) The wastewater treatment facility site does not lead

to displacement of people (5) The proposed wastewater treatment facility is accepted by the community where it is located and the general public.

Suitability Criteria

Susceptibility to flooding: this is very significant because if a wastewater treatment facility is located within a flood prone area, water pollution during flooding would result in serious health issues in the area. Therefore, areas of medium to high flood susceptibility were assigned the lowest rank during Analytic Hierarchy Process (AHP).

Slope factor: this determines the cost of levelling the field and land value during project implementation. In this regard, flat areas were ranked high during modelling than steep slope areas.

Green spaces: Rumphi town has few green spaces and these are mostly along main rivers. Therefore, a 250m riparian buffer of main rivers was considered. Distance to the green lands has a significant effect on the cost of reusing the treated wastewater for irrigation (Hama et al., 2019). The closest distance (50 to 100m) was assigned the lowest rank due to susceptibility to flooding and pollution considerations. A distance of 250m was considered most appropriate because if the distance is close, the cost of conveying water to the green areas will be less.

Population: this is essential as liquid treatment units in crowded areas may not be accepted by the people, and it needs additional precautions and expenses. In this regard, areas with low to moderate population were considered to have high rank, as it is not preferred to install wastewater units in crowded areas.

Five raster input layers were processed as shown in figure 3-6 and a Multi-Criteria Decision model (figure 3-7) were used to conduct a pairwise comparison using scale proposed by (Saaty, 1990) shown in Table 5 to come up with suitable areas for the wastewater treatment facility presented in figure 3-8.



Figure 3-6: Raster input layers for the multicriteria wastewater treatment facility suitability analysis



Figure 3-7: analytical model for a pairwise comparison for wastewater treatment facility suitability

Intensity of ImportanceDefinition1Equal Importance2Equal To Moderate Importance3Moderate Importance4Moderate To Strong Importance5Strong Importance6Strong To Very Strong Importance7Very Strong Importance8Very To Extreme Importance		
1Equal Importance2Equal To Moderate Importance3Moderate Importance4Moderate To Strong Importance5Strong Importance6Strong To Very Strong Importance7Very Strong Importance8Very To Extreme Importance	Intensity of Importance	Definition
2Equal To Moderate Importance3Moderate Importance4Moderate To Strong Importance5Strong Importance6Strong To Very Strong Importance7Very Strong Importance8Very To Extreme Importance	1	Equal Importance
3Moderate Importance4Moderate To Strong Importance5Strong Importance6Strong To Very Strong Importance7Very Strong Importance8Very To Extreme Importance	2	Equal To Moderate Importance
4 Moderate To Strong Importance 5 Strong Importance 6 Strong To Very Strong Importance 7 Very Strong Importance 8 Very To Extreme Importance	3	Moderate Importance
5Strong Importance6Strong To Very Strong Importance7Very Strong Importance8Very To Extreme Importance	4	Moderate To Strong Importance
6 Strong To Very Strong Importance 7 Very Strong Importance 8 Very To Extreme Importance	5	Strong Importance
 7 Very Strong Importance 8 Very To Extreme Importance 	6	Strong To Very Strong Importance
8 Very To Extreme Importance	7	Very Strong Importance
	8	Very To Extreme Importance
9 Extreme Importance	9	Extreme Importance

Table 5: Scale for pairwise comparisons (Saaty, 1990)

Out of the two proposed sites (Site1 and Site 2), the most suitable site is site 1. The strength of using Site 1 is that its network passes through the central/commercial area of Rumphi Town which is more planned than the network for Site 2. As such, Site 1 provides an option that would allow for more connection premises as it would be easier to lay sewer networks in the planned area as compared to the unplanned area through which the network for Site 2 passes. Furthermore, Site 1 is located in a flat area hence low costs of levelling during construction; relatively far from flood prone area; at least 10 m away from surrounding settlement/built-up area; and along 200m riparian

buffer thereby lowering the cost of discharging and reusing the treated wastewater. Figure 3-8 shows suitable and unsuitable areas based on the Multi-Criteria-Decision model.



Proposed Sewer Line for Rumphi Town

Figure 3-8: suitable and unsuitable areas based on the criteria used showing the recommended site (site 1) and unsuitable site (site 2)

3.2.2 Wastewater Management Alternatives

A number of options exist for management of wastewater (wastewater and faecal sludge) in the project area. The common options that are suitable for developing countries include ventilated improved pit latrines, waste stabilization ponds, individual septic tanks and communal anaerobic baffled reactor as detailed in table 6 below.

No	Technology	Advantages	Disadvantages
1.	Ventilated improved pit	• Flies and odours are	• Low reduction in BOD
	latrines	significantly reduced	and pathogens with

 Table 6: Comparison of wastewater management options

No	Technology	Advantages	Disadvantages
		 (compared to non-ventilated pits) Can be built and repaired with locally available materials Low (but variable) capital costs depending on materials and pit depth Small land area required 	 possible contamination of groundwater Costs to empty may be significant compared to capital costs Sludge requires secondary treatment and/or appropriate discharge
2.	Waste stabilisation ponds	 Resistant to organic and hydraulic shock loads High reduction of solids, BOD and pathogens High nutrient removal if combined with aquaculture Low operating costs No electrical energy is required No real problems with insects or odours if designed and maintained correctly 	 Requires a large land area High capital costs depending on the price of land Requires expert design and construction Sludge requires proper removal and treatment
3.	Individual septic tanks	 Simple and robust technology No electrical energy is required Low operating costs Long service life Small land area required (can be built underground) 	 Low reduction in pathogens, solids and organics Regular desludging must be ensured Effluent and sludge require further treatment and/or appropriate discharge
4.	Communal Anaerobic Baffled Reactor	 Resistant to organic and hydraulic shock loads No electrical energy is required Low operating costs 	 Requires expert design and construction Low reduction of pathogens and nutrients Effluent and sludge require further

No	Technology	Advantages	Disadvantages
		 Long service life High reduction of BOD Low sludge production: the sludge is stabilized Moderate area requirement (can be built underground) 	treatment and/or appropriate discharge

The project proposes to use waste stabilization ponds based on their resistance to organic and hydraulic shock loads, high reduction of pollutants (solids, organics, nutrients and pathogens), low operating costs, low electrical energy requirements and no real problems with insects or odours if designed and maintained correctly.

3.2.3 Alternative Siting for Solid Waste Disposal Facility (Landfill)

Two landfill site alternatives were considered as follows:

- a) Upgrading existing solid waste dumpsite behind Meru Filling Station on the western side from Rumphi Boma.
- b) Thulwe in STA Kazamawe's area

Both sites are accessible through existing roads and are far away the closest airstrip at Katumbi which is 28 km and 46 km away from sites a and b respectively.

Though site a) is relatively closer to Rumphi Boma, the challenges for the site were the proximity of the site, less than 50 m away, to residential areas and South Rukuru River as shown in figure 3-9.

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Figure 3-9: Site a - Existing Dumpsite

Having the landfill at this site would pose a risk to the surrounding communities as they may be tempted to scavenge and in so doing exposing them to risks such as pricks and cuts from sharps and also inhalation of fumes. In case of poor management of the landfill, the communities would be exposed to odours coming from the site. In addition, leachate emanating from the landfill would also contaminate South Rukuru River which is close by, and this would consequently pose public and environmental health risk.

Site b) was particularly favourable due to the because it is located far from households, nearest household is 720 m away, hence would pose minimal risk to communities as shown in figure 3-10.

In addition, the nearest surface water sources, Lunyina and South Rukuru River, are 3.8 km and 5.8km away from the proposed site respectively. This reduces the risk of contamination of water sources by the leachate coming from the landfill. The distance from the surface water sources also reduces the risk of flooding for the proposed site.



Figure 3-10: Site b – Proposed Landfill at Thulwe

3.2.4 Solid Waste Management Alternatives

A number of options exist for management of solid wastes in the project area. The common options that are suitable for developing countries include rubbish pits with composting, open dumpsites, incineration and sanitary landfills. The advantages and disadvantages of the options are presented in the table 7 below.

No	Technology	Advantages	Disadvantages
1.	Sanitary landfill	• Excellent energy	Partially responsible
		source	for climate change
		• Modern landfills are	• Methane lights up
		eco-friendly	easily
		• Protection of water	• Contaminate soil and
		supply	water through leachate

Table 7: Comparison of solid waste management options
No	Technology	Advantages	Disadvantages
		 Keep cities, towns, and districts clean Keeps hazardous waste segregated Comparatively low cost and simple technology solution when land is available. Support jobs and local business 	 Affect wildlife through ingestion of plastic and other materials A reasonably large area is required.
2.	Open dumpsites	• Comparatively low cost and simple option when land is available.	 This is not a disposal option but a common practice in low-income countries. High environmental health risks.
3.	Composting	 Environmentally friendly Beneficial for crops through nutrients and improved soil structure 	 Intensive management and experience personnel are required. Requires sufficient proportion of biodegradable material in the waste. Not a complete disposal system; if there is no market for compost a further disposal option will still be needed. Large, mechanised schemes have not been successful.
4.	Incineration	Reduces the volume of combustible waste considerably	 Smoke and fire hazards High capital costs, Requires highly skilled operation and control. The waste must have a high calorific value, which is unlikely in low- and middle-income countries.

No	Technology	Advantages	Disadvantages
			• Cost-effective only if landfill sites are not available.

From the comparison of the options, sanitary landfill is a good choice since it is environmentally friendly if properly managed, cheap and does not require high level of skill to operate.

3.2.5 Water Supply and Sewer Pipelines Material

The selection of pipe material takes into account the main aspects of its lifecycle, namely the ease of acquisition, installation and maintenance, performance, interaction with the environment, risk to third party damage and physical and chemical resistance. Table 8 shows the different pipes that can be used for the water and sewer lines.

No	Material	Advantages	Disadvantages
1.	Ductile Cast Iron (DI)	 Extremely strong and durable Requires very little maintenance once installed It is recyclable Rugged and resists damage during handling, shipping and installation. Resistant to corrosion in most soils 	 Heavy Prone to external and internal corrosion over time
2.	Corrugated polyvinyl chloride	 Chemically inert. Light in weight making it easy to transport and to work with. Relatively cheap. Pipes are made of longer lengths which enhances faster installation. Longevity as it is not subject to rust or corrosion Recyclable. Easy to make pipe connections Cheap 	 Susceptible to deformation Sizing options are limited
3.	Corrugated Polypropylene (PPc).	 Long service life, Simple and safe handling and installation, Very high resistance to mechanical impact 	Highly flammable.Susceptible to oxidation.

Table 8: Comparison of sewer pipeline materials

No	Material	Advantages	Disadvantages
4.	Glass fibre	 Stable from UV degradation High resistance to wear Light weight of the pipes enables simple and safe handling and installation, Flexibility of the pipeline Resistant to corrosion 	Susceptible to damage
	reinforced plastic (GRP)	 Light in weight making it easy to transport and to work with. High strength-to-weight ratio Affordable in terms of cost Low maintenance requirements Stable from UV degradation Able to withstand any wear and tear, pressure or damage 	 during transport and/or installation due to the brittle nature Need for specialised equipment to install
5.	HDPE	 Chemically inert. Easy to achieve water tightness Easy installation No need for totally straight trenches as the pipes are flexible. Durability Ability to resist corrosion. 	 Susceptible to stress cracking Has lower stiffness compared to Polypropylene High mould shrinkage and poor UV resistance
6.	Reinforced Concrete	 High resistance to mechanical damage Low material cost Requires less skilled labour for the erection of the structure 	 Requirement for Heavy equipment required for installation. Higher installation costs. Difficult to maintain required slide during construction Needs straight trenches for installation. Trench width must be wider The cost of the forms used for casting reinforced concrete is relatively higher.
7.	Steel	 High strength Durable Easy to maintain Easily recycled 	 Heavy equipment required for installation. Costly to install and repair Heavy

No	Material	Advantages	Disadvantages
			 Difficult to construct with required slope. Requirement for straight trenches.
8.	uPVC	 Usable for a variety of purposes Longevity as it is not subject to rust or corrosion Chemically inert. Light in weight making it easy to transport and to work with. Relatively cheap. Water tightness easy to achieve Easy to make pipe connections and maintenance 	 Susceptible to deformation Susceptible to damage during transport and/or installation. Sizing options are limited Requirement for straight trenches. Requirement for accurate bedding

The project proposes that water supply and wastewater conveyance pipelines should be ductile cast iron (DI) and uPVC. Use of DI is good choice as the materials is extremely strong to withstand high pressures, durable, requires very little maintenance once installed, recyclable, resistant to damage during handling, shipping and installation and resistant to corrosion in most soils and; not prone to theft and damage. uPVC is suitable for a variety of purposes as it is not subject to rust or corrosion, chemically inert, light in weight making it easy to transport and to work with, relatively cheap and easy to make pipe connections and maintenance. Additionally, it is easy to achieve water tightness.

3.2.6 Construction materials

Table 9 shows the different construction materials that can be used in the project. The use of concrete blocks, steel and cement blocks for construction of different structures will be more environmentally friendly than the use of burnt bricks, which contribute to deforestation. The project will also demonstrate to other contractors that cement blocks provide a practical alternative to burnt bricks though they are more expensive. The materials selected in the project are stronger and long lasting. The procurement of large quantities of cement for making the cement blocks and concrete blocks will contribute to increased growth of the local economy.

No	Material	Advantages	Disadvantages
1.	Burnt bricks	 Economical (Raw material is easily available) Very low maintenance cost is required Demolishing of brick structures is very easy, less time consuming and hence economic Reusable and Recyclable Fire resistant Equipment required is only a simple hand mould 	 Lead to deforestation and climate change Quality is not always assured Time consuming construction Since bricks absorb water easily and weaken infrastructural integrity Traditional brick making has 40-50% wastage Construction process takes a long time as the bricks are small, costing more in terms of labour
2.	Cement blocks	 Do not lead to deforestation and climate change More systematic, faster, and stronger than brick masonry because of the vast size of the blocks Cost reduction due to high speed and accuracy of construction. High compressive strength Good resistance to fire Have a very low water absorption. 	 Relatively higher construction cost Over time, they may be subject to water seepage
3.	Stabilized soil blocks	 Do not lead to deforestation and climate change Main raw material is soil with an addition of cement Less prone to theft and vandalism Less prone to theft and vandalism Made with a manually operated block press There is no wastage in production Fast to build with, and unskilled people can learn how to build with the blocks fast 	 High level of skill requirement Lack of availability and high price of cement Requires suitable soils that may not be available

Table 9: Comparison of construction materials

No	Material	Advantages	Disadvantages
4.	Steel	 Reliability Lesser construction time / greater erection speed High strength and light weight 	 Prone to theft and vandalism High maintenance costs and more corrosion
		 Uniformity, durability and performance Of inertia obtained for a reinforced concrete structure are rather indefinite. Recyclable Easy to attain watertightness in structures 	• Higher initial cost / less availability
5.	Concrete	 Do not lead to deforestation and climate change Economical Less prone to theft and vandalism Ability to be cast into shape Excellent water resistance characteristics Ability to consume and recycle waste Low or zero maintenance required 	 Consumes a lot of cement Lack of availability and high price of cement Requires sand and gravel, some rare materials in some states of South Sudan Requires skilled people to build with them

The use of concrete blocks, steel and cement blocks for construction of different structures will be more environmentally friendly than the use of burnt bricks, which contribute to deforestation. The project will also demonstrate to other contractors that cement blocks provide a practical alternative to burnt bricks though they are more expensive. The materials selected in the project are stronger and long lasting. The procurement of large quantities of cement for making the cement blocks and concrete blocks will contribute to increased growth of the local economy.

4 ENVIRONMENTAL AND SOCIAL SETTING

4.1 INTRODUCTION

This chapter presents information on the existing environmental and social conditions in the project area, based on data collected by the ESIA team using field-based primary data collection tools, literature review of secondary data from published reports, journals, public consultations and personal communication for this ESIA report. A field survey of the project area was carried out from 20th September 2022 to 2nd October 2022.

4.2 PHYSICAL CONDITIONS

The following physical information was collected to understand the baseline conditions that are prevailing in the project sites. GIS and remote sensing technology was applied where possible to achieve mapping of the baseline conditions.

4.2.1 Methodology

4.2.1.1 Atmospheric Condition

The project sites atmospheric conditions were assessed to establish baseline condition which will help to monitor how the project activities will impact atmospheric conditions. The parameters tested include Carbon Dioxide (CO₂), Temperature (ambient), Relative Humidity (RH), Particulate matter (PM_{2.5}), Sound/noise Levels (dBA), Electric Field, and Magnetic field. The parameters were measured using a CO₂/Temp./RH DATA Logger, UNI-T A25M Meter, Sound Level Meter and Electromagnetic Radiation tester.

4.2.1.2 Water Resources Condition

The project activities shall interact heavily with both ground and surface water resources. The baseline condition for water resources close to upgraded water treatment facility, proposed landfill and wastewater treatment plant were also tested for various water quality parameters.

4.2.1.3 Geology, Settlement and Drainage

Mapping exercise started by reviewing existing water infrastructure and network system, land use, site maps and high-resolution satellite imagery of the area. All the spatial data obtained from NRWB and other auxiliary data were projected to a uniform coordinate system. A review of the data sets was done to describe project area and confirm visual alignment of all planned water supply distribution network infrastructure against existing infrastructures on the ground in harmony with primary data that was collected with handheld Global Positioning System (GPS).

Estimated population coverage by the proposed project was acquired from the National Statistical Office (NSO). Geological information referenced from existing maps and literature including geological bulletins were used to plan for a detailed field mapping in the project area. In addition, Spatial distribution of soils was mapped using Food and Agricultural Organization (FAO) classification scheme on soil data referenced from Soil, and Terrain database of Malawi (Dijkshoorn et. al, 2016). This was followed by ground truth observations which were conducted to understand the underlying conditions: Soil types, texture, Geological formations and geological structures in the project sites. Remote Sensing data was integrated in a GIS environment to supplement ground truth data collection on geology, soils and land cover.

The topographical variation of the project area was derived from processing a Shuttle Radar Topographic Mission (SRTM) data. Similarly, the drainage network was derived through arc hydro tools by establishing flow direction, flow accumulation and stream network based on elevation values in the SRTM Digital elevation Model. Figure 4-1 outlines a summary of the processes for geological, topographical and drainage characteristics mapping.



Figure 4-1: Workflow for Geological mapping Methodology

In addition, WebGIS was used to map Project Affected Population through uploading readily processed spatial layers such as road reserve buffer, building footprints, proposed pipelines and all other project infrastructure into a Google Server. Surveyors were then shared a link to access the

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uploaded layers through google maps and use geolocator to determine locations of structures that are likely to be affected by the project and confirm pipe layout design. Figure 4-2 shows an example of main road reserve band properties along the outer 5 meters of reserve.



Figure 4-2: Google WebGIS platform that was used for infrastructure mapping

4.2.2 Findings

4.2.2.1 Atmospheric Condition

Temperature

Rumphi District experiences warm temperatures with a mean annual temperature of 24° C. Mean minimum temperatures range from 17° C to 23° C and occur between June and July. Mean maximum temperatures range from 27° C to 33° C and are registered between October and November.

Rainfall

Rainfall in Rumphi District varies according to topography. The district receives both conventional rainfall and relief rainfall. The mean annual rainfall for Rumphi at Katowo Station is 1087 mm. Figure 4-3 shows the total annual rainfall for Rumphi. The district receives above average mean annual rainfall.



Figure 4-3: Total Annual Rainfall for Rumphi at Katowo

Climate Change Scenarios

Figure 4-4 shows the precipitation change percentages that pertain to three possible climate change scenarios in Rumphi. The dry scenario assumes a -4% reduction in precipitation. The medium scenario assumes a 2% increase in precipitation. The wet scenario assumes a 5% increase in precipitation. Looking at the water resources availability, there will be a low climate risk for the source.



Figure 4-4: Predicted precipitation change due to climate change scenarios

Figure 4-5 shows the temperature change percentages that pertain to three possible climate change scenarios in Rumphi. The low scenario assumes a 1°C in temperature. The medium scenario assumes a 2°C increase in temperature. The worst-case scenario assumes a 2.2% increase in temperature. The high temperatures could result in heat waves and increased evaporation from the run-on-river water source.



Figure 4-5: Predicted temperature change to climate change scenarios

Air Quality

Carbon Dioxide:

The minimum and maximum carbon dioxide (CO_2) levels recorded were 366 ppm and 397 ppm at Mwazisi Booster Site (S2) and Liquid Treatment Waste (S9) site respectively. The variation of CO_2 at the different sites is shown in figure 4-6.

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Figure 4-6: Variation of C02 in the Project Area

According to the CO_2 meter manufacturer, the carbon dioxide grade guide for non-coerciveness reference is given in Table 10. With reference to this guide, all the studied sites fell in category B – depicting good living environment.

Category	CO ₂ ranges (levels) (ppm)	Description
Α	250 - 350	Ordinary level of outdoor air
В	350 - 1,000	Typical data of good living environment
С	1,000 – 2,000	The level of shortage of oxygen
D	2,000 – 5,000	The level of bad and hot air (can cause headaches, sleepiness, less concentration, heartbeat faster and mild nausea
Ε	> 5,000	Extremely bad and hot air. (can lead to permanent brain damage, coma and even death

Table 10: Carbon dioxide grade gui	le for non-coer	civeness ref	erence
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Particulate Matter:

The minimum and maximum particulate matter levels recorded were $20 \ \mu g/m^3$ and $55 \ \mu g/m^3$ at Mwazisi Booster Site and Phwezi Office site respectively. The variation of PM at the different sites is shown in figure 4-7.



Figure 4-7: Variation of Particulate Matter levels in the Project Area

The air quality categories for PM include good ($< 25 \ \mu g/m^3$), fair ($25 - 50 \ \mu g/m^3$), poor ($50 - 100 \ \mu g/m^3$), very poor ($100 - 300 \ \mu g/m^3$) and extremely poor ($> 300 \ \mu g/m^3$) as shown in table 11. According to this classification, Phwezi Office site scored "poor", while two sites (Mwazisi Office and Mwazisi Booster) scored "good", and the rest were in the category of "fair air quality"

Air quality category	PM2.5 µg/m ³ averaged over 1 hour	PM2.5 µg/m ³ averaged over 24 hours
Occul	Loss these OF	Less then 40.5
Good	Less than 25	Less than 12.5
Fair	25–50	12.5–25
Poor	50–100	25–50
Very poor	100–300	50–150
Extremely poor	More than 300	More than 150

Table 11: Ranges of PM and its associated air quality category

Noise:

The minimum and maximum ambient sound and noise levels were recorded at Proposed Thulwe Landfill (53.3 dBA) and Rumphi Water Treatment Plant (92 dBA), respectively as shown in figure 4-8. All the sites were within the recommended limits of sound and noise in both natural and working environments.



Figure 4-8: Variation of noise/sound levels in the Project Area

4.2.2.2 Water Resources Condition

Rumphi District has abundant perennial fresh surface water sources majority from Livingstonia mountain in the Northern part of the district. The project area has three major rivers namely, South Rumphi, Lunyina and South Rukuru. South Rumphi and Lunyina rivers flow in the southward direction from the Livingstonia mountain whilst South Rukuru flows from Mzimba and flows through Rumphi District in a general north eastern direction to Lake Malawi. The South Rumphi river is the source of water for the Rumphi Water Supply System. South Rukuru is the proposed wastewater treatment plant effluent recipient river, while the proposed landfill is 5.8km from the river. Considering the aforementioned factors, samples from the three water resources baseline data was tested for physical parameters as in table 12 below:

		WATER QUALITY PARAMETERS					
	No. of Samples	pH	EC ms/cm	TDS (mg/L	Turbidity NTU	DO (mg/L	Temp °C
South Rukuru	4	7.99 (7.14-8.75)	114.25 (90-160)	76 (54-95)	38.7 (22.4-78.6)	6.54 (5.56-8.19)	24.05 (20.4-24.4)
Lunyina River	2	7.075 (7.07-7.08)	80.5 (52-109)	51 (31-71)	37.8 (19.7-55.9)	6.25 (6.1-6.4)	22.95 (25.2- 22.95)
South Rumphi River	4	6.91 (6.66-7.15)	31.95 (27.6-34.6)	20.67 (17.6-22.5)	7.22 (4.49-7.15)	6.75-7.98	19.45 (17.8-24.3)
MS 539:2013 (Industrial Effluent Standard)		6.5-9.0			Max 25		Max 40°C

Table 12: Water Quality Data

The baseline data in the table above, shows that all three water resources have healthy water complying to 6.5-8.5mg/L requirement for Dissolve Oxygen (DO). The water temperatures for all three rivers were also normal and below room temperature implying no discharge of boiler or hot water in the rivers. The water pH was slightly above natural water pH signifying no discharge of chemical basic and alkaline substance in the water. Finally, the suspended particulate matter was also found to be very normal for surface water. The findings above imply the three rivers are not chemically and organically contaminated or polluted by direct anthropogenic discharges.

4.2.2.3 Geology and Drainage

Lithological Units Distribution

Geological setting of the project areas was mapped and the project area is mainly underlain by crystalline igneous and metamorphic rocks (Figure 4-9). For instance, Sillimanite-cordierite gneiss (Figure 4-10a) is the dominating bedrock around the water abstraction area while granitic gneiss dominates the Jaghala (Our Future) service tank proposed site. In addition, other common lithologies across the study area are granitic plutons, biotite gneiss and quaternary sediments including dambo soils as shown in a geological map.



Figure 4-9: Geologic units and structures in the project area



Figure 4-10: (a) Sillimanite -Cordierite gneiss near water intake in Rumphi (b) Biotite Gneiss basement around Enukweni (c) quartz veins with associated large muscovite mica crystals

cutting through basement Biotite gneiss in Thumbi (d) Basement Biotite gneiss at Thumbi tank site

Soils

In most areas, the proposed pipeline corridor passes through areas dominated by superficial deposits. Different types of soils were observed across the project areas which are characterized by the parent materials. Figure 4-11 shows different soil types in the area following a FAO classification system and Figures 4-12 a, b, c and d show detailed textural and composition variation from some sampled soils across the area. Detailed mapping of such soils will help specify proper management of excavated soils. The consultant has recommended viable mechanisms based on guiding measures on how excavated soils can be managed properly. In addition, cutting roads during laying pipes has severe implications on drainage channels and road conditions apart from other built infrastructure within the project areas. An alternative analysis was done to recommend how water pipes can be laid in cases where existing tarred roads are to be damaged or cut.



Figure 4-11: Major soil groups in the project area



Figure 4-12: (a) sandy loam soils with magnetite composition (b) sandy soil with a mixed texture and large mineral grains from immediate parent rock (c) soil horizons around Jombo area (d) sandy loam soils found around Bwengu area

Land Use Mapping

Rumphi is mostly dominated by forest cover with a large proportion of the land covered by the Vwaza Game Reserve and Nyika National Park while most valleys support various agricultural activities. Built-up areas are concentrated in commercial areas at Enukweni, Rumphi town, Bwengu, Phwezi and Bolero as shown in Figure 4-13.



Figure 4-13: Main land cover types in the project area

Topographical modelling

General drainage characteristics of the project areas were observed and detailed topographic mapping was done using Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM). A Height Above Nearest Drainage (HAND) model was used to recommend infrastructure protection measures against possible flooding events and any annual extreme events. Furthermore, various climatic parameters including precipitation and temperature over time will be reviewed to inform design considerations for water supply infrastructure. Topographic analysis was conducted to inform alternative pipe layout analysis during project implementation. Figure 4-14 shows topographic variation while figure 4-15 shows the main drainage system in the area.

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Figure 4-14: Topographic variation in project area



Figure 4-15: Rivers and tributaries that drainage of the project area

A Height Above Nearest Drainage (HAND) terrain descriptor (Rennó et al., 2008) was processed from SRTM DEM to define areas above the drainage network using a global threshold (Martinis et al., 2017) of > = 15m. A flood susceptibility classification based on Vasconcelos et al., 2017 was used to produce flood hazard map (figure 4-16) based on HAND model to show areas that are likely to be flooded and damaged after extreme inter-annual events. Although most of the pipeline corridors are not prone to areas that are likely to be affected by floods, some areas such as Bwengu, part of Rumphi town (South Rukuru River banks) and Mwazisi (after the trading centre) are very likely to be affected (figure 4-17). Therefore, necessary measures should be considered during water pipeline and other water infrastructure placement around these flood prone areas to reduce damage.



Figure 4-16: Flood likelihood within the project area



Figure 4-17: Specific areas that are more prone to flooding within the project area

4.3 BASELINE SOCIO-ECONOMIC CONDITIONS

4.3.1 Household Characteristics

The average household size of the sampled households is 5.1, with a maximum of 12 and a minimum of 1 household members. In terms of age, the average age is 25, with a range of 0.33 to 92 years. There was no child-headed household recorded. The number of female-headed households recorded was 30, representing 10.5% of the sampled households. Figure 4-18 depicts the age structure of the sampled households.



Figure 4-18: Age Structure (Years) of the sampled households in the Rumphi Water Supply and Sanitation Services Improvement Project area

The sampled households demonstrate that the longest length of stay (in years) in the village of residence is at 90 years in Rumphi and 84 years in Mzimba, with a mean of 26 and 27 respectively. This points to the youthfulness of the community as already shown through the average age above.

Table 13: Length of Stay in Area (Years) for the sampled households in the Rumphi Wat	er
Supply and Sanitation Services Improvement Project area	

District	Minimum	Maximum	Mean
Mzimba	0	84	27
Rumphi	0.33	90	26

4.3.2 Household Ethnicity and Language

The survey results show that 98% of the respondents are Malawian whereas 2% are Tanzanian (Figure 4-19). This is not surprising because Tanzania is to the North of Rumphi and Mzimba and there are some cross-border movements that occur, which may lead to some settling in Malawi.



Figure 4-19: Nationalities in the in the Rumphi Water Supply and Sanitation Services Improvement Project area

Ethnically, 95% of the respondents are Tumbuka, with 3% Chewa and 1% Ngoni and Ngonde respectively.



Figure 4-20: Ethnic groups in the Rumphi Water Supply and Sanitation Services Improvement Project area

In terms of language, the study results show that 97% of the respondents speak Tumbuka language whereas 2.5% speak Chichewa and 0.5% speak Ngonde. In our interactions with the community, we used both Tumbuka and Chewa which the community was able to understand but in responding, their main language was Tumbuka.



Figure 4-21: Common languages in the Rumphi Water Supply and Sanitation Services Improvement Project area

Although there are more than 4 major religions in the country (Christian, Islam, Hinduism and traditional), the study results showed that the respondents belonged to two religions Christianity (99.3%) and Islam (0.7%).



Figure 4-22: Religions in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.3 Gender and Societal Roles

The project area is largely comprised of people of Tumbuka ethnicity, whose culture is mainly patrilocal and patrilineal in the sense that women move to live in the husband's home area and inheritance is passed through the father's lineage. In this culture, although farming is done by both men and women, most domestic or household chores are mainly done by women, particularly drawing water, cooking and fetching firewood. In discussions with the community members, it was mostly the women who complained in detail about the challenges that they face in ensuring that they have water at the homestead. They complained about having to wake up very early in the wee hours of the morning to walk long distances to collect water. This project therefore will be very beneficial to women in terms of saving them the time that they spend walking to fetch water and sometimes just waiting at the water source for the water to be available.

4.3.3.1 Gender Based Violence (GBV), Sexual Exploitation, Abuse and Harassment (SEAH)

The project area is also not spared from Gender Based Violence (GBV), Sexual Exploitation, Abuse and Harassment. According to Rumphi Police Station, whose jurisdiction covers Rumphi and Mzimba North in T/A Jaravikuba and Mtwalo areas, three forms of Sexual Exploitation, Abuses and Harassment (SEAH) are recorded. The following are types of SEAH cases reported in project area:

Sexual Abuse: The sexual abuse cases comprise of defilement, rape and indecent assaults. The defilement case also constitutes child abuse.



Figure 4-23: Sexual Exploitation, Abuse and Harassment (SEAH) cases reported in Rumphi 2021 and 2022

Although the cases seem to be low numerically compared to estimated 235,000 policing population according Rumphi Police station, there is possibility that some cases go unreported (Dark Case) because of following reasons among others:

- i. Culture.
- ii. Shyness
- iii. Fear of losing support
- iv. Fear of community reprisal
- v. Public Shame

SEAH At Work Place: The sexual exploitation and abuse cases at work places in the Rumphi District and Mzimba North are very rare. According to police, only one case was reported involving an intern who was allegedly raped by a driver. It also believed that the cases could be considerable on the ground but become dark cases as some victims are afraid of the community negative perception about them, fear of losing position and job or benefits among others.

Assault Cases: The project area also records assault cases that include Gender Based Violence (GBV) depending on circumstance in which the assault has been committed. For example, the grievous bodily harm can result from wife battering. The most common assaults in the area are of unlawful harm seconded by Occasional Actual Bodily Harm (OAB). Figure 4-24 below presents assault cases recorded in the project area.



Figure 4-24: Graph of Assaults cases that form part of Gender Based Violence Depending on occurrence circumstance

Marital and Societal Problem: The project area also experiences different gender and marital problems. According to police data, the police station recorded following category of marital and societal cases in first seven months of 2022.

No	Category	Case
1	Defilement	39
2	Failing to Provide	0
3	Physical Violence	24
4	Indecent Assault	2
5	Extra Marital status case	0
	Total	65

Table 14: gender and marital problems

Common cause of GBV: The Gender based violence cases are caused by various reasons. According to information obtained from police station, the common cause of reported GBV are:

- i. Lack of care for the family and failure to provide for the children,
- ii. Excessive alcohol drinking,
- iii. Extra marital affairs,
- iv. Culture beliefs,
- v. Disagreements after selling agro-produce for example tobacco and groundnuts, and
- vi. Lobola payment which makes men ill-treat the wife especially in rural areas.

Mitigation Mechanism

The project shall employ several mechanisms to mitigate Sexual Exploitation, Abuse and Harassment as well as Gender Based Violence. The project has developed Sexual Exploitation, Abuse and Harassment Management Plan to ensure no sexual abuse cases occur at workplaces. The project shall also collaborate with Police Victim Support Units, Community Police Units, CSOs, NGOs and District Gender and Social Welfare Office to sensitize communities on SEAH and GBV.

4.3.4 Community Authority Structures

The structures of authority at the community level follow the decentralization policy stipulations which were mainly designed to facilitate development. As such, there is the traditional arm and the administration arm. The traditional arm starts with the Paramount/Themba la Mathemba, who is Chikulamayembe for the Tumbuka and Inkosi ya Makosi M'mbelwa for the Ngoni of Mzimba. From the Themba la Mathemba, there are Traditional Authorities (TAs). In Rumphi, the area in which the project will be implemented also falls under the Themba la Mathemba in his capacity as a TA. In Mzimba, from the Inkosi ya Makosi, we have the Inkosis and in this project, the relevant ones are Inkosi Mtwalo and Inkosi Jaravikuba. A courtesy call was paid to both of these Inkosis (see above under Public Consultation Section) to inform them about the project. They are aware of the project and they pledged to support its implementation. From the Traditional Authorities and Inkosis, there are Group Village Headmen (GVH) who are responsible for a group of villages. Under them, are the Village Headmen.

Administratively, at Traditional Authority level, there is an Area Development Committee (ADC) which is responsible for all development activities in the area. The ADC is made up of Chairpersons of Village Development Committees (VDCs) which are located at GVH level. All the ADCs in the project area were consulted during public consultations, thereby ensuring that all VDCs are aware of the project and information is shared to all.

4.3.5 Education and Literacy Levels

The survey results showed that 187 of the household members reported that they were still in primary school. Of the adults, 115 reported that they did not finish primary school whereas 44 reported that they did not finish secondary school. Only 10 of the individuals were reported to have attained higher education level (Figure 4-23). In terms of literacy, 106 individuals were reported not able to read. This included children under the age of 11 and very old persons. This represented 76% literacy rate.



Figure 4-25: Education level in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.6 Access to Health

There are several points to access health services for the people in the project area. The main health service access point is the district hospital at Rumphi town and Ekwendeni Hospital close to Mzuzu city. The other health facilities are Health Centres whose services are limited. The respondents reported that they get most of their health services from the health centre (80%), District hospital

(10%) and health facilities (10%). 83% of the respondents reported that they do get the medicines that they are prescribed. In terms of disease burden, the respondents reported the most common diseases suffered by household members, with cough (48%) and Malaria (33%) amongst the most prevalent (Figure 4-24).



Figure 4-26: Common ailments in the Rumphi Water Supply and Sanitation Services Improvement Project area

The respondents were also asked about their knowledge of HIV and AIDS. In terms of general information about HIV and AIDS, 142 reported that they know that it kills whereas 199 reported that they know the manner in which it is contracted (Table 15).

Table 15: HIV and AIDS awareness in	n sampled sites of the	Rumphi	Water Supply an	nd
Sanitation Services Improvement Project area.				

HIV and AIDS Information	Number of People Aware of It		
It kills	142		
Incurable	79		
The manner in which it is contracted	199		
Treatment or management of the condition	55		

When asked on specifics of how HIV and AIDS is contracted, 92% of the respondents reported that it is contracted through irresponsible sexual behaviour and 30% said it is contracted through sharing of sharp instruments. Only 1% did not know (Figure 4-25). This information is useful in designing the training content for sexual and reproductive health that will be delivered to the stakeholders in order to mitigate against HIV and /AIDS during project implementation.



Figure 4-27: Common causes of HIV and AIDS as reported by people of the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.7 Household Water and Sanitation Access

The study also sought to understand the current household water and sanitation situation. Almost all respondents reported using water for domestic uses and drinking (99%). Some reported using it for irrigation (9.4%) and others for livestock (18.5%) as per figure 4-26 below.



Figure 4-28: Common uses of water as reported by people of the Rumphi Water Supply and Sanitation Services Improvement Project area.

On sources of water, 77% of the respondents indicated that they draw water from a communal borehole whereas 16% reported that they draw water from government-provided communal water points (Figure 4-27 and 4-28). Government-provided communal water points were mainly reported in Rumphi where there has been a scheme for provision of water through gravity-fed piped water. During discussions with the communities, there were complaints regarding this system, which is currently being managed by the Water Users Association (WUA). The system is reportedly not working to the advantage of the communities because its water tanks were not constructed with strong materials and they have since started crumbling. In addition, the intakes were located at lower altitudes hence not taking in enough water to supply them.



Source of mater

Figure 4-29: Common sources of water for the people of the Rumphi Water Supply and Sanitation Services Improvement Project area.



Figure 4-30: Common sources of water for the people of the Project area, the case of communal boreholes

When asked about distances that they travel to access water, the maximum time taken was reported to be one hour (60 minutes) as shown in figure 4-29 below.



Figure 4-31: Time taken to travel (walk) to water source for the people of the project area

4.3.8 Treatment of water before use

Since the water sources provide untreated water which is not safe for drinking, the study also sought to understand if they treat the water before drinking and how they treat it. About 98% of the respondents indicated that they treat the water prior to drinking (Figure 4-30). The most common method of treatment was letting it stand to settle (49%) followed by adding chlorine (47%). Only 2% reported that they boil the water prior to drinking (Figure 4-30).


Figure 4-32: Treatment of water before use (top) and common methods of treating water before use (bottom) in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.9 Sanitation Facilities

On sanitation facilities, 97% of the respondents reported that they have sanitation facilities. About 83% of respondents also reported that they do share sanitation facilities with other households. Therefore, the number of households sharing a sanitation facility are very high.



Figure 4-33: Sanitation in the Rumphi Water Supply and Sanitation Services Improvement Project area. The proportion of people with sanitation facilities (Left) and proportion of households that share a sanitation facility (Right)

The most common sanitation facility is the pit latrine reported by 96.5% of the respondents. Flush toilets were reported for 3.5 % of the households. Pit latrines are constructed using various materials as shown in figure 4-32 below. It is rare to find a hand washing facility outside a pit latrine as depicted below. The pit latrines are located outside the main house. In one of the meetings, the members encouraged each other to make plans to include toilet facilities within the main house in preparation for the upcoming project.



Figure 4-34: Nature of pit latrines in the Rumphi Water Supply and Sanitation Services Improvement Project area: one type made with grass material and no hand washing facility (Left) and another type constructed with brinks having a hand washing facility outside (Right)

4.3.10 Cooking and Lighting Energy Sources

According to the respondents, 89.9% use firewood for cooking, whereas 8.7% use charcoal for cooking. Only 1% reported that they use electricity for cooking. Combining charcoal and firewood for cooking shows that there is a high burden on the trees in the area.



Figure 4-35: Type of energy used for cooking

In terms of source of energy for cooking (see Figure 4-34 below), a majority of the respondents (28%) indicated that they buy from market vendors, 6% from their gardens/farms and 5% from the homestead and surrounding areas. Only 1% reported that they collect the firewood from the forest themselves. This shows that there is a lot of firewood and charcoal trading in the area.



Figure 4-36: Sources of energy for cooking

The survey also sought to understand the types of energy used for lighting and their sources. 49% of the respondents indicated that they use flashlights powered by batteries, while 27% use ESCOM electricity, followed by 20% who reported that they use solar panels. 3% of them reported that they use candles whereas 1% reported that they use the same charcoal they use for cooking as their source of energy for lighting.



Figure 4-37: Type of energy for lighting

In terms of source and acquisition of energy for lighting, 72% of the respondents reported that they buy from the markets whereas 27% buy from ESCOM. Only 1% reported that they buy from NGOs such as Catholic Development Commission (CADECOM).



Figure 4-38: Source of energy for lighting

4.3.11 Land Tenure

A large proportion of the respondents reported having at least one piece of land (44%) seconded by those with 2 pieces of land (32%). A further 16% reported that they had access to 3 pieces of land. Only 3 % of the respondents reported that they did not have access to land (Table 16)

Table 16: Land Ownership in the Rumphi Water Supply and Sanitation Services ImprovementProject area.

Number of Pieces of Land Owned	% of respondents
0	3
1	44
2	32
3	16
4	4
5	1

In terms of tenure, 70% reported that it was customary land whereas 17% reported that it was individual titled land. Others reported that they were renting and paid in cash (9%), rented and paid in kind (1%) and freehold (3%). The titled and freehold land was mostly reported in the townships. Land was reported to be used for farming all year round by only 12.2% compared to those who farmed seasonally reported by 87.1%. Land size/holdings ranged from 0.25 to 24 acres, with the majority (93.9%) holding between 0.25 and 3 acres (Figure 4-37).



Figure 4-39: Land holding sizes (Acres) per household in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.12 Sources of Income and Livelihoods

According to the survey results, a large number of the individuals in the sample (207) are still going to school, which also speaks to the young population as alluded to above. Therefore, farming is the main source of income for those who are not going to school, seconded by doing piece work/labourers. This is the pool of human resources that the project may have to employ because as shown below, the skills levels for any other kind of employment are very low in the community.



Type of economic activity

Figure 4-40: Main types of economic activities in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.13 Employment and Labour Market

A number of skills were presented to the respondents to indicate who in their household has any of those skills. The majority of individuals, about 91% (n = 456), were reported to hold none of the skills as per figure 4-39 below. About 2% (9) of the individuals reported having carpentry skills whereas 1.8% (8) were reported to be computer literate. Seven of them (1.5%) reported that they have driving skills while 6 (1.3%) reported that they have building skills. In general, the labour pool for unskilled labour is large hence there will be need to manage the employment opportunities that the project can avail. Systems and structures need to be put in place by the contractor to ensure that there are no challenges with employment offers.



Nature of employability skill

Figure 4-41: Main types of employability skills in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.3.14 Grievances and Redress Mechanisms (GRM)

During the study, it was established that the Grievance and Redress Mechanism (GRM) is located at the Area Development Committee (ADC) level. Only one ADC, at Chinyolo, had a fully existent and functional GRM. It was observed that this was because the ADC covers areas along the M1 road that have recently experienced asset valuation and compensation by the Roads Authority/Roads Fund who are working on the maintenance of this road. After assessment and valuation of the assets, it was reported, there were some grievances in terms of amounts of compensation to some of the schools in the area. Although the GRM Committee had advised the PAPs not to receive the cheques if there were any complaints, the complainants went ahead to encash the cheques. They did this for fear of losing the amounts that had already been given to them. This was a demonstration that the GRM Committee is functional.

For those ADCs whose GRM Committees were non-existent and non-functional, they were urged to ensure that they form these committees prior to commencement of the project. Similarly, the representatives of the District Council also indicated that they have a GRM Committee at the Council level, which collaborates with the ones at the ADC level in resolving disputes whenever they arise.

4.3.15 Corona Virus and Cholera Situation

Corona Virus (Covid19) situation in the country had generally improved since the first reports in March of 2020. According to the Ministry of Health (<u>https://covid19.health.gov.mw</u>), the situation as of 18th October 2022 was as follows:

Table 17: Corona	Virus Situation	in Malawi and in	Mzimba North	ı and Rumphi as	of mid-
		October 2022			

	Numbers recorded				
Nature of Covid-19 Case	National	Mzimba North	Rumphi		
Total Confirmed Cases	88,061	5,134	1,023		
Total Confirmed Deaths	2,682	128	46		
Total Recovered	84,973	4,880	977		
Lost during follow-up	232	0	0		
Active Cases	174	126	0		

The Ministry of Health declared a cholera outbreak in Malawi on 3rd March 2022, following laboratory confirmation of a case in the country. A second case was detected on 7 March. As of 26th April 2022, 78 cholera cases and four deaths had been reported, of which 97% (76 cases) were from Nsanje District. The Northern Region started reporting cases from 15th October 2022. Presently, twenty-five districts have reported cholera cases, including Rumphi (650 cases and 10 deaths) and Mzimba North (409 cases and 1 death), which were among some of the districts with highest cholera incidence. The major factors that lead to cholera include poor food hygiene, lack of access to safe water and low coverage and usage of latrines (i.e., practising open defecation).

4.3.16 Archaeology and Cultural Heritage

Desk studies were conducted to identify any cultural heritage sites within the project area from gazzeted sources. Local knowledge was also solicitated from traditional leaders and communities. The exercise revealed that no existing information or reports are available on archaeological or culture heritage in the project area.

In addition, a field survey was conducted by walking over proposed sites for major facilities looking for visible cultural heritage signs such as surface materials (i.e., pottery pieces, stone tools, etc.) and any structural remains (i.e., historic buildings, evidence of historic settlement, etc.). The sites were also examined for signs of graves, headstones, or unusual formations. The survey found that there are no archaeological or cultural artefacts at any of the sites.

However, a chance find procedure has been developed to provide guidance in case of discovery of archaeological or cultural resources during implementation of the project.

4.4 SANITATION

4.4.1 Methodology

In this study the focus of sanitation was on environmental sanitation which includes human excreta control, managing solid waste and wastewater, and pest and vector control (Onyango & Uwase, 2017). Data was mainly collected through documentation review, field observations and interviews with key informants and community members. The institutions that were visited included Rumphi District Hospital, Rumphi Boma Market, Bolero Market, Rumphi Secondary School and Phwezi Trading Centre. All the sites where the water supply, liquid and solid waste management infrastructures are proposed to be constructed were also visited. The study sought to understand the existing knowledge, attitudes and practices on environmental sanitation in the project area. Field observations were used during field data collection to document the existing practices on sanitation and solid waste management in the proposed project area. This was used to inform and validate/triangulate issues that come from community and key informant interviews, and review of documents.

4.4.2 Findings

4.4.2.1 Wastewater Management

Rumphi District and the surrounding areas have no sewerage network or wastewater treatment facility. The district wastewater is, therefore, managed on-site using pit latrines and septic tanks (NRWB, 2022). Out of the total of 48,624 households in the district, 78% use traditional pit latrines. About 11% of the households use improved latrines in the form of flush toilets, VIP latrines and traditional pit latrines with slabs. The remaining 11% of households practice open defecation (NRWB, 2022). The commercial and public institutions in the district mostly use on-site flush toilets connected to septic tanks to manage their wastewater. For the market centres, the main markets at Rumphi Boma and Bolero, have flush toilets with running water. However, at Rumphi Boma Market the flushing mechanisms were non-functional and there was no hand washing facility. Other market centres such as Katowo, Mhuju, Phwezi and Mphompha have unimproved traditional latrines.

The district has 25 health facilities and all of them have flush toilets with running water and pit latrines (NRWB, 2022). For school sanitation, the district has inadequate sanitation facilities in schools. The primary school learner to toilet ratio for boys and girl's learners in the district at 1:80 and 1:82 respectively against the 1:60 ratio recommended by the Ministry of Education, Science

and Technology. The School Health and Nutrition Manual recommends one toilet per 25 girls and one toilet plus one urinal per 50 boys (Save the Children, n.d.)

The district. however, faces challenges in terms of emptying, transportation and disposal/reuse of faecal sludge from the onsite sanitation systems in public and commercial institutions due to absence of wastewater collection and treatment facilities. The district mainly relies on public Service providers (Malawi Defence Force) and private companies based in Mzuzu city to carry out desludging of septic tanks and toilets. However, the faecal sludge in most cases is not delivered to the treatment plant in Mzuzu City because of the distance (about 67 km) from Rumphi District which makes it very costly. The faecal sludge is, therefore, illegally emptied in forests, causing all forms of pollution that threaten public health and the environment (NRWB, 2022).

4.4.2.2 Solid Waste Management

Currently, solid waste is generated from various domestic, commercial and institutional premises. The composition of the solid waste includes both biodegradable and non-biodegradable waste. Table 18 shows the major categories for the waste generated in Rumphi. The highest proportion of solid waste generated is food and organic waste followed by plastic waste; garden; ash and dust waste; and finally metal waste. The waste generation trends were found to be similar for domestic, institution and public establishments.

		Proportion (%)	
	Solid Waste Type	Domestic Solid	Institution & Public
		Waste	Places Solid Waste
1	Food and organic waste	27.5	28.72
2	Plastic waste	21.6	28.72
3	Garden waste	20.4	18.09
4	Metal waste	12.0	8.51
5	Ash and dust	18.6	15.96
	TOTAL	100.0	100.00

Table 18: Major waste categories

Source: NRWB, 2022

The Rumphi District Council is mandated to manage the solid waste generated within Rumphi Town and the surrounding areas. However, due to challenges of inadequate resources, the Council has not been equipped sufficiently to undertake the mandate as required. The Council for instance has limited personnel and does not have the necessary equipment such as a waste collection vehicle. For example, despite high levels of waste generated at market centres, it is only Rumphi boma Market which has some form of facilities for waste storage and collection for disposal. The

market has a refuse bank constructed with burnt bricks situated inside the market. There are also some bins available in the market (Figure 4-40).



Figure 4-42: Bins at Rumphi Boma Market

The waste from the bank and bins in the market is collected by the District Council and disposed of at a dumpsite site close to South Rukuru River behind Meru Filling Station on the western side of Rumphi Boma. The dumpsite is less than 500 metres from residential area and close to the river posing risk of contamination.



Figure 4-43: Dumpsite behind Meru Filling Station

According to the Integrated Household Survey 2019-2020, the majority (67.9%) of the households in Rumphi District use rubbish pits for solid waste disposal. About 11.1% use rubbish bins, 1.3% burn their waste and 0.2% dispose at public rubbish heaps (Rumphi WASH DSIP,2021). Generally, the study established that poor disposal of solid waste is a general problem within the communities and the markets that were visited. There is an accumulation of unsightly uncollected waste within the town and surrounding areas especially around the market areas, bus depot and various residential areas. Currently, the solid waste generated from various domestic, commercial and institutional premises is disposed of by open dumping within the town, near Nyika Progressive secondary. Alternatively, the wastes are buried in small pits or burned in the vicinity of the premises. This is attributed to erratic and unreliable solid waste management operations. These dump sites are uncontrolled, unsightly and pose risks to public health and hygiene due to pollution/ foul odour, attraction to infestation by vermin and growth of unwanted disease-causing insects. For instance, it was observed that residents surrounding Rumphi Secondary School were disposing of diapers openly in rubbish pits and along water drains as shown in Figure 4-42.



Figure 4-44: Diapers disposed of openly

Waste mixed with disposable diapers poses a high public health risk as it contains pathogens from human faces which may lead to the spread of diarrheal disease such as cholera. Poor solid waste management disposal was also established at other market centres in the district as depicted in Figure 4-43. Poor waste disposal often leads to odour, loss of aesthetic, blocking of the drainage system, and spreading of airborne and waterborne diseases.



Figure 4-45: Poor waste disposal at (a) Bolero Market and (b) Lungazi River at Phwezi Trading Centre

The District Hospital has an incinerator and a placenta disposal pit where the waste generated within the hospital are appropriately processed and disposed of. However, the hospital experiences challenges disposing of the ash from the incinerators since the district has no proper landfill. Similarly, other public and private institutions operating in the area experience challenges disposing of their wastes due to lack of proper collection and disposal facilities. This forces some waste generators to resort to backyard waste burning which releases a lot of smoke in the atmosphere causing air pollution.

4.5 **BIOLOGICAL CONDITIONS**

Assessment of existing biological conditions in the proposed project area, an important part of the ESIA process, was based on both direct and indirect observation methods and focused on plants, mammals, birds, reptiles, amphibians, fish and macro-invertebrates of the project area. The project area is characterised by different habitats; most of the sites are in cultivated land and degraded miombo woodland. The other habitats are mixed woodland, Wetlands and thickets on hill tops (Figure 4-44).



Type of habitat



Findings from the assessments of biological conditions in these habitats are detailed in the subsections below. The detailed methodology adopted for studies on existing biological conditions are contained in Appendix VII.

4.5.1 Flora Assessment

Species Diversity

The total number of plant species varies from site to site main due to land use type. The highest number of species (91) was recorded along the route of the pipeline from the water intake (Table 19). The complete listing of the relevant species is presented in Appendix VII.

Table 19: Number of plant species per site as recorded in the Rumphi Water Supply and
Sanitation Services Improvement Project area.

Ser.	Site	Total no. of plant	Habitat description
No.	Name	species	
			Mixed woodland along Rumphi
1	Rumphi River Intake	40	River
2	Bwengu offices	64	Cultivated land
3	Thumbi Booster	63	Cultivated land
4	Mzokoto stop over	35	Cultivated land
	Phwezi Offices &		Cultivated land
5	Housing	51	
			Degraded miombo woodland on
6	Thumbi tank site	30	hilltop
			Degraded miombo woodland at the
7	Our Future - Boma	27	hill stops
8	Bolero tank site	42	Thicket on top of the hill
9	Luviri tank site	27	Miombo woodland on top of the hill
10	Luviri booster	30	Cultivated land
	Mwazisi booster &		Cultivated land
11	Housing	45	
12	Mwazisi tank site	30	Miombo woodland on top of the hill
	Mwazisi Housing &		Cultivated land
13	offices	28	
14	Kacheche tank	25	Uphill
15	Kacheche booster	55	Cultivated land
16	Bolero offices	39	Bolero offices
17	Bolero Booster	33	Along Nyika – Rumphi road
18	Enukweni Offices	44	Cultivated land
			Mixed woodland along Rumphi
19	Pipeline from intake	91	River
20	Treatment & Tank site	34	Miombo woodland along hill slopes
21	Sewage Site 1	50	Cultivated land
22	Sewage Site 2	42	Wetland or dambo
23	Bolero waste disposal	52	Mixed woodland

Plant habits and plant uses

The main different plant forms or habits in the project area include trees, herbs and grasses. Trees are the most abundant, followed by herbs and grasses. The rest of the other plant habits are in small numbers, likely a reflection of the land use types and human activities of the area. (Figure 4-45). Most of the plants found in the project area are used for medicine, environmental management and firewood (Figure 4-46).



Plant form type

Figure 4-47: Plant habits of the Rumphi Water Supply and Sanitation Services Improvement Project area



Figure 4-48: Uses of plants in the Rumphi Water Supply and Sanitation Services Improvement Project area

Site-specific Flora Rumphi River water intake

This site, a mixed woodland (Figure 4-47), has a species richness of 40. Apart from *Afzelia quanzensis*, which is an endangered species, 18 of the recorded plant species are vulnerable and hence require special protection. It was noted that NRWB already has designated for reforestation areas within the intake area up to its treatment plant. It was also noted that most species are classified as data deficient under the International Union for the Conservation of Nature (IUCN)(Appendix VIII). A data deficient species is one which has been categorized by the IUCN as lacking sufficient information for proper assessment of its conservation status to be made. The high plant species diversity of this site makes it of high value and any project activity is expected have a moderate impact.

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Figure 4-49: Rumphi River water intake site of the Rumphi Water Supply and Sanitation Services Improvement Project area

Rumphi treatment tank site

This site is characterized by degraded miombo woodlands on the hill slopes (Figure 4-48). A total of 34 plant species were recorded. Similar to the intake, most plant species are data deficient while a few are vulnerable under the IUCN. The endangered species recorded at this site were *Sterculia quinqueloba* and *Afzelia quanzensis*.



Figure 4-50: Some flora around the Rumphi treatment tank site of the Rumphi Water Supply and Sanitation Services Improvement Project area.

Bolero site

The four activities proposed for the Bolero site fall in different habitat types (Figure 4-49). The Booster and office buildings are located in cultivated land with 30 and 39 plant species, respectively. Although the tank site and waste disposal site have higher species numbers (42 and 52 respectively) than the booster and office sites, these sites are already highly degraded as a result of burning and firewood collection. Most of the plants are regenerants that are subject to continued degradation. The project may in the long term have a positive impact by keeping out the current degrading activities of burning and firewood collection, allowing these regenerants to grow into trees in the spaces where construction will not have taken place. Increase in trees numbers may attract other species like birds and insects into the area.



Figure 4-51: Some flora around Bolero in the Rumphi Water Supply and Sanitation Services Improvement Project area

Luviri site

The booster site at Luviri has 30 plant species in cultivated land while the tank site located in the miombo woodland on a hill top has about 27 plant species (Figure 4-50). The major impact of the project will be on the grass vegetation which is used as thatch by the local people.



Figure 4-52: (a)Flora around Luviri tank site (b) flora around Luviri booster station

Mwazisi site

In Mwazisi no endangered species were recorded at all localities. The offices will be in a former tobacco cultivation land. The booster is also going to be in a rotationally cultivated land. This is why a few shrubs were observed during the study. Moderate negative impacts are expected at the tank site due to the already highly degraded nature of the area (Figure 4-51).



Figure 4-53: Some flora at booster, tank, office and staff houses at Mwazisi site of the Rumphi Water Supply and Sanitation Services Improvement Project area

Kacheche site

Moderate impacts on flora are expected at both sites at Kacheche. The tank is located within miombo woodland and the booster is in a cultivated land (Figure 4-52). There is no species of conservation concern in this area.



Figure 4-54: (a) Kacheche tank site (b) Kacheche booster site

Our future site

This is another degraded miombo woodland (Figure 4-53). Twenty-seven plant species were recorded with 3 endangered one, namely *Dalbergia melanoxylon*, *Pterocarpus angolensis* and *Dalbergia melanoxylon*. The area is burnt annually.



Figure 4-55: Some flora at Our Future tank site of the Rumphi Water Supply and Sanitation Services Improvement Project area

Thumbi site

Thirty species were recorded at the proposed Thumbi tank site within the degraded miombo woodland whilst 63 species were recorded at the booster site which is proposed in a cultivated land (Figure 4-54). There was no endangered species recorded.



Figure 4-56: Some flora at tank and booster site at Thumbi in the Rumphi Water Supply and Sanitation Services Improvement Project area

Enukweni site

Forty-four species were recorded at Enukweni office site in a cultivated land. Only one species of endangered plants (*Hyphaene ventricosa*) was recorded. Minimal impacts to vegetation are expected at this site (Figure 4-55).



Figure 4-57: Some flora at the proposed Enukweni office site in the Rumphi Water Supply and Sanitation Services Improvement Project area

Bwengu site

As in other sites, offices are proposed in a cultivated land at Bwengu (Figure 4-56). Grasses and fruit trees are abundant at this site, with 64 species of mainly herbs recorded. None of the recorded species is endangered.



Figure 4-58: Some flora at the proposed Bwengu office site in the Rumphi Water Supply and Sanitation Services Improvement Project area

Mzokoto site

Thirty-five plant species were recorded at this site (Figure 4-57). Herbs are the dominant plant habit. Only one endangered species of palm (*Hyphaene ventricosa*) was recorded in the area.



Figure 4-59: Some flora at the proposed commuter stop over site at Mzokoto in the Rumphi Water Supply and Sanitation Services Improvement Project area

Phwezi staff houses and offices site

This site is in a cultivated land (Figure 4-58) and hence harbours a lot of annual weeds. Fifty-one species of trees were recorded. Though this seems to be high, most of these are seedlings and regenerants, which are perpetually burnt and cut during the growing season. Project impact is therefore expected to be low in this area.



Figure 4-60: Some flora at the proposed Phwezi staff houses and offices site in the Rumphi Water Supply and Sanitation Services Improvement Project area

Rumphi wastewater treatment plant site 1

This site lies along a stream in a cultivated area (Figure 4-59). Endangered species were not recorded. The area is of little conservation value as most of the grass and herb species are classified as data deficient while four species are recorded as vulnerable under the IUCN red list database.



Figure 4-61: Flora at the proposed Rumphi wastewater treatment plant site 1 in the Rumphi Water Supply and Sanitation Services Improvement Project area

Rumphi wastewater treatment plant site 2

Site 2 of the wastewater treatment plant is in a wetland area (Figure 4-60). Only one endangered species of palm (*Hyphaene ventricosa*) was recorded. Most of the species are herbs. Because of the nature of the habitat as a potential breeding area for fish, the impact of the project is anticipated to be high.



Figure 4-62: Flora at the proposed Rumphi wastewater treatment plant site 2 in the Rumphi Water Supply and Sanitation Services Improvement Project area

Plant species of Conservation significance

Most plant species (60%) found in the project area are data deficient (Figure 4-61, Appendix VIII). Five species (2%) represented by a few individual plants are listed as endangered, namely

Pterocarpus angolensis, Dalbergia melanoxylon, Terminalia sericea, Khaya anthotheca and *Hyphaene ventricose*. The impact is therefore expected to be moderate and mitigatable.



Figure 4-63: The IUCN status of plant species in the Rumphi Water Supply and Sanitation Services Improvement Project area

4.5.2 Terrestrial Fauna Assessment

Wildlife resources recorded in the project area were not many. This could be attributed to the fact that most of the proposed project sites, including almost all hill sites planned for water storage tanks, are already disturbed by human activities such as wildfires and clearance for housing developments and agricultural activities. Table 20 gives a summary of number of species recorded per taxa and site. The list of wildlife species sighted or reported in and around the project area is provided in Appendix IX.

Table 20: Number of species per taxa and per site as recorded in the Rumphi Water Supply andSanitation Services Improvement Project area.

		Number of Species				
Ser.	Name of Site					
No.		Mammals	Birds	Reptiles	Amphibians	S
	Intake on South					
1	Rumphi River	5	16	7	1	37
2	Treatment Plant	4	6	3	0	25

		Number of Species				
Ser.	Name of Site					Invertebrate
No.		Mammals	Birds	Reptiles	Amphibians	S
	Our Future					
3	Tank site	2	15	4	0	37
	Bolero office					
4	site	1	8	2	0	39
	Bolero booster					
5	site	3	18	3	2	24
6	Bolero Tank site	3	18	6	0	35
7	Luviri Booster	3	11	4	1	30
8	Luviri Tank site	4	15	6	0	28
	Mwazisi					
9	Booster site	4	15	5	0	23
	Mwazisi Tank					
10	site	3	11	6	1	33
	Mwazisi Office					
11	site	3	6	2	1	29
	Kacheche					
12	Booster site	5	13	6	1	38
	Kacheche Tank					
13	site	2	12	6	0	27
14	Bwengu Office	4	12	2	1	21
	Enukweni					
15	Office	3	7	3	0	24
16	Thumbi booster	6	9	4	2	39
17	Thumbi tank	4	14	2	0	32
	Mzokoto					
	Commuter					
18	stopover	4	13	4	1	19
	Phwezi Office					
19	site	4	13	4	1	28
	Solid waste -					
20	Bolero	6	20	6	3	40
21	Sewage site 1	3	16	5	4	15
22	Sewage site 2	5	13	4	2	46

Taxon-specific key findings

Mammals

Almost all the categories of mammals recorded are of Least Concern under the IUCN except for *Aonyx capensis* (Clawless otter), recorded along the pipeline at the intake, which is listed as a near

threatened species under IUCN as well as under the Malawi Wildlife Order 2017. The list of all the mammals recorded in the project area is presented in Appendix IX.

Birds

Appendix IX gives a detailed list of the birds recorded in the project area. Four species, *Bubo africanus* (Spotted Eagle Owl), *Glaucidium capense* (Barred Owlet), *Glaucidium perlatum* (Pearl-spottedowlet) and *Numida meleagris* (Helmeted Guinea Fowl) recorded at the intake site are gazetted under the Malawi listed species. At the solid waste dump site and at Mwazisi, *Numida meleagris* (Helmeted Guinea Fowl), a gazetted Malawi listed species was recorded. At Kacheche booster site, two species, *Bubo africanus* (Spotted Eagle Owl) and *Glaucidium capense* (Barred Owlet), under the gazetted Malawi species were recorded.

Reptiles:

Appendix IX gives detailed list of reptiles recorded in the project area. Four species listed under the Malawi Wildlife Order 2017 were recorded as follows: *Chamaeleo dilepis-dilepis* (Common Flap-necked Chameleon) at Out Future tank site, at Kacheche and Mwazisi tank sites, at Bolero Tank site and at Luviri Tank site; *Bitis arietans* (Puff adder) was recorded at the solid waste dump site, wastewater treatment sites 1 and 2, at Kacheche booster site, at Bolero Tank site and at Luviri Booster site; *Varanus niloticus* (Nile monitor) was recorded at wastewater treatment sites 1; *Varanus albigularis* (rock monitor) were recorded at Kacheche tank site and *Naja subfulva* (Eastern Forest cobra) was recorded at Mwazisi booster site.

Amphibians

Appendix IX gives detailed list of amphibians recorded in the project area that include Bufo gutturalis (Guttoral toad) and Breviceps poweri (Power's Rain Frog). None of the species recorded in the project area is listed under the Malawi Wildlife Order 2017 or IUCN as vulnerable or endangered.

Terrestrial Invertebrates

The sampled project sites show high diversity of invertebrate species despite most of them being dry and burnt. In general, the high abundance of species for an area can be attributed to the fact that the area has had greater number of successful species and more favourable and stable ecosystems with a wide range of habitats and a lot of available ecological niches. The following is the analysis of the conservation station of the recorded species:

Conservation significant species

Assessment of the species encountered for the IUCN red list status (Version 2022-1 IUCN red list) and (CITES, 2021) in the proposed project area was conducted. No endangered species of

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invertebrates were encountered at all the project sites. Most of them were under 'Least concern' or not yet evaluated under IUCN. Appendix VII gives details of the species assessed. Figure 4-62 shows some of the terrestrial macroinvertebrates of this project area. The invertebrates sampled during this survey seem not to be classified as threatened at national and international levels. But these invertebrates are involved in the balance of the ecosystem activities, nutritional and economic importance to the local communities hence they need to be considered important. Considerations should be taken to protect these invertebrates through sustainable project activities and mitigation measures during the project cycle.



Figure 4-64: Some of the terrestrial macroinvertebrates of the Rumphi Water Supply and Sanitation Services Improvement Project area. Top row from left to right: Trithemis kirbyi and Tricarinodynerus guerinii. Bottom row from left to right: Mylabris amplectens and Castalius calice calice

4.5.3 Aquatic Fauna and Macroinvertebrates Assessment

Fishes and fisheries of the Rumphi River (Proposed weir water intake site)

According to local sources, Messrs Simeon Mkandawire, Jackson Milanzi, Charles Nyirenda and Simeon Mbale, the aquatic habitats of the Rumphi River harbour several types of fish including Mphunju, Zaireichthys rotundiceps (Baju), Labeobarbus johnstonii (Nthuwa), Opsaridium microlepis (Mphasa), Clarias gariepinus (Milamba), Oreochromis shiranus (Chambo), Nkholokolo (Synodontis spp.), Nyingwi (Labeo cylindricus), Enteromius paludinosus, Astatotilapia calliptera, Brycinus imberi and Labeo mesops (Ntchila). Limited fisheries activities

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occur in this river (Involving more than 10 fisher folks), mainly between September and November when water levels are low and some fish are stranded in temporary pools of water separated from the main flow although, generally, catches are better during the rainy season than during the dry season. Some species like *Clarias gariepinus* are abundant mainly in the rainy season. Figure 4-37 shows some of the fish that were encountered during the field visit. The main gears used for fishing include hand lines, fish traps, gill nets, mosquito seine nets (Figure 4-63). The fish are caught for food and sale at local markets or through door-to-door vending.



Figure 4-65: Some of the fishes of Rumphi River of the Rumphi Water Supply and Sanitation Services Improvement Project area. Top row from left to right: Labeo cylindricus and Enteromius paludinosus. Bottom row from left to right: Labeo mesops and Astatotilapia calliptera



Figure 4-66: fishing gears in use in Rumphi River (a) Gill net set (b) fisherman showing off his Labeo mesops catch from his gill net (c) hook and line (d) fish trap

Fishes and fisheries of the South Rukuru River (Proposed wastewater treatment plant site) According to local sources, Messrs Richard Gondwe, Dumisani Longwe, Daniel Chiumia, Peter Phiri, Boyd Munthali, Goodwin Kaunda, Chikondi Nkhoma and Stocker Munthali, the aquatic habitats of the South Rukuru River within the proximity of the proposed wastewater treatment plant site have several types of fish including Labeobarbus johnstonii (Nthuwa), Zaireichthys Opsaridium microlepis (Mphasa), Clarias gariepinus (Milamba), rotundiceps (Baju), Oreochromis shiranus (Chambo), Nkholokolo (Synodontis spp.), Labeo cylindricus (Nyingwi), Enteromius paludinosus, Enteromius trimaculatus, Astatotilapia calliptera, Brycinus imberi, Bathyclarias spp., and Labeo mesops (Ntchila). Limited fisheries activities occur in this river mainly between September and November when water levels are low and some fish are stranded in temporary pools away from the main flow. The main gears used for fishing include hand lines, cast nets, fish traps, gill nets, mosquito seine nets and, occasionally, use of traditional herbs to poison fish stranded in small impoundments off the main flow. The fish are caught for food and sale at local markets or through door-to-door vending. Figure 4-65 shows some fish, Bathyclarias spp., that was observed during the field visit.



Figure 4-67: Some of the fishes (Bathyclarias spp.) of South Rukuru River within the vicinity of the proposed wastewater treatment plant site of the Rumphi Water Supply and Sanitation Services Improvement Project area.

Table 21 shows the conservation status of the fishes that were identified to species level, based on the most current FishBase data and IUCN Red list database (Version 2022-1). Of these 12 species of fish, 10 are of least concern, one, *Opsaridium microlepis*, is classified as vulnerable (VU) and another, *Labeo mesops*, is critically endangered (CR) under the IUCN Red List.

Table 21: The conservation	status of some of	f the fishes of South	Rukuru and Ru	mphi Rivers
within the Rumphi Wate	r Supply and San	itation Services Imp	provement Proj	ect area.

Family	Species	IUCN Red List Status
Alestidae (African tetras)	Brycinus imberi (Peters, 1852)	Least Concern
Amphiliidae (Loach catfishes)	Zaireichthys rotundiceps (Hilgendorf, 1905)	Least Concern
Cichlidae (Cichlids)	Astatotilapia calliptera (Günther, 1894)	Least Concern
	Oreochromis shiranus (Boulenger, 1897)	Least Concern
Cyprinidae (Minnows)	Labeo cylindricus (Peters, 1852)	Least Concern
	Labeo mesops (Günther, 1868)	Critically Endangered
	Opsaridium microlepis (Günther, 1864)	Vulnerable
	<u>Labeobarbus</u> johnstonii (Boulenger, 1907)	Least Concern
	Enteromius paludinosus (Peters, 1852)	Least Concern
	Enteromius trimaculatus (Peters, 1852)	Least Concern
	Brycinus imberi (Peters, 1852)	Least Concern
<u>Clariidae</u> (Airbreathing catfishes)	Clarias gariepinus (Burchell, 1822)	Least Concern

Aquatic macro-invertebrates of the Rumphi Water Supply and Sanitation Services Improvement Project area

Seventeen macro-invertebrate families comprising 12 fully aquatic ones and five semi- aquatic ones represented across at least 25 species were sampled within the aquatic habitats of the Rumphi Water Supply and Sanitation Project area. In total, 345 individual aquatic macro-invertebrates were sampled. Of these 17 macro-invertebrate families, only six contributed at least 5% each to the total collection and together comprised about 84% of the whole sample. The two most dominant families were the Veliidae (Riffle bugs) and the Libellulidae (Common skimmers), each of which accounted for about 26% of the collected samples. The Gyrinidae made up about 17% of the collection while the Coenagrionidae (Damselfly Nymphs) accounted for about 6% of the sample. The Atyidae (Basket shrimps) and the Chlorocyphidae (The Jewels damselflies) each
contributed 5% of the sample. Some of the least represented families were the Naucoridae (Creeping Water Bugs), the Gomphidae (Club-tailed dragonflies) and the Dytiscidae (Predaceous diving beetle), each of which accounted for less than 1% of sample (Table 22).

Ser. No.	Family Name	Common Name	Habitat Type	Proportion of Sample (%)
1	Veliidae	Riffle bugs	Aquatic	26.4
2	Libellulidae	Common skimmers	Semi- Aquatic	25.5
3	Gyrinidae	Whirligig beetles	Aquatic	16.5
4	Coenagrionidae	Narrow-winged damselflies	Semi- Aquatic	5.8
5	Atyidae	Basket shrimps	Aquatic	4.9
6	Chlorocyphidae	Jewels damselflies	Semi- Aquatic	4.9
7	Baetidae	Small minnow mayfly	Aquatic	4.1
8	Potamonautidae	Freshwater crabs	Aquatic	4.1
9	Aeshnidae	Darners	Semi- Aquatic	1.7
10	Calopterygidae	Broad-winged damselflies	Semi- Aquatic	1.4
11	Perlodidae	Springflies	Aquatic	1.2
12	Gomphidae	Clubtail dragonfly	Aquatic	0.9
13	Athericidae	Water snipe flies	Aquatic	0.9
14	Chlorolestidae	Running water damselflies	Aquatic	0.6
15	Naucoridae	Creeping water bugs	Aquatic	0.6
16	Belestomatidae	Giant water bugs	Aquatic	0.3
17	Dytiscidae	Predaceous diving beetle	Aquatic	0.3

 Table 22: Aquatic Macro-invertebrates sampled from the Rumphi Water Supply and Sanitation

 Project area, Rumphi, Northern Malawi

An overall family level Shannon index of 2.1 was obtained for the aquatic macro-invertebrates of the project area. The highest diversity of macro-invertebrates was at the proposed wastewater treatment site on South Rukuru River (Shannon index = 2.1) while the lowest value (Shannon index = 0.4) was obtained for the aquatic microhabitats of the Mwazisi pipeline. The proposed weir water intake site on Rumphi River had an intermediate Shannon index value of 1.7. All of the

19 macro-invertebrate taxonomic groups that were identified to the species level are of least concern on the IUCN Red list (Version 2020-3) (Table 23).

Table 23: The IUCN	Red list (Version 2	2022-1) status oj	f some macro	o-invertebrates	sampled from
	the Rumphi Water	r Supply and Sar	itation Proje	ect area	

Ser.	Species	Family	Habitat	IUCN Red
No.	Name	Name	Туре	List Status
1	Anax imperator	Aeshnidae	Semi-Aquatic	Least Concern
2	Caridina nilotica	Atyidae	Aquatic	Least Concern
3	Chlorocypha calligata	Chlorocyphidae	Semi-Aquatic	Least Concern
4	Crocothemis erythraea	Libellulidae	Semi-Aquatic	Least Concern
5	Crocothemis	Libellulidae	Semi-Aquatic	Least Concern
	sanguinolenta			
6	Cybister tripunctatus	Dytiscidae	Aquatic	Least Concern
7	Dineutes aereus	Gyrinidae	Aquatic	Least Concern
8	Limnogeton fiebberi	Belestomatidae	Aquatic	Least Concern
9	Orthetrum	Libellulidae	Semi-Aquatic	Least Concern
	chrysostigma			
10	Orthetrum julia	Libellulidae	Semi-Aquatic	Least Concern
11	Orthetrum machadoi	Libellulidae	Semi-Aquatic	Least Concern
12	Orthetrum stemmale	Libellulidae	Semi-Aquatic	Least Concern
13	Palpopleura lucia	Libellulidae	Semi-Aquatic	Least Concern
14	Phaon iridipennis	Calopterygidae	Semi-Aquatic	Least Concern
15	Pseudagrion acaciae	Coenagrionidae	Semi-Aquatic	Least Concern
16	Pseudagrion	Coenagrionidae	Semi-Aquatic	Least Concern
	sudanicum			
17	Trithemis arteriosa	Libellulidae	Semi-Aquatic	Least Concern
18	Trithemis furva	Libellulidae	Semi-Aquatic	Least Concern
19	Trithemis kirbyi	Libellulidae	Semi-Aquatic	Least Concern

Some of the sampled macro-invertebrates are shown in figure 4-66 below.

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Libellulidae - Trithemis arteriosa





Belestomatidae - Limnogeton fiebberi



Potamonautidae - Potamonautes sp.



Gyrinidae - Aulonogyrus sp.

Perlodidae

Figure 4-68: Some of the aquatic macro-invertebrates sampled from the from the Rumphi Water Supply and Sanitation Project area

Aquatic macro-invertebrate composition and habitat quality

An assessment of habitat quality and the ecological state of the sampled aquatic sites was conducted based on its macro-invertebrate assemblage using the average score per taxon (ASPT) of South African Scoring System version 5 (SASS 5) as per Dickens and Graham (2002). ASPT scores of 6.2, 6.8, 4.8 and 5.9 were obtained for the proposed weir intake site on Rumphi River, the Bolero tank site area, Mwazisi pipeline and the proposed sewage site on South Rukuru River, respectively, an indication that the aquatic micro-habitats of the project area are generally of above average quality and not in a state of environmental impairment.

4.5.4 Conclusion

In conclusion, the baseline conditions have established that except for the townships, most of the project areas are in rural settings, with poor access to water hence making the project highly desirable by the communities living in the project area. Women are the ones to benefit most because they do most of the domestic chores and it is their role to fetch water. Their complaints about the current water supply system and the unavailability of safe and potable water provide a reason for the project to be implemented but also sets the project implementer on a direct collision path with the current suppliers of water, the WUA structures. These therefore must be managed. Due to the level of skills among the population, there is a large youthful pool of labour that will have high expectations for employment from the project.

5 POLICY AND LEGAL FRAMEWORK

This chapter concerns the policy, legal and administrative framework within which the ESIA is carried out. It presents the relevant environmental and social policies of the country as well as the national and international legal requirements and related constraints (e.g., practices that may discriminate or exclude any stakeholder group) relevant to the project.

5.1 The Malawi vision 2063

The Vision articulates the national goals that will facilitate the realization of the aspirations of the people of Malawi. These are built around values of national consciousness such as unity, patriotism, hard-work, integrity, self-help and an aversion for hand-outs. The vision stipulates that the provision of clean water, sanitation and hygienic services is critical at the household and community level in promotion of a healthy population of Malawians. It further calls upon the development of water networks that cater for agricultural, industrial and household usage across the country. Environmental sustainability has been identified as one of the enablers in attainment of the vision 2063. Sustainable management of the environment such as adequate waste disposal, treatment and recycling; air and water pollution management; and prudent water resource management are paramount for the sustainable development of the country. The project at hand shall make sure environmentally sustainable practices are adopted in all project activities to help maximize resource efficiency.

5.2 POLICY FRAMEWORK

Malawi is a signatory to Article 17 of the 1992 Rio Declaration on Environment and Development under which it commits itself to conduct ESIAs on all proposed activities that have the potential to significantly impact on the environment. The National Fisheries and Aquaculture policy (2016), The National Environmental Policy (2004), The Malawi National Water Policy (Malawi Government, 2005), The National Environmental Action Plan (NEAP, 2002) and The Malawi Government Environmental Impact Assessment Guidelines (1997) form the basic framework within which this work was conducted. Written within the framework of integrated rural development, Malawi's national fisheries and aquaculture policy (2016) advocates for the need to protect endemic fish fauna not only for its scientific and educational value but also for its economic value. It thus advocates for efficient and sustainable exploitation of fish resources from existing national waters. The policy recognizes the need to adopt and strengthen a participatory approach for resource management that fosters greater and effective local community participation to improve effectiveness and appropriateness of management initiatives in fisheries management. The National Environmental Policy (2004) calls for the sustainable social and economic development through sound environmental and natural resources management. The National Environmental Action Plan (NEAP, 2002) provides for integrating the environment into all socioeconomic development activities of the country and highlights water resources degradation due to a proposed project among its priorities. Water Policy (Malawi Government, 2005) is an overall framework for sustainable, integrated and coordinated development and management of all water resources and specifically aims at ensuring that water is of acceptable quality for all needs.

In addition to national legislation, there is a range of international standards that are relevant to the Project. Wherever possible, alignment with such standards is recommended in order to complement and reinforce national legislation and comply with recognized international practice. In case of flora assessments different instruments were considered. Malawi is a signatory to a number of treaties and agreements that govern issues of biodiversity management in general and those focusing on plant diversity in particular. International agreements reviewed in relation to flora baseline assessments in this project include: Convention on Biological Diversity (CBD) which aims at the conservation of biological diversity, the sustainable use of its components. The agreement covers all ecosystems, species, and genetic resources; The International Treaty on Plant Genetic Resources for Food and Agriculture which is aimed at the conservation and sustainable use of plant genetic resources for food and agriculture; International Plant Protection Convention (IPPC) which aims to protect world plant resources, including cultivated and wild plants by preventing the introduction and spread of plant pests and promoting the appropriate measures for their control. Below are the relevant policies for this ESMP.

5.2.1 National Sanitation Policy (2008)

Sanitation and hygiene are key focus areas which if not properly addressed, can endanger public health and cause water pollution. The National Sanitation Policy of 2008 seeks to promote human health and environmental quality especially with regards to water. It strongly complements the National Environmental Policy by advocating for women participation in increased pollution control. It encourages pollution control in all sectors, by enforcing proper litter and human excreta disposal. This policy resonates well the proposed project that intends to improve the district sanitation services by constructing landfill for proper solid waste management, and sewerage and wastewater treatment plant.

5.2.2 The National Environmental Policy (NEP, 2004)

According to the EIA Guideline for Water Sector Projects (GoM, 2006), the National Environmental Policy (NEP) is the key instrument that provides standards or benchmarks for environmental and natural resources policies and legislation in Malawi. The NEP therefore is a central guide for all environmental and natural resources sectoral activities, including water resources management. The overall goal of the NEP is the promotion of sustainable social and economic development through sound management of the environment in Malawi. The NEP also aims to secure for all person's resident in Malawi now and in future, an environment suitable for

their health and well-being. The policy recognizes the trade-offs between economic development and environmental degradation and calls for the use of EIA and environmental monitoring as tools for minimizing impact of development on the environment. The establishment of the water supply project will integrate the principles of the environmental policy into the project so that all project activities are done in an environmentally responsible manner with the participation of all stakeholders using EIA as a tool. The developer must integrate environmental concerns during the whole cycle of the project i.e., planning, design, and implementation.

5.2.3 National Environmental Action Plan (2002)

The National Environmental Action Plan (NEAP) of 2002 is a reference guide for integration of environmental considerations into development planning. It presents an environmental protection and management plan that defines the roles, and responsibilities of various actors (including local communities, government and line ministries) in environmental management. In order to protect the environment from further degradation, the NEAP sets out the actions that need to be considered, to guarantee adequate environmental protection. In its action plans the NEAP calls for reduction in degradation of surface and groundwater. It states that all developments must endeavour to reduce the sediment load in both river and lake water and combat water pollution. The proposed project is aligned to the action plan by among others incorporate water catchment management interventions to protect the South Rumphi River catchment where the project shall abstract its raw water resource.

5.2.4 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 and 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 project, therefore, shall take 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. To minimise damages on people's properties Rumphi Water Supply and Sanitation Improvement project shall ensure to greater extent water supply and sewage lines are installed within the road reserves wayleave.

5.2.5 The National Water Policy (2005)

The policy aims at providing comprehensive and integrated water resources conservation and management. It addresses all aspects of water including resource management, development, and service delivery conforming to the current global and regional trends and the requirements as reflected under the Millennium Development Goals. The overall policy goal is sustainable management and utilization of water resources in order to:

- a) Provide water of acceptable quality and of sufficient quantities,
- b) Ensure availability of efficient and effective water and sanitation services that satisfy the basic requirements of every Malawian, and
- c) Enhance the country's natural ecosystems.

One of the objectives of the policy is promotion of public and private sector participation in water resources management, development, supply and conservation. The principles that will guide the implementation of the proposed project in relation to the policy include the following:

- i. Management, protection and conservation of water resources to be undertaken in an integrated manner,
- ii. Water resources shall be optimally, equitable and rationally allocated and regulated to ensure sustainable optimal economic returns and social enhancement,
- iii. Water resources management will be based on the concept of decentralization and will promote local participation with the catchment as the unit of water management,
- iv. Promote the empowerment of user communities to own, manage and invest in water resources development; and Pollution of water resources shall follow the "Polluter Pays" principle in order to ensure water user responsibility.

Water abstraction activities during project implementation have the potential to negatively affect downstream users. The abstraction should take into consideration downstream users and ecological water requirements. The act provides for integrated management and utilization of water resources in order to provide water acceptable quality and quantity in Malawi. The act also ensures the availability of efficient and effective water and sanitation services that satisfy the basic requirement of every Malawian and for the enhancement of the country's natural ecosystem. It promotes advancement of water pollution control in order to promote public health and hygiene, and environmental sustainability. It gives water utilities to collect, transport, treat and dispose of or recycle and reuse wastewater and promote sanitation services. The proposed project is aligned to the act as it is expanding the storage tanks to capacity range of 500 m³ to 2500 m³ to ensure that water of adequate quality and quantity is available for people in Rumphi District. The project is providing for solid and wastewaters management services to ensure proper sanitation and hygiene. The proposed project should also make sure that the water sources are protected from pollution

and should also consider measures that reduce negative impacts on existing water bodies with regards to the quantities and quality of water during construction and operation phases.

5.2.6 The National Gender Policy (2015)

Gender mainstreaming into socio economic development plans is one of the enablers for sustainable development worldwide. The Sustainable Development Goals (SDGs) II) recognises the importance of gender and women empowerment in socio-economic development. The National Gender Policy provides guidelines for mainstreaming gender 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. According to the policy, persistent gender inequalities and under-representation of women in decision making positions at all levels, necessitated development and implementation of the gender policy in order to address such gender imbalances and other related issues.

The implementation of the project shall therefore mainstream gender related issues to ensure that beneficial impacts and adverse impacts affecting women and girls are appropriately enhanced and mitigated against, respectively. The project has to integrate consideration of needs of both males, females and other vulnerable groups in project activities. The potential considerations could be equal employment opportunities to both male and female during the implementation of the project in order to enhance income for both. In addition, membership for various committees, such as VNRMC and WUA, advocates for 50% representation for both sexes to ensure that concerns of all sexes are taken into consideration.

5.2.7 The Malawi National Climate Change Policy (2016)

The Malawi National Climate Change Policy was drafted by the Government in recognition of the country's high susceptibility to the climate change effects. It is aimed at promoting climate change adaptation and mitigation for sustainable livelihoods, with consideration of economic development that significantly reduces environmental risks and ecological scarcities. Among the specific objectives of the policy is the management of impacts of climate change through interventions that build and sustain the social and ecological resilience of Malawians. The Malawi National Climate Change Policy also seeks to promote the stabilization of greenhouse gas concentrations in the atmosphere, to a level that would prevent dangerous human-induced interference with the climate; while ensuring sustainable social, economic and environmental development. To counter persistent power outages while minimising emission of greenhouse gases by fuel power generator, the project shall install solar power system to power water booster pumps. The ESIA shall explore measures to further improve community resilience such as the catchment management activities through re-afforestation, reforestation and patrolling against environmental degradation. The project will complement Malawi's National Adaptation Programme of Action (NAPA, 2006),

which recognises the country's high vulnerability to the impacts of climate change. The proposed adaptation measures under NAPA include improved water resource management, which is addressed under the proposed project through provision of treated safe water supply to the communities.

5.2.8 National Forestry policy (2016)

The policy recognizes the importance of forest resources in the socio-economic development of the population, especially rural communities. The project recognizes the importance and desirability of forest conservation in catchment stability. As part of conservation efforts, the policy prohibits land use changes or encroachments that may result in deforestation or degradation of areas of cultural importance and forests with catchment management importance. The proposed water supply project will neither encroach into forests nor result in land use changes that may negatively affect catchments. The project will complement and enhance efforts by the Department of Forestry to establish nurseries in communities for afforestation. The water supply infrastructure will enable the maintenance and expansion of existing community nurseries.

5.2.9 National HIV and AIDS Policy (2012)

The policy seeks to address HIV and AIDS issues that have affected socio-economic development especially in the Southern Region where the project will be carried out. Even though the issues are more pronounced in urban areas where there is a higher concentration of economic activities, rural areas such as the targeted project areas have been affected. Economic growth is negatively affected by the issues and this includes sectors such as agriculture and tourism. Transmission of HIV and AIDS has been prevalent in cases where there have been migration and increase in disposable income both which may result from the proposed water supply system development. The proposed project shall therefore address the issues of HIV and AIDS and deter transmission by working with relevant stakeholders such as district health officials, faith leaders and local health officials to sensitize communities and project beneficiaries on prevention measures. Further, Information, Education and Communication (IEC) materials on HIV and AIDS should be utilized. To discourage migration into the project area, which may cause transmission of STIs, labour will be sourced from beneficiary communities. Sourcing labour from the local community also facilitates skills transfer that ensures a longer infrastructural lifespan.

5.2.10 National Parks and Wildlife Policy (2017)

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 contractor's contracts 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.

5.2.11 National Energy Policy (2018)

The policy recognises that industrial and socio-economic development of the country depends on access to modern, reliable and sufficient energy. As such, it has put the energy sector as a priority in its National Development Agenda. It highlights challenges faced in the energy sector, such as unreliable power supply, low generation capacity and over dependence on biomass. Trees are the main biomass used and to reduce their use, the policy encourages efficient stoves and utilisation of renewable sources of energy and technologies such as solar power.

To contribute to achieving the policy goals in energy diversification drive, The project will consider installation of solar power as an alternative source of energy for water pumping, which may become critical during periods of power outages. Through the catchment management intervention, the project shall also promote the use efficient cook-stoves which shall reduce biomass energy consumption thereby reducing deforestation.

5.2.12 The National Water Policy (2005)

The policy aims at providing comprehensive and integrated water resources conservation and management. It addresses all aspects of water including resource management, development, and service delivery conforming to the current global and regional trends and the requirements as reflected under the Millennium Development Goals. The overall policy goal is sustainable management and utilization of water resources in order to:

- a) Provide water of acceptable quality and of sufficient quantities.
- b) Ensure availability of efficient and effective water and sanitation services that satisfy the basic requirements of every Malawian; and

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c) Enhance the country's natural ecosystems.

One of the objectives of the policy is promotion of public and private sector participation in water resources management, development, supply and conservation. The principles that will guide the implementation of the proposed project in relation to the policy include the following:

- i. Management, protection and conservation of water resources to be undertaken in an integrated manner.
- ii. Water resources shall be optimally, equitable and rationally allocated and regulated to ensure sustainable optimal economic returns and social enhancement
- iii. Water resources management will be based on the concept of decentralization and will promote local participation with the catchment as the unit of water management.
- iv. Promote the empowerment of user communities to own, manage and invest in water resources development; and
- v. Pollution of water resources shall follow the "Polluter Pays" principle in order to ensure water user responsibility.

Water abstraction activities during project implementation have the potential to negatively affect downstream users. The use of water efficient technologies will therefore be promoted as one of the mitigation measures. Further, the project will install water resource monitoring system to optimally abstract the water resource while ensuring resources sustainability.

5.2.13 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. The guidelines provide a list of prescribed projects for which EIA is mandatory. They 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 MEPA for review and approval for all prescribed projects.

5.2.14 Environmental Impact Assessment 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 Malawi Environment Protection Authority (MEPA) in the Ministry responsible for Environment.

5.3 LEGAL FRAMEWORK

5.3.1 The Constitution of the Republic of Malawi (1995)

The Constitution of the Republic of Malawi is supreme over any legal policy or Act in Malawi. Any Act of Government or any law that is inconsistent with the provisions of the Constitution shall be invalid to the extent of such inconsistency (Section 5). Therefore, the reviewed policies, and legislations, relevant to the project, must be in line with the Constitution. The Constitution of the Republic of Malawi as amended in 2010 serves as the supreme laws from which all other policies, activities, legislations or laws draw their mandates and principles with full interest of safeguarding the fundamental rights of human beings in their totality. As such, the Constitution establishes systems and processes to govern these.

The Constitution warrants the welfare and development of all the people of Malawi. Section 13(e) stresses that one of the roles of the state is to enhance the quality of life in rural communities and to recognize rural standards of living as a key indicator of the success of government policies. In implementing this project, NRWB will have to ensure that the project does not leave rural people worse off, but rather improves their life, for example through employment opportunities and access to water where possible, including ensuring fair acquisition of land.

Section 13 (d) addresses the need 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. NRWB will therefore comply with the "section" by carrying out the Environmental and Social impact assessment and coming up with an Environmental Management Plan (ESMP). The ESIA at hand will have to consider all activities during all phases of the project, promote environmental protection and sustainable development of natural resources, including water and biological diversity resources. The Constitution in Section 28 (2) prohibits arbitrary deprivation of a person's property. NRWB will be required to acquire land in accordance with the provision of Section 44, which states that "expropriation of property shall be permissible only when done for a 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 for redress".

5.3.2 The Environment Management Act (EMA, 2017)

The Environment Management Act (EMA), as an overarching legislation for environmental management in Malawi, accords specific responsibilities to various sectoral authorities on matters pertaining to environmental planning and management. The Act requires the Director General of MEPA to ensure that, prior to implementation, all projects prescribed for environmental impact assessment shall undergo comprehensive assessment in order to enhance beneficial impacts and

mitigate adverse impacts. The Act also prescribes projects which require either ESIA and/or ESMP studies to form part of the implementation cycle. After screening, the project under review qualified for an ESIA study as provided for in Section 31 of Part VI in EMA, 2017.

5.3.3 Land Act (2016)

The Land Act of 2016 was enacted to provide for land administration and management in Malawi. The Act groups land into two categories, "private land" and "public land". Public land comprises 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."

If there will be any loss of land that does not belong to the NRWB, the provisions for the land acquisition, which includes fair compensation of PAPs, shall be adopted.

5.3.4 Land Acquisition Act (2017)

The Lands Acquisition Act provides procedures which have to be followed by developers when acquiring land of any tenure in the country. These procedures will be followed as provided under this Act. Section 3 of the Act provides for the payment of fair compensation on acquisition of land by compulsory or by agreement. The compensation can be paid as a lump sum or by instalments as has been provided in Section 9 of this Act. To ensure fair compensation, Section 9 provides that an assessment for compensation will have to be carried out taking into account the following aspects:

- a) The amount of money that the owner of the land paid when acquiring it;
- b) The value of the improvements on the land, standing crops and growing produce; and
- c) Appreciation in the value of the land since the date of acquisition.

The Act, in Section 5, provides that the owners of the land that is to be acquired should be given a notice of the intention to acquire their land which should be served on the people and also published in the Government gazette.

The project shall utilise pieces of land from two categories of land tenures, thus public land and customary land. The water treatment plant expansion shall be done within the land belong to public by Northern Region Water Board. All pieces of land identified for reservoir sites are hills and belong to category of public land. The project shall apply for land use permit from Government of Malawi, Ministry of Lands. The land identified for the rest of facilities are either bare idle land or

farming land that belong to category of customary land. The project shall engage the land owners for purchase of the land through and with guidance of Rumphi and Mzimba District Lands Offices.

To comply with the AfDB Operation Standard on involuntary resettlement, the project activities shall not displace anyone or communities to pave way for project. It, where possible, shall avoid to acquire private and customary lands already developed for example with permanent infrastructures by owners. In case of cultivated land, the project shall only negotiate and acquire part or small portion of the land for project infrastructure to ensure that their project affected person's continue to engage their agricultural activity on the remaining piece of the land. Besides the project shall ensure that people are compensated before start developing acquired land.

5.3.5 The Water Resources Act (2013)

The Water Resources Act of 2013 supersedes the 1969 Water Resources Act. It aims at improving on already existing water resources management efforts in the country. The Water Resources Authority under the Ministry of Water and Sanitation administers the Act. Two main requirements being advocated by the Act to promote sustainable water resources management in Malawi are:

- a) The need for any individual intending to abstract water, for purposes other than domestic use, to obtain a "Water Right" permit before abstracting surface water or groundwater from any source.
- b) The need for any individuals intending to discharge wastewater (effluent) into surface water ecosystems to obtain an "Effluent Discharge" permit for that intent. Some of the conditions governing the permits above include:
- c) Avoidance of monopolising or over-abstraction of a water resource by a Water Right holder, thereby denying other users the right to use the same water resource;
- d) The need to comply with discharge quality limits for effluent in accordance with applicable Malawi Standards or any relevant international standards.

The water supply project shall therefore adhere to these requirements by obtaining water rights for water abstraction and ensuring that water abstraction does not deprive other users their right to use the same resource.

5.3.6 Water Works Act (1995)

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

Part III, section 11 of the Act gives powers to the Northern Region Water Board to develop, construct and maintain all works as are necessary and convenient for the purpose of creating, maintaining and extending water supply. The proposed rehabilitation, upgrading and expansion works for the water supply system as well as the proposed sanitation works are therefore within the legal mandate of NRWB. Section 12 allows for carrying out construction works through any land whatsoever, provided that NRWB does not interfere with any existing buildings. Where the water works has to pass through or over any public, private or customary land, section 12 (2) requires NRWB to give notice, published in the Gazette, or in such other manner as the Minister or any other person authorised by him may direct, at least one month before the works begin. If the land owner objects, the Act allows him to write to the Minister who shall make a ruling, allowing or disallowing the construction works. Where the owner is not satisfied with the ruling, he may appeal to the high court. In the event the owner of land objects to the use of the land for water works, the project developer shall make sure that all disputes are settled before actual movement of affected persons and before land or related assets are taken. In accordance with the Act, NRWB shall also pay compensations for all loss or damage caused in the execution of its powers.

5.3.7 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 affected district Councils and ensuring that any by-laws set by the Council are followed throughout the project cycle.

5.3.8 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.

In compliance with the requirements of the Act, the Contractor for the construction works will develop an Occupational Safety, Health and Welfare Policy and program. Furthermore, according to Section 58 (Part VI) all workers for the construction works will be provided with appropriate

personal protective equipment (PPE) and these include work suits, industrial boots, hard helmets and gloves during the construction period.

In addition, the Contractor shall ensure that a well-stocked First Aid Box is made available at the construction site for use by workers as provided for under Section 33 (Part IV) of the Act. The First Aid Box shall be under the charge of a well-qualified person. In line with Part II, Section 6 of the Occupation Safety, Health and Welfare Act, the contractor shall register the construction camp as a 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 the developer to ensure that OSH requirements are adhered to at all times. This Act also promotes community/workers' health, safety and security. Therefore, the ESIA shall outline the interventions that will be required for implementation and monitoring during the lifespan of the project.

5.3.9 Forestry Act (Amendment) (2019)

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 smallholders farming systems; protect fragile areas such as steep slopes, river banks, water catchment and conserve and enhance biodiversity.

The Project has to comply with this Act in all areas where the project activities are planned to be implemented as to ensure environmental sustainability.

5.3.10 National Parks and Wildlife (Amendment) Act (2017)

The National Parks and Wildlife (Amendment) Act of 2017 was enacted to consolidate the laws relating to national parks and wildlife management; to establish the Wildlife Research and Management Board; and to provide for matters incidental to or connected therewith. The purposes of the Act are as follows:

- a) Conservation of selected examples of wildlife communities in Malawi.
- b) Protection of rare, endangered and endemic species of wild plants and animals.
- c) Conservation of wildlife throughout Malawi so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use, in order to support sustainable utilization of wildlife for the benefit of the people of Malawi.
- d) Control of dangerous vertebrate species.

- e) Control of import, export and re-export of wildlife species and specimens; and
- f) Implementation of relevant international treaties, agreements or any other arrangement to which Malawi or the Government is a party.

Some of the key provisions of the Act that are relevant to the current project include the following:

- a) Determining and assessing threatened species in order to develop measures to protect flora and fauna in the project areas. This has been addressed through the ESIA study.
- b) Managing the impacts on flora and fauna, through the mitigation of adverse impacts on local flora and fauna and reducing the opportunity for conflict with local animals. The Environmental and Social Management and Monitoring Plans developed through this study have provided measures for ensuring that the impacts are adequately managed.
- c) Promotion of local participation in the designing and implementing of protection objectives.
- d) The new Act gives the court powers to put serious wildlife criminals behind bars up to 30 years with no option of a fine.

The Client and the contractor for proposed project will, therefore, strictly adhere to this National Parks and Wildlife Act by ensuring that its workers do not violate any regulations in this Act during the implementation and operation of the project activities, and should also ensure that wildlife species of either plants and animals are protected and sustainably managed at all time.

5.3.11 The Physical Planning Act (2016)

This Act, administered by the Commissioner for Physical Planning, provides for regulation of development with respect to location, to ensure compatibility of land use over a project area. It promotes protection and sustainable utilization of natural resources through optimal use of land and related service infrastructure. The Act provides guidelines for physical development planning and development control and has provisions for environmental protection. It prescribes measures for approval of plans for any development. It also states that local councils must ensure that negative environmental impacts of projects are avoided or mitigated. The planning committees, under the local councils, use this provision as a condition for the granting of development planning permission. The Physical Planning Act also provides guidance on ensuring that the developer optimally utilizes and manages land resources and that the proposed development activities are compatible with the land use planning. In the current project, the developer will work with the respective district councils to obtain the appropriate development approvals for the project in line with the requirements of this Act

5.3.12 The Employment Act (1999)

The Employment Act of 1999 reinforces and regulates minimum standards of employment with the purpose of ensuring equity necessary for enhancing industrial peace, accelerated economic growth and social justice; and for matters connected therewith and incidental thereto. Relevant to the current project is the set minimum wage, fair labour practices, non-discrimination, equal remuneration, and prohibition of employment of children. When employing people for the implementation of the project activities, the developer will ensure that the provisions of this Act are complied with.

5.3.13 Public Health Act 1948, (Amended, 1992)

Public Health Act of 1948, as amended in 1992, amends and consolidates the law regarding the preservation of public health. Section 59 of the Act prohibits any person from causing nuisance on any land or premises owned or occupied by him. The developer should therefore not cause any nuisance during the construction and implementation of the project.

The Act under Part X requires developers to provide adequate sanitary and health facilities to avoid harmful effects of waste on public health. Further, section 82 prohibits persons from disposing of certain matters into public waters. The matters include petroleum spirit and any substance that may cause injury to public health. The developer will have to comply with the requirements of this Act by providing for waste disposal facilities in accordance with the anticipated volumes of waste. The developer will further have to comply with the relevant provisions of the Act which are aimed at the preservation of public health.

The Act, in Sections 79, 87 and 88 empowers local authorities to enforce the provision of sewage works for large scale development projects. Section 87 stipulates the need for properly designed drainage works for new buildings so as to carefully drain out storm water and sub soil from building sites and cartilage. Section 88 stipulates the requirements for separate toilets for both male and female persons in public buildings.

In order to comply with the requirements of the Act, the contractor ensure that adequate toilets for both men and women are provided during the construction phase of the project.

5.3.14 Monuments and Relics Act (1991)

The Act makes 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, prehistoric and other interests. The Act also provides for the declaration of protected monuments and relics and acquisition thereof by the Government and the acquisition by the Government of rights and trusteeship over monuments and relics and for the preservation thereof by agreement with the owners; and to provide for the listing of monuments and the registration of monuments and relics; and to provide 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; and to

establish an advisory council to advise the Minister on matters aforesaid; and to provide for matters connected therewith or incidental thereto.

During the construction of the water supply infrastructure, excavation activities have potential to expose some archaeological remains such as cultural artifacts such as pottery and stone tools. When that happens, these will be recorded and the Department of Museums and Monuments will be engaged. The Department will collect the remains for analysis at the Department of Museums and Monuments repository.

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.

5.3.15 The National Gender Equality Act (2013)

The Gender Equality Act of 2013 promotes gender equality, equal integration, influence, empowerment, dignity and opportunities for men and women in all functions of the society. It prohibits and provides redress for sex discrimination, harmful practices and sexual harassment. Part IV of the Act also provides quotas in terms of employment opportunities such that an appointing or recruiting authority in the public service shall appoint not less than 40% and no more than 60% of either sex in any department in the public service.

Therefore, when employing people for the implementation of the project activities, the Contractor and the Client will have to ensure that the provisions of this Act are complied with to ensure gender equality in all spheres of socio-economic development. It also emphasizes non-discrimination in labour practices and opportunities, including non-discrimination of physically challenged persons among the categories of vulnerable groups.

5.3.16 Public Road Act (2015)

The public Roads act (69:02) provides guidelines for classification for public roads, and designate widths for Road Reserve Boundaries (RRB). The act reserve widths of (a) for a main road, 60 metres; (b) for a secondary road, 36 metres; (c) for a district road, 36 metres; (d) for branch roads and estate roads, 18 metres. The act make provision for legally occupier or owners of land in a road reserve who suffers damage as a result of works carried out on such land by to be entitled to compensation in respect of such damage in accordance with Part II. Notwithstanding such consent, neither the person doing such act or thing nor any person who may acquire any interest in the land in question shall be entitled to compensation.

The proposed project therefore shall install water supply and sewage pipeline in the wayleaves of road reserve boundary as determined by the Public Roads Act. This will ensure that damages of people's property are minimised and, in some cases avoided. Despite the act does not allow compensation of loss of property of illegal occupier of Road Reserve Boundary, on social safeguard perspective, the project will still compensate for the loss or damage of people's property resulting from implementation of the project.

5.3.17 Public Health (Corona virus and Covid-19) Prevention, Containment and Management Rules of 2020

The regulation was crafted to curb the spread of the deadly COVID-19 virus. Some of the rules in the regulation include prevention measures such as social distancing, use of facial masks and sanitizers in public and workplaces. All these measures will be followed during all project phases with the Project employees and affected community members being continually reminded of the need to do so in order to reduce spread of infection. COVID-19 has negatively impacted socio-economic development with a risk of increase in poverty. Most affected are people in rural areas.

5.4 AFRICAN DEVELOPMENT BANK SAFEGUARD STANDARDS

African Development Bank (AfDB) promulgated Integrated Safeguard Standards (ISS) to be followed by borrowers in projects financed by the Bank. The ISS are aimed at fostering development in a socially inclusive and environmentally sustainable manner. The safeguards standards are a tool for identifying risks, lowering development costs and improving project sustainability, thus benefiting affected communities and helping to preserve the environment. The safeguards objectives are as follows:

- Avoid adverse impacts of projects on the environment and affected people, while maximising potential development benefits to the extent possible,
- Minimise, mitigate, and/ or compensate for adverse impacts on the environment and affected people when avoidance is not possible, and
- Help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

To meet the above-mentioned objectives, the AfDB ensures that development projects it finances comply with the operation safeguard standards:

• **Operational Safeguard 1**: Environmental and social assessment – This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements.

Upon screening of the project brief by the AfDB, the Rumphi Water Sanitation and service Improvement Project was classified as Category 1 project hence an ESIA and RAP have been developed.

• **Operational Safeguard 2:** Involuntary resettlement land acquisition, population displacement and compensation – This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement and incorporates a number of refinements designed to improve the operational effectiveness of those requirements.

To comply with this operational safeguard, the project ensured people in the project area will not be physically displaced. This will be achieved by utilising unoccupied public land spaces such as hills for water reservoirs. In instances where customary land is required, only bare land will be utilised. If the land is being used for farming, only part of the land will be acquired. The land acquisition and compensation will be negatotiated through PAPs engagement, and then compensated for. To that effect, the project developed a Resettlement Action Plan (RAP) to guide in compensation and mitigating losses that will occur due to project implementation

• **Operational Safeguard 3:** Biodiversity and ecosystem services – This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water resources management into operational requirements.

To comply with this safeguard, the project conducted a thorough ESIA for project which among other things assessed impact on project on biodiversity and ecosystems. The ESMP outlined mitigation measures to be implemented to ensure that the project activities do not have severe impact on biodiversity and ecosystems. Besides the project ensured no project site falls within wetlands, national parks or game reserves, natural forests which would damage natural habitats, risk endangered species and disturb ecosystems among other. To prevent possible marine life exposure to landfill leachate, the project proposed to construct the landfill at a site with nearest water surface resource at minimum distance of 3 km compared to another site option at distance of 150 meters from South Rukuru river.

• **Operational Safeguard 4:** Pollution prevention and control, hazardous materials and resource efficiency – This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.

To comply with the safeguard, the project ensured that the design promotes efficient resource utilisation and pollution prevention techniques. To prevent pollution, the project ensured that the landfill site is away from water resource and settlement. The landfill design also provided site drainage facilities and leachate lagoon to contain possible landfill pollutants within the site. On wastewater treatment, the project design provided maturation ponds to improve effluent quality before discharging into South Rukuru River. To enhance compliance to the operational safeguard, the project also developed subsidiary waste management plan, and pollution control and prevention plan to enhance the developed project ESMP to meet the safeguard standard.

• **Operational Safeguard 5:** Labour conditions, health and safety – This safeguard establishes the AfDB's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It also ensures greater harmonisation with most other multilateral development banks

Labour conditions, health and safety are very critical to implementation of the project in construction and operation phase. To comply with the safeguard, the project shall ensure that all contractors to be engaged on the project register and are certified by the Ministry of Labour. This will only happen upon satisfying all labour laws and conditions. The project will ensure gender balance when recruiting employees, no discrimination at work place and equal salary and wages for equal work. The project will also ensure no sexual exploitation and harassment at work place by developing Sexual Exploitation, Abuse and Harassment (SEA/SH) Management Plan. Similarly, the project will ensure health and safety of workers is adequately complied through training of workers, provision of Personal

Protective Equipment (PPEs). To proactively prepare, the project has developed Health and Safety Management Plan to ensure compliance to this safeguard.

5.4.1 Environmental Standards in Malawi

The Malawi Bureau of Standards and are listed in Table 24 and will be triggered during the construction and operation phase of the project.

Standard	Title	Year of implementation
MS 214:2013 (Second Revision)	Drinking Water – Specification	2013
MS 733:2005	Borehole and shallow well water quality - Specification	2005
MS 714:2005	Occupational Safety and Health Management Systems - Specification	2005
MS 533:2013 (Second Revision)	Industrial effluents – Tolerance limits for discharge into inland surface waters	2013
MS 719:2005	Hazardous Waste – Management, Classification and Disposal – Code of Practice	2005
MS 59:2002	Solid waste – handling, transportation and disposal – code of practice	2002
MS 730:2005	Solid waste disposal sites, guidelines for design	2005

 Table 24: Malawi Bureau of Standards

5.5 PERMITS AND LICENCES REQUIRED BY PROJECT PROPONENT

Regulations/ Standards/ Approvals	Description	Reference	Issuing Institution	Applicant
EIA certificate	The certificate will be provided after approval of the ESIA report	Environment Management Act, 2017 (Cap 60:02)	Malawi Environment Protection Authority (MEPA)	Developer
Workplace Registration Certificate	Every workplace is required to be registered and must commit to abide by all of the country's labour laws	Occupational Safety Health and Welfare Act (1997)	Ministry of Labour	Construction contractor
License to handle and store hazardous waste	Every establishment producing hazardous waste in their production line/ processes need to acquire a license for handling and storage of hazardous waste	The Environment Management Act (EMA, 2017)	MEPA	Construction contractor
Water Abstraction Rights	For water abstraction, it is a requirement for the project to obtain water abstraction rights	Water Resources Act (2013) (CAP 72.03)	National Water Resources Authority	Developer
Road cutting permit, permit for working in road reserves	The project plans to construct a water pipeline which will most likely need to cross roads or be laid in the road reserve boundary, this shall require permit form the Roads authority	Road Traffic Act (1998)	Roads Authority	Construction Contractor

Table 25: Permits and Licences

Regulations/ Standards/ Approvals	Description	Reference	Issuing Institution	Applicant
Development Planning Permission	The project is within the jurisdiction of the Rumphi and Mzimba District Councils, which will require to approve the designs and the plans for the proposed water supply infrastructure	Physical Planning Act (2016)	National/ District/ Local Commissioners and Planning Committees, Rumphi and Mzimba District Councils	Developer

5.6 INTERNATIONAL CONVENTIONS AND AGREEMENTS

Table 26 presents applicable international conventions and agreements ratified by the Malawi Government which are applicable to the water supply project.

International convention/ Agreement	Year of adoption	Objectives
The Kyoto Protocol on Climate Change	1997	To fight global warming by reducing greenhouse gas concentration in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system.
Dublin Principle- International Conference on Water and Development	1992	Summarises 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.
Agenda 21 UN Conference and Development	1992	Application of the integrated approaches to the development, management and use of water resources.

 Table 26: International Conventions and Agreements

International convention/ Agreement	Year of adoption	Objectives
International Plant Protection Convention	1997	Emphases cooperation and the exchange of information towards the objective of global harmonisation. In addition to describing national plant protection responsibilities, it also addresses important elements of international cooperation for the protection of plant health and establishment and use of international standards for phytosanitary measures.
African Convention on Conservation of Nature and Natural Resources	2017	Utilisation of natural resources
United Nations Framework Convention on Climate Change	1994	The United Nations Framework Convention on Climate Change established an international environmental treaty to combat "dangerous human interference with the climate system", in part by stabilizing greenhouse gas concentrations in the atmosphere
Montreal Protocol	1987	The Montreal Protocol on Substances that deplete the Ozone Layer is the landmark multilateral environmental agreement that regulates the production and consumption of nearly 100 manmade chemicals referred to as ozone depleting substances (ODS).
Basel convention	1989	The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics, as well as two types of wastes defined as "other wastes" – household waste and incinerator ash.

6 PUBLIC CONSULTATION

6.1 Introduction

Stakeholder consultations were done to get their input on various players relevant to the project. The consultations focused on the scope of the project and expected roles from the stakeholders. The consultations were held with the relevant agencies and government departments. District level stakeholders as well as local leaders and project beneficiary communities were also consulted. Consultations involved highlighting project activities and soliciting their views through open discussion forum, interviews and open dialogues with key informants with relevant expertise, and village meetings with community members

6.2 Objectives

The objective of the public consultations was as follows:

- 1) To inform targeted key stakeholders about the upcoming project,
- 2) To raise awareness to all project targeted localities in the district, including surrounding residents, and
- 3) To gather concerns, particularly from groups of people who would be directly affected by the project.

6.3 Consultation Methods

Stakeholders were consulted through introductory meetings, consultation meetings and household questionnaires. The details of stakeholder consultations are provided in appendix XII.

6.4 GOVERNMENT STAKEHOLDER

6.4.1 Ministries, Departments and Agencies

The NRWB identified institutions with high interest, power and authority for project consultations. Through this process, the project consulted Ministries of Lands, Housing & Urban Development and Labour, National Water Resources Authority, ESCOM and MEPA, and informed about the project, ESIA study, solicited their views and inputs about the project.

6.4.2 Consultation with Rumphi and M'mbelwa District Councils

The project will be implemented in Rumphi District and Parts of Mzimba North District. Due to this the two District Councils were consulted about the project to get input, feedback, concerns and their expectations.

6.4.3 District Environmental and Social Committee

The District Environment and Social committees for Mzimba and Rumphi Districts were engaged and consulted to hear environmental and social issues which the project should consider from design phase, and their technical input.

6.4.4 Communities and other Stakeholders Consultation

Northern Region Water Board and Rumphi District councils further consulted communities and other stakeholders of interest and influence on the proposed project to hear their reactions, concerns and expected outcome, and to get feedback that would provide critical information in the designing, preparation, construction and operation phases for the project to sustainably benefit the communities. The group of stakeholders consulted included:

6.4.4.1 Local Civil Society Organisation (CSO)

A number of Civil Society Organisation attended the project consultation meeting held at Rumphi District council chamber. The CSOs represented diverse interests and included representative from Light of Hope, Evangelical Association Malawi (EAM), Rumphi Resident Association (RRA), Youth Net and Counselling (YONECO), Federation of Disability Organizations in Malawi (FEDOMA), GOWLHA, Right Empowerment & Action Platform (REAP), Development Action for Marginalized Rural Areas (DAMRA), Matunkha Development Trust (MDT). The CSO attendance register is attached in appendix XII.

6.4.4.2 VDC and ADC Consultation

The Village Development Committees (VDC), Area Executive Committees (AEC), and Area Development Committee were consulted as they are entrants of development in the area. Several VDC, AEC and ADC committee meetings were conducted that included meeting with Chinyolo, Bumba, Kanyelere, Mwazisi, Bembe and Bolero committees.

6.4.4.3 Landfill Surrounding Communities

Area Development Committees, traditional leaders and community members from around proposed solid waste landfill site were consulted. The meeting attendance register is attached in appendix XII.

6.4.4.4 Wastewater Treatment Plant surrounding Community

Area Development Committees, traditional leaders and community members from surrounding proposed wastewater treatment plant site. Since the facility is proposed to be in Mzimba, both members from Mzimba and Rumphi side attended the consultation meeting. The meeting attendance register is attached in appendix XII.

6.4.4.5 Water User Association Meeting

Bolero trading centre water is supplied by Water User Association (WUA). The scheme faces many problems from water quality, technical to operation challenges that make it difficult to provide water to people. The Bolero WUA was consulted as one of key stakeholders.

6.4.4.6 Market Centres Committees and Child Based Organisation

Market centres are some of places to be affected positively by the project through improvement of water and sanitation services. To have better understanding of their challenges and input, several market committees were consulted. These included Bwengu, Phwezi, Thumbi, Bolero, Mumba market centre committees. The consultation also engaged members of Thumbi Child Based Organisation.



Figure 6-1: Meeting with (a) Paramount Chikulamayembe (b) Inkosi Jaravikuba



Figure 6-2: Meeting with (a) Mtwalo ADC (b) Bwengu ADC (c) Mwazisi ADC and AEC (d) Bwengu Market Leaders (e) Bembe ADC and Market Leaders (d) Bolero ADC, AEC, Market Leaders and WUA

6.4.5 Consultation Outcomes from Government Departments and Agencies

Stakeholders from the Ministries of Lands, Housing & Urban Development and Labour, National Water Resources Authority, ESCOM and MEPA were informed about the project, ESIA study and consulted regarding their views about the project. The stakeholders were informed that the consultant is at draft reporting stage. Table 27 below summarises outcomes of the consultations.

Table 27: Outcome of Consultation Meetings

	Department/	Agency	Outcome
1	Timothy	Mwale-	The Commissioner reviewed the project area through the map
	Regional	Lands	provided and indicated that the department will provide any
	Commissione	er	support that will be required during project implementation.
	0993947852		

	Department/ Agency	Outcome
2	Mr. Msukwa- Deputy Labour Commissioner 0999315139	The deputy commissioner indicated that it is important that the Head office be kept in the loop since policy issues on occupational health and safety are formulated at the Ministry of Labour while district offices are the implementers. They look forward to receiving more information on the project.
	Mrs. V. Linyama- Deputy Regional Labour Office (Northern Region) 0999391224	The officer reviewed the project area through the map provided and indicated that the department will provide any support that will be required during project implementation.
3	Mr. P. Banda- National Water	NWRA indicated that they need to be informed of the current and proposed water abstraction figures.
	Resources Authority (NWRA) 0999333069	The Authority also indicated that NRWB needs to apply for new licenses for the proposed water abstraction. The NWRA indicated that they are interested to know the results of the assessments done on the effect on the upstream and downstream communities. NRWB should obtain licenses if they are extracting using boreholes. It was explained to him that the intake is on a river, the same that is currently being used. The new intake will be at a higher elevation.
4	George Matukuta- ESCOM 0888721117	Indicated that they are in support of the project and committed to provide more feedback if there is further need.
5	Katambo- EAD/MEPA 0999346466	Acknowledged about the project information and approved the terms of reference for the ESIA study. MEPA through the Advisory Committee on Environment and Social Assessment (ACESA) will review the ESIA report.

6.4.6 Consultation Outcomes Community and Stakeholder Areas of Interest

6.4.6.1 Compensation for crops and other assets

All assets to be affected will be compensated for according to the laws of Malawi and AfDB operational safeguards before commencement of the project. The assets will be valued to determine how much they should be compensated for. The valuation will be based on full replacement value of the assets.

6.4.6.2 Land acquisition and Resettlement

The project will try to be implemented within existing public land. For pipeline routes, people will be allowed to grow their crops and install temporary hawker stalls, but these assets will not be compensated for again. However, where the land required is private or customary, acquisition through negotiation and engagement will be applied.

6.4.6.3 Access to water

The project target targets Rumphi and surrounding areas. As much as it is practicable, all the people within the project area are expected to benefit from the improved water supply services.

6.4.6.4 Gender based violence and SEAH

There will be sensitisation of the communities and project workers on prevention of GBV/SEAH. Grievance redress mechanisms for reporting and resolving grievances will developed and implemented.

6.4.6.5 Waste Management

Schools will be provided with waste bins that will be procured under the project.

6.4.6.6 Conservation of forestry resources and livelihood enhancement

The project will implement activities to improve forest cover in the water catchment area. Some fruit seedlings will be provided to the communities to support their livelihood requirements.

6.4.6.7 Employment issues

All contractors will ensure that some of the workers are employed from within the project area. All work-related disputes will be handled by the District Labour office.

6.4.6.8 Water connection procedure

People who are willing to be connected to water supply will apply for a connection as per NRWB standard procedure and pay the connection fees. However, the connection procedure for Communal Water Points and free new water connection policy is slightly different.

6.4.6.9 Relationship between WUA and NRWB

The areas under the project implementation have been gazetted as areas of supply for NRWB. However, a working arrangement between NRWB and WUA will be established in order to facilitate handover and also to make sure that the WUA's don't phase out.

6.4.6.10 School Sanitation

The schools to benefit from the improved pit latrines will be identified by the District Councils through the office of District Education Manager.

6.4.6.11 Free Water Connection

There will be no free water connection. However, the government has a policy to provide free water connection to those meeting the set criteria for free water connection.

6.4.6.12 Sustainability of Toilet facilities at Mzokoto

NRWB will only construct the toilet facilities at Mzokoto, the operations of the facilities will be handled by the district council.

6.4.6.13 Operation of Communal water points

The communal water points will be operated by the communities themselves through communal water points committee or Water Users Association

6.4.6.14 Grievance Redress Mechanism

The grievance redress mechanism will be implemented through Grievance Redress Committees. Where there are existing GRM committees they will be strengthened through training. For areas where there are no established committees, these will be established and trained.

6.4.6.15 Project Commencement and duration

The project is expected to commence in August 2023 and is expected to be implemented in 4 years.

6.4.6.16 Water Connection Subsidy for Government Institutions

There will be no subsidy for Government institutions. This is because connection subsidies aim to support the low income and vulnerable communities to promote access to safe water.

6.4.6.17 Project negative impacts mitigation measures

The project will prepare an Environmental and Social Impact Management Plan (ESMP) to mitigate the negative impacts of the project activities.

6.4.6.18 Payment and Water Tariff system

Communities were told that water shall not be free, and to use different tariff customer categories including category C for communal water point.

6.4.6.19 Water connection modalities

Water connection shall be both paid and government free water connection based on distance to connection main line.

6.4.6.20 Integration of WUA and working framework with NRWB

NRWB is exploring different working arrangement including extending them to be WUA for NRWB as it is the case in other schemes and Mzuzu.

6.4.6.21 Alternative Sources of electricity

NRWB shall install solar power system to generate power where critical infrastructure shall be installed.

6.4.6.22 Stakeholders Vandalism of pipes and theft project material

Communities wanted to know measures project has put in place to avoid cases of vandalism and theft of materials; and will deploy guards to different projects site to protect project material.

6.4.6.23 Water supply -sewage Contamination.

The main water pipes shall be installed on different sides of road, and at different trench depth, where water supply shall be on top sewer line where possible.

6.4.6.24 South Rukuru Pollution due Poor Wastewater facility management, and Rukuru river is a source of drinking water for people in Lumemo.

Communities were told drinking water lines shall reach Lumemo, Vongo, and beyond Chilanganombo school end. In addition, NRWB would ensure efficient operation of the system to prevent pollution of the river.

6.4.6.25 Fear of smell in the surrounding areas

On smell and odours fears, the treatment plant shall have well trained personnel to properly manage the facility to avoid cases of treatment failure; it shall also promote planting of trees in surrounding areas to aid in air purification and re-circulation, despite install air monitoring system. The selected site is also not in path of wind direction.

6.4.6.26 The water coming from the last stage of wastewater treatment facility can be diverted to agriculture

On use of sewage effluent, communities and stakeholders were told that effluent shall be discharged in South Rukuru river where it can be used for agriculture.

6.4.6.27 Pit latrine designs

The project shall promote construction of VIP which are good for emptying when full. and surrounding areas. NRWB noted about the need to take care of pipelines to avoid pollution and contamination.

6.4.6.28 The facility fencing

The landfill design has provision for construction of cement blocks perimeter fence to control scavenging and solid waste refuse.

6.4.6.29 Air pollution

On air pollution, smell and odours, the facility shall also promote planting of trees in surrounding areas to aid in air purification and re-circulation, while ensuring that organic waste are properly sorted and managed on time.

6.4.6.30 Buffer zone establishment and Additional landfill land acquisition

On Buffer zone establishment and additional land acquisition, it will be considered and to engage landowners if would allow releasing additional land.

6.4.6.31 Consider bringing electricity to the area around the solid waste facility

The facility shall have electricity to power administration building and some equipment, therefore electricity shall reach the place.

The additional stakeholder and communities consultation issues and concerns, and their responses are attached in the appendix XII.

6.5 STAKEHOLDER ANALYSIS

During the process several stakeholders were identified and they can be grouped into the following categories:

6.5.1 Direct Beneficiaries:

These are the ones whom the project targets based on the justification as articulated in the project document. They include individual households and business persons in the project area who will benefit from the water supply and waste management services, local community members who will benefit from employment opportunities during the implementation of the project. It also includes institutions who will benefit from the water supply and waste management services, such
as the hospital and prison at Rumphi town. These stakeholders should be engaged during the design and construction phases to ensure that there is buy in and cooperation on the project.

Women are a special sub-category in the sense that they are mostly the ones responsible for collecting water in the households. During public consultations, it was very clear from the women that they welcome the project because they are tired of having to fetch unsafe water which is far from their homesteads and also unreliable and erratic in supply when sourced from Water Users Association (WUAs) infrastructure. There is a lot of goodwill towards the project from the women because of this.

Another set of direct beneficiaries are the travellers who will be using the Stopover to be constructed at Phwezi/Mzokoto. They will benefit from clean ablution services.

During the construction phase of the project, there will be opportunities for employment for the local people, starting from the construction of the new intake, to digging of trenches for the water supply network and construction of water tanks, offices, booster pump housing and to the traveller's stopover. The local community members will therefore be an important stakeholder in this. During consultations, they expressed interest in gaining from employment and requested that locals should be employed rather than bringing in people from other areas.

6.5.2 Project Affected Persons (PAPs):

These include those people whose assets or properties will be affected by the project directly because they are located either in the route of the water supply or sewer pipelines or an office or booster pump housing will be constructed on their land. At the time of the study, NRWB had mapped out all routes for the water supply network and associated infrastructure including the sites for construction of offices and tanks. NRWB has the completed the identification and acquired land based on the preliminary designs. In addition, a Resettlement Action Plan (RAP) has been prepared to assess likely impacts, outline procedures of compensation for loses by Project Affected Persons (PAPs). The document also provides institutional arrangements for RAP implementation, implementation mechanisms and schedules as well as processes designed for grievance redress, monitoring and evaluation. The RAP was prepared in line with AfDB Involuntary Resettlement Policy (2013), AfDB Integrated Safeguards Systems - Operational safeguard number 2, and laws of Malawi.

For the water supply network and sewer network, the NRWB would keep them within the road reserve boundaries (RRB), which is public land. However, there are risks that in some of the areas, the RRB is not very clear because the road may not be gazetted, especially the feeder roads at Rumphi Boma. In such cases, the NRWB may have to negotiate with the PAPs and compensate according to the laws of Malawi and in compliance with AfDB environmental and social standards (OS 2). In cases where the road is gazetted, like the M1 from Enukweni to Phwezi, and from Bwengu to Mwazisi Turnoff, the compensation will also have to consider the fact that there is an

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RR for utilities. In addition, these two roads are going to be rehabilitated shortly. For the Enukweni to Phwezi road section, compensations have already been made by the Roads Authority. The NRWB will therefore not compensate for the same road. Similarly, the Rumphi to Mwazisi turn-off section of the road is likely to be compensated for by the Roads Authority hence the NRWB has to liaise with the Roads Authority on these matters. During the stakeholder consultations sessions, these issues were explained to the potential PAPs, particularly through the business and market leaders because they are the ones whose structures are located close to the roads.

These stakeholders were targeted during the consultations. The NRWB needs to keep them closely informed and engaged throughout the process because they are also very likely to be customers to access water supply. However, they may also derail the project if they are not handled well during the construction phase.

Those PAPs whose gardens or other assets will be affected through acquisition will also need to be well managed throughout the design and construction phase. There are possibilities of abnormally high expectations in terms of land valuation. The NRWB should therefore ensure that the PAPs in this category are well managed. Construction on the sites should start only when all parties agree on the said transactions, including the District Councils.

6.5.3 Partners to the implementing agency (NRWB):

The NRWB will implement this project with the support of several partners including the financiers of the project and the district councils of M'mbelwa and Rumphi. The departments that will be partnering with the NRWB at the district councils include: Water, Planning and Development, Lands, Education, Prisons and Health. In addition, various (Non-Governmental Organisations (NGOs) and Civil Society Organisations (CSOs) who are interested in water and sanitation in the two districts.

Another set of partners are the local level representatives who are in the various local governance structures such as the ADCs and Business and Market Leaders. These are important to keep engaged throughout the project because they represent the people.

Due to the fact that the water supply network will be within the road reserve, the Roads Authority and District Councils will be another set of partners that the NRWB need to work with.

6.5.4 Perceived competitors to the implementing agency (NRWB)

Rumphi district is one of the districts in this country that has for a very long time enjoyed rural water supply through the gravity-fed water supply by the Water Department. Further to this, Rumphi District has empowered communities to establish local level water governance structures known as Water Users Associations (WUAs) who are responsible for managing the water supply. Communities pay a fixed monthly fee to access the water either at a communal water point or at

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individual households. The proposed project will be implemented in an area where the Nkhamanga Water Users Association operates. To this end, the WUA Committee members are apprehensive, particularly on the role that they will play in the water supply arena. Specifically, the WUA views NRWB as a competitor and has been pressing the NRWB to clearly stipulate how they will be working in the water supply arena, considering that this is the WUA's territory so to say. The areas within which the WUA's operate are within the NRWB's gazetted supply area. The WUA's will be taken over. However, the NRWB is exploring the best possible working arrangement to integrate the WUA into communal water seller association just like in other cities and towns.

The Community members were of the view that the water from NRWB will be cleaner and safer hence they expressed willingness to pay higher amounts than what is currently charged by the WUAs. The WUA does not treat the water that it supplies to the community members. In addition, due to challenges with the water supply system, despite recent project support to improve supply, the water is only available a few days in a month and only in the early hours of the morning. This puts the WUAs at a disadvantage compared to the NRWB.

The NRWB should therefore aim to address this stakeholder during the design phase in order to clarify the working relationship because this is the stakeholder that is most likely to affect the social contract that the NRWB will have to operate in the area. During construction and implementation, this stakeholder should be closely managed to ensure that there are no challenges emanating from loss of trust.

7 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

This chapter presents analysis of positive and negative impacts of various components of the project on the climate, soils, geology, topography, air, noise, water resources, sanitation, biological, social and economic status of the people. The assessment is presented for the preconstruction, construction and operational phases. Appropriate mitigation measures to prevent, minimise, mitigate or compensate for adverse environmental and/or social impacts are proposed. The impacts in this chapter are presented according to the following categories: Environmental impacts, Occupational Health and Safety (OHS) impacts, Community Health and Safety (CHS) impacts and social impacts.

The assessment will be based on the key activities listed below which are explained in detail in Chapter 2.

- Construction of Intake Weir
- Upgrading of the water treatment plant
- Construction of pumping stations and installation of pump sets
- Upgrading of Transmission System Covering Pumps, Pipelines and Installation of Solar Power
- Design and Installation of Solar Power
- Construction of Storage Tanks
- Upgrading and Expansion of the Distribution Pipe Network
- Construction of sanitary landfill and associated solid waste management facilities
- Construction wastewater treatment plant and provision of associated liquid water management equipment
- Installation of sewer network
- Water Resources Monitoring
- Climate Change Adaptation and Mitigation

7.1 METHODOLOGY

After document review and field surveys were conducted, the data collected was analysed and draft and final reports produced. The results of the analysis show that the project is expected to cause environmental stresses of various magnitudes, importance, probability and duration which could be exerted at different phases of the project. The ESIA has made predictions and analysed the impacts to determine the extent of change likely to be brought about by the project.

The impacts are described on a scale of Low Medium and High. The impacts will be analysed using the 3-step method (Figure 7-1).

The overall analysis of impacts using the 3-step procedure, is based on standard EIA approaches shown in Figure 7-1. The advantage of this method is that it is simple and allows for a systematic approach to impact assessment.



Figure 7-1: 3-Step procedure of Environmental Impact Analysis

Step 1: Involves the description of baseline situation and where possible ascribing a value (low, medium, high) to the project area (s) according to a set of environmental and social criteria and magnitude of the impact.

The environmental criteria to be used to determine the value of the environments are:

- conservation value of species,
- biodiversity values and
- ecological function of species and habitats.

The environmental value of the species will be based on whether it is listed in the IUCN Red data book or in the Malawi Gazette supplement of 2017, which provides species which are protected, endangered and listed (Government Notice No. 70).

The social criteria will use the following criteria:

- Availability & dependency on natural resources
- Ability to cope with natural hazards
- Socio-economic status

- Public health situation
- Capacity to adjust to cultural changes
- Local infrastructure & public institutions capacity in determining the magnitude of the impact the consultant will look at the:
- Size of affected area
- Number of people displaced (magnitude of socio-economic impacts only)
- Duration and reversibility of effect
- Probability of the impact arising

Step 2 is an assessment of the **magnitude of project impacts** according to another set of criteria (e.g., duration, extent, reversibility etc.). During this step the analysis of impacts will focus on the source of impacts, extent, magnitude, duration, significance, probability and confidence. The assessment of environmental impacts will be done at all stages of the project i.e. pre-construction, construction and operational. For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) will be described. These criteria will be used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. Table 28 shows the scale that will be used to assess these variables and define each of the rating categories.

CRITERIA	CATEGORY	DESCRIPTION					
Extent or spatial	Regional	Beyond a 10 km of the site boundary					
influence of	Local	Within a 10 km of the site boundary					
impact	Site specific	On site or within 10 m of linear					
		infrastructure corridors					
Magnitude of impact	Large	Natural and/ or social functions and/ or					
(at the indicated		processes are severely altered					
spatial scale)	Medium	Natural and/ or social functions and/ or					
		processes are notably altered					
	Minimal or None	Natural and/ or social functions and/ or					
		processes are slightly altered or					
		remain unaltered					
Duration of impact	Short Term	Up to 5 years					
	(Construction						
	period)						
	Medium Term	0-10 years after construction					
	Long Term	More than 10 years after construction					

Table 28: Assessment Criteria for the Evaluation of Impacts

The SIGNIFICANCE of an impact was derived by considering the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in Table 29.

Significance Ratings	Level of Criteria Required
High	• High magnitude with a regional extent and long-term duration
	• High magnitude with either a regional extent and medium-term duration or a local extent and long-term duration
	• Medium magnitude with a regional extent and long-term duration
Medium	 High magnitude with a local extent and medium-term duration High magnitude with a regional extent and construction period or a site-specific extent and long-term duration
	• High magnitude with either a local extent and construction period duration or a site-specific extent and medium-term duration
	• Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term
	• Low magnitude with a regional extent and long-term duration
Low	• High magnitude with a site-specific extent and construction period duration
	• Medium magnitude with a site-specific extent and construction period duration
	• Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term
	• Very low magnitude with a regional extent and long-term duration
Very low	• Low magnitude with a site-specific extent and construction period duration
	• Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

 Table 29: Definition of significance ratings

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact will be determined, using

the rating systems outlined in Tables 30 and 31 respectively. It is important to note that the significance of an impact shall always be considered in concert with the probability of that impact occurring.

PROBABILITY	RATINGS CRITERIA
Definite	Estimated greater than 99 % chance of the impact occurring.
Highly probable	Estimated 80 to 99 % chance of the impact occurring.
Probable	Estimated 20 to 80 % chance of the impact occurring.
Possible	Estimated 1 to 20 % chance of the impact occurring.
Unlikely	Estimated less than 1 % chance of the impact occurring.

Table 30: Definition of probability ratings

Table 31: Definition of Confidence Ratings

CONFIDENCE	RATINGS CRITERIA
Certain	Wealth of information on and sound understanding of the environmental
	factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound
	understanding of the environmental factors potentially influencing
	the impact.
Unsure	Limited useful information on and understanding of the environmental
	factors potentially influencing this impact.

In Step 3, Magnitude of impacts is combined with Environmental Value in order to arrive at an Overall Impact Assessment.

7.2 ASSESSMENT OF PROJECT INTERACTION WITH RECEPTORS

The activities of the proposed project are classified in four (4) phases, namely planning and preconstruction, construction, operation and decommissioning phases as detailed in chapter 2. A summary of the activities in each phase is provided below:

Planning and Pre-construction Phase

- 1. Community sensitisation
- 2. Topographic surveys
- 3. Field reconnaissance
- 4. Stakeholder consultations & Socio-economic study
- 5. ESIA Field studies

- 6. Identification of impacted property
- 7. Preparation and Tendering of the project construction work.

Construction phase

- 1. Construction of an intake weir on South Rumphi River and installation of gravity main raw water pipeline.
- 2. Increase the capacity of the treatment plant for Rumphi will be increased from the current $1,500 \text{ m}^3/\text{day}$ to $19,415 \text{ m}^3/\text{day}$
- 3. Construction of pumping stations and installation of clear water pumps to convey water to Jaghala, Bolero, Luviri, Mwazisi, Kacheche and Thumbi reservoirs
- 4. Installation of pumping mains and transmission mains to Jaghala, Bolero, Luviri, Mwazisi, Thumbi and Kacheche reservoirs
- 5. Design and Installation of Solar Power System
- 6. Increase water storage capacity by construction of reservoirs/storage tanks at Rumphi Treatment Plant, Jaghala, Bolero, Luviri, Mwazisi, Kacheche and Thumbi
- 7. Upgrading and Expansion of the Distribution Pipe Network in proposed areas in Rumphi and Mzimba
- 8. Sanitation and hygiene improvement in selected schools
- 9. Construction of solid waste management facilities
- 10. Construction of wastewater management facilities

Operational Phase

- 1. Catchment management interventions
- 2. Installation of water resources monitoring system
- 3. Implementation of climate change adaptation and mitigation activities/interventions

Decommissioning Phase

- 1. Removal of batteries and recycling.
- 2. Installation of geotextile layer, sealing layer and drainage layer.
- 3. Installation of gas collection system
- 4. Aftercare and monitoring of leachate, gas and groundwater.

The interactions between project activities and environmental and social receptors were assessed. Based on the assessment, geology, soil and topography, climate, water quality, plants, birds, invertebrates and reptiles belong to the Environmental category whilst social disruption and livelihoods, jobs & income belong to Social category. Health & safety, noise, air quality and sanitation belong to Community Health; Safety and Occupational Health & Safety belong to Occupation Health & Safety category. The project activities will lead to both positive and negative impacts which are indicated as (+) and (-) respectively.

The Leopold Matrices in tables 33 to 35 were used to show the potential impacts anticipated during the proposed project. The key to the matrices is provided in Table 32 below.

Nature a	nd magnitude matrix	Duration a	and reversibility matrix
+	Positive impact	LT	Long term
-	Negative impact	MT	Medium term
VL	Very large	ST	Short term
L	Large	r	reversible
М	Medium	ir	irreversible
S	Small		
N	No or insignificant impact		

 Table 32: Key to the matrices

7.2.1 Impacts During Planning and pre-construction phase

Table 33 shows interaction matrices between the different project activities during planning and pre-construction phases and associated impacts on different aspects of the environment. Further the tables indicated the nature, magnitude, duration and reversibility of these impacts.

		Environ	mental		Social		S							
	ENVIRONMENTAL	Geology	Climate	Water	Plants	Bi	Inv	Repti	F	Gr	Su	Social	Livel	Sanitat
	PARAMETER	/Soil/To		quality		rd	erte	les/A	i	ou	rfa	disrupti	ihood	ion
		pograph				s	brat	mphi	s	nd	ce	on	s	
	PROJECT	У					es	bians	h	wa	wa			
	ACTIVITIES							/		ter	ter			
								Mam						
								mals						
								mala						
		N	N	N	N	N	N	niais NI	N	N	N	N	N	N
1.	Community sensitisation	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
	T 1:	-S	N	N	Ν	N	Ν	N	Ν	Ν	N	N	Ν	Ν
2.	Topographic surveys	ST r												
	Field reconnaissance	N	N	Ν	N	N	N	N	N	Ν	N	N	N	N
3.	Theid reconnaissance													
	Stakeholder	N	N	N	N	N	N	N	Ν	Ν	N	N	Ν	N
4.	consultations & Socio-													
	economic study													
		N	N	Ν	N	-S	-S	-S	Ν	Ν	N	N	N	N
5.	ESIA Field studies					ST r	STr	STr						
	Identification of	N	N	N	N	N	N	N	Ν	N	N	-S	N	N
6.	impacted property											ST r		
	Preparation and	Ν	N	N	Ν	N	N	N	Ν	Ν	N	Ν	Ν	Ν
7.	Tendering of the project													
	construction work.													

Table 33: Leopold Matrix for nature, magnitude, duration and reversibility of impacts in the planning and pre-construction phase

7.2.2 Impacts During Construction phase

Table 34 show interaction matrices between the different project activities during the construction phase and associated impacts on different aspects of the environment. Further the table indicates the nature, magnitude, duration and reversibility of these impacts.

Table 34: Leopold Matrix for nature, magnitude, duration and reversibility of impacts in the construction phase includingancillary works

		Environ	Environmental											S
		Geol	Cl	W	Pla	В	Inv	Reptiles/	F	Gro	S	Social	Liv	Sanitation
	ENVIRONMENTAL	ogy/	im	ate	nts	ir	ert	Amphibi	i	und	ur	disrupt	eli	
		Soil	at	r		d	ebr	ans/	s	wat	fa	ion	ho	
	PARAMETER		e	qu		s	ate	Mammal	h	er	ce		ods	
				alıt			S	S			w			
	PROJECT			У							at			
	ACTIVITIES										er			
1	Construction of an	-S	Ν	-S	-S	-S	-S	-S	- S	N	-S	+S	+STr	-S
	intake weir on South	ST r		MTr	MT r	ST r	ST r	ST r	ST		MTr	Т		ST r
	Rumphi River and								r					
	installation of gravity													
	main raw water													
	pipeline.													
2	Increase the capacity	-M	N	Ν	N	Ν	Ν	N	Ν	Ν	-S	-STr	+ST	-S
	of the treatment plant	ST r									MTr			ST r
	for Rumphi will be													
	increased from the													
	current 1,500 m ³ /day													
	to 19,415 m ³ /day													
3	Construction of	-M	N	N	-S	-S	-S	-S	N	N	-S	-STr	+ST	-S
-	pumping stations and	ST r			ST r	ST r	ST r	ST r			MTr	~		ST r
	installation of clear													
	water pumps to													
	convey water to													
	Jaghala. Bolero.													
	Luviri, Mwazisi.													

		Environ				Soci	al	S						
	ENVIRONMENTAL	Geol ogy/ Soil	Cl im at	W ate r	Pla nts	B ir d	Inv ert ebr	Reptiles/ Amphibi ans/	F i s	Gro und wat	S ur fa	Social disrupt ion	Liv eli ho	Sanitation
	PARAMETER PROJECT ACTIVITIES		e	qu alit y		S	ate s	Mammal s	h	er	ce w at er		ods	
	Kacheche and Thumbi reservoirs													
4	Installation of pumping mains and transmission mains to Jaghala, Bolero, Luviri, Mwazisi, Thumbi and Kacheche reservoirs	-M ST r	Ν	N	N	-S ST r	-S ST r	-S ST r	N	N	-S MTr	-MTr	+MTr	-S ST r
5	Design and Installation of Solar Power System	N	Ν	N	N	N	Ν	N	N	N	-S MTr	-MTr	+MTr	-S ST r
6	Increase water storage capacity by construction of reservoirs/storage tanks at Rumphi Treatment Plant, Jaghala, Bolero, Luviri, Mwazisi, Kacheche and Thumbi	-M ST r	N	N	-S ST r	-S ST r	-S ST r	-S ST r	N	N	-S MTr	-MTr	-MTr	-S ST r
7	Upgrading and Expansion of the	-S ST r	N	N	-S ST r	-S ST r	-S ST r	-S ST r	-S	N	-S MTr	-MTr	+MTi r	-S ST r

		Environmental											al	S
		Geol	Cl	W	Pla	В	Inv	Reptiles/	F	Gro	S	Social	Liv	Sanitation
	ENVIRONMENTAL	ogy/	im	ate	nts	ir	ert	Amphibi	i	und	ur	disrupt	eli	
		Soil	at	r		d	ebr	ans/	S	wat	fa	ion	ho	
	PARAMETER		e	qu		S	ate	Mammal	h	er	ce		ods	
				alıt			S	S			w			
	PROJECT			У							at			
	ACTIVITIES										CI			
	Distribution Pipe								ST					
	Network in proposed								r					
	areas in Rumphi and													
	Mzimba													
8	Sanitation and	S	N	N	N	N	N	N	N	N	S	N	N	S
0	hygiene improvement	ST r	14	19	14	14	11	14	14	14	-5 MTr	11	14	ST r
	in selected schools	511									10111			511
	In sciected schools													
9	Construction of solid	-S	Ν	N	-S	-S	-S	-S	-S	N	-S	Ν	Ν	-S
	waste sanitary landfill	ST r			ST r	ST r	ST r	ST r	ST		MTr			ST r
	and associated								r					
	facilities													
10	Construction of	c	N	N	S	c	S	c	c	N	c	N	N	S
10	westewater treatment	-5 8T #	19	11	-5 8 T #	-5 -7	-5 8T #		-5 6T	1	-5 MTr	IN	19	-5 9 T #
	and associated	511			511	511	511	511	51 r		10111			511
	facilities								1					
	lacinues													
11	Water Resources	Ν	-S	+ LT	Ν	Ν	Ν	Ν	Ν	N	Ν	Ν	Ν	N
	Monitoring		ST	r										
			r											
12	Climate Change	N	N	+ LT	Ν	Ν	N	Ν	+	+ LT	+	Ν	+ LT	N
	Adaptation and			r					LT	r	LT r		r	
	Mitigation								r					

7.2.3 Impacts During Operation phase

Table 35 shows interaction matrices between the different project activities during operation phase and associated impacts on different aspects of the environment. Further the table indicates the nature, magnitude, duration and reversibility of these impacts.

		Envir	onme	ntal									Social	S
		Ge	С	Wa	Pl	В	In	Reptil	F	Gr	Sur	Socia	Livelihood	Sanitation
		olo	li	ter	an	ir	ve	es/Am	i	ou	fac	1	s	
	PROJECT	gy/	m	qua	ts	ds	rte	phibia	S	nd	e	disru		
	ACTIVITIES	Soi	а	lity			br	ns/	h	wa	wa	ption		
		1	t				at	Mam		ter	ter			
			e				es	mals						
1	Catchment	-S	+L	+L	-S	-S	-S	-S	-S	+S	+L	N	+MTr	N
	management	ST r	LTr	LTr	STr	STr	ST r	ST r	ST	LT	LTr			
	interventions								r					
		Ŋ	ŊŢ	ŊŢ		Ŋ	Ŋ	Ŋ	N	Ŋ	Ŋ	N	N	N
2	Water	N	N	Ν	N	N	N	N	N	N	N	N	N	N
	Resources													
	Monitoring													
3	Climate	N	+L	+S	N	N	N	N	N	+S	+S	N	N	N
	Change		LTr	LTr						LT	LTr			
	Adaptation and													
	Mitigation													
4	Operation of	N	Ν	+ LT	N	N	Ν	Ν	+	+ LT	+ LT	-S	+ LT r	+L
	solid waste								LT				-S	LT r
	management								r				ST r	
	facilities								-S					
	(including the								ST					
	basic sanitary								r					
	landfill,													

Table 35: Leopold Matrix for nature, magnitude, duration and reversibility of impacts in the operation phase

		Envir	onme	ntal		Social	S							
		Ge	C	Wa	Pl	В	In	Reptil	F	Gr	Sur	Socia	Livelihood	Sanitation
		olo	li	ter	an	ir	ve	es/Am	i	ou	fac	1	s	
	PROJECT	gy/	m	qua	ts	ds	rte	phibia	S	nd	e	disru		
	ACTIVITIES	Soi	а	lity			br	ns/	h	wa	wa	ption		
		1	t				at	Mam		ter	ter			
			e				es	mals						
	temporary waste													
	holding sheds													
	and waste													
	collection points)													
5	Operation of	-S	Ν	Ν	Ν	Ν	Ν	Ν			+ L		+ LT r	+L
	wastewater	ST r												LT r
	emptying and													
	sludge													
	transportation													
	system to sludge													
	treatment facility													
6	Operation of	N	N		N	N	N	Ν						+L
	wastewater													LT r
	management													
	facilities													
7	Operation of	-S	Ν		N	N	N	Ν						+L
	improved	ST r												LT r
	sanitation													
	facilities for													
	public													
	institutions													
	(schools and													
	healthcare													
	facilities and													
	markets)													

			Envir	onme	ntal									Social	S
			Ge	С	Wa	Pl	В	In	Reptil	F	Gr	Sur	Socia	Livelihood	Sanitation
			olo	li	ter	an	ir	ve	es/Am	i	ou	fac	1	S	
	PROJECT		gy/	m	qua	ts	ds	rte	phibia	S	nd	e	disru		
	ACTIVITIES		Soi	а	lity			br	ns/	h	wa	wa	ption		
			1	t				at	Mam		ter	ter			
				e				es	mals						
8	Operation	of	Ν			N	N	N	Ν						+M
	commuter														MT r
	facilities														

7.2.4 Impacts During Decommissioning phase

Table 36 shows interaction matrices between the different project activities during decomissioning phase and associated impacts on different aspects of the environment. Further the table indicates the nature, magnitude, duration and reversibility of these impacts.

		Envir	onme	ntal									Social	S
		Ge	С	Wa	Pl	В	In	Reptil	F	Gr	Sur	Socia	Livelihood	Sanitation
		olo	li	ter	an	ir	ve	es/Am	i	ou	fac	1	S	
	PROJECT	gy/	m	qua	ts	ds	rte	phibia	S	nd	e	disru		
	ACTIVITIES	Soi	а	lity			br	ns/	h	wa	wa	ption		
		1	t				at	Mam		ter	ter			
			e				es	mals						
1	Removal of	-S	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν
	batteries and	ST r												
	recycling													
	leeyening													
2	Installation of	+L	Ν	+S	N	N	Ν	Ν	+S	+S	+S	Ν	N	N
	geotextile layer,	LTr		LTr					LTr	LTr	LTr			
	sealing layer													

		Envir	onme	ntal									Social	S
		Ge	С	Wa	Pl	В	In	Reptil	F	Gr	Sur	Socia	Livelihood	Sanitation
		olo	li	ter	an	ir	ve	es/Am	i	ou	fac	1	S	
	PROJECT	gy/	m	qua	ts	ds	rte	phibia	S	nd	e	disru		
	ACTIVITIES	Soi	а	lity			br	ns/	h	wa	wa	ption		
		1	t				at	Mam		ter	ter			
			e				es	mals						
	and drainage													
	layer													
3	Installation of	+L	+L	+S	N	N	N	Ν	Ν	+S	+S	N	Ν	N
	gas collection	LTr	LTr	LTr						LT	LTr			
	system													
4	Aftercare and	+L	+L	+S	Ν	N	Ν	Ν	Ν	+S	+S	Ν	Ν	N
	monitoring of	LTr	LTr	LTr						LT	LTr			
	leachate, gas and													
	groundwater.													

7.3 MITIGATION / ENHANCEMENT MEASURES

7.3.1 Positive Impacts

While most projects of this nature are associated with negative impacts, they usually have both short term and long-term positive impacts to the environment and society. Table 37 provides an analysis of positive impacts and ways of enhancement.

Phase	Environment al parameter	Impact	Causes of Impact	Proposed enhancement measures
Construction phase	Social	Opportunitiesforemploymentandsubsequent income	Construction may require workers	Ensure that women, youth and other vulnerable categories of people are included.
		Increased opportunities for business	Workers require food, accommodation and other stuff	Ensure that women and youth have access to business opportunities.
	Flora	Improved protection of forests/plants	Easy access due to road construction will benefit plant/forest protection agencies as they patrol.	Keep the roads functional through maintenance.
Operation Phase	Social	Improved health due to reduced incidences of waterborne diseases Reduced time spent by women search for water	Improved supply of treated and potable water Improved liquid and solid waste management Water available nearby or close to where needed	NRWB should design innovative ways of ensuring that many households have access to safe and potable water close to where they need it (either through increased communal water points or individual household connections)
		Improved sanitation for travellers and local communities	Availability of improved ablution services at the traveller's stopover	The District Council should make the stopover attractive by increasing the number of services on offer so that many travellers use

 Table 37: Analysis of positive impacts

Phase	Environment	Impact	Causes of Impact	Proposed enhancement measures
	al parameter			
	Sanitation	Increased access to safely managed sanitation for resident of Rumphi District	Connection of institutions to the sewer network and treatment of the wastewater	The project should be implemented
		Improved sanitary conditions in Rumphi District	Reduction in open defecation and indiscriminate disposal of septage through provision of sanitation facilities in institutions and faecal sludge	 Conduct regular inspection of the sewer network to detect leaks, overflows; and repair them Enforce by-laws to ensure that
			emptying and transportation system to sludge treatment facility	there is no indiscriminate disposal of wastewater, faecal sludge and solid waste in the environment.
				• Community sensitization on the negative effects of poorly managed wastewater, faecal sludge and solid waste on public and environmental health
			Improvement of solid waste management and resultant reduction in the occurrence of	
			flooding and unhygienic conditions arising from the	
			blockage of drainage by solid waste.	

Phase E	Environment	Impact	Causes of Impact	Proposed enhancement measures
a	al parameter			
		Reduction in pest and vector infestation in Rumphi District	Elimination of waste dumps which act as breeding sites for pests and vectors.	• Community sensitization on the negative impacts from pests and vectors that are harboured in poorly managed waste
				• Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites
F	Fish	Expanded lacustrine– like environment favourable for aquatic biota	Construction works of the weir on Rumphi River alter the bathymetric setting of the water course at the intake site through excavations and inundation of parts of the riparian environment that may have been previously dry, effectively changing the nature of microhabitats at the proposed weir site. This will result in novel pool-like micro-habitats on the immediate upstream of the weir structure, which will favour fish species that typically thrive in slow-	Ensure that lacustrine environment is well considered in catchment management plan

Phase	Environment	Impact	Causes of Impact	Proposed enhancement measures
	al parameter			
			instance, <i>Clarias gariepinus</i> , a hardy species that spends its life mainly in quiet waters, lakes and pools with soft, muddy substrates is likely to flourish under the new dam- like conditions.	
	Social	Provide reliable water supply due to improved power availability through solar power system	Continuous power supply and reduced blackouts through the use of solar system	Provision of adequate security and regular maintenance to the solar system
Decommission		Reducedleachatereleaseintoenvironment	Leachate release from a closed landfill	Leachate monitoring
		Reduced accidents after closing borrow pits	Open borrow pits for quarry and selected backfill material	Community sensitisation

7.3.2 Negative Impacts

Due to the nature of activities to be undertaken in this project, there will be some negative impacts on the physical, biological and social environments. These impacts will however differ depending on the phase of the project. Table 38 shows impacts and mitigation measures incurred during construction and operation phases.

Phase	Impact	Causes of Impacts	Proposed mitigation measures
Planning	Loss of property such as buildings, crops, tree, etc.	Construction of infrastructure	• NRWB to work with the District Councils and Traditional Authorities in acquisition of assets
	Lossofland,physicaland	Construction of infrastructure	• Provide adequate information on compensation procedures and laws
	economic displacement		• Provide appropriate compensation according to the laws of Malawi and at full replacement cost as well as resettlement assistance are provided
			Preparation of RAP
			• Provide resettlement assistance particularly to vulnerable PAPS
	Degradation of soil	Clearing of vegetation,	• Refilling of the pits, trenches
		vehicular movements,	• Use excavated earth materials in backfilling trenches
		excavation works	• Planting vetiver
Construction	Deterioration of sanitary conditions	Poorly managed sanitary facilities and poor	• Provide sanitation facilities such as mobile toilets at the construction sites
	in the project implementation	sanitation	• Sensitise construction workers on the dangers of open defecation
	areas		• Provide solid waste management facilities at construction sites

Table 38:	Negative	impacts	during	construction	phase
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Phase	Impact	Causes of Impacts	Proposed mitigation measures			
			• Segregate construction waste into recyclables and unrecyclable so that the recyclable can be reused or sold to recyclers.			
			• Sensitise construction workers on proper solid waste management			
			• Remove all construction waste upon finishing construction			
			• Use construction waste as fill material			
	Pollution of surface and ground water	Sediment run-offOil and fuel spillage	• Use sediment filter bags to clear runoff of sediments before it reaches the water courses			
		from vehicles and machinery	• Fuel vehicles at impermeable containment structures that are not prone to surface runoff			
		Construction works during heavy	• Service construction equipment regularly to minimize leakage of oil and fuel			
		downpoursAbsence of sanitary	• Minimize construction works during heavy rains to minimize issues of siltation			
		facilities	• Provide sanitary (for both males and females) and solid waste facilities in the construction sites			
	Loss of plants during	Site clearing	• Confine land clearing to just the site for a plant			
	site clearing		infrastructure			
			• Plant trees surrounding project sites as a replacement.			
Construction	Occurrence of	• Lack signage at	• Mark all construction sites with visible tape			
	accidents and	 No visible tape and barricades 	• erect appropriate safety signs to warn workers and visitors			
	injuries		• Provide workers with appropriate PPE			
			• Use fall protection equipment when			

Phase	Impact	Causes of Impacts	Proposed mitigation measures			
		 Failure to use Personal Protective Equipment (PPE) Absence of fall protection equipment 	 working at heights Maintain work areas to minimize slipping and tripping hazards Implement fire and explosion prevention measures Provide necessary breathing equipment and ventilation for workers in deep trenches and manholes 			
	Increased incidence of teenage pregnancies	Increased incomes of communities within project area	Sensitise communities and workers			
	Sexual exploitation, abuse and harassment at work	 Abuse of power at workplace Absence of Code of Conduct Lack of Grievance redress mechanism 	 Sensitisation of workers and communities Establish Grievance Redress mechanism with clear referral pathways Conduct training for all workers on labour and Gender Based Violence laws 			
	Violationofworkers' RightsbyContractor,ConsultantandSuppliers	Abuse of power at workplace	Conduct training for all workers on Labour Laws of Malawi			
	Vandalism and theft of project equipment including solar equipment and pipes	 Inadequate security measures Disgruntled workers and communities 	 Sensitize communities on importance of safeguarding water infrastructure Provide adequate security in project sites 			

Phase	Impact	Causes of Impacts	Proposed mitigation measures		
		• Lack of job	Fencing the solar installation sites		
		opportunities	Empowering community police		
	Deterioration of air	• Over-speeding of	• Employ dust suppression measures like sprinkling of water		
	quality	construction vehicles	Reduce speed by construction vehicles		
		• Emissions from construction vehicles	• Maintenance of construction vehicles to minimise exhaust emissions.		
		• Land clearing and excavation works	• Switching off vehicles when not in use unless impractical for health and safety reasons.		
		• Failure to implement dust suppression measures	• Use of tarpaulin barriers.		
		Absence of road	Ensure that first aid services are put in place		
	Increase in road traffic accidents	signage and signposts	• Introduce humps on the		
		• Over-speeding within project areas	• roads to help reduce the speed of the vehicles		
		Absence of speed limit and Control devices	• Erect warning signs showing that there is heavy machinery and construction vehicles using roads for people to be alert		
Construction	Loss of Fauna	Destruction habitats	Reduced speed when driving		
		• Illegal hunting of wildlife	• Sensitize workers on illegal hunting		
	Noise and vibration	• Using old and poorly	Servicing of vehicles and plants		
	around construction	serviced machinery	Scheduling of work to day time		
	sites	• Use of heavy construction	Provide earplugs to workers		

Phase	Impact	Causes of Impacts	Proposed mitigation measures	
		 machinery in settlements Absence of noise suppression devices 	Sensitizing communities	
Construction	Loss of Flora	Clearing for project sites and access roads	 Confine land clearing to just the site for a plant infrastructure. Plant trees surrounding project sites as a replacement. 	
	Leachate emission and groundwater contamination	• Indiscriminate disposal of wastes within project sites	 Proper covering of landfill sites Provide of drainage Installation of monitoring wells 	
	Introduction/spread of alien species	• Vehicles and soil movements	 Ensure that vehicle tires are thoroughly washed Sensitize communities on alien species 	
	Increased incidence of sexually transmitted diseases like HIV and AIDS	Influx of workers from other areas	 Conduct Sexual and Reproductive Health education for communities and workers Employ workers from within the project area 	
Operation	Deterioration in sanitary conditions in the district	 Poorly managed sanitary facilities and poor sanitation Leakages and overflows from sewer network 	 Conduct regular inspection of the sewer network to detect leaks, overflows; and repair them Enforce by-laws to ensure that there is no indiscriminate disposal of wastewater, faecal sludge in the environment. Provide facilities for proper management of screenings and sludge. 	

Phase	Impact	Causes of Impacts	Proposed mitigation measures	
		 Discharge of faecal sludge into the environment Odour and stench from landfill and wastewater treatment plant 	 Plant trees around the landfill and wastewater treatment plant for natural air purification and circulation. Conduct air quality monitoring. 	
Operation	Increased pest and vector infestations in	Poor waste management	• Community sensitization on the negative impacts from poorly managed wastes	
	the project area		• Provide solid waste management facilities in communities and institutions	
			• Develop and enforce by-laws to ensure that there is no indiscriminate disposal of solid waste in the environment.	
	Pollution of surface	• Poorly treated	Implement catchment conservation measures	
	and groundwater effluent discharged from treatment plants		• Monitor the quality of effluent discharged from the treatment plant regularly	
		• Oil and fuel spillage from vehicles and	• Inspect water and sewer pipelines to detect leakage	
		machinery	• Develop standard procedures for maintenance works	
		• Leaking water and sewage pipelines		
Decommissioni	Leachate emission	Leachate release from	Proper covering of landfill sites	
ng phase	and ground water closed landfill		Installation of monitoring wells	
	contamination		• Conduct quarterly monitoring of ground water quality	

Phase	Impact	Causes of Impacts	Proposed mitigation measures		
			• The contractor to prepare groundwater monitoring procedure/plan		
	Soil pollution due to improper disposal solar accessories and lithium batteries	Solar batteries and accessories	Follow guidelines for solar accessories and batteries disposal and pollution control management for the project		
	Open borrow pit and quarry mining site	Construction backfilling material and quarrying	Backfill with construction rubbles and disposed soiReplant vegetation		

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7.4 CHANCE FIND PROCEDURES

7.4.1 Chance Finds

Chance Finds are cultural heritage objects, commonly related to archaeological or historic sites cultural resources, paleontological, family heritage, and geological resources that are unexpectedly encountered during project-related activities/ clearance. The chance finds examples could be pottery, artifacts, graveyards, stone tools, and minerals that are unintentionally encountered, discovered, (exhumed, and disturbed a result of earth movement activities especially during the construction and operation phase.

7.4.2 Monuments and Relics Act (1991)

The Monuments and Relics 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; and to establish an advisory council to advise the Minister on matters aforesaid; and to provide for matters connected therewith or incidental thereto. It also makes a declaration of protected monuments and relics and acquisition thereof by the Government and the acquisition by the Government of rights and trusteeship over monuments and relics and for the preservation thereof by agreement with the owners.

This act entails any chance finds during the project implementation must be reported to the Minister in writing, within fourteen days following the discovery or date he was informed of discovery. Excavation works have to be suspended until responsible government officials visit the site. The Act also stipulates that anything that has been discovered belongs to the government and must be handed over to the Chief Antiquities Officer

7.4.3 AfDB Operational standard

7.4.3.1 Cultural heritage

The AfDB mandates the borrower or client to be responsible for ensuring that project sites and designs avoid significant damage to cultural heritage, including both tangible and intangible cultural heritage. In the event that the proposed location of the project is in an area where tangible cultural heritage is likely to be found, the chance-finds procedure be provided in the ESMP. The bank further guides that Chance finds are not disturbed until an assessment by qualified experts is made, and actions consistent with this operational safeguard are identified. The project shall not remove any tangible cultural heritage unless the following conditions are met:

- No technically or financially feasible alternatives to removal are available,
- The overall benefits of the project substantially outweigh the anticipated cultural heritage loss from removal,

• Any removal is conducted in accordance with relevant provisions of national and/ or local laws, regulations, and protected area management plans and uses internationally accepted best available techniques.

7.4.4 Chance Finds Procedure (CFP)

The Chance Find Procedure (CFP) outlines the actions to be taken if archaeological objects are accidentally encountered. The following procedure shall be followed in case of Chance Finds;

- i. Workers must be vigilant to any relics found during excavation.
- ii. In case of discovery during the excavation, workers must immediately report the findings to the foreman.
- iii. The supervisor must stop the work immediately and communicate the findings to the Site Agent.
- iv. The supervisor then communicates the findings to the Contract Manager.
- v. The Contract Manager through Consulting engineers notifies implementing entity NRWB.
- vi. NRWB will then notify the Minister through the Department of Museums and Monuments. The communication shall be written and shall be made within 14 days from the date NRWB was informed of discovery
- vii. Any further excavations or continuation of the infrastructure development at the Site of the discovered heritage will be undertaken only with the approval of the Department of Museums and Monuments.

7.5 CUMULATIVE IMPACTS

These are impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project. The accumulation of impacts is characterized by two different types of relationships, thus:

- Intra-relationship: combined effect of individual development for example, noise, dust and visual on one particular receptor; and,
- Inter-relationship: several developments with insignificant impacts individually but which together represent a significant cumulative effect.

"The accumulation of, and the interrelationship between, effects which might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place"

To determine the cumulative impact of the proposed project, the M1 and M24 road construction projects which are at the construction phase in the project area, and the existing water treatment plant impacts were considered. The assessment addressed the following possible scenarios:

- i. Implementation of project facilities prior to construction of the M1 and M24 roads,
- ii. Implementation of project and Road projects simultaneously, and
- iii. The implementation of the project after the construction of the road.

7.5.1 Methodology and Tool

The perform the cumulative impact assessment for the proposed project, two methods were generally considered and these are:

- 1. **Scoping and Impact Identification technique** this was used to identify how and where a cumulative impact would occur. The project used Expert Opinion method to scope cumulative impacts of the project with road construction using descriptive matrix checklist method. This described how the project will interact with other projects in the area.
- 2. **Evaluation techniques** it quantifies and predict the magnitude and significance of impacts based on their context and intensity. The matrix method was used to signify severity of project impact on receptors as in Table 39.

Table 39: Descriptive matrix for Water and sanitation improvement project interaction with road construction in the projects in thearea.

Resource	Past Activities	Present Activities	Project Impact	Future Activities	Cumulative Impact
Soils and Geology	Soil erosion	Soil erosion result from road earth cut and moving works	Excavation of site and pipe trenches would result in soil erosion; contamination from oils spillages	Soil pollution from solid waste disposal	Soil erosion severity increase
Plant and vegetation	Loss of vegetation to deforestation	Loss of vegetation from road construction works	Loss of vegetation to project site clearing		Vegetation loss hectarage increase
Surface water	Contamination of water agriculture activities	Backwash water discharge from water treatment plant Contamination from dumpsite facility	Contamination from oil spillages and soil erosion	Poor quality effluent discharge from wastewater treatment plant, Contamination landfill leachates	Pollution of water severity increase
Groundwater		Contamination from oil spillages	Contamination from oil spillages	Landfill leachate contamination	Groundwater contamination
Air and climate	Air pollution from unsanitary sanitation facilities	Air pollution from dumpsite	Air pollution from construction machinery; wastewater	Air pollution from wastewater treatment facility, and landfill	Air pollution level increased

Resource	Past Activities	Present Activities	Project Impact	Future Activities	Cumulative Impact
			treatment plant, landfill		
Flora and fauna	Diminishing of flora and fauna	Disturbance of flora and fauna	Disturbance of flora and fauna	Disturbance of flora and fauna	Loss of flora and fauna
Buildings and Structures		Destruction of shops and building along road reserves	Destruction of shops and building for pipelines		Loss of people's property
Cultural heritage		Possible damage of burial sites from road construction	Possible damage of burial site from excavation of pipeline and project facilities foundation		Damage to cultural heritage site
Noise and vibration	Noise from water pumps	Noise from construction vehicles	Noise from new booster station pumps		Increase level of noise
Health, and quality of life	Access of Potable water		Improved access to potable and sanitation	Reduction of water and sanitation borne diseases	Increased access to potable water and reduction of diseases

Resource	Past Activities	Present Activities	Project Impact	Future Activities	Cumulative Impact
Economic life and employment	Job opportunity from water supply business	Job opportunities from road construction	Job opportunities from project construction	Job opportunities for operation of landfill, wastewater plant and upgraded plant	Livelihood of people improve
Pressure on social services i.e., education and hospital	Insufficient crass room and hospital bed space	Increased number of people migrating to work for roads project	Increased number of people migrating to work for water and sanitation project	Increased population due urbanization	Increased pressure on social service
Traffic, Movement, and access		Delayed traffic flow due to road detours for road construction	Excavation of pipelines and road crossings affect traffic		Traffic flow rate increased
Table 40: Descriptive matrix for Water and sanitation improvement project interaction with road construction in the projects in the area.

	Proposed Actions			Other				
Potential Impacted Area	Planning	Construction	Operation	Decommissioning	Past Action	Present Action	Future Action	Cumulative Impact
Soils and Geology		***		*	*	***	*	***
Plant and vegetation		**			*	**	*	**
Surface water quality		***	*++	*	*	***	*	**+
Groundwater quality			*++		*		*	*++
Air and climate quality		***	*	*	*	**	*	**
Flora and fauna		**	*		*	**	*	**
Buildings and Structures		***	++	**		***		**+
Cultural heritage		*				*		*
noise and vibration		***	*	*	*	***	**	*
Health, and quality of life		*	*++		+	*	*++	*+
Economic life and								
employment		*++	++	**	+	+++	++	*++
Sanitation		**	+++		*	**	*++	++
Social disruption		***	+			***	+	**
Social services like hospital, education		***	*+		+	**+	+	*+
Traffic, movement and access		***	+++	*		***	+++	+++

Potential Impacted Area	Proposed Actions	Past Action	Future Action

						Other Present	
	Planning	Construction	Operation	Decommissioning		Action	
Soils and Geology		***		*	*	***	*
Plant and vegetation		**			*	**	*
Surface water quality		***	*++	*	*	***	*
Groundwater quality			*++		*		*
Air and climate quality		***	*	*	*	**	*
Flora and fauna		**	*		*	**	*
Buildings and Structures		***	++	**		***	
Cultural heritage		*				*	
noise and vibration		***	*	*	*	***	**
Health, and quality of life		*	*++		+	*	*++
Economic life and employment		*++	++	**	+	+++	++
Sanitation		**	+++		*	**	*++
Social disruption		***	+			***	+
Social services like hospital education		***	*+		+	**+	+
Traffic, movement and acess		***	+++	*	•	***	+++

*low adverse effect, **moderate adverse effect, ***high adverse effect, + beneficial effect

7.5.2 Mitigation / Enhancement Measures

Since the cumulative impacts in Table 40 above are results of Inter-relationship interaction between Rumphi Water and Sanitation Service Improvement Project and M1 and M24 road construction projects, the generic mitigation and enhancement measures have been proposed in table 41 to address the cumulative impacts. The moderate to high adverse or beneficial effects have been considered for enhancement or mitigation

Cumulative impact	Enhancement Measure	Mitigation Measure				
Soils and Geology		• Minimize construction works during heavy rains to				
		minimize issues of siltation; and				
		• Plant vetiver glass or bamboo to control soil erosion				
Plant and vegetation		• Vegetation and tree restoration; and				
		• Use of steel and metal instead of timber and wood				
Surface water quality		• Conduct regular inspection of the treatment plant to detect				
		plant fault and repair them				
		• Adequate plant operator training,				
		Regular wastewater quality monitoring				
Groundwater quality	 Ground water quality monitoring 					
Ground mater quanty	 Landfill leachate collection and treatment: and 					
	• Control of oil and fuel spillages					

Cumulative impact	Enhancement Measure	Mitigation Measure
Air and climate		• Employ dust suppression measures like application of
quality		water.
		• Plant trees around the landfill and wastewater treatment
		plant for natural air purification and circulation.
		Conduct air quality monitoring; and
		• Conduct periodic medical examination for facilities
		workers
Flora and fauna		• Develop animal conservation policy,
		• Reduced speed when driving on road that pass forest
		reserve; and
		Sensitize workers on illegal hunting
Buildings and		• Enforce RRB laws, and
Structures		Active town planning inspection
noise and vibration		Frequent maintenance water pumps,
		• Greasing and oiling of movable parts, and
		Maintenance of construction vehicles
Economic life and	• Job employment to local workers,	
employment	• Gender affirmative actions in job recruitment	
Sanitation	• Sanitation structures inspection,	
	• Prompt sewer pipeline burst maintenance,	
	Solid waste collection scheduling	
Social disruption		Community awareness campaigns,
Social services like		Prioritise local workers to reduce migration,
hospital, education		

Cumulative impact	Enhancement Measure	Mitigation Measure
Traffic, movement,	• Installation of road sign post,	
and access	• Observe vehicle load restrictions,	
	• Timely road section maintenance, and	
	• Do not park construction vehicles or plants	
	along main road	

7.6 CONTRACTORS' CAMPSITES

The Campsite is a place with temporally structures from which the contractor operates from during implementation of the project. The site may comprise structures such as office buildings, dinning, stores and warehouses, worker's accommodation building, recreation facilities, vehicle maintenance garage, metal and electrical workshop, crushed quarry stone and sand piles, other fixed equipment such as cement batch plant, fuel storage facility, quarry stone piles among others. Depending on the activities at campsites, and materials and chemical stored at the place, the campsite might have low, medium to high impacts on social and natural environment of the area that needs proper assessment and mitigation measure put in place. The campsites will be decommissioned after construction phase completion.

The implementation of this project shall also have contractors' campsites during construction phase. A project of this nature requires a vast campsite hence the Contractors are required to prepare the campsite ESMP by Malawi Environmental Protection Authority. Therefore, the requirement for preparation for contractor ESMP shall be included in contractor procurement bid document to be prepared and get approved by authority before the start of construction works.

7.6.1 Camp Site Location Criteria

Camp site selection depends on many factors, including the size and conditions of the site and availability of resources; the safety, security and protection it offers and cultural and social considerations. Choosing a site involves consideration of access, coexistence with surrounding communities, topography, trees and vegetation, the potential impact on the environment, environmental causes of disease and other public health issues.

Selection of the location for the campsite location should consider environmental and social mitigation hierarchy i.e. Avoidance, where avoidance is not possible minimize/reduce risk and impacts, once risk reduced mitigate, and where significant residue impacts remains compensate for. The project will ensure that all campsites have minimal environmental and social impacts by following the criteria below to guide selection:

- i. Away from populated human settlement preferable away from villages and cluster settlement, (preferably at least 5km away). This is to prevent disruption to local communities due to an influx of labour
- ii. The area to be used for the camp must be agreed with the landowner and compensation paid in line with the project's RAP before access to the site is permitted
- iii. No tree that is bigger than 200mm diameter at breast height may be felled in the construction of a camp
- iv. Away from cultural sites and heritage such as graveyard,
- v. At least 1.0 km away from surface water resource,
- vi. Away from flood water passage,
- vii. Availability of reliable water supply,
- viii. Availability of sanitation services,

- ix. Public Safety and Security,
- x. No requirement for intensive vegetation clearance,
- xi. No heavy settlement along access road to campsites,
- xii. Away of wind passage direction,
- xiii. The site development should result in changes to drainage patterns,
- xiv. The site should no result in dispersion of solid waste, and dust.

7.6.2 Camp Closure

Camp closure or decommissioning shall be done upon completion of construction phase. The site ESMP shall also carefully consider impacts and re-instatement of campsite place during closure. The contractor shall ensure once the use the camp(s) has been completed, the camp must be fully rehabilitated. All buildings, foundations and hard-standings must be removed. The septic tank must be pumped out by a certified waste disposal company, removed and the hole backfilled. All waste materials must be disposed of according to the guidelines provided in this ESIA.

7.7 OVERALL IMPACT ASSESSMENT

7.7.1 Geology, Topography and Soils

The project implementation requires that the physical environment is also considered. We included the following conclusions based on the analysis of the geology, soils and topography. These conclusions are with respect to the construction of all water supply infrastructure, distribution pipelines and sanitation facilities. Overall, the project will have minimal negative impact on the geology, topography and soils.

- The Geology of the Mayembe hills at the water intake point and all proposed service reservoir sites is suitable for construction and establishment of associated structures. Moreover, pipes will be placed in the upper layers of superficial deposits and soils. As such, there will be minimal impacts on geology and soils.
- The structural geology of the area is stable and does not contain any active structures that would affect the construction. Therefore, the treatment plant would not be at risk of tectonic factors.
- The topography greatly varies across the area such that the setting favours the gravity fed water from the treatment plant as well as service reservoir to distribution areas. Gravity should be considered in the design of the whole system. Ground levelling may be required at the treatment plant area and service reservoirs.

• The HAND model portrays areas which are susceptible to flooding for any annual extreme event such that construction works and pipeline layout should consider necessary design considerations to minimize damage during flooding.

7.7.2 Sanitation

Overall, the project will lead to a long-term positive impact of a cleaner environment in the district. Despite negative impacts to be experienced for a short term during the construction phase, it will be offset by reduction in open defecation, indiscriminate disposal of faecal sludge in the environment; proper management of solid waste wastewater and the associated control of pests and vectors the operation phase.

7.7.3 Biological Environment

Overall, the project will have a small and negative impact on fauna. The project may lead to fauna losses in addition to habitat destruction. This will result from site clearing activities during construction works and vehicle movements, noise from machinery, dust from construction works etc. Similarly minimal impacts are expected on the flora of the project area.

7.8 Social

This project generally has an overall positive benefit in the sense that it is providing clean and safe water in an area where clean water is in short supply. In addition, it is also providing both liquid and solid waste management services in Rumphi. Travellers' stopover is also another benefit.

The project also includes a component of watershed and catchment management services which will also benefit the local communities.

The negatives mainly include social ills related to sexual and reproductive health such as sexual harassment at work, spread of HIV and AIDS and other sexually transmitted diseases and infections. Disturbances to traffic and movement as well as loss of assets by some PAPs are also some of the negative impacts. Therefore, this is a positive project socially.

7.9 Loss of the property

The implementation of the project will generally affect property in both planning and construction phases that need to be compensated for according to laws of Malawi. In the planning phase some people will lose their land to the project for construction of various water supply and sanitation infrastructures. In preparation for the project, 14 land pieces have been identified and negotiated for acquisition as detailed in table 42 below. The acquisition process for these pieces of land has been completed. Similarly, during construction phase, some people in the project area especially along road reserve boundary shall lose their property such as crops, trees and infrastructure to

installation of pipelines. It is estimated that around 993 people with be affected by the project and the estimated cost of compensation of private and community assets, allowances and contingency is **MWK 914,759,100.00**. Appropriate mitigation measures shall be followed to minimise the number of project affected persons.

RUI	RUMPHI WATER SUPPLY AND SANITATION SERVICES IMPROVEMENT							
Proj	ect Land Acquisition							
No	Site Name & Land	Owner	Ha	Amount (MK)	Status			
•	Use							
1	Phwezi Office land & Staff House	Frank Kazira Mkandawire	0.4365	6,600,000.00	completed			
2	Thumbi Booster & Staff House	Moffat Nyirenda	0.56	5,000,000.00	completed			
3	Bwengu Office	Nelson Kawiya Gondwe	0.1344	5,700,000.00	completed			
4	Enukweni Office	Edington Munthali (GVH Mwagwaza)	0.095	3,800,000.00	completed			
5	Kacheche Booster and Staff House	William Kumwenda	0.5	4,800,000.00	completed			
6	Booster & staff house	Lucy Banda	0.2475	3,500,000.00	completed			
7	Bembe land Booster & Staff House	Griffin Ganizani Luhanga	0.5355	6,500,000.00	completed			
8	Mwazisi Booster and Staff House	Adam Kanyelere Gondwe	0.391	5,500,000.00	completed			
9	Mwazisi Booster and Staff House	Brian Gondwe Chikalamba	0.36	5,500,000.00	completed			
					Sanitation			
10	Solid Waste Damp Site		2.76	4,000,000.00	completed			
11	Wastewater treatment site				Identified			
12	Mzokoto Commuter Drop Toilet Facility	Lazarous Sotwani	0.208	6,000,000.00	completed			
14	Toilet facilities	Selected Schools			To be provided by Rumphi and Mzimba DEM			
	TOTAL			56,900,000.00				

Table 42: Summary of Project Land Acquisition

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLANS

8.1 Introduction

An Environmental and Social Management Plan (ESMP) provides the framework for management and mitigation of impacts anticipated from the proposed project. This ESMP has been prepared in accordance with national and international requirements.

The environmental management and monitoring plan aims to bring the project into compliance with applicable national environmental and social legal requirements and African Development Bank safeguards policies and procedures. The ESMP outlines the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts.

Further, plan also provides indicators for monitoring impact management and mitigation, roles and responsibilities as required by the Malawi Environment Protection Authority (MEPA).

8.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

To minimise adverse impacts of the project mitigation measures, responsibilities, period of impact management, resources required and estimated costs are proposed in Table 43. The total cost of implementing the ESMP including compensations for all project affected persons in the RAP is **MK 1,247,259,100**.

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
Planning	Loss of property such as buildings, crops, tree, etc.	 NRWB to work with the District Councils and Traditional Authorities in Compensation assessment and Resettlement action Plan development Payment of compensation before commencement of works 	NRWB and District Council	Before commenceme nt of construction works	 Human resources Transport GIS expert, Transport Design route Map 	914, 759,100
	Loss of land Degradation of	 Provide adequate information on compensation procedures and laws Provide appropriate compensation according to the laws of Malawi Refilling of the pits, trenches 	District Lands Officer Contractor	Before commenceme nt of construction work Throughout	 Human resources Transport Human 	57,000,000
	soil	 Use excavated earth materials in backfilling trenches Planting vetiver 	Contractor	construction phase	 Resources Vetiver, bamboo, transport 	20,000,000
Construction	Deterioration of sanitary conditions in the project implementation areas	 Provide sanitation facilities such as mobile toilets at the construction sites Sensitise construction workers on the dangers of open defecation Provide solid waste management facilities at construction sites Segregate construction waste into recyclables and 	Contractor	Throughout the project	 Vehicles, fuel and stationery Permanent toilets at construction camps, Mobile toilets, skips 	1,000.000

Table 43: Environmental and Social Impact management plan for all project phases

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
		 unrecyclable so that the recyclable can be reused or sold to recyclers. Sensitise construction workers on proper solid waste management Remove all construction waste upon finishing construction Use construction waste as fill material 				
	Pollution of surface and ground water	 Use sediment filter bags to clear runoff of sediments before it reaches the water courses Fuel vehicles at impermeable containment structures that are not prone to surface runoff Service construction equipment regularly to minimize leakage of oil and fuel Minimize construction works during heavy rains to minimize issues of siltation Provide sanitary (for both males and females) and solid waste facilities in the construction sites 	Contractor	Throughout construction phase	 Sediment filter bags/ saw dust Mobile toilets Skips for waste disposal Standard procedure for operating landfill 	20,000,000
	Loss of plants during site clearing	• Confine land clearing to just the site for a plant infrastructure	Contractor	Annually	• Seedlings, human	50,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
		• Plant trees surrounding project sites as a replacement.			resources, transport	
	Increased dropout rates of girls from school	Sensitising girls on importance of staying in school	NRWB	Throughout the project	 Transport Public Address Systems 	1,000,000
	Occurrence of accidents and injuries	 Mark all construction sites with visible tape and erect appropriate safety signs to warn workers and visitors Provide workers with appropriate PPE Use fall protection equipment when working at heights Ensure that first aid services are put in place to ensure quick response from emergency Maintain work areas to minimize slipping and tripping hazards Implement fire and explosion prevention measures Provide necessary breathing equipment and ventilation for workers in deep trenches and manholes Introduce humps on the roads to help reduce the speed of the vehicles 	Contractor	Throughout the construction phase	 Visible tapes Safety signs PPE Fire hydrant 	10,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
		 Erect warning signs showing that there is Heavy machinery and construction vehicles using roads for people to be alert 				
	Increased incidence of teenage pregnancies	 Supply of condoms at the construction site Development of a Code of Conduct / rules for worker-community interaction and on-site behaviour 	NRWB	Throughout	 Transport Public Address Systems 	1,000,000
	Sexual Exploitation, Abuse and Harassment	 Conduct training for contractors and their workers on labour and Gender Based Violence laws Include GBV/SEAH requirements in the bid documents Integrate measures for prevention and handling Gender Based Violence (GBV) and SEAH in the C-ESMP All workers should sign code of conduct which include specific clauses on GBV/SEAH prevention Include GBV/SEAH prevention Include GBV/SEAH prevention in the induction programme Conduct awareness raising to 	NRWB and Contractor	Throughout	 Human resources Transport Training aids 	5,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
		 regarding SEAH and reporting mechanism Including receiving handling channel of SEAH allegations within the GRM and training responsible GRC members on handling the allegations 				
	Violation of workers Rights by Contractor, Consultant and Suppliers	Conduct training for Contractor and workers on labour laws of Malawi	NRWB, Contractor, Consultant and Suppliers	Throughout	 Human resources Transport Training aids 	5,000,000
	Vandalism and theft of project infrastructure including solar equipment and pipes	 Sensitize communities on importance of safeguarding water infrastructure Provide adequate security in project sites Fencing the solar installation sites Empowering community police 	Contractor and NRWB	Annually	 Sensitization materials Security personnel Security kits 	2,000,000
	Increase in incidence of dust emission	 Employ dust suppression measures like application of water Reduce speed by construction vehicles 	Contractor	During construction	 Water bowser, Fuel Speed control signage, 	10,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
	Increase in road traffic accidents	 Conduct Road safety sensitization for communities and road users Road signage placed at appropriate places Drivers to observe speed limits 	Contractor, NRWB	Throughout	 Human Resources Transport Training aids Road signs 	5,000,000
	Loss of Fauna	 Reduced speed when driving Sensitize workers on poaching 	Contractor	throughout	 Sensitization materials Road signs 	2,000,000
	Noise and vibration around construction sites	 Servicing of vehicles and plants Rescheduling of work to day time Provide earplugs to workers Sensitizing communities 	Contractor	During construction	 Seismometer, Noise meter, Human resource. Transport. 	5,000,000
	Loss of Flora	 Confine land clearing to just the site for a plant infrastructure. Plant trees surrounding project sites as a replacement. 	NRWB and Contractor	During construction	Transport,Tree nurseryPersonnel	8,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
	Leachate emission and groundwater contamination	 Proper coverage of landfill sites Provision of drainage Installation of monitoring wells 	NRWB and District Council	Throughout the decommission period	 Transport Human Resource Water monitoring equipment 	5,000,000
	Potential introduction/spre ad of alien species from vehicles and soil movements	 Ensure that vehicles are washed thoroughly so that no alien species are brought to project sites Sensitizing communities on alien species 	Contractor	Throughout	 Transport Monitoring personnel 	5,000,000
	Increased incidence of sexually transmitted diseases like HIV and AIDS	Conduct Sexual and Reproductive Health education for communities and workers	Contractor and NRWB	Throughout	 Human resources Transport Training aids 	5,000,000
Operation	Deterioration in sanitary conditions in the district	 Conduct regular inspection of the sewer network to detect leaks, overflows; and repair them Enforce by-laws to ensure that there is no indiscriminate disposal of wastewater, faecal sludge in the environment. Enforce by-laws to ensure that there is no 	District Council	throughout	 Vehicles, fuel and stationery Leakage detectors Effluent monitoring equipment Skips 	25,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
		 indiscriminate disposal of screenings and sludge in the environment. Provide facilities for proper management of screenings and sludge 				
	Deterioration of air quality as result of wastewater treatment plant failure	 Conduct regular inspection of the treatment plant to detect faults, and repair them Train plant operator adequately. Plant trees around the wastewater treatment plant for natural air purification and circulation 	District Council	Throughout	Tree seedling CO2, Oxygen, SOx and NOx meters, Human resource, • Human Resource	5,000,000
	Cases of respiratory diseases due to long-term exposure to poor air quality	 Plant trees around the landfill and wastewater treatment plant for natural air purification and circulation Conduct air quality monitoring Conduct periodic medical examination for facilities workers Provide PPEs such as air respirators to facility's workers 	District Council	Throughout	Tree seedling CO2, Oxygen, SOx and NOx meters, Human resource, Human Resource	5,000,000
	Increased pest and vector infestations in the district	• Community sensitization on the negative impacts from pests and vectors that are	NRWB and District Council	Throughout	 Vehicles, fuel and stationery Skips Information, Education and 	10,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
		 harboured in poorly managed waste Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites Enforce by-laws to ensure that there is no indiscriminate disposal of solid waste in the environment. 			Communicatio n (IEC) materials	
	Pollution o surface and groundwater	 f Implement catchment conservation measures Monitor the quality of effluent discharged from the treatment plant regularly Inspect water and sewer pipelines to detect leakage Develop standard procedures for maintenance works 	NRWB	Quarterly	 Water quality measuring equipment Transport Human Resources 	3,000,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
	Occurrence of accidents and injuries	 Train all workers on the use of operating and maintenance equipment Provide workers with appropriate PPE Ensure that first aid services are put in place to ensure quick response from emergency Avoid handling screenings with bare hands to prevent pricks and scratches Maintain work areas to minimize slipping and tripping hazards Implement fire and explosion prevention measure 	Labour officer	Throughout the operation phase	First aid kit Training materials Personal protective equipment	7,000,000
Decommissio ning	Open borrow pit and quarry mining sites	 Backfill the pits and quarry sites Replant vegetation 	Contractor	Throughout decommission ing phase	 Transport Human resource Seedlings 	10,000,000
	Construction waste Rubble	 Use material to backfill the borrow pits, quarry sites and gullies Reuse the waste for construction such as road maintenance 	Contractor	Throughout decommission ing phase	Transport Human resource	1,500,000

Phase	Impact	Proposed mitigation measures	Responsibilit	Period	Resources	Estimated cost
			У		required	(MK)
	Dust emission	• Employ dust suppression	Contractor	Throughout	• Human	1,000,000
		measures like application of		decommission	Resources	
		water		ing phase	Transport	
	Noise and	• Servicing of vehicles and	Contractor	Throughout	Seismometer,	10,000,000
	vibration around	plants	the Noise meter,			
	construction sites	• Rescheduling of work to day		decommission	Human resource,	
		time		period	Transport	
		• Provide earplugs to workers				
		• Sensitizing communities				
	Leachate	• Proper coverage of landfill	District	Throughout	Transport	5,000,000
	emission and	sites	Council	the	Human Resource	
	groundwater	• Provision of drainage		decommission	Water monitoring	
	contamination	• Installation of monitoring		period	equipment	
		wells				
	pollution due to	• Follow guidelines for	NRWB	Throughout	Personnel	3,000,000
	improper disposal	disposal and pollution		the	Transport	
	of solar batteries	control management plan for		decommission	Solar Accessories	
		this project		period	disposal containers	
TOTAL						1,247,259,100

8.3 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

The monitoring plan will enable the managers of the project to compare the monitored data against the baseline data collected during the ESIA study. This will help in assessing the effectiveness of the proposed mitigation measures and protection of the environment based on standards used at national and where necessary at international level. It will also help redress emerging issues that were not foreseen during ESIA studies. ESMP monitoring tools such as checklists, atmospheric monitoring equipment for example noise meter, atmospheric particulate meter measuring meter, gaseous emission testing meter, and water quality testing. It shall also use subsidiary management plans developed for the project such as RAP, Waste Management Plan, Health and Safety Management plan, Pollution Control and Prevention Plan and Stakeholder Engagement plan. The monitoring plans shall monitor the project focusing the following areas among others:

- Bio-physical alteration, landscape change and vegetation maintenance
- Pollution control and prevention
- Waste management
- RAP implementation
- Occupation Health and Safety
- Sexual Harassment, Exploitation and Child Abuse
- Project Social Fabric disturbance
- Community employment engagement and gender inclusivity
- Physical culture resource
- Community awareness and engagement
- Workforce training

The project ESMP monitoring can be grouped into two categories: internal monitoring and evaluation, and external monitoring and audits. The internal ESMP monitoring involves contractor's self-verification programmes, and NRWB validation and compliance assessment. The internal monitoring will ensure regular reporting, which will be monthly, bi-annual and annual reports. The external monitoring shall be done by external stakeholders such as District Councils, Ministry of Lands, MEPA and AfDB among others in the form of inspection and compliance audits. Table 44 below presents the environmental and social management monitoring plan for the project. The total cost of implementing the ESMP monitoring measures is estimated to be **MK 86,600,000.00.** It is important to note that monitoring will be conducted at all project sites.

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
Planning	Loss of property such as buildings, crops, tree, etc.	NRWB to work with the District Councils and Traditional Authorities in acquisition of assets	 Number of PAPs compensated Number of PAPs satisfied with compensation Number of ADCs with functional GRMs Number of complaints registered in GRM records Number of complaints fully resolved 	District Council/ Lands Department	Quarterly	 Human resources Transport to sites and ADCs 	1,500,000
	Loss of land, crops and property	 Provide adequate information on compensation procedures and laws Provide appropriate compensation according to the laws of Malawi 	 Number of complaints recorded in the GRM records Number of resolved complaints 	District Lands Officer	Quarterly	 Human resources Transport 	1,000,000
	Degradation of soil from erosion and seepage from surfaces leaked or	• Refilling of the pits, trenches	 Formation of gullies Siltation of rivers 	District Environmental Officer	Throughout construction phase	Human Resources	5,000,000

Table 44: Environmental and Social Impact monitoring plans

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
	spilled with fuel, oil and lubricants	 Use excavated earth materials in backfilling trenches Fuel vehicles at impermeable containment structures Service construction equipment regularly 					
Construction	Pollution of surface and ground water	 Use sediment filter bags to clear runoff of sediments before it reaches the water courses Fuel vehicles at impermeable containment structures that are not prone to surface runoff Service construction equipment regularly to minimize leakage of oil and fuel Minimize construction works during heavy rains to minimize issues of siltation Provide sanitary (for both males and females) and solid waste 	Level of Pollutants according to local and international standards	 District Environme ntal Office District Water developme nt Office 	Monthly	Water quality measuring equipment Transport Human resources	1,000,000

noogunog					Lotinatea
lleasures	monitored			required	cost (MK)
facilities in the construction sites					
 Provide sanitation facilities such as mobile toilets at the construction sites Sensitise construction workers on the dangers of open defecation Provide solid waste management facilities at construction sites Segregate construction waste into recyclables and unrecyclable so that the recyclable can be reused or sold to recyclers. Sensitise construction workers on proper solid waste management Remove all construction waste upon finishing construction waste 	 Number of episodes of open defecation Number of sanitary facilities Number of sensitisation sessions 	Director of Health and Social Services	Quarterly All construction sites	Vehicles, fuel and stationery	1,000,000
	facilities in the construction sites Provide sanitation facilities such as mobile toilets at the construction sites Sensitise construction workers on the dangers of open defecation Provide solid waste management facilities at construction sites Segregate construction waste into recyclables and unrecyclable so that the recyclable so that the recyclable can be reused or sold to recyclers. Sensitise construction workers on proper solid waste unagement facilities at the recyclable can be reused or sold to recyclers. Sensitise construction waste upon finishing construction waste as fill material	facilitiesinthe construction sitesProvidesanitation facilities such as mobile toilets•Number of episodes of open defecationtoiletsatthe construction sites•Number of sanitary facilitiesSensitiseconstruction•Number of sanitary facilitiesSensitiseconstruction•Number of sanitary facilitiesof open defecation•Numberof sensitisationProvidesolidwaste management facilities•Numberof sensitisationsessionsProvidesolidwaste management facilitiesat construction sitesSegregate construction waste into recyclables and unrecyclable so that the recyclers.Sensitiseconstruction workers on proper solid waste uponfinishing construction waste uponUseconstruction waste as fill materialuse	facilitiesinthe construction sitesProvidesanitation facilitiesNumber of episodes of open defecation facilitiesDirectorof Healthtoiletsatthe of open defecation facilitiesNumber of sanitary facilitiesDirectorof Healthconstruction sitesSensitiseconstruction sensitisation sensitisation sessionsNumber of sensitisation sessionsDirectorof HealthProvidesolidNumberof sensitisation sessionsNumber of sensitisation sessionsSocial ServicesProvidesolidwate management facilitiesNumber of sensitisation sessionsSocial ServicesSegregateconstruction waste into recyclables and unrecyclable can be reused or sold to recyclers.Sensitise construction waste upon finishing construction waste uponImage: Social ServicesRemoveall construction waste as fill materialImage: Social Services	facilitiesinthe construction sitesDirectorQuarterly AllProvidesanitation facilities•Number of episodes of open defecationDirectorQuarterly Alltoiletsatthe construction sites•Number of sanitary facilitiesSocial ServicesSocial ServicesSensitiseconstruction sensitisation sof open defecation•Number of sensitisation sessionsSocial ServicesSitesProvidesolid waste management facilities•Number of sensitisation sessionsSocial ServicesSitesSegregateconstruction sessionssessionsSocial ServicesSitesSitesSegregateconstruction sessionssessionsSocial ServicesSitesSegregateconstruction sessionssessionsSocial ServicesSitesSegregateconstruction sessionssessionsSocial ServicesSitesSegregateconstruction sessionssessionsSocial ServicesSitesSegregateconstruction sessionssessionsSocial ServicesSitesSensitiseconstruction sessionssessionsSocial ServicesSitesSensitiseconstruction workers on proper solid waste upon finishing constructionset set set set set set set set setSocial ServicesSitesUseconstruction workersingset set set set set set set set setset set set set <td>facilitiesinthe construction sitesNumber of episodes of open defecationDirectorof Quarterly All construction sitesProvidesanitation facilities such as mobile toilets•Number of episodes of open defecation facilitiesDirectorQuarterly All construction sitesSensitiseconstruction sites•Number of sanitary facilitiesSocial ServicesVehicles, fuel and stationerySensitiseconstruction sensitisation sof open defecation sensitisation sessions•Number of sensitisation sessionsSocial ServicesSitesProvidesolid waste management facilities at construction waste into recyclables and unrecyclable can be reused or sold to recyclers. Sensitise construction waste management Remove all construction waste upon finishing construction Use construction waste as fill materialImage: Social ServicesImage: Social ServicesImage: Social ServicesImage: Service sector•Number of sensitisation sessionsImage: Social ServicesImage: Social ServicesImage: Social ServicesSegregateconstruction sessions•Number of sensitisation sessionsImage: Social ServicesImage: Social ServicesImage: Social ServicesSegregateconstruction sessions•Number of sensitisation sessionsImage: Social ServicesImage: Social ServicesSegregateconstruction sessions•Image: Social ServicesImage: Social ServicesImage: Social Services</br></td>	facilitiesinthe construction sitesNumber of episodes of open defecationDirectorof Quarterly

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
	Loss of plants during site clearing	 Confine land clearing to just the site for a plant infrastructure Plant trees surrounding project sites as a replacement. 	Plant diversity	Department of Forestry	annually	Transport and monitoring personnel	5,000,000
	Noise and vibration around construction sites	 Servicing of vehicles and plants rescheduling of work to day time Provide earplugs to workers Sensitizing communities 	Noise and vibration levels	District Environmental Officer	Throughout	 Seismomet er Human resource Transport 	3,500,000
	Occurrence of accidents and injuries	 Mark all construction sites with visible tape and erect appropriate safety signs to warn workers and visitors Provide workers with appropriate PPE Use fall protection equipment when working at heights Ensure that first aid services are put in place to ensure quick response from emergency 	Injuries among the workers Number of accidents and injuries among community members	Labour officer	Monthly	Vehicles, fuel and stationery	4,000,000

Phase	Impact	Proposed mitigation	Parameters	to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored				required	cost (MK)
		 Maintain work areas to minimize slipping and tripping hazards Implement fire and explosion prevention measures Provide necessary breathing equipment and ventilation for workers in deep trenches and manholes Introduce humps on the roads to help reduce the speed of the vehicles Erect warning signs showing that there is heavy machinery and construction vehicles using roads for people to be alert 						
	Increased incidence of teenage pregnancies	 Supply of condoms at the construction site Development of a Code of Conduct / rules for worker-community interaction and on-site behaviour 	Number of pregnancies	teenage	 Director of Health and Social Services Gender and Social Welfare officer 			

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
	Sexual Exploitation, Abuse and Harassment	 Conduct training for contractors and their workers on labour and Gender Based Violence laws Include GBV/SEAH requirements in the bid documents Integrate measures for prevention and handling Gender Based Violence (GBV) and SEAH in the C-ESMP All workers should sign code of conduct which include specific clauses on GBV/SEAH prevention Include GBV/SEAH prevention in the induction programme Conduct awareness raising to neighbouring communities regarding SEAH and reporting mechanism Including receiving handling channel of SEAH allegations within the GRM and training responsible GRC members on handling the allegations 	Number of cases/complaints on sexual exploitation, abuse and harassment,	 Gender and Social Welfare Police- Victim Support Unit 	Monthly	 Human resources Transport Training aids 	1,500,000

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
	General abuse of	Conduct training for	Number of	Department of	Monthly	• Human	
	workers by	Contractor and workers on	cases/complaints on	Labour		resources	
	Contractor	labour laws of Malawi	general abuse of			Transport	
			workers			• Training	
						aids	
	Increase in	Employ dust suppression	Concentration of dust in	District	Quarterly	• Human	800,000
	incidence of dust	measures like application of	the air	Environmental		Resources	
		water		Officer		• Transport	
		• Conduct Road safety	• Number of road	Police	Quarterly	• Human	2,500,000
		briefings/trainings for	traffic accidents	Road		Resources	
	Increase in road	communities	• Number of road	Traffic		Transport	
	traffic accidents	• Road signage placed at	traffic briefings	Directorate		• Training	
	tranne accidents	appropriate places	conducted			aids	
		• Drivers to observe					
		speed limits					
	Vandalism and	• Sensitize communities	Number of reported	Contractor	Throughout	• Sensitizatio	6,000,000
	theft of project	on importance of	cases of vandalism and		construction	n materials	
	infrastructure	safeguarding water	theft		phase	• Security	
	including solar	infrastructure				personnel	
	equipment and	• Provide adequate				• Security	
	pipes	security in project sites				kits	
		• Fencing the solar					
		installation sites					
		• Empowering					
		community police					
	Loss of Flora	• Confine land clearing to	Plant diversity	Department of	annually	• Transport	3,000,000
		just the site for a plant		Forest		• Personnel	
		infrastructure.					

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
		• Plant trees surrounding project sites as a replacement.					
	Potential introduction/sprea d of alien species from vehicles and soil movements	Ensure that vehicles are washed thoroughly so that no alien species are brought to project sites	Plant diversity	Department of Forest	annually	TransportMonitoring personnel	3,000,000
	Increased incidence of sexually transmitted diseases like HIV AND AIDS	Conduct Sexual and Reproductive Health education for communities and workers	Number of patients presenting with conditions at the health centres and hospitals	Director of Health and Social Services	Bi-Annual	 Human resources Transport Training aids 	4,000,000
Operation	Deterioration in sanitary conditions in the district	 Conduct regular inspection of the sewer network to detect leaks, overflows; and repair them Enforce by-laws to ensure that there is no indiscriminate disposal of wastewater, faecal sludge in the environment. Enforce by-laws to ensure that there is no indiscriminate disposal of ensure that there is no indiscriminate disposal of screenings and 	Number of leakages and overflows Number of episodes wastewater, and faecal sludge disposal in the environment. Number of facilities for proper management of screenings and sludge	Director of Health and Social Services	Annual All construction sites	Vehicles, fuel and stationery	1,000,000

measures sludge in environment. Provide facilities	monitored			required	cost (MK)
sludge in the environment.Provide facilities for					
 proper management of screenings and sludge Community 	Number of pest related	Director of	Annually	Vehicles, fuel	5,000,000
 Community sensitization on the negative impacts from pests and vectors that are harboured in poorly managed waste Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites Enforce by-laws to ensure that there is no indiscriminate disposal of solid waste in the environment 	outbreaks	Health and Social Services	7 tinituari y	and stationery	3,000,000
 Monitor the water quality regularly Monitor the quality of effluent discharged from the treatment plant 	Pollutants according to local and international standards	District Environmental Office and National Water Resources	Quarterly	Water quality measuring equipment Transport Human	3,000,000
	 Provide Taemites for proper management of screenings and sludge Community sensitization on the negative impacts from pests and vectors that are harboured in poorly managed waste Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites Enforce by-laws to ensure that there is no indiscriminate disposal of solid waste in the environment. Monitor the water quality regularly Monitor the quality of effluent discharged from the treatment plant regularly 	 Frovide fractions for proper management of screenings and sludge Community Sensitization on the negative impacts from pests and vectors that are harboured in poorly managed waste Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites Enforce by-laws to ensure that there is no indiscriminate disposal of solid waste in the environment. Monitor the water quality regularly Monitor the quality of effluent discharged from the treatment plant regularly 	• Frovide fractifies for proper management of screenings and sludgeNumber of pest related outbreaksDirector Healthd• Community sensitization on the negative impacts from pests and vectors that are harboured in poorly managed wasteNumber of pest related outbreaksDirector HealthAlenth and Social Services• Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsitesProvide solid waste management facilities in communities and institutions to avoid formation of waste dumpsitesPollutants according to local and international standardsf• Monitor the water quality regularly • Monitor the quality of effluent discharged from the treatment plant regularlyPollutants according to local and international standardsDistrict Environmental Office and National Water Resources Authority	 Frovide ratificts for proper management of screenings and sludge Community Sensitization on the negative impacts from pests and vectors that are harboured in poorly managed waste Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites Enforce by-laws to ensure that there is no indiscriminate disposal of solid waste in the environment. Monitor the quality of effluent discharged from the treatment plant regularly 	Image in the formation of the screenings and sludge Number of pest related outbreaks Director of Health and Social Services Annually Vehicles, fuel and stationery Image in the sensitization on the negative impacts from pests and vectors that are harboured in poorly managed waste Number of pest related outbreaks Director of Health and Social Services Annually Vehicles, fuel and stationery Image in the relation of the negative impacts from pests and vectors that are harboured in poorly managed waste Provide solid waste management facilities in communities and institutions to avoid formation of waste dumpsites Provide solid waste in the environment. Pollutants according to of solid waste in the environment. District Quarterly Water quality measuring equipment facilities in the environment. f • Monitor the water of filuent discharged from the treatment plant regularly Pollutants according to attain international standards District Quarterly Water quality measuring equipment Transport

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
		 Inspect water and sewer pipelines to detect leakage Develop standard procedures for maintenance works 					
	Leachate emission and groundwater contamination	 Proper coverage of landfill sites Provision of drainage Installation of monitoring wells 	Pollutants emanating from leachates	District Environmental Office, District Water Development Office	annually	 Transport Human Resource Water monitoring equipment 	2,000,000
	Occurrence of accidents and injuries	 Train all workers on the use of operating and maintenance equipment Provide workers with appropriate PPE Ensure that first aid services are put in place to ensure quick response from emergency Avoid handling screenings with bare hands to prevent pricks and scratches Maintain work areas to minimize slipping and tripping hazards 	 Number of trainings on operation and maintenance; and health and safety Issue Number of accidents and injuries among workers 	Labour officer	Monthly	Vehicles, fuel and stationery	7,000,000

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
		• Implement fire and explosion prevention					
		NRWB to work with ADCs to form/revamp functional Grievance Redress Mechanism Committees (GRMs)					
Decommissio ning	Open borrow pit and quarry mining sites	Backfill the pits and quarry sitesReplant vegetation	Number of pits	District Environmental Office	Throughout decommissi oning phase	Transport Human resource seedlings	6,000,000
	Construction waste Rubble	 Use material to backfill the borrow pits, quarry sites and gullies Reuse the waste for construction such as road maintenance 	Number of sites cleared	District Environmental Office	Throughout decommissi oning phase	Transport Human resource	1, 500,000
	Dust emission	Employ dust suppression measures like application of water	Number of times dust suppression measures are applied per day	District Environmental Officer	Quarterly	• Human Resources Transport	800,000
	pollution due to improper disposal of solar accessories batteries	Follow guidelines for disposal and pollution control management plan for this project	number of cases of unsafe disposal of batteries and other solar accessories	District Environmental Officer	Throughout decommissi on and maintenance phase	 Solar waste containers Transport Personnel 	2,500,000
	Noise and vibration around construction sites	 Servicing of vehicles and plants rescheduling of work to day time 	Noise and vibration levels	District Environmental Office	Throughout the decommissi on period	 Seismomet er, Noise meter, 	5,000,000

Phase	Impact	Proposed mitigation	Parameters to be	Responsibility	Frequency	Resources	Estimated
		measures	monitored			required	cost (MK)
		• Provide earplugs to				• Human	
		workers				resource,	
		Sensitizing				Transport	
		communities					
	Leachate emission	• Proper coverage of	Pollutants emanating	District	Throughout	Transport	7,000,000
	and groundwater	landfill sites	from leachates	Environmental	the	• Human	
	contamination	• Provision of drainage		Office, District	decommissi	Resource	
		• Installation of		Water	on period	• Water	
		monitoring wells		development		monitoring	
				Office		equipment	
	Pollution of	• Monitor the water	Pollutants according to	District	Quarterly	• Water	3,000,000
	surface and	quality regularly	local and international	Environmental		quality	
	groundwater	• Monitor the quality of	standards	Office and		measuring	
		effluent discharged		National Water		equipment	
		from the treatment plant		Resources		Transport	
		regularly		Authority		• Human	
		• Inspect water and sewer				Resources	
		pipelines to detect					
		leakage					
		• Develop standard					
		procedures for					
		maintenance works					
TOTAL							86,600,000

8.4 INSTITUTIONAL CAPACITY AND IMPLEMENTATION ARRANGEMENT OF ESMP

The implementing agency, NRWB, has implemented similar projects that required an ESIA and implementation of ESMP. The most recent ones are Mzimba Water Supply and Sanitation Project and Nkhatabay Town Water and Sanitation Project which were both financed by AfDB and OPEC Fund for International Development (OPEC Fund), and Malawi NRWB Water Supply Efficiency Project financed by the European Investment Bank (EIB). NRWB also implemented the Chitipa water Supply Project financed by the Arab Bank for Economic Development in Africa (BADEA) and Songwe Water Supply under National Water Program II financed by World Bank.

The projects have strengthened NRWB's internal capacity to implement ESMPs and ensuring compliance with national and financier's safeguard requirements. NRWB's Project Implementation Unit (PIU) has personnel trained in Environmental Management, Social Safeguards, Water Resources Management, Public Health which has enabled NRWB to successfully implement the past projects.

The NRWB PIU currently has the following experts who have participated in project design and planning phase including preparation of the ESIA and RAP. The staff will also being responsible for the implementation of the ESMP.

- i. Environmental and Social Safeguard Experts
- ii. Environmental and Social Safeguard Officer
- iii. Community Mobilisation and Gender Expert
- iv. Health and Safety officer
- v. Monitoring and Evaluation Officer
- vi. Sanitation and Hygiene Officer.

The team shall also be responsible for monitoring, reviewing and reporting different aspects of the ESMP. The Environmental and Safeguard Experts shall be responsible for overall implementation, and preparation of reports. The reports on ESMP implementation performance shall be submitted monthly to AfDB and bi-annually to MEPA.

8.4.1 Implementing Stakeholders and Roles

The successful implementation of the project ESMP shall require seamless interaction and coordination from different stakeholders involved in the project including AfDB, NRWB, Engineering Consultant, Contractor, Government Regulatory Agencies such as MEPA, Ministry of Lands, District Environmental Office, and District Councils among others. These stakeholders shall have the following roles:

8.4.1.1 NRWB

The implementing agency shall ensure the following is done;

- Incorporating Environmental and Social Safeguards in procurement documents and ensuring compliance by bidders,
- Implementation of ESMP by contractor,
- Ensuring swift grievances redress,
- Inspection and Monitoring ESMP implementation, and
- Reporting to MEPA and AfDB.

8.4.1.2 Engineering Consultant

The Engineering consultant is responsible for reviewing designs and supervising the contractor. S/he will ensure that the designs and works being implemented by contractors comply with E & S requirements. The consultant shall therefore have Environmental and Social Safeguard Specialist within their team.

8.4.1.3 Contractors

The project construction activities shall be carried out by contractors. The contractors shall be responsible for most ESMP implementation. The contractor shall have Environment, Health and Safety Officer to ensure implementation and monitoring of Environmental, Health and Safety measures on daily a basis.

8.4.1.4 Ministry of Lands

The Ministry of Lands is responsible for checking RAP implementation by ensuring Project Affected Persons are compensated fairly and adequately following guiding Laws of Malawi as well as AfDB requirements. All compensations before shall be vetted and approved by responsible Lands Official.

8.4.1.5 District Project Monitoring Team (DPMT)

As a way of ensuring stakeholder participation, it is proposed that a District Project Monitoring Team (DPMT) be formed to take part in the monitoring of implementation of project activities including ESMP. This is necessary for the stakeholders to be kept abreast of the project progress and appraise the ESMP implementation. The DPMT shall include members from M'mbwelwa District Council, Rumphi District Council: Directors of Planning and Development - Chairperson; Directors of Health and Social Services; Directors of Public Works/ Engineering; District Water Development Officers; District Environmental Health Officers; District Forestry Officers; Monitoring and Evaluation Officers; District Education Managers; District Labour Officers and Gender Officers and representatives from CSOs and NGOs.
8.4.1.6 Malawi Environmental Protection Authority (MEPA)

MEPA is the responsible for ensuring ESIA adherence and ESMP compliance in Malawi. They are mandated to inspect project sites, sanction or issue stop order when the project is not in compliance with approved ESIA and ESMP conditions.

8.4.1.7 African Development Bank (AfDB)

The AfDB shall provide oversight to the implementing entity, NRWB, to ensure NRWB complies with ESMP and E & S safeguards standards during implementation of the project. It will also provide technical assistance and guidance where shall be needed.

8.4.2 Capacity building

Capacity building is one of the critical elements for successful and efficient implementation of ESMP and AfDB's Environmental and Social operation safeguard standard for PIU. Based on the assessment of the NRWB institution capacity and officers to be involved in in the implementation of the ESMP, the following broad areas of capacity strengthening have been recommended for PIU team:

- Training on revised AfDB Environmental & Social provisions in procurement document for all PIU members.
- Occupation health and Safety for Health and Safety officer, Environmental and Social Safeguard Officer
- Environmental and social assessment and monitoring implementation of the ESMP and RAP
- Environmental Audit, Environmental Management ISO 14001:2025, and Project Risks Assessment and Management for Environmental and Social Safeguard Expert, Officer and Community Mobilisation and Gender Expert
- Gender Transformative Approaches for project for Community Mobilisation and Gender Expert.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusion

This report has presented a comprehensive assessment of the social, physical and biological conditions of the Rumphi Water Supply and Sanitation Project. The biological studies at the project site have shown that the expected project activities will have little impact on the biodiversity as most of the species encountered are not listed under IUCN, CITES and Malawi gazette species. Generally, the ESIA study results show that although there will be some limited negative environmental implications of the project, implementation of the Rumphi Water Supply and Sanitation Services Improvement Project will have socio-economic benefits to people in the area as well as environmental benefits. Specific mitigation measures have been proposed in this report to offset the inherent adverse impacts. In implementing these mitigation measures there would be an increase of environmental soundness and social acceptability of the project. The total cost for implementing Environmental and Social Management Plan including the Monitoring Plan is estimated to cost **MWK 1,333,859,100.00** (**USD 1.3 million, round up figure**) including costs for resettlement and relocation of business

In addition, the implementation of the wastewater management services and facilities will reduce the quantities of human excreta in the environment thereby ensuring public and environmental health. The solid waste management component of the project will help in addressing the problem of poor waste management in Rumphi District.

Socially, the assessment has found that the project is beneficial to the residents of Rumphi and Mzimba who will benefit from clean water supply and improved liquid and solid waste management services. Travellers are also going to benefit from improved ablution services whereas the District Council will also benefit from increased source of income. There are several potential negative impacts which are mainly temporally and manageable if the mitigation measures that have been proposed are implemented.

It is, therefore, concluded that, implementation of the Rumphi Water Supply and Sanitation Services Improvement Project will entail no detrimental impacts on the environment and social aspects if the recommended mitigation measures are adequately and timely put in place. NRWB is committed to implement all mitigation measures recommended in the ESIA

9.2 Recommendations

Some key recommendations for the execution of the project include:

Draft ESIA Report for Proposed Rumphi Water Supply and Sanitation Services Improvement

Based on the social impact assessment, the NRWB is advised to closely keep an eye on its relationship with the WUA, because this is the most sensitive stakeholder. Apart from that, the project is welcomed by the communities and other partners.

It is also expected, through measures proposed in this document, that there will be minimum destruction of the environment by limiting construction activities to locations where infrastructure will be constructed. The remnant vegetation should later be supplemented with further reforestation to help create a green environment. Where possible breeding sites for birds, small mammals and other animals should be avoided. It is also recommended that vehicles should be moving at low speeds to give room for animals to escape.

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11 APPENDICES

APPENDIX I: ESIA TERMS OF REFERENCE

Telephone: 01 771 111 Telefax No.: 01 773 379 Our Reference No.: MEPA/99/07/05 Your Reference No...... Communications should be addressed to: The Director General of MEPA



MALAWI ENVIRONMENT PROTECTION AUTHORITY LINGADZI HOUSE CITY CENTRE PRIVATE BAG 394 LILONGWE 3 MALAWI

9th December, 2021

The Chief Executive Officer Northern Region Water Board Private Bag 94 MZUZU

Dear Sir,

REQUIREMENT OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR UPGRADING AND EXPANSION OF WATER SUPPLY SYSTEM AND IMPROVEMENT OF SANITATION FOR RUMPHI TOWN

Reference is made to your project brief on the above captioned subject which was submitted to the Malawi Environment Protection Authority (MEPA) for review and guidance. I wish to inform you that the project brief was reviewed by the Authority.

Considering the nature and scope of the proposed project and as a requirement of EMA, 2017, I wish to advise that you are required to conduct an Environmental and Social Impact Assessment (ESIA) before implementation of activities on the proposed project sites. Find attached Terms of Reference for conducting the ESIA.

Should you require any further information or clarification on the foregoing, please do not hesitate to contact us.

Yours faithfully,

Benon Yassin FOR: ACTING DIRECTOR GENERAL OF MEPA

Attd: Terms of Reference for ESIA

ESIA TERMS OF REFERENCE FOR UPGRADING AND EXPANSION OF WATER SUPPLY SYSTEM AND IMPROVEMENT OF SANITATION FOR RUMPHI TOWN

- Provide a full description of the nature/components of the proposed project with respect to the name the proponent, postal address, aim and objectives of the project, the spatial location of the site for the project, the estimated cost of the project, the size of land for the project site, evidence of land approvals or land lease, the number of people to work on the area (provide a breakdown of males and females, locals and non-locals), number of people to be residing on the project area.
- 2. Provide a site-specific visible map of the area (scale 1:50,000) showing the proposed sites and (1:10,000) showing existing establishments in the proposed area and surrounding areas. A site plan for the project should be provided. All maps should be in color to portray the themes clearly.
- 3. 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 nature of the project including detailed description of project components, project sites beneficiary, type of machinery to be used, types of pipes to be used and size, project coverage in terms of distance and etc, types of raw materials to be used and source, nature and estimated quantity of wastes (both solid and liquid) that will be generated, circularity to waste management i.e. state the means of reducing waste to a minimum by reusing and recycling the wastes, facilities for appropriate disposal of waste that cannot be reused or recycled, inputs and outputs including estimated costs for the activities
- 4. Provide a concise description of the existing biophysical characteristics and the socioeconomic environment status of the proposed area by identifying and analyzing:
 - Physical conditions: soil, geology, site topography, temperature, rainfall patterns and drainage system (water courses);
 - Biological Resources: scope of vegetative resources of the project area including riparian vegetation, extent of terrestrial and aquatic fauna including identification of endangered, threatened species in scientific and local names;
 - Socio-economic conditions: demographic trend within and around the project area, main land uses, including current use of the proposed project site, the distance from the nearest settlements/ houses, agriculture and marketing, business activities, basic infrastructure and health situation including description of HIV/AIDS prevalence rates; and
 - Any changes anticipated during implementation of the project area.
- 5. 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 ESIA should also consider 'within – project' alternatives e.g. designs, technology, pipe usage and any other material use etc.

- Predict environmental and social impacts associated with the activities at and around the site, focusing on both the positive and negative impacts. The impacts should include:
 - Project location (e.g. loss of grazing pastures, impact on flora and fauna, impact on cultural site);
 - Project design (e.g. drainage problem and other structures);
 - Construction works (e.g. soil erosion, disposal of construction spoils); and
 - Project operation (e.g. impacts on soil, risk of water pollution, (conflict of natural resources use) phases of the project through its projected life.
- Prescribe the measures to eliminate, reduce or mitigate the negative effects (including dust, utilities damage, occupational and public safety risks, noise) identified and the measures to enhance the positive effects.
- 8. Propose an Environmental and Social Management Plan (ESMP) by which all of the measures prescribed in 7 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.
- 9. Propose an Environmental and Social 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.
- 10. Review the legal framework pertaining to the proposed project and indicate their impacts on the project. Reference should at least be made to the Environment Management Act, Forestry Act, Water Resources Act, National Water Policy, Sanitation Policy, National Environment Policy, Malawi National Land Policy, Public Health Act, Occupational Safety, Health and Welfare Act, New Land Laws, Malawi standards, Malawi Development and Growth Strategy other relevant policies and piece of legislation. Furthermore provide an account of all regulatory licences 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.
- 11. Undertake stakeholder consultation to ensure key interested and affected stakeholders are involved in the Environmental and Social Impact Assessment process. Incorporate their views in the report and indicate a record of consultations in the appendices parts of the report.
- 12. Ensure that the District Commissioner and EDO for Rumphi District are fully aware of the proposed project.
- 13. The preparation, presentation and structure of the ESIA report should follow the format in the Guidelines of Environmental Impact Assessment for Malawi (1997) as stipulated on pages 33-37. The minimum content of required information in an ESIA Report is outlined in pages 53-59.

- 14. In order to adequately address the core issues of the study. It is advisable that the team should at least be composed of:
 - ESIA expert
 - Social expert
 - Hydrologist
 - Ecologist or Botanist
- 15. Submit 2 hard copies to MEPA for preliminary review before submission of 15 hard copies for Advisory Committee on Environmental and Social Assessments (ACESA) review and a soft copy of the ESIA report to the Director General of MEPA.
- 16. Provide the names of the ESIA Team and their respective fields and attach them as annex of the ESIA report.
- 17. Ensure that the report is printed on one sided using Times New Roman, font size 12.

APPENDIX II: MINUTES OF INTRODUCTORY AND KICK-OFF MEETING

MINUTES OF PREPARATION OF ESIA AND ESMP FOR PROPOSED RUMPHI WATER SUPPLY AND SANITATION IMPROVEMENT PROJECT KICK-OFF MEETING HELD ON 16th AUGUST 2022 AT KAWILUWILU HOUSE, BOARDROOM FROM 10:00 HOURS

Members present

		NORTHER	RN REGION WATER	BOARD	
		KICK OFF MEET	ING FOR RUMPHI P	ROJECT ESIA	
		16 TH AUGUST, 20	22 AT KAWILUWILU	BOARDROOM	
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Northern Region Water Board (NRWB) and ENVIROCONSULT discussing project activities during kick-off meeting The meeting chair, C. Mwafulirwa from NRWB, called the meeting to order and outlined the meeting agenda. Agenda for this kick-off meeting was:

- 1. Review and Adoption of the Agenda
- 2.Introduction and Apologies
- 3. Opening Remarks
- 4. Issues from Client
 - a. Project Overview
 - b. Key Personnel availability
 - c. Project mobilization and planning
 - d. RAP
 - e. Information required from Client
- 5. Issues from the Consultant
- 6. Closing Remarks

001/01/2022 Review and Adoption of the Agenda

There were no changes and further comments on the agenda therefore the agenda was adopted.

002/01/2022 Introduction and Apologies

 \cdot Dr V. Msadala (Water Engineer) and Dr. K. Kalulu (Sanitation Expert) from ENVIROCONSULT were not available because of other commitments but they are fully committed to the project activities.

- Mr. Chifundo Mtenga- NRWB issued an apology for joining the meeting late.
- \cdot The meeting chair requested the consultant to write a letter of commitment for all experts who were not available during the meeting.

003/01/2022 Opening Remarks

The chair of the meeting welcomed all to the kick-off meeting and gave a briefing about the project. She highlighted that the project is financed by African Development Bank. She further indicated that Environmental and Social Impact Assessment; Environmental and Social Management Plan and Monitoring Plans (ESMPs) and Resettlement Action Plans (FRAP/ARAP) are required before the commencement of project activities. The chair handed the floor to Mr. Mwawi Kumwenda to present an overview of the project components.

004/01/2022 Issues from Client

a. Project Overview

Mr. M. Kumwenda indicated that there are no changes to the Terms of References (ToRs) that were shared with the consultant. He described the existing system and indicated that there is no weir constructed across the river bed at the current intake structure. He further presented two key components of the project:

1. Water supply

- Constructing a weir, upgrading the intake and transmission pipelines
- Upgrading water treatment plant

• Constructing additional service reservoirs at Rumphi treatment plant and Our Future-Rumphi site

 \cdot Constructing new service reservoirs at Bolero, Luviri, Mwazisi and kacheche

• Constructing pumping stations with reinforced concrete sumps at Bolero, Luviri, Kacheche, Thumbi and Mwazisi

He further presented preliminary maps of project extent highlighting existing infrastructure and proposed extension.

2. Sanitation

 \cdot On sanitation, Mr. Kumwenda indicated that NRWB would like to focus on preparation of the District Sanitation and Hygiene Plan and Investment Strategy and establish solid waste facilities including waste holding, transporting station, wastewater sludge treatment and sewerage facilities for public institutions and surrounding households.

• In line with sanitation issues, Mr. L Banda-NRWB was invited to describe NRWB's plan on catchment management activities. He pointed out that NRWB has noticed degradation of the Rumphi River catchment area due to charcoal burning and cutting down of trees. He outlined that NRWB is planning to introduce programs to improve community resilience as a measure to curb the environmental interference from the surrounding communities.

005/01/2022 Stakeholder Consultation

• Dr Margaret Sikwese(Social expert)- ENVIROCONSULT asked the meeting chair to clarify on who are the main stakeholders to be considered during consultation meetings between Rumphi and Mbelwa District Councils.

• The chair indicated that initially Rumphi district council was the target stakeholder. However, the project also includes areas belonging to Mbelwa district council. Therefore, Inkosi Jaravikuwa and other officials including the District Commissioner from Mbelwa district council were invited to a project briefing meeting and are aware about the project.

 \cdot Mr. kumwenda and Mr Chifundo Mtenga concurred with the chair and stated that officials from both district councils will be available during project presentation.

006/01/2022 Proposed Pipeline extent

 \cdot Mr. M. Phula(RAP)-ENVIROCONSULT wanted to know the length of proposed pipeline and corridor buffer.

• Mr. Peter Mbisa-GIS-NRWB responded that they total length of the pipeline will be provided by NRWB and the project will consider a 5 meters corridor.

007/01/2022 Plan on Sewerage Service connection

• Mr. W. Chitaukali(Biodiversity) wanted to know NRWB's plans on the coverage of the planned sewerage services.

• In response, the client indicated that the extent of service provision will depend on the survey results. However, NRWB indicated that only public institutions including Rumphi District Hospital, Rumphi Secondary School and houses surrounding the institutions will be considered. Further, NRWB also indicated that such arrangement was done to ensure low costs by eliminating the need for pumping.

• In addition, the plan is to acquire collection vehicles and introduce skips, disposal areas with a central collection point near Rumphi Market and Bolero.

008/01/2022 Impact Boundary and Resettlement

 \cdot Mrs Kalidekafe(ESIA)-ENVIROCONSULT wanted confirmation on where the assessment will be focused and enquired if there are any considerations on physical resettlement.

• Mr. Chifundo Mtenga explained that only areas with planned facilities are going to be assessed and NRWB does not expect any physical resettlement or involuntary resettlement.

 \cdot Mr. P.Mbisah(GIS)-NRWB assured the consultant that updated project data and maps will be provided to the client soon after the meeting.

009/01/2022 Project Awareness Messages

Dr. Margaret Sikwese-ENVIROCONSULT asked if the project steering team has visited project areas and made agreements on land acquisition.

The meeting chair indicated that the team has surveyed and most people are aware of the project. However, the message was not conveyed at household level but up to Village Development Committee (VDC) level.

010/01/2022 Waste Disposal Facilities Site Suitability analysis

Mr. S. Gondwe(GIS)-ENVIROCONSULT- needed clarification on whether NRWB has already identified suitable sites for waste disposal or the consultant has to establish suitable areas.

Mr. M. Kumwenda-NRWB clarified that site suitability analysis will be done by NRWB. However, he indicated that Rumphi District Council identified a possible site but NRWB is reviewing the criteria used in the site identification process. NRWB will identify two more areas and share with the consultants to advise on the most suitable site. The meeting chair, C. Mwafulirwa, also clarified that sanitation facilities will be handed over to Rumphi District Council such that service access fees issues including waste emptying truck fees will be discussed at council level.

b. Key Personnel availability

All key project personnel were present in the inception meeting except Dr. V. Msadala and Dr. K. Kalulu from ENVIROCONSULT due to other commitments. However, ENVIROCONSULT assured the client that the experts are fully committed to the task assigned and a commitment letter will be issued to the client.

c. Project mobilization and planning

On planned activities, Mrs. Kalindekafe-ENVIROCONSULT stated that the project schedule can be re-adjusted to accommodate any initial oversight after project negotiations. However, the current plan remains intact as it was discussed before with the client. The following were proposed flow of activities:

• Initial field visits with the client and reconnaissance survey from 16th August 2022 to 18th August 2022.

Inception report to be submitted to client by 26^{th} August 2022.

· Client to review inception report in 5 days from submission date and provide feedback to the consultant by 30^{th} August, 2022.

- Baseline study will commence on 31^{st} August 2022 and submit a draft ESIA report to clients by 23^{rd} September 2022.

 \cdot The consultant will expect to get feedback on draft ESIA report Feedback by 30th September 2022

• ENVIROCONSULT expects to incorporate comments on the draft ESIA report and update the report by 7th October 2022.

 \cdot Upon submitting the report to Malawi Environment Protection Authority (MEPA), the consultant expects to incorporate comments and suggestions by 30th October 2022 and the final report will be submitted by 7th November 2022.

• However, NRWB suggested that activities need to be speeded up to meet the project timeline and suggested that there might be a joint report review with MEPA.

d. Resettlement Action Plan(RAP)

• Mr. M. Phula-ENVIROCONSULT sought clarification on infrastructures that require land acquisition to be considered for RAP assessment.

• Mr. Chifundo Mtenga-NRWB pointed out that booster stations, planned tanks, access roads, other auxiliary structures and pipelines will require land acquisition. He further added that land for proposed tanks has been identified and negotiation on acquisition has already started. However, further negotiation with other landowners

in approximately four sites need to be done before commencement of the assessment.

 \cdot Mr. Mtenga further described areas around Rumphi boma and Bolero as hot spots where many people are likely to be affected and agreed to a recommendation by ENVIROCONSULT that some NRWB officials should accompany the consultant during initial site visits.

011/01/2022 Information required from Client

The client requested the consultant to prepare a list of data required and request for provision through email and M. Kumwenda, P. Mbisah and H. Chiwanda of NRWB are key personnel to provide project data.

012/01/2022 Issues from the Consultant

 \cdot On project areas terrain and land acquisition, the consultant wanted to know general information on accessibility and land acquisition plans.

• NRWB assured the consultant that proposed pipelines are planned to be placed in relatively easily accessible terrain while tanks are mostly in higher elevation areas. Furthermore, tanks and pipelines are planned to be mostly placed in public land especially following existing roads for pipeline placement.

013/01/2022 Field visit

The client and consultant planned to start visiting the intake infrastructure at Rumphi boma by on 17th August 2022 and later hold a meeting with Rumphi district council at 9:00AM before proceeding to Bolero, Luviri and Mwazisi project sites. On the following day, 18th August 2022, both teams agreed to visit Enukweni, Kacheche, Bwengu, Thumbi and Luzi project sites. Traditional Authority (TAs) areas within the project extent are Chikulamayembe, Jaravikuwa and Mwahenga.

Finally, the client emphasized that the consultant should use the meetings with district council officials as a platform to request any relevant data that might be needed for the project.

014/01/2022 Closing Remarks

The meeting chair thanked all for positive contributions to the kick-off meeting and closed the meeting.

Conclusion and Recommendation

The Inception meeting was a success, with comments and recommendations being incorporated into the assessment plan to ensure better coordination and implementation of the project activities. It is recommended that the client and consultant work closely together to ensure that identified project activities are executed in a timely manner to meet the project time.

APPENDIX III: STUDY TEAM

In order to address the objectives of the assignment and respond to the terms of reference, the Consultant engaged a highly qualified and experienced team of experts. The key staff are grouped into three working teams (Physical &Chemical Assessment Team, Biological Assessment Team and Social Assessment Team) as shown below. A GIS expert was engaged to liase with all experts in producing maps for the report. The executive director of ENVIROCONSULT in conjunction with the Team Leader were responsible for general project management and quality control.

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Figure 11-1: ESIA Working Teams

Name	Area of Expertise	Position	Tasks Assigned
Mrs M.P. Kalindekafe	ESIA Expert and Ecologist	Team	Technical supervision and leadership of the assignment
		Leader	
Assoc. Prof Bosco Rusuwa	Biodiversity Expert	Consultant	Aquatic Fauna & Invertebrates
Dr Vincent Msadala	Water Supply Engineer	Consultant	Water Supply assessment
Dr Margaret Sikwese	Social Expert	Consultant	Social Impact Assessment
Mr Steven Gondwe	GIS & Geology Expert	Consultant	Map production for the project & description of the geology
			and soils of the area
Mr Wilbert Chitaukali	Biologist	Consultant	Terrestrial Fauna & Flora
Mr Mavuto Phula	RAP Expert	Consultant	Resettlement Issues and Property Valuation
Assoc. Prof Leonard Kalindekafe	Geology, Policy and DRM	Executive	Quality Control and Overall office project management &
		Director	administration

Table 45: Areas of Expertise and Specific Tasks of Key Experts and Specialists

APPENDIX IV: QUESTIONNAIRE FOR SOCIAL SURVEY



ENVIROCONSULT

Plot 278 Old Naisi,

P.O. Box 370, Zomba, MALAWI

Tel: +265995623338/888896625

+265888201 324/+265995363485

1. Data collection information

- 1. Valuation/household number:
- 2. Interviewer names:
- 3. Date:
- 4. Village/Area:
- 5. District:
- 6. Names of household head (HHH):....
- 7. Nationality of HHH.....
- 8. Mobile number of HHH or main contact person:
- 9. Names of person interviewed (if not the HHH):....
- 10. Relationship of person interviewed to HHH:

.....

2. Household demographics

- 1. Is this household part of a polygamous household?
- 2. If yes, state the number of wives:
- 3. Household number/s of related polygamous households:
- 4. Home language:
- 5. Ethnicity:
- 6. Religion:

3. Household members

1. How many people are in this household (excluding tenants/occupants)?

							Only for per	sons 5 years and	l older	Only for persons	15 years and old	ler
1. Name	2. Age	3. Relation ship to house hold head	4. Marital status	5. Gender (M / F)	6. Residential status	7. Disability/ serious illness	8. Attendin g school? (Y / N)	9. Highest education completed	10. Able to read? (Y / N)	11. Primary activity (if formal employmen t specify, location)	12. Secondary activity	13. Employab le skills

4. Residency and tenants

- 1. For how many years has the household been living in this Village/Area?
- 2. Does the household have another home? Y/ N
- 3. If yes, where is this other home:
- 4. Are there tenants accommodated on this property?
- 5. If yes, number of tenants being accommodated?
- 6. Is the property used for business purposes? Y / N
- 7. If yes, specify type of business?

5. Dwellings and structures

- 1. How many structures do this household own?
- 2. How many of each structure make up this homestead?

Structure	Number	Status of the Structure G = Good P = Poor
Multifunctional residential		
Stand-alone Sleeping		
Stand-alone Kitchen		
Stand-alone Toilet/Shower		
Business only		
Combined multifunctional residential & business		
Livestock kraal		
Other (specify)		

6. Water, sanitation and energy

- 1. Where is this household's water MOSTLY obtained from?
- 2. How long does it take to walk to that water source? (minutes)
- 3. What do you use the water for?

.....

- 4. Do you treat your water before drinking it? Y/N
- 5. What method, if Yes in 4 above, do you use most often to treat your water before drinking it?
- 6. Does the household have a sanitation facility? Y/N
- 7. If yes in 6 above, what type of sanitation facility does this household have?
- 8. Does the household share this sanitation facility with another household? Y / N
- 9. If No in 6 above, what type of sanitation facility does this household use most of the times?

.....

10. What energy source does the household mostly use for cooking?

- 11. Where is it sourced from?
- 12. What energy source does the household mostly use for lighting?......13. Where is it sourced from?......

7. Land tenure and arable land

1. How many pieces of arable land does this household currently have access to?

For each piece of land owned or used by the household, please provide the information indicated below:

		1		
#				
1	Y/N			
2	Y/N			
3	Y/N			
4	Y/N			

2. If none, please provide reason?

.....

Plot #	3. What are the main crops/plants grown by the household on each plot?	4.What is the total acreage grown per season	5.What is the average quantity of this crop/plant sold per season? (Quantity & percentage)
1	Crop 1		
1	Crop 2		
	Crop 1		
2	Crop 2		
	Crop 1		
3	Crop 2		
	Crop 1		
4	Crop 2		

3. Would you say that farming produces the (a.) principal or (b.) supplementary food source for this household? Y/N

- 4. Would you say that farming produces the (a.) principal or (b.) supplementary cash income for this household?Y/N.....
- 5. What tillage method does the household mostly use?.....
- 6. Has your household received any agricultural extension services during the last two seasons? Y/N
- 7. Did the household use any of the following modern inputs during the last season? (a.) improved seeds (b.) fertiliser (c.) improved breeds of livestock (d.) tractor
- 8. What was the source of the modern inputs:
 - a. Improved Seeds source
 - b. Fertiliser source
 - c. Improved breeds of livestock
 - d. Tractor

8. Livestock and poultry

1. Does the household own any livestock animals and/or poultry?

T: (1/D 1/	Est. Number	Use			
Livestock/ Poultry	owned by household	Consumption	Sales	Rituals / ceremonies	
1. Cattle		Y / N	Y / N	Y / N	
2. Sheep		Y / N	Y / N	Y / N	
3. Chickens / poultry		Y / N	Y / N	Y / N	
4. Pigs		Y / N	Y / N	Y / N	
5. Goat		Y / N	Y / N	Y / N	
6. Guinea fowl		Y / N	Y / N	Y / N	
7. Pigeons		Y / N	Y / N	Y / N	
8. Other (specify)		Y / N	Y / N	Y / N	

2. Does your household currently have access to land for grazing livestock? Y / N

3. If yes, how far is the grazing area from this homestead (minutes' walk)?

4. If No, please provide reason?

.....

9. Use of natural resources

Resource type		Harvesting frequency? (D -Daily, W -Weekly, S - Seasonally)	For own use (O) or to sell (S)	How far do you have to walk to access these natural resources? (Minutes)
1.	Wood (construction/ fire)	D / W / S	O / S	
2.	Bamboo	D / W / S	O / S	
3.	Honey	D / W / S	O / S	
4.	Forest food products	D / W / S	O / S	
5.	Bush meat	D / W / S	O / S	
6.	Fish	D / W / S	O / S	
7.	Medicinal plants	D / W / S	O / S	
8.	Clay (brickmaking)	D / W / S	O / S	
9.	Thatch/Straw	D / W / S	O / S	
10.	Other (specify)	D / W / S	O / S	

10. Sources of livelihood

2.

1. What is the MOST important livelihood activity for this household?

-
- Is the household mostly engaged in (a.) cash generating or (b.) food producing activities?
- 3. Please indicate main sources of household income below (all family members).

(Cross check all sources of income with reported sources of livelihood)

Source	of income	Amount during <u>last month</u> for entire household (MK)	Regular (R), Occasional (O)
1.	Salary/wage (specify source)		R / O
2.	Small-scale/ artisanal mining		R / O
3.	Small trader		R / O
4.	Crop sales		R / O
5.	Livestock sales (incl. sale of animal products)		R / O
6.	Social grants		R / O
7.	Tenants		R / O
8.	Firewood and/or charcoal		R / O
9.	Building materials		R / O
10.	Other (specify)		R / O

4. Who is the main cash income provider in this household?

11. Marketing of produce and transport

- 1. Where do you sell most of your produce, crops or animals? (If at home, cross check with Q)
- 2. What is the principal mode of transportation used to take your goods to where they are sold?
- 3. How long does it take you to transport your goods to where it is sold?
- 4. What is the principal mode of transportation used to travel to work or farms?

12. Expenditure

.....

Expenditure item	Rank the 5 most important items (1 most important – 5 least important)	Est. Amount during <u>last</u> <u>month</u> for entire household (MK)
1.		
2.		
3.		
4.		
5.		

13. Credit

1. Does the household rely on any of the following credit lending facilities?

Facility		Y/N	Approximately how much was borrowed last month? (MK)	
1.	Village/Area Savings and			
	Loans (VSL)			
2.	Commercial Bank			
3.	Loan Sharks (Katapila)			
4.	Loans from family			
	and/or friends			

14. Moveable assets

Item		Number currently owned in <i>working order</i>
1.	Cell phone	
2.	Radio	
3.	Television	
4.	Sewing Machine	
5.	Motor cycle	
6.	Car/Van	
7.	Tractor	
8.	Donkey cart	
9.	Bicycle	
10.	Wheelbarrow	
11.	Solar Panel	
12.	Fridge	
13.	Gas lamp	
14.	Bed	
15.	Generator	
16.	Seeder	
17.	Plough drawn by oxen	
18.	Table	
19.	Other (Specify)	

15. Nutrition

- 1. Was there a shortage of food during the last two seasons? Y / N
- 2. If yes, circle the months: Jan / Feb / March / April / May / June / July / Aug / Sept / Oct / Nov / Dec
- 3. What was the most important reason for food shortage?
- 16. Health
 - 1. Generally, when members of this household get ill, where do they go for medical attention?
 - 2. How long do household members need to travel to get to this facility (minutes)?
 - 3. Do you always get the prescribed medicine at the health facility? Y/N
 - 4. Do you get the prescribed medicines for free? Y/N
 - 5. If you buy medicines, how much have you spent on medicines in the past six months?

(Estimate in MK).....

- 6. Has your household received any household immunisation services in the last 6 months? Y/N
- 7. How often is the household visited by a community health worker?
- 8. Does your youngest child have a vaccination card? Y / N (If yes, request to see it)
- 9. Did any members of the household fall ill in the last six months? Y/N
- 10. Did any member of the household fall ill to the point of being bedridden in the past six months? Y/N
- 11. If yes in 7, for how long were they bedridden? (Days)
- 12. What are the three most common diseases that have affected this household in the past six months?
-

13. What do you know about HIV and AIDS?.....

```
14. In your view, what are the most common causes of HIV and AIDS?
```

17. Access to public services and livelihood resources

Service / resource	Location (Name of nearest Village/Area/town)	Time it takes to get there walking (n minutes)
18. Church/mosque		
19. Primary/Secondary school		
20. Bus stop		
21. Clinic/ Health Centre		
22. Market/ shop		
23. Police station		
24. Bank / credit facilities		
25. Hunting area		
26. Fishing area		
27. Area where medicinal plants are collected		
28. Area where firewood and forest food products are collected		

29. Social networks

1.	Do you	have relative	s in this	Village/A	rea? Y / N
----	--------	---------------	-----------	-----------	------------

Activity		Depend on friends and/or family
1.	Share equipment / tools / transport	V/N
	/ Cultivate fields etc.	1/11
2.	Exchange goods / services	Y/N
3.	Take care of children	Y/N
4.	Take care of sick household	V/N
	members	1/11
5.	Borrow money	Y/N

30. Needs analysis

1. What are this household's five most urgent needs?

Need		Rating (Assign 1 to most urgent and 5 least urgent)
1.	Infrastructures i.e. roads, bridges	
2.	Foodstuffs/water	
3.	Health facilities	
4.	Schools	
5.	Agricultural equipment	
6.	Police station	
7.	Skills training	
8.	Employment	
9.	Community gardens	
10.	Livestock watering hole	
11.	Other (specify)	

31. Expectations regarding the project

1. What are your main expectations regarding the proposed Water/Sanitation Project:

Issue		Y/N
1.	It will create employment	
2.	It will create opportunities for local businesses	
3.	It will improve local infrastructure (roads, etc.)	
4.	It will improve sanitation	
5.	Other (specify)	

2. What are your main concerns regarding the proposed Water/Sanitation project: (indicate level of importance by ranking from 1 to 5, 1 being most important and 5 least important)

Issue		Y/N
1.	People will be displaced off their land	
2.	People will be inconvenienced in accessing their	
	plots	
3.	Jobs will be given to outsiders	
4.	Loss of traditional values	
5.	It will impact on water resources	
6.	The environment will be polluted	
7.	Security will be compromised	
8.	Other (specify)	

3. Are you willing to relocate your agricultural activities to another area? Y/N

4. Suppose the livelihood activities that you are currently depending on are impacted upon due to a loss of your house and/or land? What would the best way be to restore your life?

32. CODES FOR RESPONSES TO QUESTIONS IN THE QUESTIONNAIRE

33.

34. (PART A) Relationship to household head

Household head	1
Spouse of household head	2
Son/ daughter of household head	3
Son-in-law/ daughter-in-law of household head	4
Grandchild of household head	5
Parent of household head	6
Parent-in-law of household head	7
Brother/ sister of household head	8
Cousin of household head	9
Grandparent of household head	10
Adopted/ foster/ step child of household head	11
Orphan	12
Not related but dependent	13
Other (specify)	14

District:

Mzimba	1
Rumphi	2

Village/Areas/settlements

	2
	4
	5
••••••••••	6
	7
	8
	9
	10
	11
	12
	13
	14
	15
	16
	17
	18
	19
	20
	21
	22
	23

35. Relationship of person interviewed to HHH Household head

Nationality	
Other (specify)	5
Parent or parent-in-law of household head	4
Son/ daughter of household head	3
Spouse of household head	2
inousenoid neud	-

i (unioinainy)	
Malawian	1
Tanzanian	2
Mozambican	3
Burundian	4
Rwandese	5
Other (specify)	6

1

36. (PART B) Home language:	
Chiltumbuka	1
Chichewa	2
Chingoni	4
Other (specify)	5
27 Ethnicity	
Tumbuka	1
Chewa	2
Ngoni	3
Yao	4
Other (<u>specity</u>)	3
Religion	
Christian	1
Islam	2
Other (specify)	4
(PART C) Residence and Tenancy	
Landlord	1
Employer	2
Government	4
Other (specify)	5
Marital status	
Married	1
Divorced	2
Widowed	3
Single Living together	4
Child	6
38 Residential status	
Lives here full time	1
Lives here part-time (more than 5 days per month)	2
Lives here irregularly (less than 5 days per month)	3
39. Highest education	
None	1
In primary School	2
Finished Primary School	5 4
In Secondary School	5
Did not finish Secondary School	6
Finished Secondary School	7
Higher Educational Level	8
40. Economic/livelihood activity	-
Farming Small trading	2
Livestock keeping	5 4
Artisanal mining	5
Other self-employment/ own business	6
Salaried employment (Government)	7
Salaried Employment (Private Sector)	8 Q
Day labourer/ pieceworker	
· 1 · · ·	~

Too old or sick to work Staying at home/ not looking for work Still in school or studying Other (specify)	11 12 13 14 15
41. Employable Skills	
Driving	1
Operation of heavy equipment	2
Mechanical skills	3
Electrical skills	4
Plumbing	5
Builder/ construction	6
Carpentry	7
Computer operating	8
Administrative/ clerical	9
Warehouse/ storekeeping	10
None of the above	11
(DADT D) If was only in this other hame?	
(PART D) If yes, where is this other nome?	1
Same Village/Area in this District (specify Village/Area)	1
Other District in this Degion (specify District)	2
Other District in this Region (specify District)	3
Other Country (specify Country)	4
other country (speerry country)	5
Type of business	
Government Employee	
Medium Enterprise	2
Small trading from shop	3
Mechanical Workshop	4
Salon	5
NGO/CSO Employee	6
Private Sector Employee7	
Other (Specify)	8
	0
/// / PAPTEN Where is weter MUNTLY obtained from	1?
42. (IARIF) where is water with SIL1 obtained iton	
Northern Region Water Board	2
Northern Region Water Board	2 3
Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe)	2 3 4
Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River stream dam or creek	2 3 4 5
 42. (TARTF) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank 	2 3 4 5 6
Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor	2 3 4 5 6 7
Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify)	2 3 4 5 6 7 8
Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify)	2 3 4 5 6 7 8
 42. (FARTF) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? 	2 3 4 5 6 7 8
 42. (FARTF) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking 	2 3 4 5 6 7 8
 42. (FARTF) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) 	2 3 4 5 6 7 8 1 2
 42. (FARTF) where is water wors if if obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops 	2 3 4 5 6 7 8 1 2 3
 42. (FARTE) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock 	2 3 4 5 6 7 8 1 2 3 4
 42. (FARTE) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) 	2 3 4 5 6 7 8 1 2 3 4 5
 42. (FARTE) where is water worst DT obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method if any, do you use most often to treat your way 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it?
 42. (FARTE) where is water worst ET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method, if any, do you use most often to treat your wa Do not treat water 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it? 1
 42. (FARTE) where is water wors if if obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method, if any, do you use most often to treat your wa Do not treat water Boiling 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it? 1 2
 42. (FARTE) Where is water WOSTET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method, if any, do you use most often to treat your wa Do not treat water Boiling Adding chlorine 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it? 1 2 3
 42. (FARTE) Where is water WOSTET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method, if any, do you use most often to treat your wa Do not treat water Boiling Adding chlorine Straining through cloth 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it? 1 2 3 4
 42. (FARTE) Where is water WOSTET obtained from Northern Region Water Board1 Communal borehole/well Individual borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method, if any, do you use most often to treat your wa Do not treat water Boiling Adding chlorine Straining through cloth Letting it stand and settle 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it? 1 2 3 4 5
 42. (FARTE) where is water wors if if obtained from Northern Region Water Board1 Communal borehole/well Government provided water (community tap/standpipe) River, stream, dam or creek Rain tank Water vendor Other (specify) What do you use the water for? Drinking Domestic use (bathing, cleaning, etc.) Irrigation / crops Livestock Other (specify) What method, if any, do you use most often to treat your wa Do not treat water Boiling Adding chlorine Straining through cloth Letting it stand and settle Water filter 	2 3 4 5 6 7 8 1 2 3 4 5 ter before drinking it? 1 2 3 4 5 6

How do you store drinking water?	
Do not store	1
Special water buckets	2
Any buckets	23
Covered clay pot	4
Other (specify)	5
ould (speeny)	5
43. Sanitation facility	
No sanitation facility	1
Pit latrine	2
Flush toilet	3
Other (specify)	4
Type of energy mostly	
Concreter	1
Solar papel	1
Public Electricity	23
Charcoal	Д
Elashlight/Batteries	5
Butane Gas	6
Candles	7
Wood	8
Cow dung	9
Paraffin	10
Other (specify)	11
$44 (\mathbf{P} \mathbf{A} \mathbf{P} \mathbf{T} \mathbf{C})$ What is the piece of land used for?	
Cultivation of crops throughout the whole year	1
Cultivation of crops during part of the year	2
Fallow/ resting	3
Grazing	4
Rented or lent to someone else	5
Not used	6
Other (specify)	7
No correct to forming land	
Not access to faithing failu	1
Not enough land available	1
No need for land	23
Other (specify)	Д
Such (Speeny)	-
45. Crops/plants	
Maize	1
Kice V	2
Y am	3
White sorghum	4
Red sorghum	5
Peanuts/groundnuts	7
Cownea	8
Cotton	9
Onion	10
Tomato	11
Lettuce	12
Carrots	13
Cotton	14
Coffee	15
Beans	16
Potato	17
Pumpkin	18

Cassava	19
Pimento	20
Aubergine	21
Green legume	22
Watermelon	23
Nielon	24 25
UKIA Mango	25
Banana	20
Orange	27
Citrus	20
Panava	30
Other (specify)	31
T. 4.1	
1 otal acreage grown per season	1
1-5 5 10	1
10 15	2
15+	5 4
151	7
Average amount sold per year (bunches, kilograms, sa	cks, poles)
1-5	
5-10	2
10-15	5
10^{+}	4 5
Outer (specify)	5
46. If any fields were left uncultivated, why wer	e they not cultivated?
Resting/ lying fallow	1
No rain	2
Late rain	3
Not enough financial resources	4
No seeds to plant	5
No farming implements	6
Shortage of labour	7
Birds/ animals eat the crops	8
Pests/ crop disease	9
Other (specify)	10
Tillage method	
Leased line cows (plough)	1
Manual labour	2
Tractor	3
Other (specify)	4
What type of ownership does the household have over	r the land?
Individual land title	1
Customary land title	2
Rent/Lease (paid in cash)	3
Rent/Lease (paid in kind)	4
Free hold	5
Occupied without authorization	6
Other (specify)	° T
	7
47. (PART H) Grazing areas	7
47. (PART H) Grazing areas Around the homestead/concession	7
47. (PART H) Grazing areas Around the homestead/concession In the pasture of the Village/Area	7 1 2
47. (PART H) Grazing areas Around the homestead/concession In the pasture of the Village/Area Grazing in the forest	7 1 2 3
47. (PART H) Grazing areas Around the homestead/concession In the pasture of the Village/Area Grazing in the forest Transhumance	7 1 2 3 6

48. (PART J) Livelihood resources	
Subsistence farming	1
Sales of crops	2
	2
Small trading	3
Sales of livestock/ livestock products	4
Artisanal mining	5
Other self-employment/ own business	6
Salariad amployment (specify)	7
Salaried employment (speerry)	7
Other (<u>specify</u>)	9
Main income provider source of income	
Farming	1
Fishing	2
Shanharding	2
Shepherding	5
Hunting	4
Driving	5
Apprentice	6
Mechanic	7
Shop owner	8
	0
Military service	9
Livestock seller	10
Baker	11
Butcher	12
Company	12
	15
Artisanal mining	14
Other (specify)	15
(PART K) Where do you sell most of your produce, cr	ops or animals?
Δt the Village/ $\Delta rea itself$	1
Surrounding Village/Areas	1
Surrounding vinage/Areas	2
Surrounding towns (specify)	3
Other (<u>specify</u>)	4
Who transports produce to the market	
Male adult	1
	2
Female adult	2
Male child	3
Female child	4
How long does it take you to transport your goods to w	here it is sold?
Less than 1 hour	1
1.2 hours	2
	2
3-6 hours	3
More than 6 hours	4
49. Mode of transport	
Bicycle	1
Due	1
Bus	2
Car driver	3
Car passenger	4
Animal drawn cart	5
Motorhike	6
Truck	5
TIUCK	· /
	7
Head loading	8
Head loading Public transport	7 8 9
Head loading Public transport Other (specify)	9 10
Head loading Public transport Other (specify)	9 10
Head loading Public transport Other (specify) (PART O) What was the most important reason for fo	7 8 9 10 od shortage?
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Head loading Public transport Other (specify) (PART O) What was the most important reason for fo Lack of income Shortage of instruments to farm	7 8 9 10 od shortage? 1 2

Drought

4
Lack of access to markets Insufficient labour Shortage of land Sold food for cash Bad luck/ witchcraft Other (specify)	5 6 7 8 9 10
50. (PART P) Health Facilities District hospital Public health centre Private sector health facility Private nurse Traditional therapist/healer Did not seek treatment Other (<u>specify</u>)	1 2 5 6 8 9
HIV and AIDS Perception/information It kills Incurable The manner in which it is contracted Treatment or management of the condition Other	1 2 3 4 5
Frequency of visits from health care workers? Once a month Twice a month Once in three months Twice a year	1 2 3 4
Common causes of HIV and AIDS Irresponsible sexual behaviour Blood transfusion Sharing of sharp instruments such as syringes, razorblades etc Mother to child transfusion Don't know Other (specify)	1 2 3 4 5 6
(PART T) Relocation preferences I don't want to lose access to my land Replacement of my land elsewhere to continue cultivation Be compensated with cash and find another land for cultivation Be compensated with cash and start another business Other	1 2 3 4 5

APPENDIX V: ATTENDANCE REGISTER

Rumphi DESC Attendance

NANE	O- PORTMENT	CONTACT
I light all all	Formene DNS	09933711001
Simparathe Chirws		0994694855
2 Raccia Vinto	Negdola RUDC	099157132
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kelvin Varde	Course DVPT	099995633L
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Mohatoo Kayora	Inigettor	0884 280 845
Vincent Juhanga	hender	12599529633
2 Chilindo Attenso	Water borrof	
52 Harroh Chillon		0193932610
s Hamah chivenda.	NRWE	000000000000
- Agress Kumuser Ra	Gruizonent	000000000000000000000000000000000000000
(. Dr Margaret Skille	EnviroLonsum	DRAMASTIEL
6 Phillip Kondowe	Water Resources	0594230191
17. Collins Mulchale_	Inviton lunsult	01140.000
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Bembe Market Leaders Attendance Register

PEINA BEMBE TO MEETING UDINDO/BUSINESS PHONE UDINDO/BUSINESS PHONE BENSON JUMBO VAC Secretary (HSA) 0991396346 09800282 DZINA 2 Joseph huhanga C.b.0 098002822 3 Benson Simusaka Chair C.B.O (Gloceny) 099778874 4. Analy Under CBO Secretary Group Soldstore 0992009139 5 Owen Chawinga member carpentery 09940480 6 MOSOS Mughogho Carpentery 08863282 7 PETER HupENTY Huno Gondive GANIX4 099284766 1 J * Timothy Luhansa Kabaza 9 Malini Chawinsa Masese (600) 10 Simon -K. Gonduse VDC treasurer tran mptml 0888430270 11 Kelvin kangerere tot vitt Burnemali 099813690 12 Kondurni Luhrugs Member Butcher off3251115 B Grodfuy KASIMBA member ganger Oggi655000 14 Chelinzgo Ersimba member ganger Oggi655000 15 Wisdom trondue Police committy tolam 0990378478 16 Emmanuel Kangika Police committy tolam 0993 994725 16 Emmanuel Kangika Endironment 0992031681 (1) Haswell Mutadiri VAC Chair selling neize 0995143158 (3) Grafs Gendwap Member Grosser 0993320200 0993320200

Bolero ADC AEC Market Leaders WUA Attendance

BOLERO ADCIAEC MEETING 24-09-2023 WURA & MARKET COMMITTEE HEAD TEACHERS DZINA UDINDO / BUSINESS 0884624067 VICE BOU STAR MHONG MLCZA 0886953197 BOT MEMber WUA 2 Maru Chirambo 0884628384 Head teacher 5 Maria Dumber Scheme Manager 0880482444 a Noel NUNDWE < Kond white 0998493170 air Wuf Mandawire Lucky Chirambo Treasure 0888057154 FOI 1 Watness Mound Sacreatary 0990863790 Bolaro VSC Ky materiala 0 4882 359 29 Veorge Secretary(KIUA) S. Martan 0998661961 Malame Bord member Moses mane Yoc chair Lurili 0586724694 10 Letter NYINDAD VUC Chair chankhom 0884362929 11 frince Luhanga 12 Melton Ngoma V.D.C Chair Taulayonna 0882092680 13 Jake Nyirensk Bales Market Vice Secretsy 0555030570 14, phip ketyah Betere D880320074 JAC Chain 15 Emanuel Sichniga NBC Chair Milliama 0881627258 16 - Aaron Chidimba VIC Abain Chihwawa 0881998778 17. Hensley Numberda Ubc Chair Bowe 0885155712 feter Banda Vbc Sec Kasongure 0821366852 Chanty Mcandcewin UNC Chair Kanzara 14 0885512661 20 - Mass M. Chia to Classen b Ub C Choise 0884327171 21. Anthony Mibale Ma choir Charyol: 0992458449 22 William Souringa chair cohere market 0994130024 Robert Gondine CHAIP WARKE NDC 33 24. Season Chavula HT Bolero Sec. Sch. 0999 949 945 0994400645 DS. Alfred Britgo COUNCILLOR Phillip Kapira 0884901076 Acro Balero 2 0884621089 Chipofya Lameck ADC Chair -27 Bhodgers Membrini De Chair Lunder Frimanuel Cangila Environment 0883768363 0992431081

Bumba Head Teachers Attendance

BUMBA HEAD TEACHERS & MARTOT 26-09-22 MONDO MANE MARTE Mando MARE Andre Donal. Kileme CDA DAS231155 Henry blem DEA DA92658100 HEASTEACHER DA92658100 HEASTEACHER DA92658100 DEALS NYIRONGO HEADTEACHER 099265823658 DEALS NYIRONGO HEADTEACHER 0996623256

Bwengu ADC Attendance

BWENGU ADX MEETING 24/05/22 WOINDO PHONE Joe 088414 Treasures (NDE) 088018067 DZINA Disa Mhango DElwan Vinkhumbo 0888405535 3 Obvious Alcamange Abc Member Hy Godfrey Chavula Chair Robertson vbc 0888142666 6) Elius cinyasalu Vichuir sukuzwayo NBC 0871279835 6 Hister China ABC member 0985079892 JDC Secretary 0991716440 Jessie Ndauh Bettie Mhango V DC TLEASUR 0980106236 of klebstermlando VDC Chair 0884061577 10 martes Simera Vdc chain 0884305104 10 Chartes Simera Vdc chain 0884251763 mathens Nguher UDC chair 0992428348 12 13 Edwin Nyirenda VDC Char 0984195711 MOSES MRymala U.D.C. Chan 14 0884584904 16 Kennedy Hyands Male Chair 0994/07663 16 Kennedy Hyands Male Chair 0994/07663 17 Winford Chipopye VSC Chair 0994540677 18 Ulemu Mkandawre v&C Chair 0986194178 29 Nyuma Méonoga VBC Chair 0990447773 20 Jean milandacuire VDC Chair 058876743 21 Miumuzana Matemola Chinung 0888767430 22 LOVERNOVE K-MKadlane VDC KAUKILO 0880164337 23 Saulos Chirando VDC Murualita 0886557666 14 Reputered Moowoods USC Magarga 0883493269 25 INNOCENT MITANICO MULLIMIZANS MALLANDE OF85299044 26. Callo 1. Chirambo ADC CHandnerra 0881094760 27 - Kenni wasini Alcmenter Katandala Ottist 96613 28 - Pioda Longue RDC Membar Morriando 08822198

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BINENSU AJC MEETING 441-ULINJO MINTA PHONSE 0990908315 29. Maclean mitete G.V.H.n 0996153155 30 Ancdorsald Milamanishe GNH 0995266533 31 Joseph Mkandawere Abc 32 Boseph Singuri Muhrmuszanen Magazo 0981100028 33 chiza charula ADC 0984487121 34 NTANGWANIKA GVH 0881916391 35 STEPHEN MEDWER Unais 36 MLUMURANA GOLOZERA 0983716888 MWACHOLOCO KANTGNOA 37 38 OSman Tembe GVH TimotiTembo 0888150537 SAKASAKA MHANTO GUH 39 0884246632 10 - Thanks KAUSIAT APE 0796597186 41 - Mahannagana Dungulung Singeris 0997427636 42 ZALLETO HADRALEN. 0918788390 43 Manjanila Msorious S.V.H. 0884974336 44 Aaron Chunezza mulizana ulab 0888050411 45 Phillimon Gama ullosana 0884145688 HE SHERRYSHENTIZEDED MULLIMUZINTA 0854535075 MUWALLRA MUNTHALI INKOSANIA 47 0597778885 Mulupuzara Kacheche Mhango 099574022 48 49 Memuzana Mara Syrvenda. Edrin Mowaya 50 Edrin Monwoyg Paulos Saliala Con Aev - 0888373678 1998633161

Bwengu Market Leaders Attendance

Burnell MET 2001-2022 DEINA Glory Mhangu UNDO/Businers MMVE BGRCENES Shop 0882053745 U.Chair Dolophy Ngwila Leal Jerhanga SECRETARS 0887054088 JEHN BOSCO SINGINI TREASURE CHAIMAN 08886666620

Phwezi Market Leaders Attendance

	PHWERI MARKET COMMITTEE	26-09-2022
DZINIA	Upwoo/Busine	PHONE
Happy Nyasul	Treasure	032841531
Elizabeth Gardne	Chair	0831525679
Ethel Rahango	V-Chair	0993062052
Irean Mutuali	V. Secletary	0997543310

Mwazisi Market Leaders Attendance

MWAZISI MARKET COMMITTEE MEETING PZINA 101NDO 24/05/2022 Esta Mandaedire Nice Chair 088 6490 98 Troccolari Myasuriu Chair 0994641222 Mases Mtele Chair 0994641222 Moses Mtele Chair 0994641222 Moses Mtele Chair 0994641222 Moses Mtele Chair 0994641222 Moses Mtele Chair 0994641222 PHONE

Thumbi CBO and Market Leaders Attendance

THUMBI CBD & MARKET COM 27/09/2027 DZINA WINDO/BUSINESS PHONE Sec. Degreesiss Chair Degreesiss Toosdageor 69 Jane Gama Sec. Faney Mkandawire Chair Member Treasure TRADE 099145009 Treasure TRADE 088.1415246 Monica Chinambo Rhoda Msowaya Pigekel nyirenda member Unice Mhango member medson Nyirenda Sect TRADE 0888786923 Dehans Mberjo TRADE Chair Parson 0888786923 member 1517711880

Chinyolo ADC Attendance

Draft ESIA Report for Proposed Rumphi Water Supply and Sanitation Services Improvement

23/04/2022 DZINA HONE CHINYOLD ADO UDINDO 0999737950 Horaus Murling CDA ADC Member(Chinyelo) 0995559200 ADC Menter (Luma) 0888142168 unthal ADO MORNER Kalaldu 0884648850 Ohn M2842to 0588778457 CPUKI Christy Mkonda unic MIZOUATO 0997300705 ADC Mitah 6 wanangwa ADC Member Mlypzi 0880349703 pylicongo 7. Benedicto ADC Member BTL clair 0880937032 ADe member mhomby 088128003 Chance Nyprenda Konstand Bote Asc Member Mivale 0882524205 Goodfuck Mhangs hungozi 0284884698 10 ADC Member mbare Zex ADC Member CHingda 0888337722 11 Arrow Norlendy A De membe Monguture 09999278 12 Brichard Mune Charles obsirende ABC Member MrSAKSTO 9885591959 13 14 AEC Member MKomberi 0884997196 Sabina Munthan 15 MICOLOTO DESTITZES AEC Member (PEN) Jayce G Banda 16 Leah movamion & ADC member 17 MZOKOTO DSSISTESS Nemeth Schumber 18 AEC V. Seesetary Chinepote 0895541145 Maden mhange Acc member m370/404, 0881292620 19 Secretary ASC ne tramara cu-spla 2269354067350 20 AEC member Charles JC Goudwe M20 Koto 088403 6545 Fostone & Mhango AEDO AEC) 21 Jackson Shunt 22 ASHP clai OTTAYOUT Chrugelo 0835677 561 Chustopier. AEC Member Chinyolo 099636 this 23 Christopher M. Munthel 24 25

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23/09/2022 CHINYOLO ASC No NAME TITLE PHONE # Christen Mlenge Abe Secreting Manassel Algura Abe Cheve 26 0884033994 27. 0917756 331 Robert Chidothe ACDO 28 29 Keltin Bande 600 0999755466

Kanyerere ADC Attendance

0 881067799 Harsey Nyizenda mersber 2-Medson Chaingo Noc Chair Kanhelo 3) Bright also PZINA 0887207005 Choroli Kanyere ALC 0995631059 3, Bright rkhate F.G. 4, Chrussy Mawagua vice chair kahera 0880750646 5. Martha Gondwe J. Chair Kasasa, 0884238640 6. Martha Gondwe J. Chair Kasasa, 0884238640 7. Juli Chardwe J. Chair Chozoli 0886009742 Yalanda Kumwenda y Noc chair kanyered 0886049871 William Chavela NEL Chair Choyde-Kanyon 0884273612 9 Simen muone JOC chair mphande 0884270248 10 macuson Sichinga member Lupatamizi 0884031193 Tayon: Nychily V.D.C Cheir Kengerere 0888629000 12 Henry Zzando Voc chair Kasasa 0884255217 12 Guillet Goudine voc clair tupelamizi 0831117550 14 Owen andre Voc chair Buising 0884200060 15 Nelson Moyo vie ABCChin Chozoli 0999490405

Mwazisi ADC Attendance

MWATKI 23/04/2022 DRINK UDINDO PHONE VISC Champerton SELOMON 0991658266 N Landarshe Julias 098184-984-9 Latta Chain person VAC 0885056706 VSC Chaioperson Mandawie 0588188248 learante CDA N.Sansty 0990121093 Rose V bc member 5 KNULLYC 08649980 VDC 4407 Chair UDC 0982623450 VAC MEMBER RWA MEMBER RENT 0881953602 LUHANTER Star YDE CHAIR 10. 0882582999 MGHOGHO CHARLESS MUNTHAL 0882620431 11. VACIENAIR 12. Arnold K Metunbulg VSC Chair Batos 0884277973 13 Genald Luhanga ALSC MEMBER 0996011108 Heiston Nyaculy 14 Patron 0995082559 is Myasulu Madonna 0995022232 YOUHL NEHWORK Nundue 16 Mana member 0996403857 Alfred 17 Nymencia Voc Chair 0991347053 Omputys 18 Sollah UDE Chairkda 0991089327 chipopya 19 Annie Homen rep santature 0995143955 20 dames Chirala VDC Chair 0881416634 ABC Chair D991458458 Singthi Malnute Environ Contra It L C 099425212 23 Dr. Marcanet newer CA95424927 Imparathe Christian 24 0993971007 Kelon Dand 25 0999733 466 Robert Chidutte X EDO DODD 09999556331

Mtwalo Attendance

	MIWALD ADL MEETING	30/09/2022
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Mzimba DESC Attendance

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APPENDIX VI: MINUTES OF MEETING

Rumphi DESC stakeholder consultation meeting

Team members present:

- Dr M. Sikwese
- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa

Meeting Date and time: 22nd September, 2022. 9 a.m.

Chair of meeting: Kelvin Banda -Forestry Department

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 12 members from the District council, 2 members from Northern Region Waterboard and 4 members from ENVIRONCOSULT.

Apologies that other members of the DESC were out.

Review and adoption of agenda

The chair of the meeting delegated to C. Mtenga to review the agenda of the meeting

Opening Remarks by Northern Region Waterboard, Mr. C. Mtenga

A brief background of the project was given highlighting the main components of the project. The 2 main components are sanitation and water supply. The project reach was also highlighted explaining where it will begin and end. Mwazisi to the West, Phwezi to the North, Bwengu,, Thumbi and Enukweni to the West.

For the sanitation component waste water treatment plant is being proposed and an engineered landfill for the DC.

Sewer lines will be installed for different institutions in the DC. Sanitation facilities for institutions for example schools and public places.

There is a proposal for vehicles for collection of wastewater and solid waste.

A map was presented to outline all areas that the project will be implemented. There will be NRWB offices in Mwazisi, Bolero, Bwengu and Chiwato Jere.

There will be catchment management measures implemented for the area of water intake.

Water treatment facility will be upgraded to treat 19,000 m³ from 1000 m³ a day.

Remarks by ENVIRONCONSULT by Dr. M. Sikwese

ENVIRONCONSULT is here to conduct baseline studies after a reconnaissance has been done.

There are 3 teams mainly working on Ecological study (flora and fauna, rivers and geology), Social impact assessment and stakeholder consultation and resettlement action plan.

Other teams have already started operating because of the difficulties in scheduling. Consultation meetings were start then the teams to go out and start their operations.

It will be helpful for the DC to help us notify communities affected with the study that the Northern Region Water board has tasked the consulting firm to go around in their areas.

ENVIRONCONSULT is seeking views, issues and inputs of the DESC to the ESIA and how the NRWB can implement the project. How do you see the project positively and negatively affecting the communities? What mitigation measures can be utilized towards the impacts of the project. And how the benefits of the project can be enhanced. Suggestions on alternatives on design of the project.

QUESTIONS and ANSWERS

Table below shows questions and responses

1. In the Bolero area there is already an operating structure providing water to communities. How will waterboard integrate with these structures when they start operations?	NRWB is working on a framework to supplement water supply to the operating structures. This is because the operating structures have intermittent water supply and low water quality (sanitation)
2. Is Waterboard buying land?	For customary and private land there will be compensation For public land NRWB will acquire from the government For people within the Road reserve they will be compensated
3. How long will people have to move after they have been compensated?	Project start next year in the 1 st quarter therefore there is ample time for people to be on the land. They can utilize it for this growing season.
4. Will there be a main office as in Nkhatabay?	A site has not yet been identified for the office
5. Where is the solid waste management site?	Site has been identified but not visible on the present map. Has been located on Mzimba side
6. Is the project targeting the entire Mwazisi area?	Only part of Mwazisi, other areas of mwazisi will be targeted later

7. How long will the project be implemented?	1 st quarter begins next year
8. How long will data be collected?	The exact date cannot be given but planning to finish in November.
9. Are you going to engage DC staff in the data collection?	No but do require DC to provide people to escort the teams to meet communities and local governance structures. Assist us setting up meetings.
10. What is the mitigation plan on social issues such as GBV, OHS, HIV etc.?	Stakeholder consultations The management plan has mitigation measures and recommendations to address these issues
11. Is the pipeline going to be dug by machines or people?	Use of machinery will depend on the size of the pipes. similarly use of people will depend on the size of the pipes.
12. What is the security measure been placed on waste treatment plant?	Perimeter fence with concrete blocks and guard houses will be erected
13. What power is going to be used on the booster stations?	Other areas will use gravity and there will be a feasibility study on other alternative sources of power that can be used. Solar or wind power.
14. How will you deal with the issue of vandalism of pipes?	Ductile iron pipes will be used. They have a concrete cast that makes the pipes very heavy. It makes the pipes very had to be tampered with.
15. What happens after treatment of solid waste?	The DC will decide what to do with the products after treatment
16. What are the views from the DESC about GBV and social issues that occur due to projects?	Mitigation measures recommended by project implementers should be integrated with already existing government structures to ensure sustainability.
17. How to deal with compensation issues	The Land acquisition act of Malawi If an individual build in anticipation of a project, we are not liable to compensate
18. How is air pollution going to be addressed?	Settlement is far from the proposed site and wind direction of the proposed site is against any settlement
19. What is the approach on the catchment management?	Management has already started with the forestry department. Tree planting, 50 thousand trees to be planted yearly Meetings have been done with ADCs and VDCs

	Finding alternate sources of energy
20. How will water be priced?	Pricing is regulated by the Ministry of
	Water and Sanitation and there is a
	tariff structure
21. What is the corporate social	On the project the NRWB has no plans of
responsibility of NRWB on this	corporate social responsibility works
project?	due to the nature of the project.
Suggest building schools and bridges	Building of bridges can be considered
	as catchment works and can be
	justified.

Final Remarks

ENVIRONCOSULT

The consulting firm wants to work with the district council and by assigning people to us will be very helpful. Help in organizing meetings.

NRWB

Grateful for cooperation from DC and departments

Give feedback where necessary to ENVIRONCONSULT

Closing Prayer

NAME	DEPARTMENT	CONTACT
Simbarashe Chirwa	ENVIRONCONSULT	0993971007
Mabvuto Phula	ENVIRONCONSULT	0994192105
Bessie Kunje	Disaster-RUDC	0991571359
Mathias Kawonga	AGR-LRCO	0882971235
Happy Nyirenda	Agribusiness	0881469761
Boyd Msowoya	Agriculture	0991147605
Kelvin Banda	Forestry	0999755466
Robert Chidothi	Community Dept	0999956331
Abraham Mhango	Agriculture	0991452891
Mphatso Kayoza	Irrigation	0991285130
Vincent Luhanga	Gender	0884280845
Chifundo Mtenga	NRWB	0999029653
Hannah Chiwanda	NRWB	0992952610
Agness Kumwenda	Environment	0888080928
Dr Margret Sikwese	ENVIRONCONSULT	0995424927
Phillip Kondowe	Water Resources	0884253151
Collins Mukhala	ENVIRONCONSULT	0994816266
John Mpoha	Health	0881257890

Bumba ADC and AEC Meeting

Team members present:

- Dr M. Sikwese
- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa
- Mr. K. Banda
- Mr. R. Chidothi

Meeting Date and time: 23rd September, 2022. 1:30 p.m.

Chair of meeting: Mr. Happy Nyasulu- ADC Chairman

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 2 members from the District council, 19 members from ADC and 3 members from ENVIRONCOSULT.

Apologies that the team arrived late.

Review and adoption of agenda

The chair of the meeting delegated to K. Banda to review the agenda of the meeting

Opening Remarks by K. Banda

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by Dr. Sikwese

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

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There is a component of sanitation, that is liquid and solid waste management apart from water supply.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Remarks by M. Phula

The road reserve has a radius of 3 to 5 meters.

Many of the roads in this area are D and the project will mainly work within 5 meters of the road reserve.

The law in Malawi (Public roads act) says that no one should build in the road reserve and no one to be compensated if they have. But the policy being used by AFRICA DEVELOPMENT Bank (funders) is that people should be compensated if in the road reserve.

Remarks by K. Banda

The project has negative impacts but mitigation measures have been placed. These are either social or environmental impacts.

The project is there to improve the lives of the communities.

People should not build in anticipation of the project.

QUESTIONS and ANSWERS

Table below shows questions and responses

1.	How are issues between the contractors and workers going to be handled?	Complaints must be recorded and taken to the rightful authorities GRM
2.	How will payment issues of workers going to be handled? Workers are left unpaid	Address issues to labour office and GRM committees
3.	Are all types of trees eligible for compensation	Yes
4.	How are you going to deal with nature of aesthetic value along the project pathway?	Ecology team will make assessments and the right recommendations
5.	<i>Is the water going to be free or paid?</i>	It is paid
6.	How will the survey be conducted? How will they be identified?	VDC representatives will be called once in the community to identify themselves and assist the enumerators
7.	Is NRWB working with WUA?	They are working on a framework and ENVIROCONSULT is also meeting with WUA's

Comments

- Contractors hired should be fair (in treatment) because we have had other contractors who did not handle community members well especially women.
- Contractors should build durable things
- When project is starting all ADC's should be notified

Final Remarks

ENVIRONCOSULT

The consulting firm wants to work with the ADC and AEC.

ADC CHAIR

Grateful for the project and increase in supply of clean water.

Closing Prayer

13.1.1 Chinyolo ADC and AEC Meeting

Team members present:

• Dr M. Sikwese

- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa
- Mr. K. Banda
- Mr. R. Chidothi

Meeting Date and time: 23rd September, 2022. 4:00 p.m.

Chair of meeting: Mr. Manasseh Ngwira- ADC Chairman

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 2 members from the District council, 27 members from ADC and 3 members from ENVIRONCOSULT.

Apologies that the team arrived late.

Review and adoption of agenda

The chair of the meeting delegated to K. Banda to review the agenda of the meeting

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by Dr. Sikwese

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

There is a component of sanitation, that is liquid and solid waste management apart from water supply.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Remarks by M. Phula

The road reserve has a radius of 3 to 5 meters.

Many of the roads in this area are D and the project will mainly work within 5 meters of the road reserve.

The law in Malawi (Public roads act) says that no one should build in the road reserve and no one to be compensated if they have. But the policy being used by AFRICA DEVELOPMENT Bank (funders) is that people should be compensated if in the road reserve.

Remarks by K. Banda

The project has negative impacts but mitigation measures have been placed. These are either social or environmental impacts.

The project is there to improve the lives of the communities.

People should not build in anticipation of the project.

QUESTIONS and ANSWERS

Table below shows questions and responses

1.	Is the water going to reach high	NRWB has to be consulted
	elevated areas in our ADC's	Application for water points has to be made
2.	How will compensation work with	Procedure is to follow the laws of the
	the project	country (Land acquisition and
		resettlement act 2016). There various
		things that are considered when it
		comes to compensation. That is trees,
		structures, disturbance allowance,
		shifting allowance etc.
3.	Are all types of trees eligible for	Yes
	compensation	
4.	For this project do we need to setup	This is up to the ADC to decide
	new GRM committees?	
5.	Is the water going to be free or paid?	It is paid
6.	When will the project start?	June 2023 and ends in 2026
7.	Is money already available for the	NRWB is getting a loan from AFDB but the
	project	loan awaits reports that will be made
		from the ESIA.
		The project is very likely to happen because
		it has already been done in Nkhatabay
		and Mzimba and this is more of a
		continuation with Rumphi district.

Final Remarks

ADC CHAIR

Grateful for the project and increase in supply of clean water. He emphasized the issue of compensation so that the right information will be taken to the communities.

Closing Prayer

13.1.2 Kanyerere ADC and AEC Meeting

Team members present:

- Dr M. Sikwese
- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa
- Mr. K. Banda
- Mr. R. Chidothi

Meeting Date and time: 23rd September, 2022. 12:23 p.m.

Chair of meeting: Owen Gondwe- ADC Chairman

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 2 members from the District council, 15 members from ADC and 3 members from ENVIRONCOSULT.

Apologies that the team arrived late.

Review and adoption of agenda

The chair of the meeting delegated to R. Chidothi to review the agenda of the meeting

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by Dr. Sikwese

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

Draft ESIA Report for Proposed Rumphi Water Supply and Sanitation Services Improvement

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

Remarks by M. Phula

The road reserve has a radius of 3 to 5 meters.

Many of the roads in this area are D and the project will mainly work within 5 meters of the road reserve.

The law in Malawi (Public roads act) says that no one should build in the road reserve and no one to be compensated if they have. But the policy being used by AFRICA DEVELOPMENT Bank (funders) is that people should be compensated if in the road reserve.

Remarks by K. Banda

The project has negative impacts but mitigation measures have been placed. These are either social or environmental impacts.

The project is there to improve the lives of the communities.

People should not build in anticipation of the project.

QUESTIONS and ANSWERS

Table below shows questions and responses

1. Is the water going to be distributed	NRWB has to be consulted
to the further parts of kanyelele	
2. Will WUA and NRWB work	The two parties will meet and find a way
together?	forward
	ENVIRONCONSULT will also meet WUA
<i>3.</i> Will the water be metered or not	It will be metered

Comments

• WUA is failing to supply water to the areas and people still get charged monthly for water

Final Remarks

The Chief

Chief-There is untreated water and are waiting with anticipation for the NRWB clean water.

Grateful for the job opportunities that will be created because of the project

Mwazisi ADC and AEC Meeting

Team members present:

- Dr M. Sikwese
- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa
- Mr. K. Banda
- Mr. R. Chidothi

Meeting Date and time: 23rd September, 2022. 9 a.m.

Chair of meeting: Peter Singini- ADC Chairman

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 2 members from the District council, 21 members from ADC and 3 members from ENVIRONCOSULT.

Apologies that other members of the ADC did not make it due to communication difficulties.

Review and adoption of agenda

The chair of the meeting delegated to R. Chidothi to review the agenda of the meeting

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by Dr. Sikwese

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

Remarks by M. Phula

The road reserve has a radius of 3 to 5 meters.

Many of the roads in this area are D and the project will mainly work within 5 meters of the road reserve.

The law in Malawi (Public roads act) says that no one should build in the road reserve and no one to be compensated if they have. But the policy being used by AFRICA DEVELOPMENT Bank (funders) is that people should be compensated if in the road reserve.

Remarks by K. Banda

The project has negative impacts but mitigation measures have been placed. These are either social or environmental impacts.

The project is there to improve the lives of the communities.

People should not build in anticipation of the project.

QUESTIONS and ANSWERS

Table below shows questions and responses

1.	Are contractors going to come in with their	ADC and other local governance structures will
	own work force?	liaise about complaints and grievance redress
		mechanism should be placed with the DC.
		Contractors decide where to get their skilled and
		unskilled labour
2.	Will the water be distributed throughout the	Not sure, but a map will be provided so that this can
	whole ADC	be cleared

Draft ESIA Report for Proposed Rumphi Water Supply and Sanitation Services Improvement

3.	For those living in the higher elevation	NRWB can address this issue better
	distribution?	
4.	We want to know the actual plan of the	The very high areas in Mwazisi will not be reached
	water project because some VDCs are far	due to the design.
	from where the pipes are passing?	
5.	Does compensation of trees include all	Yes, all trees
	trees?	
б.	What power will the boosters use?	It must be understood that the engineers designed
		that water will be pumped and there will be
		enough power to reach the designated areas.
7.	How long will the project be implemented?	1 st quarter begins next year

Comments

- There are some VDCs that have acute water problems namely; Thazima, Kasasa, Bawa, Kapiri, Chakaramo
- ADCS have to apply to NRWB for water points to be installed

Final Remarks

ENVIRONCOSULT

The consulting firm wants to work with the ADC and AEC.

The Chief

Grateful for the project that is coming in. Grateful for the job opportunities that will be created because of the project

Closing Prayer

Bembe Market Committee Meeting

Team members present:

- Dr M. Sikwese
- Mr. S. Chirwa
- Mr. E. Kanyika

Meeting Date and time: 24th September, 2022. 10:40 a.m.

Chair of meeting: Mr. Haswel Mwandira- VDC Chairman

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 1 member from the District council, 17 members from Market, VDC, CBO and 2 members from ENVIRONCOSULT.

Apologies that the team arrived late.

Review and adoption of agenda

The chair of the meeting delegated to H. Mwandira to review the agenda of the meeting

Opening Remarks by E. Kanyika

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by Dr. Sikwese

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

There is a component of sanitation, that is liquid and solid waste management apart from water supply.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Compensation will be done for those individuals who may have trees and structures within the road reserve boundary. If pipes and other structures will be installed outside the boundary then individuals are eligible for compensation.

There are 4 types of roads; M being the road, S being the secondary, T being the tertiary and D being the District. Many of the roads in this area are D and the project will mainly work within the last 5 meters of the road reserve.

QUESTIONS and ANSWERS

Table below shows questions and responses

1. Are people allowed to farm once the assessment has been done	Yes, people are allowed
2. Is there any corporate social responsibility by NRWB	No according to the project they are not able to but communities are allowed to write NRWB for such programs but outside this project.
3. Is water just passing through our area	No, the project aims to supply water to communities but main pipes are passing through to reach other areas as well.
4. With NRWB does the community have to do everything for themselves as with WUA? Digging trenches and buying pipes	There are specific conditions that NRWB may require you to get materials and dig trenches. NRWB will give a quote of the materials required for you to

	access water at your site. But this is
	after water has been diverted from the
	main pipes to smaller pipes that are
	meant for distribution.
5. Is NRWB working with WUA?	They are working on a framework and
	ENVIROCONSULT is also meeting
	with WUA's

Final Remarks

ENVIRONCOSULT

The consulting firm is grateful for the time of all who attended the meeting.

ADC CHAIR

Grateful for the project and increase in supply of clean water.

Grateful for all who were able to attend the meeting leaving their businesses.

Closing Prayer

13.1.3 Bolero ADC, WUA and Market Committee Meeting

Team members present:

- Dr M. Sikwese
- Mr. S. Chirwa
- Mr. E. Kanyika

Meeting Date and time: 24th September, 2022. 1:30 p.m.

Chair of meeting: Mr. Haswel Mwandira- VDC Chairman

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 1 member from the District council, 21 members from ADC, Market, VDC, 7 members from WUA and 2 members from ENVIRONCOSULT.

'Review and adoption of agenda

The chair of the meeting delegated to L. Chipofya to review the agenda of the meeting

Opening Remarks by E. Kanyika

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by Dr. Sikwese

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

There is a component of sanitation, that is liquid and solid waste management apart from water supply.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Compensation will be done for those individuals who may have trees and structures within the road reserve boundary. If pipes and other structures will be installed outside the boundary then individuals are eligible for compensation.

QUESTIONS and ANSWERS

Table below shows questions and responses

No, water is for all and it just has to be
applied for.
Project starts in June 2023 and ends in
2026. It is being funded by African
Development Bank. It is a 32 billion
dollar project
A brief background of the project was
given. Stating where it starts and ends.
Key structures to be installed and
where to be installed.
This meeting is there to find out the views
of WUA of this project. If there are
suggestions on how they can work
together. WUA and NRWB are yet to
meet and discuss on how they can
work together.
They are working on a framework and
ENVIROCONSULT is also meeting
with WUA's
Per government communication it was said
that free water connection will depend

on the distance from the distribution
pipe to where water is required. If the
point of connection is further than
their requirements then a client will
have to pay.

Comments:

Councilor-NRWB informed the council that they will appear before the ADC and WUA to discuss on how to work together. They need to come and address these issues.

Bolero trading center is also asking for solid waste management component of the project. It should be noted that the market has already designated land for a landfill.

WUA scheme manager- khamanga area has plenty of water and when they are to deal with their issues with the intakes then they can supply water to a very large area without a problem.

There are acute water problems in Bowe, Matukha, Mkama and Songwe. These areas WUA cannot reach but maybe NRWB can.

There is an area that did have an old scheme but has been sold by the government and has run down. Water can no longer be accessed by this scheme.

The water project should also target the furthest areas not just the areas close to the main pipes passing at the road.

WUA Chair- Water problem is there and we are ready to work with NRWB as long as we can discuss favourable conditions, procedures and sign MOU's.

WUA and all members must have a mindset that NRWB shouldn't be a competitor but should be a partner in dealing with the problem of water. There should be clean and portable water in the communities.

There is a need for impact assessments to be done after the project has been implemented. To have these stakeholder meetings again so that you can hear from the communities again.

Final Remarks

ENVIRONCOSULT

The consulting firm is grateful for the time of all who attended the meeting.

ADC CHAIR

Grateful for the project and increase in supply of clean water.

Closing Prayer

Bumba Head teachers and Market Committee Meeting

Team members present:

- Mr. S. Chirwa
- Mr. R. Chidothi

Meeting Date and time: 26th September, 2022.

Chair of meeting: Mr. A. Kilembe- CDA

The chair opened the meeting and welcomed all present at the meeting. Then a prayer.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 2 members from the District council, 5 members from Education and 1 member from ENVIROCONSULT.

Review and adoption of agenda

The chair of the meeting delegated to R. Chidothi to review the agenda of the meeting.

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by S. Chirwa

Briefing of the forum that ENVIROCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

The project will begin in June 2023 and end in 2026. The project is for paid water not free water.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth. There will be an increase in business opportunities for those doing business in the market.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Young girls and boys may drop out of school to get jobs, early pregnancies and/or to marry. Boys are more prone to drug and substance abuse.
There is a component of sanitation, that is liquid and solid waste management apart from water supply.

Waste management will be at institutions such as the hospital and schools in the surrounding area.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated. It should be noted that tanks will be placed on public land and therefore there will be no compensation.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Compensation will be done for those individuals who may have trees and structures within the road reserve boundary. If pipes and other structures will be installed outside the boundary then individuals are eligible for compensation.

QUESTIONS and ANSWERS

Table below shows questions and responses

1. Will installation of water for	It is possible that it may be subsidized based
government institutions be	on arrangements they may have so
subsidized?	that they will increase access to clean
	and potable water.
2. How will schools benefit from waste	Schools will access services of waste
management?	disposal. Institutions can discuss on
	how they can create a profitable
	business from waste.
<i>3. Was a survey done to reach all</i>	Yes, there must have been a survey to come
areas where there are water	up with this design for the project.
problems	

4. What are the mitigation measures	One of the mitigation measures is GRM
placed for the negative impacts of	
the project?	

Comments:

We are looking forward to this project because there is a very big water problem. The coming in of this project will improve sanitation conditions in the schools and we are grateful.

Final Remarks

ENVIRONCONSULT

The consulting firm is grateful for all who attended the meeting.

Closing Prayer

Bwengu Market Committee Meeting

Team members present:

- Mr. S. Chirwa
- Mr. R. Chidothi

Meeting Date and time: 26th September, 2022.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 1 member from the District council, 4 members from market committee and 1 member from ENVIROCONSULT.

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by S. Chirwa

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

The project will begin in June 2023 and end in 2026. The project is for paid water not free water.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth. There will be an increase in business opportunities for those doing business in the market.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Young girls and boys may drop out of school to get jobs, early pregnancies and/or to marry. Boys are more prone to drug and substance abuse.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated. It should be noted that tanks will be placed on public land and therefore there will be no compensation.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Compensation will be done for those individuals who may have trees and structures within the road reserve boundary. If pipes and other structures will be installed outside the boundary then individuals are eligible for compensation.

QUESTIONS and ANSWERS

Table below shows questions and responses

1. Will there be free installa	ntion No, there	von't be free installation
2. How can we get water in	<i>our market</i> Apply to v	vater board
3. What are the charges for	water NRWB ha	s their own tariffs they go by

Comments:

We are afraid to draw water from the river because of cholera. We hope the project starts soon.

Final Remarks

ENVIROCONSULT

The consulting firm is grateful for all who attended the meeting.

Chikwawa Chief (Representing Chikwawa market committee) Meeting

Team members present:

- Mr. S. Chirwa
- Mr. R. Chidothi

Meeting Date and time: 26th September, 2022. 9:30 p.m.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised 1 member from the District council, 1 member from Chikwawa market and 1 member from ENVIROCOSULT.

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIROCONSULT has come into play on behalf of NRWB.

Remarks by Mr. S. Chirwa

Briefing the chief that ENVIROCONSULT is here to do assessments. An ESIA. It was further explained what is entailed in an ESIA. From household surveys to resettlement action plans.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things is the creation of jobs. These jobs must be made available to both women and youth.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having trees and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

Remarks by R. Chidothi

The project has negative impacts but mitigation measures have been placed. These are either social or environmental impacts.

The project is there to improve the lives of the communities.

Water supply project is not providing free water to people.

QUESTIONS and ANSWERS

Table below shows questions and responses

4. <i>Is the water for free</i> No, it is paid water.	4.	Is the water for free	No, it is paid water.
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Final Remarks

ENVIRONCOSULT

The consulting firm and NRWB wants to work with the market and their surrounding committees hence their cooperation would be appreciated.

The Chief

Chief-There is untreated water and are waiting with anticipation for the NRWB clean water.

Grateful for the job opportunities that will be created because of the project

NB: There is no market committee at Chikwawa market and was referred to the chief. We had to meet the Chief at Rumphi hospital where he was handling proceedings of a funeral.

Phwezi Market Committee

Team members present:

- Mr. S. Chirwa
- Mr. R. Chidothi

Meeting Date and time: 26th September, 2022.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 1 member from the District council, 4 members from market committee and 1 member from ENVIROCONSULT.

Opening Remarks by R. Chidothi

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by S. Chirwa

Briefing of the forum that ENVIRONCONSULT is here to do assessments. She further explained what is entailed in an ESIA. From household surveys to resettlement action plan.

The project will begin in June 2023 and end in 2026. The project is for paid water not free water.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth. There will be an increase in business opportunities for those doing business in the market.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Young girls and boys may drop out of school to get jobs, early pregnancies and/or to marry. Boys are more prone to drug and substance abuse.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated. It should be noted that tanks will be placed on public land and therefore there will be no compensation.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Compensation will be done for those individuals who may have trees and structures within the road reserve boundary. If pipes and other structures will be installed outside the boundary then individuals are eligible for compensation.

QUESTIONS and ANSWERS

Table below shows questions and responses

1.	Will there be free water connections	No, there will be charges
2.	When will compensation be finished for the	We cannot say an exact date but issues of
	road since there won't be compensation	compensation with the road project have to be
	twice?	referred to the DC.
3.	What are the charges for water	NRWB has their own tariffs they go by

Final Remarks

ENVIROCONSULT

The consulting firm is grateful for all who attended the meeting.

Thumbi CBO and Market Committee Meeting

Team members present:

- Mr. S. Chirwa
- Mr. P. Sakala

Meeting Date and time: 27th September, 2022.

Introduction and apologies:

The chair opened the floor for all members present to introduce themselves. The whole meeting comprised of 1 member from the District council, 2 members from market committee, 8 members from CBO and 1 member from ENVIROCONSULT.

Opening Remarks by P. Sakala

A brief background of the project was given. Highlighting the benefits, the project will have on the communities.

He further addressed the role of ENVIRONCONSULT has come in to play on behalf of NRWB.

Remarks by S. Chirwa

Briefing of the forum that ENVIRONCONSULT is here to do assessments. An ESIA. She further explained what is entailed in an ESIA. From household surveys to resettlement action plans.

The project will begin in June 2023 and end in 2026. The project is for paid water not free water.

It was further highlighted that with development such as this comes positive and negative impacts to communities. Communities will benefit from these positive things but must also be vigilant of the negative consequences of the project. One of the positive things being creation of job. These jobs must be made available to both women and youth. There will be an increase in business opportunities for those doing business in the market.

One of the negatives being taking advantage of women's rights by asking for sex in exchange for work.

Young girls and boys may drop out of school to get jobs, early pregnancies and/or to marry. Boys are more prone to drug and substance abuse.

Communities in their respective areas must be made aware that enumerators will come into their communities and ask various questions about their household. Cooperation will be appreciated because this is being done because of the proposed project.

Members were made aware of where the pipes for water will pass, emphasising that they will pass in the road reserve. Those that will be affected are only those having tress and other structures within the road reserve and will be compensated.

NRWB structures such as tanks and boosters that may be placed on an individual's property can be compensated. It should be noted that tanks will be placed on public land and therefore there will be no compensation.

Once the project starts water will be distributed to many areas and it will be able to reach the communities through community water points (200) and individual water taps.

Issues of GBV should be reported to the rightful authorities once the project starts. Young girls should be sensitised to remain in school.

A Grievance redress mechanism should be placed

Compensation will be done for those individuals who may have trees and structures within the road reserve boundary. If pipes and other structures will be installed outside the boundary then individuals are eligible for compensation.

QUESTIONS and ANSWERS

Table below shows questions and responses

1.	Is the water free	No, it is not.
2.	Who will run the communal water taps?	Community can run the taps by buying water from
		NRWB and then charge a fee to for people to
		access water
4.	In areas where offices will be built will	No this will not be necessary
	people surrounding that area have to be	
	resettled?	

Comments:

200 communal water taps is not enough and communal taps should be available in every chiefs area.

Final Remarks

ENVIROCONSULT

The consulting firm is grateful for all who attended the meeting.

PARAMOUNT CHIKULAMAYEMBE THE 13th Meeting

22nd September,2022

Members present:

- Dr M. Sikwese
- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa
- Mr. C. Mtenga
- Ms. H. Chiwanda
- Mr. R. Chidothi

Members were well received by the paramount.

Mr. C. Mtenga introduced ENVIRONCONSULT to the paramount and introductions were made.

Dr. M. Sikwese outlined what ENVIRONCONSULT will be doing in the surrounding communities and asked the paramount to help with dispersing the message to its chiefs.

13.1.4 INKOSI JALAVIKUBA EKWALIWENI 2

Members present:

- Dr M. Sikwese
- Mr. M. Phula
- Mr. C. Mukhala
- Mr. S. Chirwa
- Mr. C. Mtenga
- Ms. H. Chiwanda

Members were well received by the Inkosi.

Mr. C. Mtenga introduced ENVIRONCONSULT to the Inkosi and introductions were made.

Dr. M. Sikwese outlined what ENVIRONCONSULT will be doing in the surrounding communities and asked the Inkosi to help with dispersing the message to its chiefs.

Remarks by the Inkosi

He is grateful for the coming in of the project.

The water project will help to reduce cholera infections in the area because of the access to clean water.

He will inform all chiefs of activities that will take place because of the ESIA

Information about the project has been disseminated already once he was made aware of the project.

Where are the pipes passing at the main road? Because people have already been compensated in most of the road reserve areas.

Response: For people who have been compensated by Roads authority, they will not be compensated again. But if pipes are out of the reserve then they will be compensated

13.1.5 M'mbelwa DESC Meeting

Date: 27th September 2022

Team Members Present:

Dr Margaret Sikwese – EnviroConsult Mr Chifundo Mtenga - NRWB Ms Hanna Chiwanda – NRWB

Introductions

Everyone introduced themselves.

Proceedings

Welcome Remarks were made by Representative of the DPD in M'mbelwa District Council. Mr Chifundo Mtenga introduced the project. Ms Hanna Chiwanda made a presentation on the project.

Dr Margaret Sikwese explained the process of Environmental Impact Assessment and Resettlement Action Plan, emphasising the need for collaboration with the District Council Staff in getting in touch with the communities. In addition, the valuation of assets of the potential Project Affected Persons (PAPs).

Questions and Answers

Questions	Answers
The project looks like it is mainly in Rumphi, what is	A large part of the project is in Rumphi, this is
there for us in Mzimba?	because Mzimba was already covered by
	another project. So this project is about
	replicating it in Rumphi
Are you going to build any offices in Mzimba?	An office will be built at Bwengu and Enukweni in
	Mzimba, while other offices will be built in
	Rumphi

Is Mzimba going to have a vehicle for waste	The vehicle for waste collection will most likely be
management?	located at Rumphi District Council but
	covering both Mzimba and Rumphi Districts
We have noticed that the wastewater treatment will	Indeed the wastewater treatment plant will be in
be located in Mzimba, how will this work?	Mzimba but servicing Rumphi. People in
	Mzimba can benefit after the waste has been
	treated. These are issues to be discussed by
	the two councils
Will there be a Traveller's Stopover in Mzimba, say	The Traveller's stopover is for Rumphi. Rumphi
at Enukweni?	District Council will be managing it. We have
	located it at Phwezi because we felt that there
	is a higher likelihood of travellers to stop
	there.

The meeting was closed with a word of prayer.

Meeting with Chiefs and ADC's Around the Proposed Liquid Waste Facility

- 1. Introduction of the project overview by the DPD/ CMTM. Water supply component and sanitation component. The site for liquid waste component is located in Lumemo. The focus of the meeting is to discuss the construction of the sewerage facility that will be constructed in the area.
- Lumemo- Chikwawa stretch was affected during the cholera outbreak. The water project is an advantage to these areas.
- 2. Most Sewerage facilities managed by government are not properly managed. Rukulu river is a source of drinking water for people in Lumemo. The proposed site for crossing the sewerage pipeline is where they collect the drinking water. The project has to be really implemented alongside with the water supply project otherwise the people that rely on the river for domestic purposes will be affected.
- 3. Fear of smell in the areas surrounding the proposed wastewater treatment facility
- 4. Consider the access road and bridge leading to the facility under maintenance and construction since there will be additional traffic on that road
- 5. Main pipe for water supply ends at Chilanganombo school, this will leave out some of the people who were affected by cholera. The effluent from the sewerage is proposed to be drained in South Rukuru. If the people who live after Chilanganombo school are left out, it means these people will be using the contaminated water that will be drained in the river.
- There will be more distribution pipes that will be tapped from the main line to areas after Chilanganombo and other surrounding areas. What ends at Chilanganombo school is just the main distribution pipeline which will be extended to secondary distribution pipelines
- 6. The first consultation was not thoroughly done.
- The plea is to ensure that the consultation should be widely done in the villages so that the locals understand.
- 7. How will the water supply and sewerage pipelines be differentiated to ensure that the incident that happened in Lilongwe is not repeated (Water mixed sewerage coming out in taps in residential areas).
- All predicted risks were taken into consideration during designing and the system has designed to avoid these risks in all means (there will be a big distance between these lines, the joints will be watertight and materials to be used will be of recommended type).

- 8. Collaboration on assessments of affected people to ensure smooth facilitation of compensation.
- NRWB will ensure the transparent and accountable compensation assessment process and the payment should be done in time for successful project implementation.
- 9. Can the water coming from the last stage of sewerage treatment facility be diverted to agriculture. Is the quality of water good for agricultural use?
- The water will be drained into the river and can be used for agriculture.
- 10. Chiefs committed to discourage communities from cultivating in places where pipes have been installed.
- 11. Ensure that the pipelines are well taken care of so that the vegetables that the communities are growing in the riverbanks are not contaminated.
- 12. Will the manure produced from the sewerage facility be sold?
- The council advised that they will be a soft charge.
- 13. Will job opportunities be available for local communities?
- The project will take this request into consideration. For jobs that need skilled labour with proper qualifications, as such only those with qualifications will be considered on this. But unskilled labour will be open to the community.
- 14. Consider recorded programs that can be played on the community radio station such as Rumphi Radio Station. Other means of information dissemination to be considered also to ensure that the sensitization process is ongoing. Put in place a question- answer platform that can enable the local communities to provide queries and get answers.
- 15. Chiefs proposed if the water can cross the bridge to Valabawo already before the project since with the onset of the rains cholera might hit the area again.
- Currently it is not possible as it requires a lot of money to do the crossed pipes anchorage. However, the district council will continue with the chlorine distribution program as the interim measure while waiting for the implementation of the project as the lasting solution to the water problems

h. Meeting with Rumphi CSO's

1. How far from the existing treatment plant is the new one going to be constructed? Water is being polluted, because of people planting tobacco nurseries along the river. It was previously agreed that the water plant should be above the area where these activities are happening. Consider pushing the catchment further than where the current one is. Fears of turbidity and suspended solids

- NRWB will implement catchment management activities and livelihood enhancement programs to ensure that the people growing tobacco nurseries in the catchment area have other means of earning a living
- 2. Issues of sexual reproductive health, teenage pregnancies, sexual harassment how will these issues be handled in the project
- Sensitisation meetings will be conducted in the project area to enlight people about sexual reproductive issues including HIV & AIDS
- Grievance redress mechanism committees will be established where victims will be able to lodge complaints if abused in any way
- 3. Sources of electricity for the plant to avoid intermittent water supply when there is loadshedding or power failure
- The boosters will use ESCOM power for pumping and solar power as a backup
- 4. What design of toilets are being considered. Considering the fact that when pit latrines are full people will need ones. Can the current system (constructing a new latrine adjacent to the old one) be considered
- The VIP toilets and toilets with menstrual hygiene facilities are the type of toilets proposed for the project
- 5. What measures have considered to ensure that Rumphi doesn't experience what happened in Area 18. Since the area will now have both Sewer and potable water supply pipelines passing in the same areas?
- All predicted risks were taken into consideration during designing and the system has designed to avoid these risks in all means (there will be a big distance between these lines, the joints will be watertight and materials to be used will be of recommended type).
- 6. Under the project, are the facilities being constructed usable to people with disabilities? What about other aspects of the project?
- The project has considered designing facilities that are usable to people living with disabilities e.g. the proposed school toilets, access to buildings and the communal water points design
- 7. What is the working relationships between NRWB and areas where there are operation water schemes
- NRWB is working on a working arrangement and takeover framework of the supply areas
- 8. What is the source of money for the project? Fear of tariff doubling after project completion.

- The African Development Bank is the potential financier. The tariffs are regulated by the Ministry of Water and Sanitation
- 9. Sewer system passing through settlements. What will happen to the Sewer lines passing through some institution like the hospital
- The sewer lines will pass close to the institutions for easy connection. However, all measures will be put in place to ensure that pipe burst are maintained quickly and that possibilities of contamination are controlled.



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APPENDIX VII: BIOLOGICAL CONDITIONS – METHODOLOGY

Preamble

Natural environmental stresses notwithstanding, human interventions on ecosystems like reservoir construction or channel modification can significantly impact on the structure of their resident biological communities (Kleynhans 1999, Moyle 2004, Akindele and Liadi 2014, Arias-Andres 2018, Yang et al 2021). Plants and animals play critical functions in an ecosystem and for humanity in particular. They help to clean air and water, provide habitats where other plants and animals find food, shelter and protection, aid in controlling soil erosion as well as regulate the devastating impacts of water and wind. To humanity, plants, *inter alia*, are a source of food, pharmaceuticals and fuelwood. Animals are food to other animals and provide ecosystem services such as seed dispersal and pollination. The need to assess fish biodiversity preceding development projects cannot be overemphasized as fish account for a large proportion of the endangered vertebrate species in the world (Moyle 2004). Macro-invertebrates also integrate the effects of different environmental stressors to varying degrees and hence provide a broad measure of the summative impact of environmental dilapidation (Barbour and Paul 2010, Muralidharan *et al.* 2010). The nature and structure of fish and macro-invertebrate communities may serve as a proxy for a broad measure of the aggregate localised quality of their aquatic micro-habitats and hence the nature of general environmental stress related to both physical and chemical habitat disrepair (Barbour and Paul 2010, Muralidharan *et al.* 2010). Assessment of existing biological conditions in a proposed project area is an important part of the ESIA process. Fauna assessment for this project aimed at establishing the existing baseline plant and animal diversity included mammals, birds, reptiles and amphibians, fish and macro-invertebrates.

Based on the project description, a total of 23 sites were surveyed for biological studies. These are Rumphi River Intake, Bwengu offices, Thumbi Booster, Mzokoto stop over, Phwezi Offices & Housing, Thumbi tank site, Our Future – Boma, Bolero tank site, Luviri tank site, Luviri booster, Mwazizi booster & Housing, Mwazisi tank site, Mwazisi Housing & offices, Kacheche tank, Kacheche booster, Bolero offices, Bolero Booster, Enukweni Offices, Pipeline from intake to treatment site, Treatment & Tank site, Sewage Site 1, Sewage Site 2wastewater treatment facilities and Bolero waste disposal site. Aquatic fauna was surveyed only in aquatic habitats.

Flora assessment methodology

The main field survey involved the following approaches:

- All plant species were recorded at each site and along the pipeline, from intake to tank sites and distribution points. An inventory of plant taxa was created within 10 m distance from either side of the transect line (Appendix IV).
- To determine conservation status of the recorded species, all individual species encountered in the study area were identified.
- These locally endangered species were crosschecked against the *National Parks and Wildlife (Protected, Endangered and Listed Species) (Declaration) Order, 2017.*
- To determine species of global conservation concern, the rare species were searched on the IUCN red list website; <u>http://www.iucnredlist.org/search</u>.
- To complement the field survey data, members of communities were engaged to provide information on plant usage and overall value attached to different taxa that exist within the community.

Fauna assessment methodology

The study of fauna was based on both direct and actual sighting of animals during the field surveys as well as indirect method of sighting animal signs like footprints, spoors and calls. Information received from members of the local community living within the study areas was also included. An inventory of wildlife thus recorded is provided in Appendix VII.

Prior to the survey, a review on the terrestrial invertebrates of the project area was carried out. The review was mainly aimed at having a list of invertebrates found at the project area as well as a list of species of local Malawian conservation-significance and the IUCN/CITES-listed ones (threatened i.e. Critically Endangered, Endangered, and Vulnerable or near threatened). Field sampling for invertebrates was done using opportunistic sampling (sampling on an encountered basis) and semi systematics methods. These methods of sampling were used in order to have a clear knowledge of species distribution within the sampling points/reaches and to collect as many different species as possible, present within the proposed project area. Within each of the habitat types, invertebrates were collected by scooping, hand picking, photographing, shrubs shaking and observations. Some interviews with local people were also conducted to find out from them what invertebrates they meet as they carry out their normal day to day activities. All the terrestrial habitats were sampled by using suitable method(s) appropriate to the habitats. Specimens which could not be identified in the field were collected for later identification in a laboratory/museum.

Aquatic fauna assessment methodology

For the aquatic habitats within the project area, information on the identities of their resident fish fauna was obtained from fisher folks and local fish markets, key interviews with local residents especially those engaged in fishing or fishing-related activities during the field visit ($20^{th} - 21^{s}$ September 2022). Information was also gleaned from available published literature. Fishes known to occur in the project area (through physical encounters or other records) were identified to the lowest possible taxon in accordance with relevant field fish guides (e.g. Jubb 1967, Konings 1990, Skelton 2001) and their conservation status was determined based on the most current FishBase data and IUCN Red list database.

Sampling of macro-invertebrates of these project areas was carried out using both opportunistic sampling (sampling on an asencountered basis) and systematic sampling methods in the macro-habitats of the proposed project area. Sample collection was carried in South Rumphi and South Rukuru Rivers across a diversity of micro-habitat types, including shrubs, trees, grasses, aquatic macrophytes, pools, marginal vegetation, submerged and emergent vegetation, small rocks, tree roots and floating plant debris. Macroinvertebrates were collected by scooping, using traps, hand picking, shrub shakings and observations. Dip nets were used to collect stirred up or loosened material after sediment-kicking, substrate shaking and rock-rolling. Contents of dip nets were then emptied onto a sorting tray and the specimens collected into sampling bottles. Photographs of the invertebrates were also taken. While some invertebrate specimens (mostly adults) were identified in the field, others that were not easily identifiable in the field were kept in transparent envelopes or preserved in 95% ethanol in collecting bottles for later sorting and identification to the lowest possible taxon in the laboratory under an Olympus microscope at the University of Malawi and at the Museums of Malawi in Blantyre. Various invertebrate field guides and other books were used for sample identification, including Tarboton and Tarboton 2005 and Dijkstra, 2007. The field visit for sample collection was conducted from 20^a September to 21^a September 2022 in Rumphi and Mzimba Districts at the sites as indicated in Table 46 below:

Table 46: ESIA sampling locations for aquatic macro-invertebrates and fish for the Rumphi Water Supply and Sanitation ServicesImprovement Project.

Serial No.	Sampled site	GPS Position	Elevation (Metres)
1	Rumphi River Intake Site - Upper Part	10° 53.795S, 33° 52.618E	1139
2	Rumphi River Intake Site - Middle Part	11° 00.050S, 33° 52.471E	1106

Serial No.	Sampled site	GPS Position	Elevation (Metres)
3	Rumphi River Intake Site Lower Part – Near Treatment Site	11° 00.366S, 33° 52.404E	1086
4	Rumphi River Intake Site Lower Part – Near Treatment Site	11° 00.364S, 33° 52.404E	1084
5	South Rukuru River Wastewater Treatment Facility 1- Lower Part	11° 01.723S, 33° 51.267E	1053
6	South Rukuru River Wastewater Treatment Facility 1- Lower Part	11° 01.710S, 33° 51.237E	1057
7	South Rukuru River Wastewater Treatment Facility 1- Upper Part	11° 01.747S, 33° 51.131E	1060
8	South Rukuru River Wastewater Treatment Facility 1- Upper Part	11° 01.748S, 33° 51.133E	1057
9	South Rukuru River Wastewater Treatment Facility 2 - Lower Part	11° 01.810S, 33° 51.027E	1053
10	South Rukuru River Wastewater Treatment Facility 2 - Lower Part	11° 01.814S, 33° 51.013E	1052
11	South Rukuru River Wastewater Treatment Facility 2 - Upper Part	11° 01.740S, 33° 50.873E	1059
12	South Rukuru River Wastewater Treatment Facility 2 - Upper Part	11° 01.741S, 33° 50.868E	1061
13	South Rukuru River Wastewater Treatment Facility 2- Upper Part	11° 01.741S, 33° 50.840E	1059

Macro-invertebrate assemblage and habitat quality

Habitat quality and an ecological state of these aquatic micro-habitats were gauged based on their macro-invertebrate communities using the average score per taxon (ASPT) of the South African Scoring System version 5 (SASS 5) following Dickens and Graham (2002). An ASPT score of 7.3 represents a relatively pristine water habitat, with far much lesser values being correlated with degraded microhabitats.

APPENDIX VIII: PLANT SPECIES SAMPLED AT SITES

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Enukweni office site	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Cynodon dactylon	Grass	Exotic	Data deficient	Soil conservation
Enukweni office site	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Enukweni office site	Cultivated land	Solanum panduroforme	Herb	Indigenous	Data deficient	Medicinal
Enukweni office site	Cultivated land	Vetiveria nigritana	Herb	Exotic	Data deficient	Soil conservation
Enukweni office site	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Enukweni office site	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Enukweni office site	Cultivated land	Sesamum angolense	Shrub	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Ruffa cylindrica	Grass	Indigenous	Data deficient	Thatching
Enukweni office site	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Enukweni office site	Cultivated land	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Enukweni office site	Cultivated land	Markhamia zanzibarica	Tree	Indigenous	Vulnerabl e	Fuelwood
Enukweni office site	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Enukweni office site	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Zanha africana	Tree	Indigenous	Vulnerabl e	Medicinal
Enukweni office site	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Enukweni office site	Cultivated land	Lantana camara	Shrub	Exotic	Data deficient	Environmental use
Enukweni office site	Cultivated land	Triumfetta annua	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Urena lobata	Shrub	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Sesamum angolense	Shrub	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Eucalyptus camaldulensis	Tree	Exotic	Data deficient	Poles
Enukweni office site	Cultivated land	Chamecrista absus	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Chloris gayana	Grass	Indigenous	Data deficient	Fodder
Enukweni office site	Cultivated land	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Enukweni office site	Cultivated land	Ipomoea rubens	Climber	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Enukweni office site	Cultivated land	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Enukweni office site	Cultivated land	Brachystegia spiciformis	Tree	Indigenous	Vulnerabl e	Timber
Enukweni office site	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Enukweni office site	Cultivated land	Rourea orientalis	Tree	Indigenous	Data deficient	Fuelwood
Enukweni office site	Cultivated land	Bauhinia petersiana	Tree	Indigenous	Data deficient	Fuelwood
Enukweni office site	Cultivated land	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Enukweni office site	Cultivated land	Erythrina abyssinica	Tree	Indigenous	Vulnerabl e	Medicinal
Enukweni office site	Cultivated land	Barleria spinulosa	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Environmental use
Enukweni office site	Cultivated land	Themeda triandra	Grass	Indigenous	Data deficient	Thatching

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Enukweni office site	Cultivated land	Pterocarpus rotundifolius	Tree	Indigenous	Vulnerabl e	Timber
Enukweni office site	Cultivated land	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Enukweni office site	Cultivated land	Sporobolus pyramidalis	Grass	Indigenous	Data deficient	Fodder
Enukweni office site	Cultivated land	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Enukweni office site	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Rumphi river Intake	Rumphi river - Mixed woodland	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Rumphi river Intake	Rumphi river - Mixed woodland	Vernonia myriantha	Tree	Indigenous	Data deficient	Medicinal
Rumphi river Intake	Rumphi river - Mixed woodland	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Rumphi river Intake	Rumphi river - Mixed woodland	Erythrophleum suaveolens	Tree	Indigenous	Endangere d	Medicinal
Rumphi river Intake	Rumphi river - Mixed woodland	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Rumphi river Intake	Rumphi river - Mixed woodland	Hippocratea indica	Tree	Indigenous	Data deficient	Medicinal
Rumphi river Intake	Rumphi river - Mixed woodland	Mimusops zeyheri	Tree	Indigenous	Vulnerabl e	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Afzelia quanzensis	Tree	Indigenous	Endangere d	Medicinal
Rumphi river Intake	Rumphi river - Mixed woodland	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Parkia filicoidea	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Rumphi river Intake	Rumphi river - Mixed woodland	Toona ciliata	Tree	Exotic	Data deficient	Timber
Rumphi river Intake	Rumphi river - Mixed woodland	Ficus sur	Tree	Indigenous	Vulnerabl e	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Bridelia micrantha	Tree	Indigenous	Vulnerabl e	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Cyperus textilis	Grass	Indigenous	Data deficient	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Syzygium guineense	Tree	Indigenous	Vulnerabl e	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Pennisetum unisetum	Grass	Indigenous	Data deficient	Fodder
Rumphi river Intake	Rumphi river - Mixed woodland	Sansevieria senegambica	Shrub	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Rumphi river Intake	Rumphi river - Mixed woodland	Barleria spinulosa	Herb	Indigenous	Data deficient	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Magaritaria discoidea	Tree	Indigenous	Vulnerabl e	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Maytenus acuminata	Tree	Indigenous	Vulnerabl e	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Sansevieria longiflora	Shrub	Indigenous	Data deficient	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Tricalysia acocanthoides	Tree	Indigenous	Data deficient	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Xylopia parviflora	Tree	Indigenous	Vulnerabl e	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Mondurea sericea	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Rumphi river Intake	Rumphi river - Mixed woodland	Acalypha sp	Shrub	Indigenous	Data deficient	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Rourea orientalis	Tree	Indigenous	Data deficient	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Brachystegia microphylla	Tree	Indigenous	Vulnerabl e	Timber
Rumphi river Intake	Rumphi river - Mixed woodland	Syzygium cordatum	Tree	Indigenous	Vulnerabl e	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Lepidotrichilia volkensii	Tree	Indigenous	Vulnerabl e	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Landolphia buchananii	Climber	Indigenous	Data deficient	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Ficus natalensis	Tree	Indigenous	Data deficient	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Rumphi river Intake	Rumphi river - Mixed woodland	Albizia glaberrima	Tree	Indigenous	Vulnerabl e	Medicinal
Rumphi river Intake	Rumphi river - Mixed woodland	Psidium guajava	Tree	Exotic	Data deficient	Fruits
Rumphi river Intake	Rumphi river - Mixed woodland	Euphorbia matabalensis	Tree	Indigenous	Data deficient	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Dioscorea sp	Climber	Indigenous	Data deficient	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Commiphora marlothi	Tree	Indigenous	Vulnerabl e	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Karomia speciosa	Tree	Indigenous	Data deficient	Fuelwood
Rumphi river Intake	Rumphi river - Mixed woodland	Dalbergia lactea	Climber	Indigenous	Data deficient	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Rumphi river Intake	Rumphi river - Mixed woodland	Euphorbia cooperi	Cactus	Indigenous	Vulnerabl e	Environmental use
Rumphi river Intake	Rumphi river - Mixed woodland	Raphia farinifera	Palm	Indigenous	Vulnerabl e	Furnitures
Pipiline transect	Rumphi river - Mixed woodland	Acalypha sp	Shrub	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Barleria spinulosa	Tree	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Bridelia micrantha	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Panicum maximum	Grass	Indigenous	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Syzygium guineense	Tree	Indigenous	Data deficient	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Hypoestes forskaollii	Herb	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Grewia flavovirens	Climber	Indigenous	Data deficient	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Lepidotrichilia volkensii	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Pipiline transect	Rumphi river - Mixed woodland	Erythrophleum suaveolens	Tree	Indigenous	Endangere d	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Maytenus heterophylla	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Clematis brachiata	Climber	Indigenous	Data deficient	Medicinal
SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
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Pipiline transect	Rumphi river - Mixed woodland	Tremma orientalis	Tree	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Bridelia micrantha	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Ficus sur	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Senna siamea	Tree	Exotic	Data deficient	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Parkia filicoidea	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Lannea discolor	Tree	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Commiphora mossambicensis	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Nidorella resedifolia	Herb	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Hypoestes forskaollii	Herb	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Dalbergia lactea	Climber	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Acalpha villicaulis	Herb	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Biophytum nyikensis	Herb	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Themeda triandra	Grass	Indigenous	Data deficient	Thatching
Pipiline transect	Rumphi river - Mixed woodland	Vernonia myriantha	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Albizia gummifera	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Abrus precatorius	Climber	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Pteris sp	Fern	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Euphobia depauperata	Herb	Indigenous	Data deficient	Environmental use
Pipiline transect	Rumphi river - Mixed woodland	Vernonia myriantha	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Albizia glaberrima	Tree	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Lepidotrichilia volkensii	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Combretum molle	Tree	Indigenous	Vulnerabl e	Timber
Pipiline transect	Rumphi river - Mixed woodland	Tricalysia acocanthoides	Tree	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Premna senensis	Shrub	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Commiphora marlothi	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Parkia filicoidea	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Monodora jonodii	Climber	Indigenous	Data deficient	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Albizia lebbeck	Tree	Exotic	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Khaya anthotheca	Tree	Indigenous	Endangere d	Timber
Pipiline transect	Rumphi river - Mixed woodland	Magaritaria discoidea	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Pachystella brevipes	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Acacia polyacantha	Tree	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Syzygium guineense	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Pennisetum unisetum	Grass	Indigenous	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Cyperus textilis	Grass	Indigenous	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Pipiline transect	Rumphi river - Mixed woodland	Erythrophleum suaveolens	Tree	Indigenous	Endangere d	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Cissus quadrangularis	Climber	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Euphorbia matabalensis	Tree	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Brachystegia microphylla	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Grewia flavovirens	Climber	Indigenous	Data deficient	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Ehretia divaricata	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Boscia angustifolia	Tree	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Dalbergia boehmii	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Albizia amara	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Pipiline transect	Rumphi river - Mixed woodland	Crossoptyrx febrifuga	Tree	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Terminalia stenostachya	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Combretum adenogonium	Tree	Indigenous	Vulnerabl e	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Pterocarpus angolensis	Tree	Indigenous	Endangere d	Timber
Pipiline transect	Rumphi river - Mixed woodland	Catunaregum spinosa	Tree	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Crossoptyrx fruticulosa	Tree	Indigenous	Vulnerabl e	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Pipiline transect	Rumphi river - Mixed woodland	Diospyros squarrosa	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Acacia karroo	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Acacia polyacantha	Tree	Indigenous	Data deficient	Fuelwood
Pipiline transect	Rumphi river - Mixed woodland	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Pipiline transect	Rumphi river - Mixed woodland	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Leucaena leucocephala	Tree	Exotic	Data deficient	Fodder
Pipiline transect	Rumphi river - Mixed woodland	Senna spectabilis	Tree	Exotic	Data deficient	Poles
Pipiline transect	Rumphi river - Mixed woodland	Flacourtia indica	Tree	Indigenous	Vulnerabl e	Fruits
Pipiline transect	Rumphi river - Mixed woodland	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Pipiline transect	Rumphi river - Mixed woodland	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Pipiline transect	Rumphi river - Mixed woodland	Sterculia quinqueloba	Tree	Indigenous	Vulnerabl e	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Euphorbia matabalensis	Tree	Indigenous	Data deficient	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Albizia amara	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Treatment and Tank	Hill slopes - Miombo woodlands	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Treatment and Tank	Hill slopes - Miombo woodlands	Afzelia quanzensis	Tree	Indigenous	Endangere d	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Combretum adenogonium	Tree	Indigenous	Vulnerabl e	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Commiphora mossambicensis	Tree	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Themeda triandra	Grass	Indigenous	Data deficient	Fodder

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Treatment and Tank	Hill slopes - Miombo woodlands	Dioscorea sp	Climber	Indigenous	Data deficient	Environmental use
Treatment and Tank	Hill slopes - Miombo woodlands	Ormocarpum kirkii	Tree	Indigenous	Vulnerabl e	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Catunaregum spinosa	Tree	Indigenous	Vulnerabl e	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Vernonia myriantha	Tree	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Cussonia arborea	Tree	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Asparagus buchanannii	Shrub	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Treatment and Tank	Hill slopes - Miombo woodlands	Vitex payos	Tree	Indigenous	Vulnerabl e	Fruits
Treatment and Tank	Hill slopes - Miombo woodlands	Rourea orientalis	Tree	Indigenous	Data deficient	Fuelwood
Treatment and Tank	Hill slopes - Miombo woodlands	Brachystegia microphylla	Tree	Indigenous	Vulnerabl e	Timber
Treatment and Tank	Hill slopes - Miombo woodlands	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Treatment and Tank	Hill slopes - Miombo woodlands	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Pterocarpus angolensis	Tree	Indigenous	Endangere d	Timber
Treatment and Tank	Hill slopes - Miombo woodlands	Ozoroa insigns	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Treatment and Tank	Hill slopes - Miombo woodlands	Acacia nilotica	Tree	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Sterculia quinqueloba	Tree	Indigenous	Vulnerabl e	Environmental use
Treatment and Tank	Hill slopes - Miombo woodlands	Loranthus dregei	Shrub	Indigenous	Data deficient	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Terminalia stenostachya	Tree	Indigenous	Vulnerabl e	Timber
Treatment and Tank	Hill slopes - Miombo woodlands	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Euphorbia cooperi	Cactus	Indigenous	Vulnerabl e	Medicinal
Treatment and Tank	Hill slopes - Miombo woodlands	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Treatment and Tank	Hill slopes - Miombo woodlands	Dalbergia lactea	Climber	Indigenous	Data deficient	Fuelwood
Sewage site 1	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Combretum adenogonium	Tree	Indigenous	Vulnerabl e	Fuelwood
Sewage site 1	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Sewage site 1	Cultivated land	Vetiveria nigritana	Grass	Exotic	Data deficient	Fodder
Sewage site 1	Cultivated land	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Sewage site 1	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Sewage site 1	Cultivated land	Solanum panduroforme	Herb	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 1	Cultivated land	Chenopodium ambrosoides	Herb	Exotic	Data deficient	Medicinal
Sewage site 1	Cultivated land	Spermacose dibrachiata	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Hippocratea parviflora	Tree	Indigenous	Data deficient	Fuelwood
Sewage site 1	Cultivated land	Markhamia zanzibarica	Tree	Indigenous	Vulnerabl e	Fuelwood
Sewage site 1	Cultivated land	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Sewage site 1	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Sewage site 1	Cultivated land	Diospyros squarrosa	Tree	Indigenous	Vulnerabl e	Fruits
Sewage site 1	Cultivated land	Albizia amara	Tree	Indigenous	Vulnerabl e	Timber
Sewage site 1	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 1	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Sewage site 1	Cultivated land	Tridax procumbens	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Sewage site 1	Cultivated land	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Sewage site 1	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Sewage site 1	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Sewage site 1	Cultivated land	Cissus integrifolia	Climber	Indigenous	Data deficient	Medicinal
Sewage site 1	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Maytenus heterophylla	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 1	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Sewage site 1	Cultivated land	Cynodon dactylon	Grass	Indigenous	Data deficient	Fodder
Sewage site 1	Cultivated land	Phragmites mauritiana	Grass	Indigenous	Data deficient	Weaving
Sewage site 1	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Brooms
Sewage site 1	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Sewage site 1	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Sewage site 1	Cultivated land	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Sewage site 1	Cultivated land	Cleome monophylla	Herb	Indigenous	Data deficient	Vegetables
Sewage site 1	Cultivated land	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables
Sewage site 1	Cultivated land	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 1	Cultivated land	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Sewage site 1	Cultivated land	Indigofera hirsuta	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Tephrosia sp	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Capparis erythrocarpos	Climber	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Clerodendrum capitatum	Shrub	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Sewage site 1	Cultivated land	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use
Sewage site 1	Cultivated land	Themeda triandra	Grass	Indigenous	Data deficient	Fodder
Sewage site 1	Cultivated land	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use
Sewage site 1	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 1	Cultivated land	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables
Sewage site 1	Cultivated land	Ceratontheca sesamoides	Herb	Indigenous	Data deficient	Vegetables
Sewage site 2	Dambo area	Cynodon dactylon	Grass	Exotic	Data deficient	Fodder
Sewage site 2	Dambo area	Ocimum americana	Herb	Indigenous	Data deficient	Medicinal
Sewage site 2	Dambo area	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Sewage site 2	Dambo area	Solanum panduroforme	Herb	Indigenous	Data deficient	Medicinal
Sewage site 2	Dambo area	Vigna pygmae	Herb	Indigenous	Data deficient	Medicinal
Sewage site 2	Dambo area	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Sewage site 2	Dambo area	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Sewage site 2	Dambo area	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 2	Dambo area	Acacia polyacantha	Tree	Indigenous	Data deficient	Fuelwood
Sewage site 2	Dambo area	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use
Sewage site 2	Dambo area	Hygrophylla auriculata	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Cerosia trygina	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Gomphrena celasioides	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Urena lobata	Shrub	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Corchorus olitorius	Herb	Indigenous	Data deficient	Vegetables
Sewage site 2	Dambo area	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Sewage site 2	Dambo area	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 2	Dambo area	Albizia versicolor	Tree	Indigenous	Vulnerabl e	Medicinal
Sewage site 2	Dambo area	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Maytenus heterophylla	Tree	Indigenous	Vulnerabl e	Fuelwood
Sewage site 2	Dambo area	Triumfetta annua	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Neojeffrera decurens	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Chamecrista grantii	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Crassocephalum rubens	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Ipomoea rubens	Climber	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 2	Dambo area	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Sewage site 2	Dambo area	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Sewage site 2	Dambo area	Eucalyptus camaldulensis	Tree	Exotic	Data deficient	Poles
Sewage site 2	Dambo area	Combretum molle	Tree	Indigenous	Vulnerabl e	Timber
Sewage site 2	Dambo area	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Sewage site 2	Dambo area	Acacia sieberiana	Tree	Indigenous	Vulnerabl e	Timber
Sewage site 2	Dambo area	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Sewage site 2	Dambo area	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Sewage site 2	Dambo area	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Sewage site 2	Dambo area	Sporobolus pyramidalis	Grass	Indigenous	Data deficient	Fodder
Sewage site 2	Dambo area	Phragmites mauritiana	Grass	Indigenous	Data deficient	Weaving
Sewage site 2	Dambo area	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Sewage site 2	Dambo area	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Bolero waste disposal	Mixed woodland	Commiphora mossambicensis	Tree	Indigenous	Data deficient	Fuelwood
Bolero waste disposal	Mixed woodland	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Bolero waste disposal	Mixed woodland	Landolphia buchananii	Climber	Indigenous	Data deficient	Fruits
Bolero waste disposal	Mixed woodland	Vitex payos	Tree	Indigenous	Vulnerabl e	Fruits
Bolero waste disposal	Mixed woodland	Grewia bicolor	Tree	Indigenous	Vulnerabl e	Fruits
Bolero waste disposal	Mixed woodland	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero waste disposal	Mixed woodland	Rourea orientalis	Tree	Indigenous	Data deficient	Fuelwood
Bolero waste disposal	Mixed woodland	Lannea discolor	Tree	Indigenous	Data deficient	Fuelwood
Bolero waste disposal	Mixed woodland	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Bolero waste disposal	Mixed woodland	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Hygrophylla auriculata	Herb	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Vigna pygmae	Herb	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Friesodielsia obovata	Climber	Indigenous	Data deficient	Fruits
Bolero waste disposal	Mixed woodland	Terminalia sericea	Tree	Indigenous	Endangere d	Timber
Bolero waste disposal	Mixed woodland	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero waste disposal	Mixed woodland	Sclerocarya birrea	Tree	Indigenous	Data deficient	Timber
Bolero waste disposal	Mixed woodland	Dioscorea sp	Climber	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Combretum molle	Tree	Indigenous	Vulnerabl e	Timber
Bolero waste disposal	Mixed woodland	Flacourtia indica	Tree	Indigenous	Vulnerabl e	Fruits
Bolero waste disposal	Mixed woodland	Combretum mossambicensis	Climber	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Ximenia americana	Tree	Indigenous	Vulnerabl e	Fruits
Bolero waste disposal	Mixed woodland	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Euphorbia matabalensis	Tree	Indigenous	Data deficient	Fuelwood
Bolero waste disposal	Mixed woodland	Albizia amara	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero waste disposal	Mixed woodland	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Bolero waste disposal	Mixed woodland	Boscia angustifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Capparis erythrocarpos	Climber	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Mondurea sericea	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero waste disposal	Mixed woodland	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero waste disposal	Mixed woodland	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Strychnos innocua	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero waste disposal	Mixed woodland	Hippocratea parviflora	Tree	Indigenous	Data deficient	Fuelwood
Bolero waste disposal	Mixed woodland	Vernonia sp	Shrub	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Vitex doniana	Tree	Indigenous	Vulnerabl e	Fruits
Bolero waste disposal	Mixed woodland	Asparagus buchanannii	Shrub	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Chamecrista bracteosa	Herb	Indigenous	Data deficient	Environmental use
Bolero waste disposal	Mixed woodland	Maprounea africana	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Landolphia buchananii	Climber	Indigenous	Data deficient	Fruits
Bolero waste disposal	Mixed woodland	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits
Bolero waste disposal	Mixed woodland	Multidentia crassa	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero waste disposal	Mixed woodland	Ricinondron rautanenii	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Ochna schweifurthiana	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero waste disposal	Mixed woodland	Grewia flavovirens	Climber	Indigenous	Data deficient	Fruits
Bolero waste disposal	Mixed woodland	Asparagus falcatus	Shrub	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Cymphostemma junceum	Climber	Indigenous	Data deficient	Medicinal
Bolero waste disposal	Mixed woodland	Psydrax livida	Tree	Indigenous	Data deficient	Fuelwood
Bolero booster	Along Rumphi - Nyika road	Chloris gayana	Grass	Indigenous	Data deficient	Fodder
Bolero booster	Along Rumphi - Nyika road	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Bolero booster	Along Rumphi - Nyika road	Senna septemtrionalis	Shrub	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero booster	Along Rumphi - Nyika road	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Senna spectabilis	Tree	Indigenous	Data deficient	Poles
Bolero booster	Along Rumphi - Nyika road	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Bolero booster	Along Rumphi - Nyika road	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Bolero booster	Along Rumphi - Nyika road	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal
Bolero booster	Along Rumphi - Nyika road	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Bolero booster	Along Rumphi - Nyika road	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Bolero booster	Along Rumphi - Nyika road	Vetiveria nigritana	Grass	Exotic	Data deficient	Soil conservation
Bolero booster	Along Rumphi - Nyika road	Ricinus communis	Tree	Exotic	Data deficient	Medicinal
Bolero booster	Along Rumphi - Nyika road	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero booster	Along Rumphi - Nyika road	Albizia harveyi	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero booster	Along Rumphi - Nyika road	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Bolero booster	Along Rumphi - Nyika road	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables
Bolero booster	Along Rumphi - Nyika road	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Bolero booster	Along Rumphi - Nyika road	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero booster	Along Rumphi - Nyika road	Neojeffrera decurens	Herb	Indigenous	Data deficient	Environmental use
Bolero booster	Along Rumphi - Nyika road	Boscia mossambicensis	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero booster	Along Rumphi - Nyika road	Zanthoxylum challybeum	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero booster	Along Rumphi - Nyika road	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Bolero booster	Along Rumphi - Nyika road	Sida rhomboidea	Herb	Indigenous	Data deficient	Brooms
Bolero booster	Along Rumphi - Nyika road	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables
Bolero booster	Along Rumphi - Nyika road	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Bolero booster	Along Rumphi - Nyika road	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero booster	Along Rumphi - Nyika road	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero offices	Bolero offices	Hygrophylla auriculata	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero offices	Bolero offices	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero offices	Bolero offices	Combretum collinum	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero offices	Bolero offices	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Bolero offices	Bolero offices	Hypathellia dissoluta	Grass	Indigenous	Data deficient	Thatching
Bolero offices	Bolero offices	Neojeffrera decurens	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Bolero offices	Bolero offices	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Albizia harveyi	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero offices	Bolero offices	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero offices	Bolero offices	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Bolero offices	Bolero offices	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Bolero offices	Bolero offices	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Bolero offices	Bolero offices	Barleria spinulosa	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Bolero offices	Bolero offices	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Triumfetta annua	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables
SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
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Bolero offices	Bolero offices	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Bolero offices	Bolero offices	Senna siamea	Tree	Exotic	Data deficient	Poles
Bolero offices	Bolero offices	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Bolero offices	Bolero offices	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero offices	Bolero offices	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero offices	Bolero offices	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use
Bolero offices	Bolero offices	Vitex doniana	Tree	Indigenous	Vulnerabl e	Fruits
Bolero offices	Bolero offices	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables
Bolero offices	Bolero offices	Tephrosia vogelii	Tree	Indigenous	Data deficient	Soil conservation
Bolero offices	Bolero offices	Blepharis grandis	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero offices	Bolero offices	Hyperrhenia ruffa	Grass	Indigenous	Data deficient	Thatching
Bolero offices	Bolero offices	Ormocarpum kirkii	Tree	Indigenous	Data deficient	Medicinal
Bolero offices	Bolero offices	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Bolero offices	Bolero offices	Boscia angustifolia	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero offices	Bolero offices	Boscia mossambicensis	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero offices	Bolero offices	Eragrostris congesta	Grass	Indigenous	Data deficient	Fodder
Bolero offices	Bolero offices	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Bolero offices	Bolero offices	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Euphorbia tirucalli	Tree	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche booster	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Kacheche booster	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Mangifera indica	Tree	Exotic	Data deficient	Fruits
Kacheche booster	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Kacheche booster	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Sterculia africana	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche booster	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche booster	Cultivated land	Solanum panduroforme	Herb	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche booster	Cultivated land	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use
Kacheche booster	Cultivated land	Corchorus olitorius	Herb	Indigenous	Data deficient	Vegetables
Kacheche booster	Cultivated land	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables
Kacheche booster	Cultivated land	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Kacheche booster	Cultivated land	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche booster	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Kacheche booster	Cultivated land	Hyperrhenia filipendula	Grass	Indigenous	Data deficient	Thatching

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche booster	Cultivated land	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Kacheche booster	Cultivated land	Strychnos spinosa	Tree	Indigenous	Vulnerabl e	Fruits
Kacheche booster	Cultivated land	Albizia amara	Tree	Indigenous	Vulnerabl e	Timber
Kacheche booster	Cultivated land	Friesodielsia obovata	Climber	Indigenous	Data deficient	Fruits
Kacheche booster	Cultivated land	Themeda triandra	Grass	Indigenous	Data deficient	Fodder
Kacheche booster	Cultivated land	Flacourtia indica	Tree	Indigenous	Data deficient	Fruits
Kacheche booster	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Kacheche booster	Cultivated land	Vernonia petersii	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche booster	Cultivated land	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche booster	Cultivated land	Tridax procumbens	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Environmental use
Kacheche booster	Cultivated land	Boscia mossambicensis	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche booster	Cultivated land	Panicum maximum	Grass	Indigenous	Data deficient	Fodder
Kacheche booster	Cultivated land	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche booster	Cultivated land	Dioscorea sp	Climber	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche booster	Cultivated land	Markhamia zanzibarica	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche booster	Cultivated land	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche booster	Cultivated land	Euclea racemosa	Tree	Indigenous	Vulnerabl e	Vegetables
Kacheche booster	Cultivated land	Cynodon dactylon	Grass	Indigenous	Data deficient	Fodder
Kacheche booster	Cultivated land	Ficus exasperata	Tree	Indigenous	Vulnerabl e	Fruits
Kacheche booster	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Fuelwood
Kacheche booster	Cultivated land	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche booster	Cultivated land	Acacia polyacantha	Tree	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Albizia versicolor	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche booster	Cultivated land	Vernonia adoensis	Herb	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Kacheche booster	Cultivated land	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche booster	Cultivated land	Sesamum indicum	Herb	Indigenous	Data deficient	Vegetables
Kacheche booster	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Kacheche booster	Cultivated land	Crassocephalum rubens	Herb	Indigenous	Data deficient	Environmental use
Kacheche Tank	Uphill	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Kacheche Tank	Uphill	Commiphora africana	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche Tank	Uphill	Zanthoxylum challybeum	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche Tank	Uphill	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Kacheche Tank	Uphill	Cussonia arborea	Tree	Indigenous	Data deficient	Medicinal
Kacheche Tank	Uphill	Vernonia amygdalina	Tree	Indigenous	Data deficient	Medicinal
Kacheche Tank	Uphill	Boscia mossambicensis	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche Tank	Uphill	Brachystegia microphylla	Tree	Indigenous	Vulnerabl e	Timber
Kacheche Tank	Uphill	Pterocarpus angolensis	Tree	Indigenous	Endangere d	Timber
Kacheche Tank	Uphill	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal
Kacheche Tank	Uphill	Catunaregum spinosa	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche Tank	Uphill	Ochna schweifurthiana	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche Tank	Uphill	Magaritaria discoidea	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche Tank	Uphill	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Kacheche Tank	Uphill	Themeda triandra	Grass	Indigenous	Data deficient	Thatching
Kacheche Tank	Uphill	Pavetta schumanniana	Tree	Indigenous	Data deficient	Medicinal
Kacheche Tank	Uphill	Trichoptryx fruticulosa	Grass	Indigenous	Data deficient	Fodder

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Kacheche Tank	Uphill	Erythrina abyssinica	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche Tank	Uphill	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Kacheche Tank	Uphill	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche Tank	Uphill	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Kacheche Tank	Uphill	Hyperrhenia ruffa	Grass	Indigenous	Data deficient	Thatching
Kacheche Tank	Uphill	Xerophyta sp	Tree	Indigenous	Vulnerabl e	Environmental use
Kacheche Tank	Uphill	Ochna pubelura	Tree	Indigenous	Vulnerabl e	Fuelwood
Kacheche Tank	Uphill	Keetia quenzii	Tree	Indigenous	Data deficient	Fuelwood
Mwazisi housing and offices	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Mwazisi housing and offices	Cultivated land	Themeda triandra	Grass	Indigenous	Data deficient	Fodder

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi offices	housing	and	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Mwazisi offices	housing	and	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Mwazisi offices	housing	and	Cultivated land	Indigofera hirsuta	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Mwazisi offices	housing	and	Cultivated land	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi offices	housing	and	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Mwazisi offices	housing	and	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Mwazisi offices	housing	and	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Fuelwood
Mwazisi offices	housing	and	Cultivated land	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi offices	housing	and	Cultivated land	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Mwazisi offices	housing	and	Cultivated land	Chloris gayana	Grass	Indigenous	Data deficient	Fodder
Mwazisi offices	housing	and	Cultivated land	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Anisophyllea pomifera	Tree	Indigenous	Vulnerabl e	Fruits
Mwazisi offices	housing	and	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Eragrostris congesta	Grass	Indigenous	Data deficient	Fodder
Mwazisi offices	housing	and	Cultivated land	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables
Mwazisi offices	housing	and	Cultivated land	Albizia versicolor	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi offices	housing	and	Cultivated land	Ceratontheca sesamoides	Herb	Indigenous	Data deficient	Vegetables

SITE NAM	Æ		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi offices	housing	and	Cultivated land	Elephantorhiza goetzei	Tree	Indigenous	Data deficient	Medicinal
Mwazisi offices	housing	and	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Mwazisi offices	housing	and	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Mwazisi offices	housing	and	Cultivated land	Sesamum indicum	Herb	Indigenous	Data deficient	Environmental use
Mwazisi offices	housing	and	Cultivated land	Hyperrhenia ruffa	Grass	Indigenous	Data deficient	Thatching
Mwazisi ta	nk site		Hill top - Miombo woodlands	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi ta	nk site		Hill top - Miombo woodlands	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Mwazisi ta	nk site		Hill top - Miombo woodlands	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi tank site	Hill top - Miombo woodlands	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Brachystegia utilis	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi tank site	Hill top - Miombo woodlands	Themeda triandra	Grass	Indigenous	Data deficient	Fodder
Mwazisi tank site	Hill top - Miombo woodlands	Panicum maximum	Grass	Indigenous	Data deficient	Fodder
Mwazisi tank site	Hill top - Miombo woodlands	Digitaria milanjiana	Grass	Indigenous	Data deficient	Fodder
Mwazisi tank site	Hill top - Miombo woodlands	Pavetta schumanniana	Tree	Indigenous	Data deficient	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Brachystegia spiciformis	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi tank site	Hill top - Miombo woodlands	Brachystegia microphylla	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi tank site	Hill top - Miombo woodlands	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Multidentia crassa	Tree	Indigenous	Data deficient	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi tank site	Hill top - Miombo woodlands	Ximenia caffra	Tree	Indigenous	Vulnerabl e	Fruits
Mwazisi tank site	Hill top - Miombo woodlands	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi tank site	Hill top - Miombo woodlands	Ozoroa insigns	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Vigna pygmae	Herb	Indigenous	Data deficient	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Ximenia americana	Tree	Indigenous	Vulnerabl e	Fruits
Mwazisi tank site	Hill top - Miombo woodlands	Ochna pubelura	Tree	Indigenous	Vulnerabl e	Fuelwood
Mwazisi tank site	Hill top - Miombo woodlands	Vernonia sp	Shrub	Indigenous	Data deficient	Environmental use
Mwazisi tank site	Hill top - Miombo woodlands	Xerophyta sp	Tree	Indigenous	Vulnerabl e	Environmental use
Mwazisi tank site	Hill top - Miombo woodlands	Burkea africana	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi tank site	Hill top - Miombo woodlands	Hippocratea indica	Tree	Indigenous	Data deficient	Fuelwood
Mwazisi tank site	Hill top - Miombo woodlands	Combretum molle	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi tank site	Hill top - Miombo woodlands	Plectranthus esculentus	Herb	Indigenous	Data deficient	Medicinal
Mwazisi tank site	Hill top - Miombo woodlands	Brachystegia manga	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi tank site	Hill top - Miombo woodlands	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Mwazisi tank site	Hill top - Miombo woodlands	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Mwazisi booster and housing	Cultivated land	Ageratum conyzoides	Herb	Indigenous	Data deficient	Environmental use

SITE NAI	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi housing	booster	and	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Mwazisi housing	booster	and	Cultivated land	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Mwazisi housing	booster	and	Cultivated land	Albizia harveyi	Tree	Indigenous	Vulnerabl e	Fuelwood
Mwazisi housing	booster	and	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Mwazisi housing	booster	and	Cultivated land	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi housing	booster	and	Cultivated land	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi housing	booster	and	Cultivated land	Combretum molle	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi housing	booster	and	Cultivated land	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi housing	booster	and	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Mwazisi housing	booster	and	Cultivated land	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAI	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi housing	booster	and	Cultivated land	Brachystegia spiciformis	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi housing	booster	and	Cultivated land	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Mwazisi housing	booster	and	Cultivated land	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal
Mwazisi housing	booster	and	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Mwazisi housing	booster	and	Cultivated land	Bauhinia petersiana	Tree	Indigenous	Data deficient	Fuelwood
Mwazisi housing	booster	and	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Mwazisi housing	booster	and	Cultivated land	Chloris gayana	Grass	Indigenous	Data deficient	Fodder
Mwazisi housing	booster	and	Cultivated land	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Mwazisi housing	booster	and	Cultivated land	Xylopia parviflora	Tree	Indigenous	Vulnerabl e	Fuelwood
Mwazisi housing	booster	and	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal

SITE NAI	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi housing	booster	and	Cultivated land	Mangifera indica	Tree	Exotic	Data deficient	Fruits
Mwazisi housing	booster	and	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Mwazisi housing	booster	and	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Mwazisi housing	booster	and	Cultivated land	Fadogia odorata	Herb	Indigenous	Data deficient	Environmental use
Mwazisi housing	booster	and	Cultivated land	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi housing	booster	and	Cultivated land	Ozoroa reticulata	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi housing	booster	and	Cultivated land	Acacia amynthophylla	Tree	Indigenous	Vulnerabl e	Fuelwood
Mwazisi housing	booster	and	Cultivated land	Solanum panduroforme	Herb	Indigenous	Data deficient	Medicinal
Mwazisi housing	booster	and	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Mwazisi housing	booster	and	Cultivated land	Flacourtia indica	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAI	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi housing	booster	and	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Mwazisi housing	booster	and	Cultivated land	Vernonia adoensis	Herb	Indigenous	Data deficient	Medicinal
Mwazisi housing	booster	and	Cultivated land	Lannea stuhlmannii	Tree	Indigenous	Vulnerabl e	Medicinal
Mwazisi housing	booster	and	Cultivated land	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Mwazisi housing	booster	and	Cultivated land	Acacia nilotica	Tree	Indigenous	Data deficient	Medicinal
Mwazisi housing	booster	and	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Mwazisi housing	booster	and	Cultivated land	Crassocephalum rubens	Herb	Indigenous	Data deficient	Environmental use
Mwazisi housing	booster	and	Cultivated land	Hyperrhenia filipendula	Grass	Indigenous	Data deficient	Thatching
Mwazisi housing	booster	and	Cultivated land	Hypathellia dissoluta	Grass	Indigenous	Data deficient	Thatching
Mwazisi housing	booster	and	Cultivated land	Combretum adenogonium	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mwazisi booster ar housing	d Cultivated land	Vernonia glabra	Herb	Indigenous	Data deficient	Medicinal
Mwazisi booster ar housing	d Cultivated land	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Mwazisi booster ar housing	d Cultivated land	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Mwazisi booster ar housing	d Cultivated land	Rhus natalensis	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Brachystegia boehmii	Tree	Indigenous	Vulnerabl e	Timber
Luviri tank site	Hill top - Miombo woodlands	Themeda triandra	Grass	Indigenous	Data deficient	Thatching
Luviri tank site	Hill top - Miombo woodlands	Acacia amynthophylla	Tree	Indigenous	Vulnerabl e	Fuelwood
Luviri tank site	Hill top - Miombo woodlands	Bridelia cathartica	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri tank site	Hill top - Miombo woodlands	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Luviri tank site	Hill top - Miombo woodlands	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Commiphora mossambicensis	Tree	Indigenous	Data deficient	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Cussonia arborea	Tree	Indigenous	Data deficient	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Xerophyta sp	Tree	Indigenous	Vulnerabl e	Environmental use
Luviri tank site	Hill top - Miombo woodlands	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri tank site	Hill top - Miombo woodlands	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Luviri tank site	Hill top - Miombo woodlands	Acacia karroo	Tree	Indigenous	Vulnerabl e	Fuelwood
Luviri tank site	Hill top - Miombo woodlands	Ozoroa reticulata	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Plectranthus esculentus	Herb	Indigenous	Data deficient	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Luviri tank site	Hill top - Miombo woodlands	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri tank site	Hill top - Miombo woodlands	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri tank site	Hill top - Miombo woodlands	Pseudolachnostylis maprouneifolia	Tree	Indigenous	Data deficient	Fuelwood
Luviri tank site	Hill top - Miombo woodlands	Dombeya rotundifolius	Tree	Indigenous	Vulnerabl e	Fuelwood
Luviri tank site	Hill top - Miombo woodlands	Hypathellia dissoluta	Grass	Indigenous	Data deficient	Thatching
Luviri tank site	Hill top - Miombo woodlands	Spermacoce dibrachiata	Herb	Indigenous	Data deficient	Environmental use
Luviri tank ssampling ite	Hill top - Miombo woodlands	Commelina benghalensis	Herb	Indigenous	Data deficient	Environmental use
Luviri tank site	Hill top - Miombo woodlands	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri tank site	Hill top - Miombo woodlands	Vernonia petersii	Herb	Indigenous	Data deficient	Environmental use
Luviri tank site	Hill top - Miombo woodlands	Inula glomerata	Herb	Indigenous	Data deficient	Environmental use
Luviri booster	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Fuelwood
Luviri booster	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Luviri booster	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Luviri booster	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Luviri booster	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Luviri booster	Cultivated land	Euclea racemosa	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri booster	Cultivated land	Albizia harveyi	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri booster	Cultivated land	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Luviri booster	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Luviri booster	Cultivated land	Eragrostris ciliaris	Herb	Indigenous	Data deficient	Fodder
Luviri booster	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Luviri booster	Cultivated land	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Luviri booster	Cultivated land	Crassocephalum rubens	Herb	Indigenous	Data deficient	Environmental use
Luviri booster	Cultivated land	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri booster	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Luviri booster	Cultivated land	Albizia versicolor	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri booster	Cultivated land	Sesamum indicum	Herb	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri booster	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Luviri booster	Cultivated land	Cleome monophylla	Herb	Indigenous	Data deficient	Vegetables
Luviri booster	Cultivated land	Senna siamea	Tree	Exotic	Data deficient	Fuelwood
Luviri booster	Cultivated land	Cassia abbreviata	Tree	Indigenous	Vulnerabl e	Medicinal
Luviri booster	Cultivated land	Allophylus africanus	Tree	Indigenous	Data deficient	Medicinal
Luviri booster	Cultivated land	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Luviri booster	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Luviri booster	Cultivated land	Euphorbia hirta	Herb	Indigenous	Data deficient	Medicinal
Luviri booster	Cultivated land	Clerodendrum capitatum	Shrub	Indigenous	Data deficient	Environmental use
Luviri booster	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Luviri booster	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Luviri booster	Cultivated land	Hypathellia dissoluta	Grass	Indigenous	Data deficient	Thatching
Luviri booster	Cultivated land	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables
Bolero tank site	Hill top - Thicket	Phragmites mauritiana	Grass	Indigenous	Data deficient	Weaving
Bolero tank site	Hill top - Thicket	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Cynodon dactylon	Grass	Exotic	Data deficient	Fodder
Bolero tank site	Hill top - Thicket	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Bolero tank site	Hill top - Thicket	Ricinus communis	Tree	Exotic	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	TAXA	HABIT	STATE	IUCN STATUS	USES
Bolero tank site	Hill top - Thicket	Brachystegia microphylla	Tree	Indigenous	Vulnerabl e	Timber
Bolero tank site	Hill top - Thicket	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Bolero tank site	Hill top - Thicket	Combretum collinum	Tree	Indigenous	Vulnerabl e	Timber
Bolero tank site	Hill top - Thicket	Vernonia sp	Shrub	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Keetia quenzii	Tree	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Hippocratea indica	Tree	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Magaritaria discoidea	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero tank site	Hill top - Thicket	Trichoptryx fruticulosa	Grass	Indigenous	Data deficient	Fodder

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero tank site	Hill top - Thicket	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero tank site	Hill top - Thicket	Pseudolachnostylis maprouneifolia	Tree	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Commiphora africana	Tree	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Barleria spinulosa	Herb	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Antherotoma naudii	Herb	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Acalypha sp	Shrub	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Themeda triandra	Grass	Indigenous	Data deficient	Fodder
Bolero tank site	Hill top - Thicket	Pteris sp	Fern	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Burkea africana	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero tank site	Hill top - Thicket	Cissus quadrangularis	Climber	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Cissus integrifolia	Climber	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Plectranthus esculentus	Herb	Indigenous	Data deficient	Medicinal
Bolero tank site	Hill top - Thicket	Ochna pubelura	Tree	Indigenous	Vulnerabl e	Fuelwood
Bolero tank site	Hill top - Thicket	Euphorbia ingens	Tree	Indigenous	Vulnerabl e	Medicinal
Bolero tank site	Hill top - Thicket	Eragrostris congesta	Grass	Indigenous	Data deficient	Fodder
Bolero tank site	Hill top - Thicket	Triumfetta annua	Herb	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Bolero tank site	Hill top - Thicket	Crossoptyrx fruticulosa	Grass	Indigenous	Data deficient	Fodder
Bolero tank site	Hill top - Thicket	Euphorbia matabalensis	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bolero tank site	Hill top - Thicket	Buchnera sp	Herb	Indigenous	Data deficient	Environmental use
Bolero tank site	Hill top - Thicket	Hyperrhenia ruffa	Grass	Indigenous	Data deficient	Thatching
Bolero tank site	Hill top - Thicket	Eragrostris pyramidalis	Grass	Indigenous	Data deficient	Fodder
Bolero tank site	Hill top - Thicket	Combretum adenogonium	Tree	Indigenous	Vulnerabl e	Timber
Bolero tank site	Hill top - Thicket	Pleurostylia africana	Tree	Indigenous	Vulnerabl e	Fuelwood
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Trichoptryx fruticulosa	Grass	Indigenous	Data deficient	Fodder

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Bewisia biflora	Grass	Indigenous	Data deficient	Fodder
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Dalbergia melanoxylon	Tree	Indigenous	Endangere d	Timber
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Maprounea africana	Tree	Indigenous	Vulnerabl e	Fuelwood
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Ximenia caffra	Tree	Indigenous	Vulnerabl e	Fruits
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Hyperrhenia ruffa	Grass	Indigenous	Data deficient	Thatching
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Hyperrhenia filipendula	Grass	Indigenous	Data deficient	Thatching
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Euphorbia matabalensis	Tree	Indigenous	Data deficient	Fuelwood
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Combretum adenogonium	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Xerophyta sp	Tree	Indigenous	Vulnerabl e	Environmental use
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Commiphora mossambicensis	Climber	Indigenous	Data deficient	Timber
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Elephantorhiza goetzei	Tree	Indigenous	Data deficient	Medicinal
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Pterocarpus angolensis	Tree	Indigenous	Endangere d	Timber
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Catunaregum spinosa	Tree	Indigenous	Vulnerabl e	Medicinal
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Magaritaria discoidea	Tree	Indigenous	Vulnerabl e	Fuelwood
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Capparis tomentosa	Climber	Indigenous	Data deficient	Environmental use
SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
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Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Albizia harveyi	Tree	Indigenous	Vulnerabl e	Fuelwood
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits
Our future tank site - Rumphi boma	Hill slopes - Miombo woodlands	Vernonia petersii	Herb	Indigenous	Data deficient	Environmental use
Thumbi tank site	Hill top - Miombo woodlands	Cussonia arborea	Tree	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Commiphora mossambicensis	Tree	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Aspilia mossambicensis	Herb	Indigenous	Data deficient	Environmental use
Thumbi tank site	Hill top - Miombo woodlands	Diplorhynchus condylocarpon	Tree	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi tank site	Hill top - Miombo woodlands	Dalbergia nitidula	Tree	Indigenous	Vulnerabl e	Fuelwood
Thumbi tank site	Hill top - Miombo woodlands	Julbernardia globiflora	Tree	Indigenous	Vulnerabl e	Timber
Thumbi tank site	Hill top - Miombo woodlands	Combretum zeyheri	Tree	Indigenous	Vulnerabl e	Timber
Thumbi tank site	Hill top - Miombo woodlands	Asparagus buchanannii	Shrub	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Acacia nilotica	Tree	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Lannea discolor	Tree	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Brachystegia manga	Tree	Indigenous	Vulnerabl e	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi tank site	Hill top - Miombo woodlands	Eragrostris pyramidalis	Grass	Indigenous	Data deficient	Fodder
Thumbi tank site	Hill top - Miombo woodlands	Grewia bicolor	Tree	Indigenous	Data deficient	Fruits
Thumbi tank site	Hill top - Miombo woodlands	Cymphostemma junceum	Climber	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Ximenia caffra	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi tank site	Hill top - Miombo woodlands	Buchnera sp	Herb	Indigenous	Data deficient	Environmental use
Thumbi tank site	Hill top - Miombo woodlands	Zanthoxylum challybeum	Tree	Indigenous	Vulnerabl e	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Catunaregum spinosa	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi tank site	Hill top - Miombo woodlands	Themeda triandra	Grass	Indigenous	Data deficient	Fodder
Thumbi tank site	Hill top - Miombo woodlands	Maprounea africana	Tree	Indigenous	Vulnerabl e	Fuelwood
Thumbi tank site	Hill top - Miombo woodlands	Boscia mossambicensis	Tree	Indigenous	Vulnerabl e	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Maerua junceum	Tree	Indigenous	Vulnerabl e	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Thilachium africanum	Climber	Indigenous	Data deficient	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Bridelia micrantha	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi tank site	Hill top - Miombo woodlands	Maclura africana	Tree	Indigenous	Vulnerabl e	Fuelwood

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi tank site	Hill top - Miombo woodlands	Manilkara obovata	Tree	Indigenous	Vulnerabl e	Fuelwood
Thumbi tank site	Hill top - Miombo woodlands	Dichrostachys cinerea	Tree	Indigenous	Vulnerabl e	Medicinal
Thumbi tank site	Hill top - Miombo woodlands	Pseudolachnostylis maprouneifolia	Tree	Indigenous	Data deficient	Fuelwood
Thumbi tank site	Hill top - Miombo woodlands	Maytenus heterophylla	Tree	Indigenous	Vulnerabl e	Fuelwood
Thumbi tank site	Hill top - Miombo woodlands	Zanha africana	Tree	Indigenous	Vulnerabl e	Medicinal
Phwezi housing and offices	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Phwezi housing and offices	Cultivated land	Euphorbia depauperata	Herb	Indigenous	Data deficient	Medicinal
Phwezi housing and offices	Cultivated land	Ricinus communis	Tree	Exotic	Data deficient	Medicinal

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Phwezi offices	housing	and	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Phwezi offices	housing	and	Cultivated land	Toona ciliata	Tree	Exotic	Data deficient	Timber
Phwezi offices	housing	and	Cultivated land	Argemone mexicana	Herb	Exotic	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Phwezi offices	housing	and	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Phwezi offices	housing	and	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Ageratum houstoniana	Herb	Exotic	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Phwezi offices	housing	and	Cultivated land	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Phwezi offices	housing	and	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Phwezi offices	housing	and	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Phwezi offices	housing	and	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Phwezi offices	housing	and	Cultivated land	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal
Phwezi offices	housing	and	Cultivated land	Crassocephalum rubens	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Ficus sur	Tree	Indigenous	Vulnerabl e	Fruits
Phwezi offices	housing	and	Cultivated land	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Tridax procumbens	Herb	Indigenous	Data deficient	Environmental use

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Phwezi offices	housing	and	Cultivated land	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables
Phwezi offices	housing	and	Cultivated land	Mangifera indica	Tree	Exotic	Data deficient	Fruits
Phwezi offices	housing	and	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Phwezi offices	housing	and	Cultivated land	Cynodon dactylon	Grass	Exotic	Data deficient	Fodder
Phwezi offices	housing	and	Cultivated land	Melinis ambigua	Grass	Exotic	Data deficient	Fodder
Phwezi offices	housing	and	Cultivated land	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Phwezi offices	housing	and	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Phwezi offices	housing	and	Cultivated land	Corchorus olitorius	Herb	Indigenous	Data deficient	Vegetables
Phwezi offices	housing	and	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Phwezi offices	housing	and	Cultivated land	Clerodendrum capitatum	Shrub	Indigenous	Data deficient	Environmental use

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Phwezi offices	housing	and	Cultivated land	Indigofera lyallii	Shrub	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Hypathellia dissoluta	Grass	Indigenous	Data deficient	Thatching
Phwezi offices	housing	and	Cultivated land	Sesamum indicum	Herb	Indigenous	Data deficient	Vegetables
Phwezi offices	housing	and	Cultivated land	Crotalaria goetzei	Herb	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Boscia mossambicensis	Tree	Indigenous	Vulnerabl e	Medicinal
Phwezi offices	housing	and	Cultivated land	Cleome monophylla	Herb	Indigenous	Data deficient	Vegetables
Phwezi offices	housing	and	Cultivated land	Ipomea rubens	Climber	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Phwezi offices	housing	and	Cultivated land	Ziziphus mucronata	Tree	Indigenous	Vulnerabl e	Fruits

SITE NA	ME		DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Phwezi offices	housing	and	Cultivated land	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal
Phwezi offices	housing	and	Cultivated land	Ormocarpum kirkii	Tree	Indigenous	Vulnerabl e	Fuelwood
Phwezi offices	housing	and	Cultivated land	Rourea orientalis	Tree	Indigenous	Data deficient	Fuelwood
Phwezi offices	housing	and	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Phwezi offices	housing	and	Cultivated land	Ipomea batatus	Climber	Indigenous	Data deficient	Environmental use
Phwezi offices	housing	and	Cultivated land	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Phwezi offices	housing	and	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Phwezi offices	housing	and	Cultivated land	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Mzokoto over	commuters	stop	Cultivated land	Cynodon dactylon	Grass	Exotic	Data deficient	Fodder
Mzokoto over	commuters	stop	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Brooms

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mzokoto commuters stop over	Cultivated land	Acacia polyacantha	Tree	Indigenous	Data deficient	Fuelwood
Mzokoto commuters stop over	Cultivated land	Hyperrhenia filipendula	Grass	Indigenous	Data deficient	Thatching
Mzokoto commuters stop over	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Lippia javanica	Shrub	Indigenous	Data deficient	Medicinal
Mzokoto commuters stop over	Cultivated land	Argemone mexicana	Herb	Exotic	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Mzokoto commuters stop over	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Crotalaria goetzei	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mzokoto commuters stop over	Cultivated land	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Ageratum houstoniana	Herb	Exotic	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal
Mzokoto commuters stop over	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Mzokoto commuters stop over	Cultivated land	Mangifera indica	Tree	Exotic	Data deficient	Fruits
Mzokoto commuters stop over	Cultivated land	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Mzokoto commuters stop over	Cultivated land	Euphorbia depauperata	Herb	Indigenous	Data deficient	Medicinal
Mzokoto commuters stop over	Cultivated land	Vetiveria nigritana	Grass	Exotic	Data deficient	Soil conservation
Mzokoto commuters stop over	Cultivated land	Trichilia emetica	Tree	Indigenous	Vulnerabl e	Timber
Mzokoto commuters stop over	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mzokoto commuters stop over	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Mzokoto commuters stop over	Cultivated land	Sesamum angolense	Shrub	Indigenous	Data deficient	Vegetables
Mzokoto commuters stop over	Cultivated land	Toona ciliata	Tree	Exotic	Data deficient	Timber
Mzokoto commuters stop over	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Mzokoto commuters stop over	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Mzokoto commuters stop over	Cultivated land	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Mzokoto commuters stop over	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Mzokoto commuters stop over	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Brooms

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Mzokoto commuters stop over	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Mzokoto commuters stop over	Cultivated land	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Thumbi booster	Cultivated land	Trichilia emetica	Tree	Indigenous	Vulnerabl e	Timber
Thumbi booster	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Sporobolus pyramidalis	Grass	Indigenous	Data deficient	Fodder
Thumbi booster	Cultivated land	Ocimum americana	Herb	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Thumbi booster	Cultivated land	Vitex doniana	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi booster	Cultivated land	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi booster	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Thumbi booster	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Thumbi booster	Cultivated land	Cynodon dactylon	Grass	Exotic	Data deficient	Fodder
Thumbi booster	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Senna septemtrionalis	Tree	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Triumfetta annua	Shrub	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Ageratum houstoniana	Herb	Exotic	Data deficient	Environmental use
Thumbi booster	Cultivated land	Eragrostris ciliaris	Grass	Indigenous	Data deficient	Fodder
Thumbi booster	Cultivated land	Ageratum conyzoides	Herb	Exotic	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi booster	Cultivated land	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables
Thumbi booster	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Thumbi booster	Cultivated land	Schrebera trichoclada	Tree	Indigenous	Vulnerabl e	Fuelwood
Thumbi booster	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Brooms
Thumbi booster	Cultivated land	Vernonia petersii	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Clerodendrum capitatum	Shrub	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables
Thumbi booster	Cultivated land	Senna spectabilis	Tree	Exotic	Data deficient	Poles
Thumbi booster	Cultivated land	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi booster	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Diospyros squarrosa	Tree	Indigenous	Data deficient	Fruits
Thumbi booster	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi booster	Cultivated land	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Thumbi booster	Cultivated land	Mangifera indica	Tree	Exotic	Data deficient	Fruits
Thumbi booster	Cultivated land	Brachystegia spiciformis	Tree	Indigenous	Vulnerabl e	Timber
Thumbi booster	Cultivated land	Melinis ambigua	Grass	Indigenous	Data deficient	Fodder
Thumbi booster	Cultivated land	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi booster	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi booster	Cultivated land	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi booster	Cultivated land	Stereospermum kunthianum	Tree	Indigenous	Vulnerabl e	Medicinal
Thumbi booster	Cultivated land	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Spermacoce dibrachiata	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Cleome monophylla	Herb	Indigenous	Data deficient	Vegetables
Thumbi booster	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Thumbi booster	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Combretum mossambicensis	Climber	Indigenous	Data deficient	Fuelwood
Thumbi booster	Cultivated land	Ziziphus mucronata	Tree	Indigenous	Vulnerabl e	Fruits
Thumbi booster	Cultivated land	Albizia versicolor	Tree	Indigenous	Vulnerabl e	Medicinal

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi booster	Cultivated land	Acacia polyacantha	Tree	Indigenous	Data deficient	Fuelwood
Thumbi booster	Cultivated land	Vernonia adoensis	Herb	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Hyperrhenia ruffa	Grass	Indigenous	Data deficient	Thatching
Thumbi booster	Cultivated land	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Thumbi booster	Cultivated land	Dolichos kilimandscharicus	Herb	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Bauhinia petersiana	Tree	Indigenous	Data deficient	Fuelwood
Thumbi booster	Cultivated land	Buchnera sp	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Themeda triandra	Grass	Indigenous	Data deficient	Fodder
Thumbi booster	Cultivated land	Chlorophytum stolzii	Herb	Indigenous	Data deficient	Environmental use
Thumbi booster	Cultivated land	Vangueria infausta	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Thumbi booster	Cultivated land	Terminalia sericea	Tree	Indigenous	Endangere d	Timber
Thumbi booster	Cultivated land	Lantana camara	Shrub	Exotic	Data deficient	Environmental use
Thumbi booster	Cultivated land	Steganotaenia araliaceae	Tree	Indigenous	Data deficient	Medicinal
Thumbi booster	Cultivated land	Trichilia emetica	Tree	Indigenous	Vulnerabl e	Timber
Thumbi booster	Cultivated land	Markhamia obtusifolia	Tree	Indigenous	Vulnerabl e	Fuelwood
Thumbi booster	Cultivated land	Chloris gayana	Grass	Indigenous	Data deficient	Fodder
Bwengu offices	Cultivated land	Brichiaria brizantha	Grass	Indigenous	Data deficient	Fodder
Bwengu offices	Cultivated land	Cynodon dactylon	Grass	Exotic	Data deficient	Fodder
Bwengu offices	Cultivated land	Bauhinia petersiana	Tree	Indigenous	Data deficient	Fuelwood
Bwengu offices	Cultivated land	Gmelina arborea	Tree	Exotic	Data deficient	Timber

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bwengu offices	Cultivated land	Faidherbia albida	Tree	Indigenous	Data deficient	Soil conservation
Bwengu offices	Cultivated land	Azanza garkeana	Tree	Indigenous	Vulnerabl e	Fruits
Bwengu offices	Cultivated land	Chamecrista absus	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Solanum incanum	Herb	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Chlorophytum stolzii	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Vernonia adoensis	Herb	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Flueggea virosa	Tree	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Jasminum fluminense	Climber	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Piliostigma thonningii	Tree	Indigenous	Vulnerabl e	Fruits
Bwengu offices	Cultivated land	Achyranthus aspera	Herb	Indigenous	Data deficient	Environmental use

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bwengu offices	Cultivated land	Ageratum houstoniana	Herb	Exotic	Data deficient	Environmental use
Bwengu offices	Cultivated land	Annona senegalensis	Tree	Indigenous	Data deficient	Fruits
Bwengu offices	Cultivated land	Cissampelos mucronata	Climber	Indigenous	Data deficient	Weaving
Bwengu offices	Cultivated land	Antidesma venosum	Tree	Indigenous	Vulnerabl e	Medicinal
Bwengu offices	Cultivated land	Ozoroa reticulata	Tree	Indigenous	Vulnerabl e	Medicinal
Bwengu offices	Cultivated land	Tithonia diversifolia	Shrub	Exotic	Data deficient	Medicinal
Bwengu offices	Cultivated land	Leucas martinicensis	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Cleome monophylla	Herb	Indigenous	Data deficient	Vegetables
Bwengu offices	Cultivated land	Dolichos kilimandscharicus	Herb	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Hibiscus vitifolius	Shrub	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bwengu offices	Cultivated land	Vernonia poskeana	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Crassocephalum rubens	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Sida rhomboidea	Herb	Indigenous	Data deficient	Brooms
Bwengu offices	Cultivated land	Sida acuta	Herb	Indigenous	Data deficient	Brooms
Bwengu offices	Cultivated land	Bidens pilosa	Herb	Indigenous	Data deficient	Vegetables
Bwengu offices	Cultivated land	Crotalaria goetzei	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Mangifera indica	Tree	Exotic	Data deficient	Fruits
Bwengu offices	Cultivated land	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables
Bwengu offices	Cultivated land	Citrus sinensis	Tree	Exotic	Data deficient	Fruits
Bwengu offices	Cultivated land	Sesamum angolense	Herb	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bwengu offices	Cultivated land	Ocimum canum	Herb	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Blumea crispa	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Zea mays	Grass	Exotic	Data deficient	Fodder
Bwengu offices	Cultivated land	Ocimum americana	Herb	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Parkia filicoidea	Tree	Indigenous	Vulnerabl e	Fruits
Bwengu offices	Cultivated land	Oxygonun sinuatum	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Spermacoce dibrachiata	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Trichodesma zeylanicum	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Aerva leucaria	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Strychnos madagascariensis	Tree	Indigenous	Vulnerabl e	Fruits

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bwengu offices	Cultivated land	Leucaena leucocephala	Tree	Exotic	Data deficient	Fodder
Bwengu offices	Cultivated land	Rothmania engleriana	Tree	Indigenous	Vulnerabl e	Fuelwood
Bwengu offices	Cultivated land	Amaranthus hybridus	Herb	Exotic	Data deficient	Vegetables
Bwengu offices	Cultivated land	Markhamia zanzibarica	Tree	Indigenous	Vulnerabl e	Fuelwood
Bwengu offices	Cultivated land	Clerodendrum capitatum	Shrub	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Hyperrhenia filipendula	Grass	Indigenous	Data deficient	Thatching
Bwengu offices	Cultivated land	Senna petersiana	Tree	Indigenous	Data deficient	Medicinal
Bwengu offices	Cultivated land	Chamecrista absus	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Conyza sumatrensis	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Bidens pinnartipartita	Herb	Indigenous	Data deficient	Vegetables

SITE NAME	DESCRIPTIO N	ТАХА	HABIT	STATE	IUCN STATUS	USES
Bwengu offices	Cultivated land	Tridax procumbens	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Crotalaria goetzei	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Triumfetta annua	Herb	Indigenous	Data deficient	Environmental use
Bwengu offices	Cultivated land	Hyphaene ventricosa	Palm	Indigenous	Endangere d	Weaving
Bwengu offices	Cultivated land	Corchorus olitorius	Herb	Indigenous	Data deficient	Vegetables
Bwengu offices	Cultivated land	Chloris gayana	Grass	Indigenous	Data deficient	Fodder
Bwengu offices	Cultivated land	Khaya anthotheca	Tree	Indigenous	Endangere d	Timber
Bwengu offices	Cultivated land	Philenoptera violaceae	Tree	Indigenous	Vulnerabl e	Timber
Bwengu offices	Cultivated land	Terminalia sericea	Tree	Indigenous	Endangere d	Timber
Bwengu offices	Cultivated land	Tithonia diversifolia	Shrub	Exotic	Data deficient	Medicinal

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APPENDIX IX: MAMMAL SPECIES FOR THE PROJECT AREA

a: Mammal Species for the Project Area

	Common nomo	Scientific nome	IUC N	Malawi		
			1	gazetteu		
Intake on South Rumphi river						
1	Vervet monkey	Chlorocebus pygerythrus	LC	no		
2	African clawless otter	Aonyx capensis	NT	listed		
3	Smith's red rock hare	Pronolagus rupestris	LC	no		
4	Yellow Baboon	Papio cynocephulus	LC	no		
5	Smith's bush Squirrel	Paraxerus cepapi	LC	no		
	Treatment plant					
1	Vervet Monkey	Cercopithecus pygerythrus	LC	no		
2	Yellow Baboon	Papio cynocephulus	LC	no		
3	Smith's bush squirrel	Paraxerus cepapi	LC	no		
4	Bushveld Gerbil	Tatera leucogaster	LC	no		
		Our Future Tank site				
1	Smith's red rock hare	Pronolagus rupestris	LC	no		
2	Tree Squirrel	Paraxerus cepapi	LC	no		
	Bolero office site					
1	Multimammate mouse	Mastomys natalensis	LC	no		
	Bolero booster site					
1	Silvery molerat	Heliophobius argenteocenerius	LC	no		
2	Multimammate mouse	Mastomys natalensis	LC	no		
3	Fat Mouse	Steatomys pratensis	LC	no		

	Common name	Scientific name	IUC N	Malawi gazetted		
				generet		
	Bolero Tank site					
1	Multimammate mouse	Mastomys natalensis	LC	no		
2	Smith's bush Squirrel	Paraxerus cepapi	LC	no		
3	Bushveld Gerbil	Tatera leucogaster	LC	no		
	Luviri Booster					
1	Multimammate mouse	Mastomys natalensis	LC	no		
2	Fat Mouse	Steatomys pratensis	LC	no		
3	Bushveld Gerbil	Tatera leucogaster	LC	no		
1		Luviri Tank site				
	Silvery molerat	Heliophobius argenteocenerius		no		
2	Multimammate mouse	Mastomys natalensis		no		
3	Smith's bush Squirrel	Paraxerus cepapi		no		
4	Bushveld Gerbil	Tatera leucogaster	LC	no		
		Mwazisi Booster site				
1	Smith's red rock hare	Pronolagus rupestris	LC	no		
2	Multimammate mouse	Mastomys natalensis	LC	no		
3	Fat Mouse	Steatomys pratensis	LC	no		
4	Bushveld Gerbil	Tatera leucogaster		no		
	Mwazisi Tank site					
1	Smith's red rock hare	Pronolagus rupestris	LC	no		
2	Multimammate mouse	Mastomys natalensis	LC	no		
3	Bushveld Gerbil	Tatera leucogaster	LC	no		
	Mwazisi Office site					

			IUC	Malawi			
	Common name	Scientific name	Ν	gazetted			
				-			
1	Multimammate mouse	Mastomys natalensis	LC	no			
2	Fat Mouse	Steatomys pratensis	LC	no			
3	Bushveld Gerbil	Tatera leucogaster	LC	no			
	Kacheche Booster site						
1	Vervet monkey	Chlorocebus pygerythrus	LC	no			
2	Multimammate mouse	Mastomys natalensis	LC	no			
3	Smith's red rock hare	Pronolagus rupestris	LC	no			
4	Fat Mouse	Steatomys pratensis	LC	no			
5	Bushveld Gerbil	Tatera leucogaster	LC	no			
		Kacheche Tank site					
1	Silvry molerat	Heliophobius argentecenerius	LC	no			
2	Four-toed Elephant Shrew	Petrodromus tetradactylus	LC	no			
		Bwengu Office					
1	Multimammate mouse	Mastomys natalensis	LC	no			
2	Pouched Mouse	Saccostomus capensis	LC	no			
3	Fat Mouse	Steatomys pratensis	LC	no			
4	Bushveld Gerbil	Tatera leucogaster	LC	no			
	Enukweni Office						
1	Multimammate mouse	Mastomys natalensis	LC	no			
2	Fat Mouse	Steatomys pratensis	LC	no			
3	Bushveld Gerbil	Tatera leucogaster	LC	no			
	Thumbi Booster						
1	Silvery molerat	Heliophobius argenteocenerius	LC	no			
2	Smith's red rock hare	Pronolagus rupestris	LC	no			

	Common name	Scientific name	IUC N	Malawi gazetted		
3	Multimammate mouse	Mastomys natalensis	LC	no		
4	Pouched Mouse	Saccostomus capensis	LC	no		
5	Fat Mouse	Steatomys pratensis	LC	no		
6	Bushveld Gerbil	Tatera leucogaster	LC	no		
		Thumbi Tank				
1	Multimammate mouse	Mastomys natalensis	LC	no		
2	Tree Squirrel	Paraxerus cepapi	LC	no		
3	Pouched Mouse	Saccostomus capensis	LC	no		
4	Bushveld Gerbil	Tatera leucogaster	LC	no		
1	N Silvery molerat	Izokoto Commuter stopover				
1	Silvery molerat	Mastering natalensis		110		
$\frac{2}{2}$	Fot Movee	Masiomys natalensis		110		
3	Pushvald Carbil	Tatang lawaa agatan		110		
4	Bushveld Geron			по		
	Phwezi Office site					
1	Silvery molerat	Heliophobius argenteocenerius	LC	no		
2	Multimammate mouse	Mastomys natalensis	LC	no		
3	Pouched Mouse	Saccostomus capensis	LC	no		
4	Fat Mouse	Steatomys pratensis	LC	no		
	Solid waste – Bolero					
1	Silvery molerat	Heliophobius argenteocenerius	LC	no		
2	Smith's red rock hare	Pronolagus rupestris	LC	no		
3	Multimammate mouse	Mastomys natalensis	LC	no		
4	Pouched Mouse	Saccostomus capensis		no		
5	Fat Mouse	Steatomys pratensis	LC	no		
6	Bushveld Gerbil	Tatera leucogaster	LC	no		
		Sewage site 1	L			
1	Multimammate mouse	Mastomys natalensis	LC	no		

	Common name	Scientific name	IUC N	Malawi gazetted
2	Fat Mouse	Steatomys pratensis	LC	no
3	Bushveld Gerbil	Tatera leucogaster	LC	no
		Sewage site 2		
1	Silvery molerat	Heliophobius argenteocenerius	LC	no
2	Smith's red rock hare	Pronolagus rupestris	LC	no
3	Multimammate mouse	Mastomys natalensis	LC	no
4	Fat Mouse	Steatomys pratensis	LC	no
5	Bushveld Gerbil	Tatera leucogaster	LC	no

b: Bird Species for the Project Area

	Common name	Scientific name	IUC N	Malawi gazetted			
	Intake on South Rumphi river						
1	Chinspot Batis	Batis molitor	LC	no			
2	Spotted Eagle Owl	Bubo africanus	LC	listed			
3	Hegluin's Robin	Cossypha heuglini	LC	no			
4	Southern Puffback	Dryoscopus cubla	LC	no			
5	Yellow-Rumped Bishop	Euplectes capensis	LC	no			
6	Barred Owlet	Glaucidium capense	LC	listed			
7	Pearl-spottedowlet	Glaucidium perlatum	LC	listed			
8	Red-throated Twinspot	Hypargos niveoguttatus	LC	no			
9	Little Bee Eater	Merops pusillus	LC	no			
1							
0	African pied Wagtail	Motacilla aguimp	LC	no			
	Halmatad Cuinas Fouri	Numida malagonia	IC	listed			
1	Heimeted Gumea Fowi	Numida meleagris	LC	IIsted			
2	Yelloe-fronted Tinkerbird	Pogoniulus chrysoconus	LC	no			
1							
3	Tawny-flanked Prinia	Prinia subflava	LC	no			
1 4	Black-eyed Bulbul	Pycnonotus tricolor	LC	no			
1 5	Yellow-fronted Canary	Serinus mosambicus	LC	no			
1 6	Blue Waxbill	Uraeginthus angolensis	LC	no			
	Treatment Plant						
1	Little Bee Eater	Merops pusillus	LC	no			
2	African pied Wagtail	Motacilla aguimp	LC	no			
3	Yellow-fronted Tinkerbird	Pogoniurus chrysoconus	LC	no			
4	Black-eyed Bulbul	Pycnonotus tricolor	LC	no			
5	Yellow-fronted Canary	Serinus mosambicus	LC	no			
6	Blue Waxbill	Uraeginthus angolensis	LC	no			
	Our Future (Lughala) Tank						

	Common nomo	Scientific nome	IUC N	Malawi		
1	Southern Puffback	Dryoscopus cubla		gazetted		
2	Vellow Rumped Bishon	Euplactas canansis		no		
2	Red Bishon	Euplectes cupensis		no		
- 3	Red_necked Flancolin	Euplecies on A Flankolinus levaillanti		no		
- - -	Tropical Boubou	Laniarius aethionicus		no		
6	Little Bee Ester	Marons pusillus		no		
7	Velloe fronted Tinkerbird	Pogoniulus chrysoconus		no		
8	Tawny-flanked Prinia	Prinia subflava		no		
0	Black-eved Bulbul	Pycnonotus tricolor		no		
1	Diack-cycu Duibui			110		
0	Red-winged Pytilia	Pytilia afra	LC	no		
1	Vellow-fronted Canary	Serinus mosambicus	IC	no		
1	Tenew Honed Cunary			110		
2	Bronze Manikin	Spermestes cucullata	LC	no		
1						
3	Cape Turtle Dove	Streptopelia capicola	LC	no		
	Proven booded Tebegro	Tehagna australia		20		
4	Brown-neaded Tenagra			110		
5	Blue Waxbill	Uraeginthus angolensis	LC	no		
		Bolero Offices				
1	Red-faced Cisticola	Cisticola erthrops	LC	no		
2	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
3	African pied Wagtail	Motacilla aguimp	LC	no		
4	House Sparrow	Passer domesticus	LC	no		
5	Tawny-flanked Prinia	Prinia subflava	LC	no		
6	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
7	Cape Turtle Dove	Streptopelia capicola	LC	no		
8	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Bolero Booster					
1	African Black Swift	Apus barbatus	LC	no		
2	Common Buzzard	Buteo buteo	LC	no		
3	Black Sunbird	Chalcomitra amethystina	LC	no		
4	Red-faced Cisticola	Cisticola erthrops	LC	no		
5	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
6	Red Bishop	Euplectes orix	LC	no		

	Common name	Scientific name	IUC N	Malawi gazetted
7	Barn Swallow	Hirundo rustica	LC	no
8	Blue billed firefinch	Lagonosticta rubricata	LC	no
9	Little Bee Eater	Merops pusillus	LC	no
1 0	African pied Wagtail	Motacilla aguimp	LC	no
1 1	Tawny-flanked Prinia	Prinia subflava	LC	no
$\frac{1}{2}$	Black-eyed Bulbul	Pycnonotus tricolor	LC	no
$\frac{1}{3}$	Yellow-fronted Canary	Serinus mosambicus	LC	no
1 4	Cape Turtle Dove	Streptopelia capicola	LC	no
1 5	Red-eyed Dove	Streptopelia semitorquata	LC	no
1 6	Red-faced Crombec	Sylvietta whytii	LC	no
1 7	Blue Spotted Wood Dove	Turtur afer	LC	no
1 8	Blue Waxbill	Uraeginthus angolensis	LC	no
		Bolero Tank		
1	Yellow-bellied Bulbul	Chlorocichla flaviventris	LC	no
2	Red-faced Cisticola	Cisticola erythrops	LC	no
3	Specled mousebird	Colius striatus	LC	no
4	Southern Puffback	Dryoscopus cubla	LC	no
5	Yellow-Rumped Bishop	Euplectes capensis	LC	no
6	Red Bishop	Euplectes orix	LC	no
7	Red-necked Flancolin	Francolinus afer	LC	no
8	Blue billed firefinch	Lagonosticta rubricata	LC	no
9	Tropical Boubou	Laniarius aethiopicus	LC	no
$1 \\ 0 \\ 1$	Black-collared Barbet	Lybius torquartus	LC	no
1 1	Little Bee Eater	Merops pusillus	LC	no
1 2	African pied Wagtail	Motacilla aguimp	LC	no
1 3	Black-eyed Bulbul	Pycnonotus tricolor	LC	no
1 4	Cape Turtle Dove	Streptopelia capicola	LC	no
1 5	Red-faced Crombec	Sylvietta whytii	LC	no

	Common name	Scientific name	IUC N	Malawi gazetted		
1						
6	Blue Spotted Wood Dove	Turtur afer		no		
7	Blue Waxbill	Uraeginthus angolensis	LC	no		
1 8	Pin-tailed Widow	Vidua macroura	LC			
Luviri Boooster						
1	Red-faced Cisticola	Cisticola erthrops	LC	no		
2	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
3	Red-necked Flancolin	Francolinus afer	LC	no		
4	Blue-billed Firefinch	Lagonosticta rubricata	LC	no		
5	Tawny-flanked Prinia	Prinia subflava	LC	no		
6	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
7	Yellow-fronted Canary	Serinus mosambicus	LC	no		
8	Bronze Manikin	Spermestes cucullata	LC	no		
9	Cape Turtle Dove	Streptopelia capicola	LC	no		
1						
0	Blue Spotted Wood Dove	Turtur afer	LC	no		
1 1	Blue Waxbill	Uraeginthus angolensis	LC	no		
	<u> </u>	Luviri Tank site		1		
1	Chinspot Batis	Batis molitor	LC	no		
2	Red-faced Cisticola	Cisticola erthrops	LC	no		
3	Folk-tailed Drongo	Dicrurus adsimilis	LC	no		
4	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
5	Black collared Barbet	Lybius torquatus	LC	no		
6	Eurasian Bee bEater	Merops apiaster	LC	no		
7	African Golden Oriole	Oriolus auratus	LC	no		
8	Tawny-flanked Prinia	Prinia subflava	LC	no		
9	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
1 0	Yellow-fronted Canary	Serinus mosambicus	LC	no		
1 1	Cape Turtle Dove	Streptopelia capicola	LC	no		
1 2	Red-faced Crombec	Sylvietta whytii	LC	no		
1 3	Brown-headed Tchagra	Tchagra australis	LC	no		
	Common name	Scientific name	IUC N	Malawi gazetted		
---------------	---------------------------	---------------------------	----------	--------------------	--	--
1				0		
4	Kurrichane Thrush	Turdus libonyana	LC	no		
1	Dive Weybill	Ungesinthus meeting				
3	Blue waxbili	Uraegintnus angolensis		no		
	I	Mwazisi Booster site		I		
1	Red-faced Cisticola	Cisticola erythrops	LC	no		
2	Common Quail	Coturnix coturnix	LC	no		
3	Southern Puffback	Dryoscopus cubla	LC	no		
4	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
5	Red-necked Flancolin	Flankolinus levaillanti	LC	no		
6	Blue-billed Fire Finch	Lagonosticta lubricata	LC	no		
7	Tropical Boubou	Laniarius aethiopicus	LC	no		
8	Yelloe-fronted Tinkerbird	Pogoniulus chrysoconus	LC	no		
9	Tawny-flanked Prinia	Prinia subflava	LC	no		
1 0	Yellow-fronted Canary	Serinus mosambicus	LC	no		
1 1	Bronze Manikin	Spermestes cucullata	LC	no		
$\frac{1}{2}$	Cape Turtle Dove	Streptopelia capicola	LC	no		
1 3	Red-eyed Dove	Streptopelia semitorquata	LC	no		
1 4	Brown-headed Tchagra	Tchagra australis	LC	no		
5	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Mwazisi Tank site					
1	Yellow-Rumped Bishop	Euplectes capensis		no		
2	Red-necked Flancolin	Francolinus afer		no		
3	Blue-billed Fire Finch	Lagonosticta lubricata		no		
4	Tropical Boubou	Laniarius aethiopicus		no		
5	Black-collared Barbet	Lybius torquartus		no		
6	Helmeted Guinea Fowl	Numida meleagris		listed		
7	Yellow-tronted Tinkerbird	Pogoniulus chrysoconus		no		
8	Tawny-flanked Prinia	Prinia subflava		no		
9	Black-eved Bulbul	Pvcnonotus tricolor		no		

	Common name	Scientific name	IUC N	Malawi		
1			1	gazetteu		
0	Cape Turtle Dove	Streptopelia capicola	LC	no		
1 1	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Mwazisi Office					
1	Red-faced Cisticola	Cisticola erthrops	LC	no		
2	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
3	African Masked Weaver	Ploceus velatus	LC	no		
4	Yellow-fronted Canary	Serinus mosambicus	LC	no		
5	Cape Turtle Dove	Streptopelia capicola	LC	no		
6	Blue Waxbill	Uraeginthus angolensis	LC	no		
1	Spotted Eagle Owl	Kacheche Booster	IC	listad		
1	Disals Surphind	Bubo africanus		insted		
2	Naddialas Cisticala	Chalcomitra ameinystina		110		
3	Died Crew			110		
4	Vallow Dumped Disher	Corvus albus		no		
5	Remod Owlet	<i>Euplecies capensis</i>		listed		
0	Black aved Bulbul	Buomon otug tripolor		listed		
/	Vallow fronted Capary	Serious mosambious		no		
0	Come Turtle Deve	Serinus mosumplicus		no		
9	Cape Turtie Dove			по		
0	Red-eyed Dove	Streptopelia semitorquata	LC	no		
1						
1	Red-faced Crombec	Sylvietta whytii	LC	no		
1						
2	Blue Spotted Wood Dove	Turtur afer	LC	no		
1 3	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Kacheche Tank site					
1	Fiery-necked Nightjar	Caprimulgus pectoralis	LC	no		
2	Blck-breasted Snake Eagle	Circaetus pectoralis	LC	no		
3	Red-faced Cisticola	Cisticola erthrops	LC	no		

	Common name	Scientific name	IUC N	Malawi gazetted		
4	Southern Puffback	Dryoscopus cubla	LC	no		
5	Tropical Boubou	Laniarius aethiopicus	LC	no		
6	Pennant Winged Night Jar	Macrodipteryx vexillarius	LC	no		
7	Tawny-flanked Prinia	Prinia subflava	LC	no		
8	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
9	Yellow-fronted Canary	Serinus mosambicus	LC	no		
1						
0	African Flycatcher	Terpsiphone viridis	LC	no		
1						
1	Kurrichane Thrush	Turdus libonyana	LC	no		
1 2	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Bwengu Office					
1	Black Sunbird	Chalcomitra amethystina	LC	no		
2	Red-faced Cisticola	Cisticola erthrops	LC	no		
3	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
4	Blue billed firefinch	Lagonosticta rubricata	LC	no		
5	Tropical Boubou	Laniarius aethiopicus	LC	no		
6	Black-collared Barbet	Lybius torquartus	LC	no		
7	Tawny-flanked Prinia	Prinia subflava	LC	no		
8	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
9	Yellow-fronted Canary	Serinus mosambicus	LC	no		
1						
0	Bronze Manikin	Spermestes cucullata	LC	no		
1 1	Cape Turtle Dove	Streptopelia capicola	LC	no		
1 2	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Enukweni Office					
1	Pied Crow	Corvus albus	LC	no		
2	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
3	African pied Wagtail	Motacilla aguimp	LC	no		
4	House Sparrow	Passer domesticus	LC	no		
5	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
6	Yellow-fronted Canary	Serinus mosambicus	LC	no		
7	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Thumbi Booster					

	Common name	Scientific name	IUC N	Malawi gazetted		
			I			
1	Red-faced Cisticola	Cisticola erthrops	LC	no		
2	Barn Swallow	Hirundo rustica	LC	no		
3	Blue-billed Firefinch	Lagonosticta rubricata	LC	no		
4	Eurasian Bee Eater	Merops apiaster	LC	no		
5	Tawny-flanked Prinia	Prinia subflava	LC	no		
6	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
7	Yellow-fronted Canary	Serinus mosambicus	LC	no		
8	Cape Turtle Dove	Streptopelia capicola	LC	no		
9	Blue Waxbill	Uraeginthus angolensis	LC	no		
		Thumbi Tank site				
1	Black Sunbird	Chalcomitra amethystina	LC	no		
2	Black-breasted Snake Eagle	Circaetus pectoralis	LC	no		
3	Red-faced Cisticola	Cisticola erthrops	LC	no		
4	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
5	Tropical Boubou	Laniarius aethiopicus	LC	no		
6	Helmeted Guinea Fowl	Numida meleagris	LC	no		
7	Tawny-flanked Prinia	Prinia subflava	LC	no		
8	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
9	Yellow-fronted Canary	Serinus mosambicus	LC	no		
1 0	Cape Turtle Dove	Streptopelia capicola	LC	no		
1 1	Red-capped Crombec	Sylvietta ruficapilla	LC	no		
1 2	Black-crowned Tchagra	Tchagra senegalensis	LC	no		
$\frac{1}{3}$	Blue Spotted Wood Dove	Turtur afer	LC	no		
1 4	Blue Waxbill	Uraeginthus angolensis	LC	no		
1	Mzokoto Commuter Stopover					
2	Common Waxbill	Estrilda astrild		no		
3	Yellow-Rumped Bishop	Euplectes capensis	LC	no		

Lagonosticta lubricata

4 Blue-billed Fire Finch

LC

no

	Common name	Scientific name	IUC N	Malawi gazetted		
5	Scarlet-chested Sunbird	Nectarinia senegalensis	LC	no		
6	Tawny-flanked Prinia	Prinia subflava	LC	no		
7	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
8	Yellow-fronted Canary	Serinus mosambicus	LC	no		
9	Bronze Manikin	Spermestes cucullata	LC	no		
1 0	Cape Turtle Dove	Streptopelia capicola	LC	no		
1						
1	Red-eyed Dove	Streptopelia semitorquata	LC	no		
1 2	Brown-crowned Tchagra	Tchagra senegalensis	LC	no		
1 3	Blue Waxbill	Uraeginthus angolensis	LC	no		
		Phwezi Office site				
				1		
1	Black Sunbird	Chalcomitra amethystina	LC	no		
2	Red-faced Cisticola	Cisticola erythrops	LC	no		
3	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
4	Blue-billed Fire Finch	Lagonosticta lubricata	LC	no		
5	Tropical Boubou	Laniarius aethiopicus	LC	no		
6	Black-collared Barbet	Lybius torquatus	LC	no		
7	Tawny-flanked Prinia	Prinia subflava	LC	no		
8	Black-eyed Bulbul	Pycnonotus tricolor	LC	no		
9	Yellow-fronted Canary	Serinus mosambicus	LC	no		
1 0	Bronze Manikin	Spermestes cucullata	LC	no		
1	Cape Turtle Dove	Strantonalia canicola	IC	no		
1				110		
2	Blue Spotted Wood Dove	Turtur afer	LC	no		
1 3	Blue Waxbill	Uraeginthus angolensis	LC	no		
	Solid Waste - Bolero					
1	Black Sunbird	Chalcomitra amethystina	LC	no		
2	Yellow-bellied Bulbul	Chlorocichla flaviventris	LC	no		
3	Red-faced Cisticola	Cisticola erthrops	LC	no		
4	Hegluin's Robin	Cossypha heuglini	LC	no		
5	Folk-tailed Drongo	Dicrurus adsimilis	LC	no		
6	Yellow-Rumped Bishop	Euplectes capensis	LC	no		
7	Red Bishop	Euplectes orix	LC	no		

	Common name	Scientific name	IUC N	Malawi gazetted
8	Peter's Twinspot	Hypargos niveoguttatus	LC	no
9	Blue billed firefinch	Lagonosticta rubricata	LC	no
1 0	Tropical Boubou	Laniarius aethiopicus	LC	no
1 1	Little Bee Eater	Merops pusillus	LC	no
$\frac{1}{2}$	Helmeted Guinea Fowl	Numida meleagris	LC	listed
$\frac{1}{3}$	Terrestrial Bulbul	Phyllastrephus terrestris	LC	no
1 4	Spectacled Weaver	Ploceus ocularis	LC	no
1 5	Tawny-flanked Prinia	Prinia subflava	LC	no
1 6	Black-eyed Bulbul	Pycnonotus tricolor	LC	no
1 7	Yellow-fronted Canary	Serinus mosambicus	LC	no
1 8	Cape Turtle Dove	Streptopelia capicola	LC	no
1 9	Red-capped Crombec	Sylvietta ruficapilla	LC	no
0	Blue Waxbill	Uraeginthus angolensis	LC	no
		Sewage site 1		
1	Red-faced Cisticola	Cisticola erthrops	LC	no
2	Pied Crow	Corvus albus	LC	no
3	Common Waxbill	Estrilda astrild	LC	no
4	Yellow-Rumped Bishop	Euplectes capensis	LC	no
5	Red Bishop	Euplectes orix	LC	no
6	Little Bee Eater	Merops pusillus	LC	no
7	African pied Wagtail	Motacilla aguimp	LC	no
8	House Sparrow	Passer domesticus	LC	no
9	Tawny-flanked Prinia	Prinia subflava	LC	no
1 0	Black-eyed Bulbul	Pycnonotus tricolor	LC	no
1 1	Yellow-fronted Canary	Serinus mosambicus	LC	no
1 2	Bronze Manikin	Spermestes cucullata	LC	no
1 3	Cape Turtle Dove	Streptopelia capicola	LC	no
1 4	Red-eyed Dove	Streptopelia semitorquata	LC	no

	Common name	Scientific name	IUC N	Malawi gazetted
1				8
5	Blue Spotted Wood Dove	Turtur afer	LC	no
1				
6	Blue Waxbill	Uraeginthus angolensis	LC	no
		Sewage site 2		
1	African Black Swift	Apus barbatus	LC	no
2	Black Sunbird	Chalcomitra amethystina	LC	no
3	Red-faced Cisticola	Cisticola erthrops	LC	no
4	Southern Puffback	Dryoscopus cubla	LC	no
5	Yellow-Rumped Bishop	Euplectes capensis	LC	no
6	Red Bishop	Euplectes orix	LC	no
7	Blue-billed Fire Finch	Lagonosticta lubricata	LC	no
8	Little Bee Eater	Merops pusillus	LC	no
9	Tawny-flanked Prinia	Prinia subflava	LC	no
1				
0	Black-eyed Bulbul	Pycnonotus tricolor	LC	no
1 1	Yellow-fronted Canary	Serinus mosambicus	LC	no
1 2	Cape Turtle Dove	Streptopelia capicola	LC	no
1 3	Blue Waxbill	Uraeginthus angolensis	LC	no

c: Reptile Species for the Project Area

	Common name	Scientific name	IUC N	Malawi gazetted	
				8	
Intake on South Rumphi river					
1	Peter's Ground Agama	Agama armata	LC	no	
2	Kirk's Agama	Agama kirkii	LC	no	
3	Yellow-throated plated Lizard	Gerrhosaurusy flavigularis	LC	no	
4	Stripped Skink	Trachylepis striata	LC	no	
5	Variable Skink	Trachylepis varia	LC	no	
6	Rock Monitor	Varanus albigularis albigularis	LC	no	
	Treatment plant				
1	Peters'Ground Agama	Agama armata	LC	no	
2	Stripped Skink	Trachylepis striata	LC	no	
3	Variable Skink	Trachylepis varia	LC	no	
	Courses Florence bod	Our Future tank site			
1	Common Flap-necked Chameleon	Chamaeleo dilenis-dilenis	LC	listed	
2	Variable Skink	Trachylenis varia		no	
3	Striped Grass Snake	Psammophis tritaeniatus	LC	no	
4	Rock Monitor	Varanus albigularis albigularis	LC	no	
Bolero Office site					
1	Stripped Skink	Trachylepis striata	LC	no	
2	Variable Skink	Trachylepis varia	LC	no	
	Bolero Booster site				
1	Peter's Ground Agama	Agama armata	LC	no	

	Common name	Scientific name	IUC N	Malawi gazetted		
2	Stripped Skink	Trachylepis striata	LC	no		
3	Variable Skink	Trachylepis varia	LC	no		
	Bolero Tank Site					
1	Peter's Ground Agama	Agama armata	LC	no		
2	Puff adder	Bitis arietans	LC	listed		
3	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	LC	listed		
4	Common Dwarf Gecko	Lygodactylus capensis	LC	no		
5	Rainbow Skink	Trachylepis margaritifer	LC	no		
6	Variable Skink	Trachylepis varia	LC	no		
	Luviri Booster					
1	Peteter's Ground Agama	Agama armata		no		
2	Puff adder	Bitis arietans		listed		
3	Yellow-throated plated Lizard	Gerrhosaurusy flavigularis		no		
4	Striped Grass Snake	Psammophis tritaeniatus		no		
	Common Flap-necked	Luviri Tank site				
1	Chameleon	Chamaeleo dilepis-dilepis		listed		
2	Common Dwarf Gecko	Lygodactylus capensis capensis		no		
3	Stripped Skink	Trachylepis striata		no		
4	Eastern Forest cobra	Naja subfulva		no		
5	Striped Grass Snake	Psammophis tritaeniatus		no		
6	Variable Skink	Trachylepis varia		no		
	Mwazisi Booster Site					
1	Peters'Ground Agama	Agama armata	LC	no		
2	Stripped Skink	Trachylepis striata	LC	no		
3	Variable Skink	Trachylepis varia	LC	no		
4	Eastern Forest cobra	Naja subfulva	LC	listed		
5	Striped Grass Snake	Psammophis tritaeniatus	LC	no		
		Mwazisi Tank site				

	Common name	Scientific name	IUC N	Malawi gazetted	
1	Peters'Ground Agama	Agama armata	LC	no	
	Common Flap-necked				
2	Chameleon	Chamaeleo dilepis-dilepis	LC	listed	
3	Stripped Skink	Trachylepis striata	LC	no	
4	Stripe-bellied sand snake	Psammophis subtaenjatus	LC	no	
5	Variable Skink	Trachylepis varia	LC	no	
6	Rock Monitor	Varanus albigularis albigularis	LC	no	
		Mwazisi Office site			
1	Stripped Skink	Trachylepis striata	LC	no	
2	Variable Skink	Trachylepis varia	LC	no	
	Kacheche Booster site				
1	Peters'Ground Agama	Agama armata	LC	no	
2	Puff adder	Bitis arietans	LC	Listed	
4	Striped Grass Snake	Psammophis tritaeniatus	LC	no	
5	Eastern Vine Snake	Thelornis mossambicanus	LC	no	
6	Variable Skink	Trachylepis varia	LC	no	
		Kacheche Tank site			
1	Peter's Ground Agama	Agama armata	LC	no	
2	Brown House Snake	Boaedon capensis	LC	no	
	Common Flap-necked				
3	Chameleon	Chamaeleo dilepis-dilepis	LC	listed	
4	Yellow-throated plated Lizard	Gerrhosaurus flavigularis	LC	no	
5	Variable Skink	Trachylepis varia	LC	no	
6	Rock Monitor	Varanus albigularis albigularis	LC	listed	
	Bwengu office				
1	Puff adder	Bitis arietans	LC	listed	
2	Variable Skink	Trachylepis varia	LC	LC	
	Enukweni office				

	Common name	Scientific name	IUC N	Malawi gazetted		
			·			
1	Puff adder	Bitis arietans	LC	listed		
	Common Flap-necked					
2	Chameleon	Chamaeleo dilepis-dilepis	LC	listed		
3	Variable Skink	Trachylepis varia	LC	no		
	Thumbi booster					
1	Peter's Ground Agama	Agama armata	LC	no		
2	Yellow-throated plated Lizard	Gerrhosaurusy flavigularis	LC	no		
3	Stripped Skink	Trachylepis striata	LC	no		
4	Variable Skink	Trachylepis varia	LC	no		
		Thumbi Tank site				
1	Peter's Ground Agama	Agama armata	LC	no		
2	Puff adder	Bitis arietans	LC	Listed		
	Mz	okoto Commuter Stopover		1		
1	Puff adder	Bitis arietans	LC	Listed		
2	Stripped Skink	Psammophis tritaeniatus	LC	no		
3	Striped Grass Snake	Trachylepis striata	LC	no		
4	Variable Skink	Trachylepis varia	LC	no		
		Phwezi Office site				
1	Peters'Ground Agama	Agama armata		no		
2	Puff adder	Bitis arietans		listed		
3	Striped Grass Snake	Psammophis tritaeniatus		no		
4	Variable Skink	Trachylepis varia		no		
	Solid waste dump site					
1	Peter's Ground Agama	Agama armata	LC	no		
2	Puff adder	Bitis arietans	LC	listed		
3	Yellow-throated plated Lizard	Gerrhosaurus flavigularis	LC	no		
4	Stripped Skink	Trachylepis striata	LC	no		

	Common name	Scientific name	IUC N	Malawi gazetted	
	Eastern Yellow-bellied Sand			e e e e e e e e e e e e e e e e e e e	
5	Snake	Psammophis orientalis	LC	no	
6	Variable Skink	Trachylepis varia	LC	no	
	Sewage site 1				
1	Peter's Ground Agama	Agama armata	LC	no	
2	Puff adder	Bitis arietans	LC	Listed	
3	Stripped Skink	Trachylepis striata	LC	no	
4	Variable Skink	Trachylepis varia	LC	no	
5	Nile Monitor	Varanus niloticus	LC	listed	
Sewage site 2					
1	Puff adder	Bitis arietans	LC	Listed	
2	Yellow-throated plated Lizard	Gerrhosaurus flavigularis	LC	no	
3	Stripped Skink	Trachylepis striata	LC	no	
4	Striped Grass Snake	Psammophis tritaeniatus	LC	no	

d: Amphibian Species for the Project Area

	Common nome	Scientific nome	HICN	Malawi	
			IUCN	gazetted	
		I		I	
	Inta	ke on South Rumphi river			
1	Anchieta Rigged Frog	Ptychadena anchietae	LC	no	
		Bolero Booster site			
		Dolero Dooster site			
-			L G		
1	Guttular Toad	Bufo Gutturalis	LC	no	
2	Power,s Rain Frog	Breviceps poweri	LC	по	
		Luviri Booster			
1	Guttular Toad	Bufo Gutturalis	LC	no	
		Mwazisi Tank site			
1	Guttular Toad	Bufo Gutturalis	LC	no	
		Mwazisi office site			
1	Guttular Toad	Bufo Gutturalis	LC	no	
		Kacheche Booster			
1	Guttular Toad	Bufo Gutturalis	LC	no	
		Bwengu office			
1	Guttular Toad	Bufo Gutturalis	LC	no	
	Thumbi booster				
1	Guttular Toad	Bufo Gutturalis	LC	no	
2	Power's Rain Frog	Breviceps poweri	LC	no	
	Mzokoto Commutter Stopover				
1	Guttular Toad	Bufo Gutturalis	LC	no	

	Phwezi Office site				
1	Guttular Toad	Bufo Gutturalis	LC	no	
		Solid waste dump site			
1	Guttular Toad	Bufo Gutturalis	LC	no	
2	Grey foam -nest tree frog	Chiromantis xerampelina	LC	no	
3	Power,s Rain Frog	Breviceps poweri	LC	no	
		Sewage site 1			
1	Anchieta Rigged Frog	Ptychadena anchietae	LC	no	
2	Guttular Toad	Bufo Gutturalis	LC	no	
3	Five-stripped reed Frog	Hyperolius quinquettatus	LC	no	
4	Power,s Rain Frog	Breviceps poweri	LC	no	
	Sewage site 2				
1	Guttular Toad	Bufo Gutturalis	LC	no	
2	Power,s Rain Frog	Breviceps poweri	LC	no	

e. Invertebrate Species Diversity

	Scientific name	IUCN Status	Malawi gazetted		
	Bolero Booster Site				
1	Acanthacris rufocornis	Least Concern	no		
2	Acraea pudorella detecta	Least Concern	no		
3	Acrida accuminata	Least Concern	no		
4	Anax tristis	Least Concern	no		
5	Apis mellifera	Least Concern	no		
6	Catopsilia florella	Least Concern	no		
7	Colotis erone erone	Least Concern	no		
8	Colotis ione ione	Least Concern	no		
9	Danaus chrysippus chrysippus	Least Concern	no		
1 0	Gastrimargus sp	Not yet assessed	no		
1 1	Hamanumida daedalus	Least Concern	no		
1 2	Hoplocorypha macra	Least Concern	no		
1 3	Lepidochrysops solwezii	Least Concern	no		
1 4	Meliponula sp	Not yet assessed	no		
1 5	Nomadacris septemfasciata	Least Concern	no		
1 6	Pachycondyla tarsata	Least Concern	no		
1 7	Rachitopis sp	Not yet assessed	no		
1 8	Thyreus pictus	Least Concern	no		
1 9	Truxalis sp	Not yet assessed	no		
2 0	Xylocopa caffra	Least Concern	no		
2 1	Xylocopa flavorufa	Least Concern	no		
2 2	Xylocopa inconstans	Least Concern	no		
2 3	Xylocopa scioensis	Least Concern	no		

2 4	Zizula hylax	Least Concern	no	
	Bole	ro Office Building Area	ı.	
1	Abisares viridipennis	Least Concern	no	
2	Acanthacris rufocornis	Least Concern	no	
3	Acraea natalica	Least Concern	no	
4	Acraea pudorella detecta	Least Concern	no	
5	Acrida accuminata	Least Concern	no	
6	Acrotylus sp	Not yet assessed	no	
7	Afreumenes aethiopicus	Least Concern	no	
8	Amegilla calens	Least Concern	no	
9	Apis mellifera	Least Concern	no	
1 0	Batozonellus fuliginosus	Least Concern	no	
1 1	Belonogaster dubia	Least Concern	no	
1 2	Belonogaster petiolata	Least Concern	no	
1 3	Chrysomya marginalis	Least Concern	no	
1 4	Colotis antevippe gavisa	Least Concern	no	
1 5	Colotis erone erone	Least Concern	no	
1 6	Colotis ione ione	Least Concern	no	
1 7	Cyphononyx sp	Not yet assessed	no	
1 8	Delta emarginatum	Least Concern	no	
1 9	Delta lepeleterii	Least Concern	no	
2 0	Gastrimargus sp	Not yet assessed	no	
2 1	Hamanumida daedalus	Least Concern	no	
2 2	Hemipepsis tamisieri	Least Concern	no	
2 3	Junonia hierta cebrane	Least Concern	no	

Bolero Office Building Area				
2 4	Junonia orithya madagascariensis	Least Concern	no	
2 5	Lophyra sp	Not yet assessed	no	
2 6	Megachile bombiformis	Least Concern	no	
2 7	Meliponula sp	Not yet assessed	no	
2 8	Nomadacris septemfasciata	Least Concern	no	
2 9	Pachycondyla tarsata	Least Concern	no	
3 0	Rachitopis sp	Not yet assessed	no	
3 1	Senapsis haemorrhoa	Least Concern	no	
3 2	Synagris analis	Least Concern	no	
3 3	Synagris mirabilis	Least Concern	no	
3 4	Thyreus pictus	Least Concern	no	
3 5	Truxalis sp	Not yet assessed	no	
3 6	Xylocopa caffra	Least Concern	no	
3 7	Xylocopa flavorufa	Least Concern	no	
3 8	Xylocopa inconstans	Least Concern	no	
3 9	Xylocopa scioensis	Least Concern	no	

Bolero Solid Waste Damp Site

1	Abisares viridipennis	Least Concern	no
2	Acanthacris rufocornis	Least Concern	no
3	Acraea natalica	Least Concern	no
4	Acraea pudorella detecta	Least Concern	no
5	Amegilla calens	Least Concern	no
6	Apis mellifera	Least Concern	no
7	Archispirostreptus gigas	Least Concern	no

8	Belenois aurota	Least Concern	no
9	Belenois creona severina	Least Concern	no
1 0	Belonogaster petiolata	Least Concern	no
1 1	Catopsilia florella	Least Concern	no
1 2	Charaxes varanes	Least Concern	no
1 3	Chrysomya marginalis	Least Concern	no
1 4	Colotis antevippe gavisa	Least Concern	no
1 5	Colotis erone erone	Least Concern	no
1 6	Colotis ione ione	Least Concern	no
1 7	Not yet assessed	Not yet assessed	no
1 8	Defilippia luteicosta	Least Concern	no
1 9	Deudorix antalus	Least Concern	no
2 0	Deudorix dinomenes	Least Concern	no
2 1	Hamanumida daedalus	Least Concern	no
2 2	Hoplocorypha macra	Least Concern	no
2 3	Junonia orithya madagascariensis	Least Concern	no
2 4	Megachile bombiformis	Least Concern	no
2 5	Megachile sp	Not yet assessed	no
2 6	Meliponula sp	Not yet assessed	no
2 7	Mylabris dicincta	Least Concern	no
2 8	Nomadacris septemfasciata	Least Concern	no
2 9	Pachycondyla tarsata	Least Concern	no
3 0	Papilio demodocus demodocus	Least Concern	no

3 1	Precis natalica	Least Concern	no
3 2	Precis octavia sesamus	Least Concern	no
3 3	Protogoniomorpha parhassus	Least Concern	no
3 4	Rachitopis sp	Not yet assessed	no
3 5	Synagris analis	Least Concern	no
3 6	Syntarucus babaulti	Least Concern	no
3 7	Thyreus pictus	Least Concern	no
3 8	Utetheisa pulchella	Least Concern	no
3 9	Xylocopa caffra	Least Concern	no
4 0	Xylocopa flavorufa	Least Concern	no

Enukweni Office Site

1	Acanthacris rufocornis	Least Concern	no
2	Acrida accuminata	Least Concern	no
3	Not yet assessed	Not yet assessed	no
4	Belonogaster dubia	Least Concern	no
5	Belonogaster petiolata	Least Concern	no
6	Brachytrupes membranaceus	Least Concern	no
7	Catopsilia florella	Least Concern	no
8	Colotis erone erone	Least Concern	no
9	Colotis ione ione	Least Concern	no
1 0	Delta emarginatum	Least Concern	no
1 1	Delta hottentottum	Least Concern	no
1 2	Gastrimargus sp	Not yet assessed	no
1 3	Hamanumida daedalus	Least Concern	no
1 4	Junonia hierta cebrane	Least Concern	no

1 5	Nasidius libanasidus	Least Concern	no
1 6	Nomadacris septemfasciata	Least Concern	no
1 7	Orthetrum machodoi	Least Concern	no
1 8	Orthetrum stemmale	Least Concern	no
1 9	Philanthus loeflingi	Least Concern	no
2 0	Philanthus triangulum	Least Concern	no
2 1	Synagris analis	Least Concern	no
2 2	Synagris mirabilis	Least Concern	no
2 3	Xylocopa caffra	Least Concern	no
2 4	Xylocopa flavorufa	Least Concern	no

Kacheche Booster Area

1	Acanthacris rufocornis	Least Concern	no
2	Acrida accuminata	Least Concern	no
3	Amegilla calens	Least Concern	no
4	Anthene amarah amarah	Least Concern	no
5	Apis mellifera	Least Concern	no
6	Belonogaster dubia	Least Concern	no
7	Belonogaster petiolata	Least Concern	no
8	Brachytrupes membranaceus	Least Concern	no
9	Catopsilia florella	Least Concern	no
1 0	Colotis antevippe gavisa	Not yet assessed	no
1 1	Colotis erone erone	Least Concern	no
1 2	Colotis ione ione	Least Concern	no
1 3	Colotis pallene pallene	Least Concern	no
1 4	Danaus chrysippus chrysippus	Least Concern	no

1 5	Delta emarginatum	Least Concern	no
1 6	Delta hottentottum	Least Concern	no
1 7	Delta lepeleterii	Least Concern	no
1 8	Eurema hecabe senegariensis	Least Concern	no
1 9	Gastrimargus sp	Not yet assessed	no
2 0	Hamanumida daedalus	Least Concern	no
2 1	Hoplocorypha macra	Least Concern	no
2 2	Junonia hierta cebrane	Least Concern	no
2 3	Lampides boeticus	Least Concern	no
2 4	Megachile bombiformis	Least Concern	no
2 5	Megachile chrysohoea	Least Concern	no
2 6	Meliponula sp	Not yet assessed	no
2 7	Nasidius libanasidus	Least Concern	no
2 8	Nomadacris septemfasciata	Least Concern	no
2 9	Pachycondyla tarsata	Least Concern	no
3 0	Papilio demodocus demodocus	Least Concern	no
3 1	Precis natalica	Least Concern	no
3 2	Precis octavia sesamus	Least Concern	no
3 3	Synagris analis	Least Concern	no
3 4	Synagris mirabilis	Least Concern	no
3 5	Truxalis sp	Not yet assessed	no
3 6	Xylocopa caffra	Least Concern	no
3 7	Xylocopa inconstans	Least Concern	no

3 8	Xylocopa scioensis	Least Concern	no
]	Kacheche Tank	
1	Acanthacris rufocornis	Least Concern	no
2	Acrida accuminata	Least Concern	no
3	Afreumenes aethiopicus	Least Concern	no
4	Amegilla calens	Least Concern	no
5	Apis mellifera	Least Concern	no
6	Batozonellus fuliginosus	Least Concern	no
7	Colotis pallene pallene	Least Concern	no
8	Cyphononyx sp	Not yet assessed	no
9	Delta lepeleterii	Least Concern	no
1 0	Gastrimargus sp	Not yet assessed	no
1 1	Graphium angolanus angolanus	Least Concern	no
1 2	Hamanumida daedalus	Least Concern	no
1 3	Hoplocorypha macra	Least Concern	no
1 4	Junonia hierta cebrane	Least Concern	no
1 5	Junonia orithya madagascariensis	Least Concern	no
1 6	Meliponula sp	Not yet assessed	no
1 7	Nomadacris septemfasciata	Least Concern	no
1 8	Pachycondyla tarsata	Least Concern	no
1 9	Papilio demodocus demodocus	Least Concern	no
2 0	Probergrothus latus	Least Concern	no
2 1	Rachitopis sp	Not yet assessed	no
2 2	Synagris analis	Least Concern	no
2 3	Synagris mirabilis	Least Concern	no

2 4	Thyreus pictus	Least Concern	no
2 5	Truxalis sp	Not yet assessed	no
2 6	Xylocopa inconstans	Least Concern	no
2 7	Xylocopa scioensis	Least Concern	no
	Lu	viri Booster Area	
1	Acanthacris rufocornis	Least Concern	no
2	Acraea natalica	Least Concern	no
3	Acraea pudorella detecta	Least Concern	no
4	Acraea serena	Least Concern	no
5	Acrida accuminata	Least Concern	no
6	Amegilla calens	Least Concern	no
7	Belonogaster dubia	Least Concern	no
8	Belonogaster petiolata	Least Concern	no
9	Catopsilia florella	Least Concern	no
1 0	Colotis antevippe gavisa	Least Concern	no
1 1	Colotis erone erone	Least Concern	no
1 2	Colotis ione ione	Least Concern	no
1 3	Colotis pallene pallene	Least Concern	no
1 4	Colotis sp	Not yet assessed	no
1 5	Danaus chrysippus chrysippus	Least Concern	no
1 6	Delta emarginatum	Least Concern	no
1 7	Delta hottentottum	Least Concern	no
1 8	Gastrimargus sp	Not yet assessed	no
1 9	Hamanumida daedalus	Least Concern	no
2 0	Junonia hierta cebrane	Least Concern	no

$\begin{array}{c} 2\\ 1\end{array}$	Lampides boeticus	Least Concern	no
2 2	Meliponula sp	Not yet assessed	no
2 3	Nomadacris septemfasciata	Least Concern	no
2 4	Pachycondyla tarsata	Least Concern	no
2 5	Synagris analis	Least Concern	no
2 6	Utetheisa pulchella	Least Concern	no
2 7	Xylocopa caffra	Least Concern	no
2 8	Xylocopa flavorufa	Least Concern	no
2 9	Xylocopa inconstans	Least Concern	no
3 0	Xylocopa scioensis	Least Concern	no
		Luviri Tank	
1	Acanthacris rufocornis	Least Concern	no
1 2	Acanthacris rufocornis Acrida accuminata	Least Concern Least Concern	no no
1 2 3	Acanthacris rufocornis Acrida accuminata Apis mellifera	Least Concern Least Concern Least Concern	no no no
1 2 3 4	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus	Least ConcernLeast ConcernLeast ConcernLeast Concern	no no no no
1 2 3 4 5	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota	Least ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast Concern	no no no no no no no
1 2 3 4 5 6	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota Belenois creona severina	Least ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast Concern	no no no no no no no no no
1 2 3 4 5 6 7	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota Belenois creona severina Belonogaster dubia	Least ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast Concern	no
1 2 3 4 5 6 7 8	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota Belenois creona severina Belonogaster dubia Byblia orithya	Least ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast ConcernLeast Concern	no
$ \begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 9 \end{array} $	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota Belenois creona severina Belonogaster dubia Byblia orithya Catopsilia florella	Least ConcernLeast Concern	no
$ \begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 1 \\ 0 \\ \end{array} $	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota Belenois creona severina Belonogaster dubia Byblia orithya Catopsilia florella Charaxes jahlusa	Least ConcernLeast Concern	no
$ \begin{array}{c} 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ 7\\ 8\\ 9\\ 1\\ 0\\ 1\\ 1 \end{array} $	Acanthacris rufocornis Acrida accuminata Apis mellifera Batozonellus fuliginosus Belenois aurota Belenois creona severina Belonogaster dubia Byblia orithya Catopsilia florella Charaxes jahlusa Charaxes jasius saturnus	Least ConcernLeast Concern	no no
$ \begin{array}{c} 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ 7\\ 8\\ 9\\ 1\\ 0\\ 1\\ 1\\ 1\\ 2 \end{array} $	Acanthacris rufocornisAcrida accuminataApis melliferaBatozonellus fuliginosusBelenois aurotaBelenois creona severinaBelonogaster dubiaByblia orithyaCatopsilia florellaCharaxes jahlusaCharaxes varanes	Least ConcernLeast Concern	no no
$ \begin{array}{c} 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ 7\\ 8\\ 9\\ 1\\ 0\\ 1\\ 1\\ 1\\ 2\\ 1\\ 3\\ \end{array} $	Acanthacris rufocornisAcrida accuminataApis melliferaBatozonellus fuliginosusBelenois aurotaBelenois creona severinaBelonogaster dubiaByblia orithyaCatopsilia florellaCharaxes jahlusaCharaxes varanesDelta emarginatum	Least ConcernLeast Concern	no no

1 5	Eurema hecabe senegariensis	Least Concern	no	
1	Gastrimargus sp	Not yet assessed	no	
1 7	Lepidochrysops solwezii	Least Concern	no	
1 8	Megachile sp	Not yet assessed	no	
1 9	Mylabris dicincta	Least Concern	no	
2 0	Nomadacris septemfasciata	Least Concern	no	
2 1	Pachycondyla tarsata	Least Concern	no	
$\begin{array}{c} 2\\ 2\end{array}$	Polistes fastidiotus	Least Concern	no	
2 3	Rachitopis sp	Not yet assessed	no	
2 4	Synagris analis	Least Concern	no	
2 5	Syntarucus babaulti	Least Concern	no	
2 6	Truxalis sp	Not yet assessed	no	
2 7	Xylocopa caffra	Least Concern	no	
2 8	Xylocopa inconstans	Least Concern	no	
Mwazisi Booster				
1	A cantha cuia m fo comia	Least Concern	no	
	Acumuacris rujocornis	Least Concern	no	
2	Amagilla calens	Least Concern	no	
5	Amegina calens	Least Concorn	no	
4	Belanois creana severina	Least Concern	no	
) 2	Belenois aidica	Least Concern	no	
0	Catonsilia florella	Least Concern	no	
/ Q	Colotis antevinne aquisa	Least Concern	no	
9	Colotis erone erone	Least Concern	no	

Least Concern

1

0

Colotis ione ione

no

1	Colotis pallene pallene	Least Concern	no
1 2	Colotis sp	Not yet assessed	no
1 3	Deudorix vansoni	Least Concern	no
1 4	Eurema hecabe senegariensis	Least Concern	no
1 5	Gastrimargus sp	Not yet assessed	no
1 6	Junonia hierta cebrane	Least Concern	no
1 7	Nomadacris septemfasciata	Least Concern	no
1 8	Precis natalica	Least Concern	no
1 9	Precis octavia sesamus	Least Concern	no
2 0	Rachitopis sp	Not yet assessed	no
2 1	Senapsis haemorrhoa	Least Concern	no
2 2	Not yet assessed	Not yet assessed	no
2 3	Utetheisa pulchella	Least Concern	no
M	wazisi Offices Area		
1	Acanthacris rufocornis	Least Concern	no
2	Acrida accuminata	Least Concern	no
3	Anoplocnemis curvipes	Least Concern	no
4	Apis mellifera	Least Concern	no
5	Batozonellus fuliginosus	Least Concern	no
6	Belenois aurota	Least Concern	no
7	Belenois creona severina	Least Concern	no
8	Belenois gidica	Least Concern	no
9	Belonogaster dubia	Least Concern	no
1 0	Belonogaster petiolata	Least Concern	no
1 1	Charaxes brutus natalensis	Least Concern	no
1 2	Charaxes jasius saturnus	Least Concern	no

1 3	Charaxes varanes	Least Concern	no
1 4	Delta emarginatum	Least Concern	no
1 5	Delta hottentottum	Least Concern	no
1 6	Delta lepeleterii	Least Concern	no
1 7	Eurema brigitta brigitta	Least Concern	no
1 8	Eurema hecabe senegariensis	Least Concern	no
1 9	Gastrimargus sp	Not yet assessed	no
2 0	Megachile sp	Not yet assessed	no
2 1	Nomadacris septemfasciata	Least Concern	no
2 2	Pachycondyla tarsata	Least Concern	no
2 3	Papilio demodocus demodocus	Least Concern	no
2 4	Rachitopis sp	Not yet assessed	no
2 5	Synagris analis	Least Concern	no
2 6	Syntarucus babaulti	Least Concern	no
2 7	Truxalis sp	Not yet assessed	no
2 8	Utetheisa pulchella	Least Concern	no
2 9	Xylocopa inconstans	Least Concern	no

Mwazisi Tank Site

1	Acanthacris rufocornis	Least Concern	no
2	Achatina fulica	Least Concern	no
3	Acrida accuminata	Least Concern	no
4	Acrotylus sp	Not yet assessed	no
5	Belonogaster dubia	Least Concern	no
6	Belonogaster petiolata	Least Concern	no
7	Brachytrupes membranaceus	Least Concern	no

8	Catopsilia florella	Least Concern	no
9	Charaxes brutus natalensis	Least Concern	no
1 0	Charaxes varanes	Least Concern	no
1 1	Colotis erone erone	Least Concern	no
1 2	Colotis ione ione	Least Concern	no
1 3	Crytoflata unipunctata	Least Concern	no
1 4	Delta emarginatum	Least Concern	no
1 5	Delta hottentottum	Least Concern	no
1 6	Deudorix antalus	Least Concern	no
1 7	Deudorix vansoni	Least Concern	no
1 8	Gastrimargus sp	Not yet assessed	no
1 9	Hamanumida daedalus	Least Concern	no
2 0	Hoplocorypha macra	Least Concern	no
2 1	Junonia hierta cebrane	Least Concern	no
2 2	Lampides boeticus	Least Concern	no
2 3	Mocis mutaria	Least Concern	no
2 4	Nasidius libanasidus	Least Concern	no
2 5	Neptis laeta	Least Concern	no
2 6	Nomadacris septemfasciata	Least Concern	no
2 7	Orthetrum machodoi	Least Concern	no
2 8	Orthetrum stemmale	Least Concern	no
2 9	Pachycondyla tarsata	Least Concern	no
3 0	Synagris analis	Least Concern	no

3 1	Synagris mirabilis	Least Concern	no
32	Xylocopa caffra	Least Concern	no
3	Xylocopa flavorufa	Least Concern	no
	Oui	r Future Tank Site	
1	Acanthacris rufocornis	Least Concern	no
2	Acraea natalica	Least Concern	no
3	Acraea pudorella detecta	Least Concern	no
4	Acraea serena	Least Concern	no
5	Acrida accuminata	Least Concern	no
6	Apis mellifera	Least Concern	no
7	Batozonellus fuliginosus	Least Concern	no
8	Belenois gidica	Least Concern	no
9	Belonogaster dubia	Least Concern	no
1 0	Belonogaster petiolata	Least Concern	no
1 1	Catopsilia florella	Least Concern	no
1 2	Charaxes varanes	Least Concern	no
1 3	Colotis antevippe gavisa	Least Concern	no
1 4	Colotis erone erone	Least Concern	no
1 5	Colotis ione ione	Least Concern	no
1 6	Colotis pallene pallene	Least Concern	no
1 7	Danaus chrysippus chrysippus	Least Concern	no
1 8	Eurema hecabe senegariensis	Least Concern	no
1 9	Gastrimargus sp	Not yet assessed	no
2 0	Hamanumida daedalus	Least Concern	no
2 1	Lepidochrysops sp	Not yet assessed	no

2 2	Megachile bombiformis	Least Concern	no
2 3	Megachile sp	Not yet assessed	no
2 4	Mylabris sp	Not yet assessed	no
2 5	Nomadacris septemfasciata	Least Concern	no
2 6	Pachycondyla tarsata	Least Concern	no
2 7	Precis natalica	Least Concern	no
2 8	Precis octavia sesamus	Least Concern	no
2 9	Rachitopis sp	Not yet assessed	no
3 0	Synagris analis	Least Concern	no
3 1	Synagris mirabilis	Least Concern	no
3 2	Truxalis sp	Not yet assessed	no
3 3	Xylocopa caffra	Least Concern	no
3 4	Xylocopa flavorufa	Least Concern	no
3 5	Xylocopa inconstans	Least Concern	no
3 6	Xylocopa scioensis	Least Concern	no
3 7	Zizula hylax	Least Concern	no

Phwezi Staff Houses and Offices

1	Acanthacris rufocornis	Least Concern	no
2	Acrida accuminata	Least Concern	no
3	Amegilla calens	Least Concern	no
4	Ammophila ferrugineipes	Least Concern	no
5	Castalius calice calice	Least Concern	no
6	Catopsilia florella	Least Concern	no
7	Charaxes brutus natalensis	Least Concern	no
8	Charaxes varanes	Least Concern	no

9	Colotis pallene pallene	Least Concern	no
1 0	Danaus chrysippus chrysippus	Least Concern	no
1 1	Delta lepeleterii	Least Concern	no
1 2	Eurema hecabe senegariensis	Least Concern	no
1 3	Gastrimargus sp	Not yet assessed	no
1 4	Hamanumida daedalus	Least Concern	no
1 5	Hoplocorypha macra	Least Concern	no
1 6	Iolaus pallene	Least Concern	no
1 7	Junonia hierta cebrane	Least Concern	no
1 8	Lepidochrysops solwezii	Least Concern	no
1 9	Megachile chrysohoea	Least Concern	no
2	Meliponula sp	Not yet assessed	no
2	Nomadacris septemfasciata	Least Concern	no
$\begin{array}{c} 2\\ 2\end{array}$	Papilio demodocus demodocus	Least Concern	no
23	Phaneropter sp	Not yet assessed	no
2 4	Rachitopis sp	Not yet assessed	no
2	Synagris mirabilis	Least Concern	no
2	Truxalis sp	Not yet assessed	no
2 7	Xylocopa inconstans	Least Concern	no
28	Xylocopa scioensis	Least Concern	no
Rumphi River Intake			
1	Acanthacris rufocornis	Least Concern	no
2	Acrida accuminata	Least Concern	no

3	Afreumenes aethiopicus	Least Concern	no
4	Apis mellifera	Least Concern	no
5	Belonogaster dubia	Least Concern	no
6	Belonogaster petiolata	Least Concern	no
7	Castalius calice calice	Least Concern	no
8	Catopsilia florella	Least Concern	no
9	Charaxes varanes	Least Concern	no
1 0	Coeliades forestan	Least Concern	no
1 1	Colotis erone erone	Least Concern	no
1 2	Colotis ione ione	Least Concern	no
1 3	Colotis sp	Not yet assessed	no
1 4	Delta hottentottum	Least Concern	no
1 5	Deutorix antalus	Least Concern	no
1 6	Dineutes aereus	Least Concern	no
1 7	Eurema brigitta brigitta	Least Concern	no
1 8	Eurema hecabe senegariensis	Least Concern	no
1 9	Gastrimargus sp	Not yet assessed	no
2 0	Hamanumida daedalus	Least Concern	no
2 1	Lampides boeticus	Least Concern	no
2 2	Meliponula sp	Not yet assessed	no
2 3	Nomadacris septemfasciata	Least Concern	no
2 4	Orthetrum machodoi	Least Concern	no
2 5	Phaon iridipennis	Least Concern	no
2 6	Polistes fastidiotus	Least Concern	no
2 7	Polistes sp	Not yet assessed	no
2 8	Polyrhachis gagates	Least Concern	no

2 9	Precis antilope	Least Concern	no	
3 0	Precis natalica	Least Concern	no	
3 1	Precis octavia sesamus	Least Concern	no	
3 2	Protogoniomorpha parhassus	Least Concern	no	
3 3	Syntarucus babaulti	Least Concern	no	
3 4	Xylocopa caffra	Least Concern	no	
3 5	Xylocopa inconstans	Least Concern	no	
3 6	Xylocopa scioensis	Least Concern	no	
3 7	Zizula hylax	Least Concern	no	
Rumphi Sewage Site 1				
1	Acraea pudorella detecta	Least Concern	no	

1	Acraea pudorella detecta	Least Concern	no
2	Aethiopicodynerus sp	Least Concern	no
3	Apis mellifera	Least Concern	no
4	Belenois aurota	Least Concern	no
5	Cyphononyx sp	Not yet assessed	no
6	Danaus chrysippus chrysippus	Least Concern	no
7	Euligyra sp	Not yet assessed	no
8	Hemipepsis tamisieri	Least Concern	no
9	Hoplocorypha macra	Least Concern	no
1 0	Orthetrum chrysostigma	Least Concern	no
1 1	Pseudagrion sudanicum	Least Concern	no
1 2	Tricarinodynerus guerinii	Least Concern	no
1 3	Trithemis arteriosa	Least Concern	no
1 4	Trithemis kirbyi	Least Concern	no
1 5	Zizula hylax	Least Concern	no
			L

1	Acanthacris rufocornis	Least Concern	no
2	Acraea pudorella detecta	Least Concern	no
3	Acrida accuminata	Least Concern	no
4	Aethiopicodynerus sp	Least Concern	no
5	Amegilla calens	Least Concern	no
6	Anax imperator	Least Concern	no
7	Anax sp	Not yet assessed	no
8	Anax speratus	Least Concern	no
9	Apis mellifera	Least Concern	no
1 0	Bembecinus sp	Not yet assessed	no
1 1	Chlorocypha calligata	Least Concern	no
1 2	Chrysomya marginalis	Least Concern	no
1 3	Chrysomya sp	Not yet assessed	no
1 4	Crocothemis erythraea	Least Concern	no
1 5	Crocothemis sanguinolenta	Least Concern	no
1 6	Crocothemis sp	Not yet assessed	no
1 7	Cybister tripunctatus	Least Concern	no
1 8	Danaus chrysippus chrysippus	Least Concern	no
1 9	Eurema hecabe senegariensis	Least Concern	no
2 0	Gastrimargus sp	Not yet assessed	no
2 1	Hamanumida daedalus	Least Concern	no
2 2	Junonia orithya madagascariensis	Least Concern	no
2 3	Limnogeton fiebberi	Least Concern	no
2 4	Mylabris dicincta	Least Concern	no
2 5	Nomadacris septemfasciata	Least Concern	no

2 6	Orthetrum julia	Least Concern	no	
2 7	Orthetrum sp	Not yet assessed	no	
2 8	Orthetrum stemmale	Least Concern	no	
29	Pachycondyla tarsata	Least Concern	no	
3	Polistes sp	Not yet assessed	no	
3	Pompilus irpex	Least Concern	no	
3 2	Potamonautes sp	Not yet assessed	no	
3 3	Precis natalica	Least Concern	no	
3 4	Precis octavia sesamus	Least Concern	no	
3 5	Pseudagrion acaciae	Least Concern	no	
3 6	Pseudagrion sudanicum	Least Concern	no	
3 7	Rachitopis sp	Not yet assessed	no	
3	Rhagovelia sp	Not yet assessed	no	
3 9	Sarcophaga sp	Not yet assessed	no	
4	Trithemis arteriosa	Least Concern	no	
4	Trithemis kirbyi	Least Concern	no	
42	Truxalis sp	Not yet assessed	no	
43	Xylocopa caffra	Least Concern	no	
4	Xylocopa flavorufa	Least Concern	no	
4 5	Xylocopa inconstans	Least Concern	no	
4	Xylocopa scioensis	Least Concern	no	
	Water Treatment Site			
1	Acanthacris rufocornis	Least Concern	no	

2	Acrida accuminata	Least Concern	no
3	Anthene definita	Least Concern	no
4	Apis mellifera	Least Concern	no
5	Catopsilia florella	Least Concern	no
6	Charaxes varanes	Least Concern	no
7	Colotis antevippe gavisa	Least Concern	no
8	Colotis erone erone	Least Concern	no
9	Colotis ione ione	Least Concern	no
1 0	Danaus chrysippus chrysippus	Least Concern	no
1 1	Deutorix antalus	Least Concern	no
1 2	Eurema hecabe senegariensis	Least Concern	no
1 3	Gastrimargus sp	Not yet assessed	no
1 4	Hamanumida daedalus	Least Concern	no
1 5	Lepidochrysops sp	Not yet assessed	no
1 6	Nomadacris septemfasciata	Least Concern	no
1 7	Pachycondyla tarsata	Least Concern	no
1 8	Precis natalica	Least Concern	no
1 9	Precis octavia sesamus	Least Concern	no
2 0	Rachitopis sp	Not yet assessed	no
2 1	Truxalis sp	Not yet assessed	no
2 2	Xylocopa caffra	Least Concern	no
2 3	Xylocopa inconstans	Least Concern	no
2 4	Xylocopa scioensis	Least Concern	no
2 5	Zizula hylax	Least Concern	no
Thumbi Booster Site			
1	Abisares viridipennis	Least Concern	no
2	Acanthacris rufocornis	Least Concern	no
--------	---------------------------	------------------	----
3	Acraea goetzei	Least Concern	no
4	Acraea natalica	Least Concern	no
5	Acraea oncaea	Least Concern	no
6	Acraea serena	Least Concern	no
7	Acrida accuminata	Least Concern	no
8	Ammophila ferrugineipes	Least Concern	no
9	Apis mellifera	Least Concern	no
1 0	Belonogaster dubia	Least Concern	no
1 1	Belonogaster petiolata	Least Concern	no
1 2	Brachytrupes membranaceus	Least Concern	no
1 3	Charaxes varanes	Least Concern	no
1 4	Chrysomya marginalis	Least Concern	no
1 5	Delta emarginatum	Least Concern	no
1 6	Deudorix antalus	Least Concern	no
1 7	Gastrimargus sp	Not yet assessed	no
1 8	Hamanumida daedalus	Least Concern	no
1 9	Junonia hierta cebrane	Least Concern	no
2 0	Megachile chrysohoea	Least Concern	no
2 1	Meliponula sp	Not yet assessed	no
2 2	Nasidius libanasidus	Least Concern	no
2 3	Nomadacris septemfasciata	Least Concern	no
2 4	Palpopleura lucia	Least Concern	no
2 5	Philanthus loeflingi	Least Concern	no
2 6	Philanthus triangulum	Least Concern	no
2 7	Polistes fastidiotus	Least Concern	no

2 8	Pseudocreobotra wahlbergi	Least Concern	no
2 9	Rachitopis sp	Not yet assessed	no
3 0	Senapsis haemorrhoa	Least Concern	no
3 1	Synagris analis	Least Concern	no
3 2	Synagris mirabilis	Least Concern	no
3 3	Thyreus pictus	Least Concern	no
3 4	Truxalis sp	Not yet assessed	no
3 5	Xylocopa caffra	Least Concern	no
3 6	Xylocopa flavorufa	Least Concern	no
3 7	Xylocopa inconstans	Least Concern	no
3 8	Xylocopa nigrita	Least Concern	no
3 9	Xylocopa scioensis	Least Concern	no

Thumbi Tank Site

1	Abisares viridipennis	Least Concern	no
2	Acraea natalica	Least Concern	no
3	Acraea oncaea	Least Concern	no
4	Acraea pudorella detecta	Least Concern	no
5	Acraea serena	Least Concern	no
6	Acrida accuminata	Least Concern	no
7	Acrotylus sp	Not yet assessed	no
8	Afreumenes aethiopicus	Least Concern	no
9	Batrachotetrix stolli	Least Concern	no
1 0	Chrysomya marginalis	Least Concern	no
1 1	Colotis antevippe gavisa	Least Concern	no
1 2	Colotis erone erone	Least Concern	no

1 3	Colotis ione ione	Least Concern	no
1 4	Delta emarginatum	Least Concern	no
1 5	Delta lepeleterii	Least Concern	no
1 6	Deudorix antalus	Least Concern	no
1 7	Gastrimargus sp	Not yet assessed	no
1 8	Hamanumida daedalus	Least Concern	no
1 9	Junonia hierta cebrane	Least Concern	no
2 0	Junonia orithya madagascariensis	Least Concern	no
2	Megachile bombiformis	Least Concern	no
$\begin{array}{c} 2\\ 2\end{array}$	Menemerus sp	Not yet assessed	no
23	Nomadacris septemfasciata	Least Concern	no
2 4	Pachycondyla tarsata	Least Concern	no
2 5	Pseudocreobotra wahlbergi	Least Concern	no
2	Rachitopis sp	Not yet assessed	no
2 7	Senapsis haemorrhoa	Least Concern	no
2 8	Synagris analis	Least Concern	no
2 9	Synagris mirabilis	Least Concern	no
3	Truxalis sp	Not yet assessed	no
3	Xylocopa inconstans	Least Concern	no
3	Xylocopa scioensis	Least Concern	no
]	Bolero Tank Site	·
1	Acraea natalica	Least Concern	no
2	Acraea pudorella detecta	Least Concern	no

3	Acrida accuminata	Least Concern	no
4	Amegilla calens	Least Concern	no
5	Ammophila ferrugineipes	Least Concern	no
6	Anax imperator	Least Concern	no
7	Apis mellifera	Least Concern	no
8	Catopsilia florella	Least Concern	no
9	Chlorocypha calligata	Least Concern	no
1			no
0	Colotis antevippe gavisa	Least Concern	
1			no
	Colotis erone erone	Least Concern	
$\frac{1}{2}$	Colotis ione ione	Least Concern	по
1			no
3	Cynthia cardui	Least Concern	110
1			no
4	Danaus chrysippus chrysippus	Least Concern	
1			no
5	Delta emarginatum	Least Concern	
1		Lesst Company	no
0	Deudorix antalus	Least Concern	
7	Eurema brigitta brigitta	Least Concern	110
1	2		no
8	Gastrimargus sp	Not yet assessed	
1	Graphium angolanus		no
9	angolanus	Least Concern	
2		L C	no
$\frac{0}{2}$	Graphium leonidas	Least Concern	
2	Melinonula sn	Least Concern	по
2			no
$\frac{2}{2}$	Nomadacris septemfasciata	Least Concern	110
2			no
3	Orthetrum julia	Least Concern	
2			no
4	Papilio demodocus demodocus	Least Concern	
2		Least Car	no
2	Precis natalica	Least Concern	n c
2 6	Rachitonis sp	Not yet assessed	по
2			no
7	Synagris analis	Least Concern	
2			no
8	Trithemis arteriosa	Least Concern	

2			no
9	Trithemis furva	Least Concern	
3			no
0	Truxalis sp	Not yet assessed	
3			no
	Utetheisa pulchella	Least Concern	
3 2	Yvlocopa caffra	Least Concern	no
3			no
3	Xvlocopa flavorufa	Least Concern	
3			no
4	Xylocopa inconstans	Least Concern	
3			no
5	Xylocopa scioensis	Least Concern	
	D	Off C'4-	
	BV	wengu Office Site	
1	Abisares viridipennis	Least Concern	no
2	Acanthacris rufocornis	Least Concern	no
3	Acrida accuminata	Least Concern	no
4	Amegilla calens	Least Concern	no
5	Cynthia cardui	Least Concern	no
6	Defilippia luteicosta	Least Concern	no
7	Gastrimargus sp	Not yet assessed	no
8	Hamanumida daedalus	Least Concern	no
9	Lepidochrysops solwezii	Least Concern	no
1			no
0	Megachile bombiformis	Least Concern	
1			no
1	Megachile chrysohoea	Not yet assessed	
$\frac{1}{2}$	Mylahris amplectens	Least Concern	по
1			no
3	Nomadacris septemfasciata	Least Concern	
1			no
4	Pachycondyla tarsata	Least Concern	
1			no
5	Papilio demodocus demodocus	Least Concern	
	Bachitonia	Not wat associated	no
0	Kachitopis sp	not yet assessed	n
7	Thyreus pictus	Least Concern	110

1			no
8	Truxalis sp	Not yet assessed	
1			no
9	Utetheisa pulchella	Least Concern	
$\begin{vmatrix} 2 \\ 0 \end{vmatrix}$	X 1 CC	L C	no
$\frac{0}{2}$	Xylocopa caffra	Least Concern	
2 1	Xylocopa flavorufa	Least Concern	по
	Commu	ter Stop Over - Mzok	oto
1		I. C	
1	Abisares viridipennis	Least Concern	
2	Acraea natalica	Least Concern	no
3	Acraea pudorella detecta	Least Concern	no
4	Acraea serena	Least Concern	no
5	Ammophila ferrugineipes	Least Concern	no
6	Archibracon servillei	Least Concern	no
7	Belenois aurota	Least Concern	no
8	Belenois creona severina	Least Concern	no
9	Bembecinus laterimacula	Least Concern	no
1			no
0	Catopsilia florella	Least Concern	
1	~		no
1	Colotis antevippe gavisa	Least Concern	
	Colotia anona anona	Loost Concom	no
<u> </u>	Cololis erone erone	Least Concern	n 0
3	Colotis ione ione	Least Concern	no
1			no
4	Delta emarginatum	Least Concern	
1	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		no
5	Hamanumida daedalus	Least Concern	
1			no
6	Pachycondyla tarsata	Least Concern	
	Dhilanthus trian and un	Loost Concern	no
/	r nuaninus irianguium	Least Concern	no
1 8	Synagris analis	Least Concern	110
1	Syriagris andres		no
9	Utetheisa pulchella	Least Concern	

APPENDIX X: GRIEVANCE REDRESS MECHANISM (GRM) FOR RUMPHI WATER SUPPLY AND SANITATION SERVICES IMPROVEMENT PROJECT

Introduction

The grievance Redress Mechanism is a tool for receiving, processing, and redressing issues and complaints from either internal sources, for example, workers of the project, or external sources such a project Affected Person Persons (PAP), the communities and public, and stakeholders on different issues affecting them that may affect the project implementation. GRM provides open and systematic means of hearing, investigating, analysing, and resolving different matters.

Objective of GRM

The objective of the project's Grievance Redress Mechanisms (GRM) in this project are as follows;

- i. To provide project-affected persons (PAPs) or Concerned Person (CP) with accessible and inclusive platform to raise and submit issues and grievances.
- ii. To allow NRWB through the project team to clarify, respond and resolve issues receive.
- iii. To help project proponents ensure that project implementation timelines and overall schedule are not compromised due to delays in resolving grievance; and
- iv. To help cut down on lengthy and expensive litigation that PAPs might have to indulge in otherwise.

The Community Mobilization and Engagement mechanism of the project shall be required to disclose and explain to affected persons and communities and, to interested other stakeholders the procedure for complaints filing as early as possible and on a regular basis throughout the project cycle. The grievance mechanism shall be provided free of charge and shall be easily accessible, with special attention paid to accessibility for disadvantaged and vulnerable individuals or groups such as women and people leaving with disabilities.

The Rumphi Water Supply and Sanitation Project shall ensure that GRM works within existing legal and cultural frameworks and that it will follow community level, project District level and NRWB level structure redress channels, and communities will be thoroughly sensitized on these channels to follow.

The key features of the GRM shall be to:

- Record, categorize and prioritize the grievances.
- Settle the grievances through consultation with all stakeholders as well as provide solution feedback to such stakeholders.
- Forward any unresolved cases to the relevant authority.

Likely Grievances

Practically, it is envisaged that PAPs may complain or raise a grievance for a variety of reasons in the course of implementing the project i.e., planning and construction stages. The grievances might include but not limited to:

- Identification of affected land and associated assets within the Project area.
- Ownership/responsibility for the land and associated assets.
- Valuation of land or associated assets.
- Quality of replacement assets.
- The timing or manner of compensation payments.
- Conduct of Project staff/representatives, or their methods in dealing with compensation.
- Human rights abuse and harassment at work place
- Sexual harassment and abuse
- Gender inequality
- Unfair employee recruitment and labour
- Non-payment of wages
- increased cases of HIV/AIDS due to in-migration.
- Likelihood of increase in Gender Based Violence (GBV).
- loss of access not addressed; and
- loss of property due to theft allegedly by construction personnel

Principles To Effective Grievance Redressal

Principles in formulation of effective grievance redressal process are as follows:

- i. Institutions and procedures laid down are consistent with the anticipated grievances.
- ii. Takes cognizance of the existing socio-cultural setting such as making use of existing village/block structure in resolution of disputes.
- iii. Is housed within existing formal institutional structures thereby ensuring continuity.
- iv. Should be well represented in its composition particularly aimed to resolve the types of grievances that are likely.
- v. Is accessible i.e., close to the source of grievance so as to not make reporting of grievance difficult in the first place.
- vi. Takes cognizance of the need to resolve grievances as they are better resolved at the level at which they occur rather than the next higher level.
- vii. Provides appropriate orientation and training to all stakeholders involved in redressal of grievances.
- viii. Is well-supported by an effective information dissemination mechanism to prevent occurrence of a grievance in the first place due to lack of information.
- ix. fixes a time frame for resolution of grievance and communicates the same to communities.

- x. Is timely and responsive i.e., its recommendation and decisions are implemented by the project implementers.
- xi. Is adequately resourced to ensure desired effectiveness; and
- xii. No financial payments required for PAPs to have their grievances addressed.

Grievance Redress Mechanism for Rumphi Water Supply and Sanitation Improvement Project (RWSSIP)

For the purpose of handling grievances related to environmental and social concerns, RWSSIP will have to establish a grievance redress mechanism which will have to include a GRM committee at a District level, dedicated mobile phone, WhatsApp line, Toll free phone number and Email address. A grievance redress sub-committees will have to be established at Village Development Committee level and Area Development Committee level. These committees will have to be presented to the public through meetings and media. In these committees, grievances will have to be recorded in grievance reporting forms, sorted and assigned to appropriate party for resolution. All efforts shall be made to resolve issues at the first instance at community level. However, issues that are not resolved at first instance, such dispute/grievances shall be escalated to the District GRM committee. The final resolution will have to be recorded in the grievance resolution and complainant forms.

District Level Grievance Redress Mechanism Committee

The project District grievance redress mechanism committee shall comprise of the following membership:

- i. The District Commissioner Chairperson:
- ii. The Environmental and Social Safeguard Expert Secretary:
- iii. The District Lands Officer Member:
- iv. District Environmental Officer:
- v. The Community Mobilization and Training Manager:
- vi. The District Water Development Officer:
- vii. The District Gender & Social Welfare Officer: and
- viii. NGO representative (Water NGO preferred):

NRWB Level Grievance Redress Mechanism

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A committee of well-informed persons and experienced in the subject area, shall be constituted at the NRWB level to handle complaints that have been referred, or have not been addressed or resolved at the project level in the impact area. The NRWB level GRM shall be comprised of the following members:

Director of Infrastructure Development, Chairperson

- Director of Human Resource and Administration
- Water Quality and Environmental Manager
- Infrastructure Development Manager, and
- Internal Audit Manager.

The NRWB level Grievance Redress Mechanism committee shall do everything possible to resolve issues within fifteen (15) days from the date the case has been transferred to it from the Project District level GRM committee. The chairperson of the committee shall communicate the committee's decision to the aggrieved PAP(s) in writing. The decision reached at the NRWB committee level will be the final decision. The committee shall keep record of all decisions related to each case. When disputes are not resolved at one of the above level, the case will be directed to the Minister for Water to forward to the related ministry of the nature of grievance for example land issues to Minister responsible for Land acquisition, labour issue to Ministry of Labour for action.

Duties And Responsibilities of The Grievance Redress Committee

The committee will be meeting twice a month to propose corrective or precautionary actions. If required, the committee may also invite the applicants, relevant governmental authorities and/or third parties to these meetings. Specifically, the Committee will be doing the following:

- i. Represents the interests of PAPs and communities in the project's zone of influence.
- ii. Acts as an entry and exit point for all grievances arising from resettlement and compensation activities.
- iii. Acts as NRWB local monitoring and oversight committee on encroachment and water pipes vandalism.
- iv. Monitors safety standards, labour requirements and community health and social issues during construction works and report to NRWB.
- v. Monitors compensation activities, and
- vi. Through the community level GRC representative, provides support in rolling out the GRM community sensitization meetings, receiving and channelling grievances to the PIU and feedback to the PAPs

Procedure For Receiving and Responding to Complaints, Grievances, Appeal and Claiming Process.

Table 45 summarises the process which is being followed in the redress of the grievances.

Process		Descrip	otion	unee nee	Time Frame	Other information
Identification	of	Face to	face; phone;	letter, e-	1 Day	Email address; hotline
grievance		mail;	recorded	during		number

Table 47: Grievance Redress Process

Process	Description	Time Frame	Other information
	public/community interaction; others		
Grievance	Significance assessed and	4-7 Days	Significance criteria:
assessed and	grievance recorded or logged		Level 1 –one off event;
logged	(i.e. in a reporting book)		Level 2 – complaint is
			widespread or
			repeated; Level 3- any
			complaint (one off or
			repeated) that indicates
			breach of law or policy
			or this ESMP
			provisions
Grievance is	Acknowledgement of	7-14 Days	NA
acknowledged	grievance through		
	appropriate medium	470	
Development of	Grievance assigned to	4-7 Days	NA
response	appropriate party for	7 14 Davia	
	Response development with	7-14 Days	
	input from management/		
	relevant stakeholders		
Response signed	Redress action approved at	4-7 Days	Project staff to sign off
off	appropriate levels		. j
Implementation	Redress action implemented	10-14 Days	NA
and	and update of progress on		
communication	resolution communicated to		
of response	complainant		
Complaints	Redress action recorded in	4-7 Days	NA
Response	grievance resolution book		
	Confirm with complainant		
	that grievance can be closed		
	or determine what follow up		
	is necessary		
Close grievance	Record final sign off of	4-7 Days	Final sign off by
	grievance		NRWB Project
	If grievance cannot be		Management Unit
	closed, return to step 2 or		Manager in liaison
	refer to recommend third-		with Rumphi District
			Council

Process	Description	Time Frame	Other information
	party for arbitration or resort to court of law.		

Conclusion

The successful implementation of the Rumphi Water Supply and Sanitation Improvement Project will also depend on its compliance performance to Government and Bank operation standards environmental compliance through waste management and pollution control, improved community and stakeholders perception, as well as the heathy and safety, and welfare of workers, and the mechanism put in place to deal and resolve complaints. The management plans and the Grievance Redress Mechanism are aimed at preparing to achieve high performance implementation of the project.

APPENDIX XI: DRAFT CONTRACTOR ENVIRONMENTAL AND SOCIAL

MANAGEMENT PLAN (CESMP)

Apart from other environmental and social management interventions that the contractor must include in the CESMP, the following should also be included:

Green Environment Management Plan

The execution and implementation of this project shall involve site clearing and tree felling to create room for designed infrastructure. Plants play critical roles in urban environments including; helping in soil conservation, flood control, acting as wind breaks and habitats for fauna. Vegetation clearance may thus lead to a permanent loss of some plant species and loss of habitats and breeding/nesting sites for animals, particularly birds. There will thus be a need to reforest/replant these areas after project completion to re-establish a sustainable urban ecosystem. The contractor should thus ensure that;

- i. They use native flora as much as possible during reforestation. This is critical since native plants are not demanding in terms of care and maintenance and would thus be beneficial for the maintenance of the integrity of ecosystems.
- ii. Where recommended alien species for reforestation are considered, *Mangifera indica* (Mango), *Senna sp* (Kesha), *Psidium guajava* (Gwafa) and *Persea americana* (Avocado (Peyala) would be good options. These species have notable uses such as firewood and fruits to communities. The contractor should however avoid planting species that are ecologically unfriendly such as *Gmelina arborea* and *Eucalyptus sp*.

Traffic Management Plan

The contractor shall be required to set up a traffic management plan during construction phase of this project. Considering the nature of the project, the following may be the overall objectives of the Traffic Management Plan:

- i. To make the safety of the public a priority at all times.
- ii. To ensure that all road users including pedestrians, cyclists, and motorcyclists and motorists using the adjacent roads are safe always.
- iii. To ensure that traffic is routed conveniently and within minimum inconvenience around the construction site.
- iv. To make sure that the safety of all on-site workers within the construction site is assured.

The main features of the Work Zone Traffic Management Plan may include, but not limited to, the following areas:

a. Presence of a Site Road Map:

i. The contractor is obligated to make sure that there is always a clear site layout plan and the site road map highlighting the areas where major traffic load will be envisaged.

ii. The Contractor shall always provide all drivers with a map of the roads authorized for the execution of the works.

iii. The Traffic Management Plan must demarcate public vehicle and pedestrian routes from site vehicles and site worker routes. The plan should further indicate areas for loading, unloading, parking, and exit routes.

b. Pedestrian Safety:

- i. The contractor must make sure that there will be uninterrupted movement of pedestrians. If need be, make sure they are told in advance and there is an explanation to such.
- ii. The storage and loading of construction materials should be away from the areas of frequent pedestrian activity like community footpaths, access to any public place or residential area, markets etc.
- iii. During the construction activities, the roads in the vicinity of the project site shall be kept clean all the time to secure unhindered pedestrian movement.

c. Traffic Safety and Control:

- i. There should be specific indication in site layout plan about general traffic control in the project area, and specific work sites that may require specific traffic control.
- ii. The contract is supposed to install road message signs (signposting) to warn possible traffic congestion at work areas.
- iii. If possible, the contractor should allocate time slots and schedules for construction vehicles to avoid haphazard ways of operating with the heavy construction vehicles. And further, all demolition and excavation will be adhering to the allocated time slots to avoid traffic congestion.
- iv. Road closures of short durations must be done where possible only during non-peak hours, for example during afternoon.
- v. The road closures must be initiated in a manner that allows the traffic to slow down at least 500 m ahead of such closures.
- vi. In cases of road closures, alternative traffic routes should be provided to control traffic congestion and public inconvenience.
- vii. All detour must include following requisites:
 - The nearby community members must be informed prior to detouring the road by the contractor. Tentative timeline of such detours must also be provided to the community members.
 - Location of access roads /detours shall be done in consultation with the local community especially in important and sensitive environments such as school crossing, markets etc.
 - Traffic divergences should be demarcated through appropriate informatory road signs. Such detours should also have adequate safety measures such as a temporary signalling system, warning signs and regulatory signs, and humps.

d. General Traffic Accident Prevention Measures:

- i. All the drivers employed by the Contractor should have a valid driving license.
- ii. All the drivers must be fully sensitized about the speed limits and the need for strict compliance to the safety rules.
- iii. Regular speed monitoring of construction vehicles respective to the guidelines need to be conducted.

All traffic related issues should be recorded on a daily basis. Action should be taken to avoid any disturbances to the public immediately by the Project Contractor. When road accidents happen, it has to be reported to the relevant authority.

In view of the Traffic Management Plan, some of the warning signs during construction are shown in the figure below, but not limited to these:



Figure 11-2: Sample of warning signs to road users

APPENDIX XII: METHODOLOGY FOR THE ASSESSMENT OF SOCIO-ECONOMIC CONDITIONS IN THE PROJECT AREA

1. Introduction

The main objective of establishing the baseline socio-economic conditions of the area was to ensure that prior to implementing the project, the prevailing conditions are known in order to identify the potential positive and negative impacts of the project. This would assist in ensuring that the positive impacts are enhanced while the negative impacts are mitigated. The specific objectives therefore include:

- Identifying the impacts of the projects on vulnerable groupings like women and youth
- Establishing the water and sanitation access conditions in the area
- Establishing the status of economic activities in the area
- Understanding the gender roles and relations and how these may affect the project

2. Assumptions and Limitations

This socioeconomic study was conducted as guided by the following assumptions:

- There will be no relocation of any Project Affected Persons (PAPs) due to the project hence there is no need for a census of PAPs to be conducted (No universal targeting of PAPs).
- There will be alienation of some assets from some PAPs, particularly land along the road reserve which may have been used for farming, land on which offices and booster pump housing will be located.
- NRWB will reach amicable resolution of all asset acquisition

In terms of limitations, the study was limited in form of time resources.

3. Methodology

To establish the socio-economic conditions of the project area, several methods of data collection were used, including household socio-economic survey, observations and information from public consultations. The sampling of respondents for the household survey involved a total of 287 households spread across 23 villages of the project area as shown in figure 12-3 below. The number of households surveyed per village ranged from 5 to 21 and averaged 12.5 \pm 5.0. In total, 588 individuals from these households were interviewed. Oout of these 303 individuals were male and 286 individuals were female, representing 51.4% and 48.6% respectively.



Figure 11-3: Distribution of survey sample across 23 villages in the project area

APPENDIX XII: PUBLIC CONSULTATION METHODOLOGY

3.2 Introduction

Stakeholder engagement was done to inform stakeholders about the project activities as well as to engage stakeholders for their input to the assessment and project implementation. Consultations involved presenting to and leading an open discussion forum with the Rumphi and Mzimba District Councils, interviews and open dialogues with key informants with relevant expertise, and village meetings with community members.

3.3 Objectives

The purpose of the public consultations was as follows:

1) to inform targeted key stakeholders about the upcoming project,

2) to raise awareness to all project targeted localities in the district, including surrounding residents, and

3) to gather concerns, particularly from groups of people who would be directly affected by the project.

3.4 Consultation Methods

3.4.4 Introductory Meetings

Introductory meetings were conducted with the District Councils, through the District Environmental Sub-Committees (DESC), ensuring that all the relevant council departments are aware of the project. To this end, DESC meetings were held on 22nd September 2022 (for Rumphi DESC) and 27th September 2022 (for M'mbelwa DESC). In addition, introductory calls were also made to the Traditional Authorities including Paramount Chikulamayembe (on 22nd September 2022), Inkosi Jaravikuba (on 22nd September 2022) and Inkosi Mtwalo's representative (on 30th September 2022).

3.4.5 Consultation Meetings

The public consultations were held with the Area Development Committees (ADCs), Market and Business Leaders, as well as Water Users Association (WUAs) and Area Executive Committees (AECs).

The ADCs and AECs included: Mwazisi, Bembe, Bolero, Thumbi, and Mtwalo. Business and Market Leaders from the following areas: Mwazisi, Bembe, Bolero, Thumbi, Bwengu, Phwezi, Chinyolo, and Chikwawa.

Due to the fact that the project will also benefit some schools, head teachers of some schools like Bumba, Mwazisi and Bolero were also among those who were consulted during this process.

3.4.6 Household questionnaires

The Rumphi Water and Sanitation Project Socio-Economic Household survey was implemented from 23rd to 30th September 2022. An orientation session of the household questionnaire was conducted on 23rd September at Kanthuwekha Lodge and on 24th September, household survey commenced as tabulated in table 48 below:

Sn	Survey sampling area	Date (s)
1	Mwazisi, Waliro/Kkayora and Kamphenda	24 th September, 2022
2	Luviri, Bembe, Luhono, Chirambo and Chikwawa	26 th September, 2022
3	Chozoli, Bolero and Nkhamanga	27 th September, 2022
4	Bwengu, Luzi, Mkombezi and Thumbi	28 th September, 2022
5	Kacheche, Chizawula, Chinyolo, Mzokoto and Phwezi	29 th September, 2022
6	Chisyombi, Jombo and Enukweni	30 th September, 2022

Table 48: Survey implementation

Household survey sampling areas, sample size and sampling methodology

Table 49 shows the areas that were sampled for the household survey. The sampling of the areas was on purpose and was opted to cover most and larger settlements/areas that had been mapped by NRWB to benefit from the project. The survey collected data from 300 households as shown in table 49. Sampling of households was done using interval systematic sampling with interval of 10 for survey sample areas with target of 20 households and 5 for areas with 10 and 15 households. In settlements along the road, sampling of households was done on either side by going to the very end while in circular or nucleated settlements, it was done starting from the centre moving north, south, east west directions.

sn	Survey sampling area	Target # HHs	Achieved	Divergence
1	Mwazisi	20	20	0
2	Waliro/Kayora	15	15	0
3	Kamphenda	15	13	(2)
4	Bembe	10	10	0

Table 49: Survey sample areas, target number of households and achievements

sn	Survey sampling	Target # HHs	Achieved	Divergence
	area			
5	Luviri	10	10	0
6	Luhono	10	10	0
7	Chirambo	10	5	(5)
8	Chikwawa	10	7	(3)
9	Chozoli	10	10	0
10	Bolero	20	20	0
11	Nkhamanga	10	10	0
12	Bwengu	20	20	0
13	Luzi	20	20	0
14	Mkombezi	10	10	0
15	Thumbi	10	10	0
16	Kacheche	20	20	0
17	Chizawula	10	10	0
18	Chinyolo	10	10	0
19	Mzokoto	10	10	0
20	Phwezi	10	10	0
21	Chisyombi	10	10	0
22	Jombo	10	10	0
23	Enukweni	20	20	0
	Total	300	290	(10)

3.5 SUMMARY OF ISSUES RAISED DURING STAKEHOLDER CONSULTATIONS

During stakeholder consultations, a number of issues were raised and these have been tabulated as follows:

Date of Meeting	Who	Issues presented	Issues raised by attendees

22/09/2022	Rumphi District	Introduced the project and the	What is the
	Environmental Sub-	Consultant to conduct the ESIA and	working
	Committee (DESC)	RAP	relationship
		Informing them of the processes for ESIA and RAP	between the NRWB and Nkhamanga
		Reminded importance of the following:	Water Users Association?
		HIV and AIDS knowledge sharing	Concern about
		Protection of vulnerable especially school girls	compensations due to experience
		Provision of employment opportunities to the vulnerable including women and youth	with PRIDE which changed terms for
		Preventing and dealing with issues of sexual exploitation against women and girls	compensation after assessments were done
		Dealing with gender-based violence (GBV)	Wanted to know:
		Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee.	the process for acquiring land for the project infrastructure
			if there was any relocation due to the project
			if there will be an office for the NRWB
			which sites will be covered by the project due to the terrain in other areas

	length of
	project
	implementation
	period
	how sexual and
	reproductive
	health issues
	will be
	addressed
	waste
	management:
	whether there
	will be sales of
	treated waste
	if trees will be
	planted for air
	pollution
	control
	what will be
	what will be
	water tariffs

Paramount Chikulamayembe	Curtesy call and introducing the project and the Consultant to conduct the ESIA and RAP Informing him of the processes for ESIA and RAP Reminded importance of the following: HIV and AIDS knowledge sharing Protection of vulnerable especially school girls Provision of employment opportunities to the vulnerable including women and youth Preventing and dealing with issues of sexual exploitation against women and girls Dealing with gender-based violence (GBV) Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	The Paramount was thankful for the project as it would serve the people with potable water He welcomed the project and promised to work with the NRWB for its successful implementation
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Inkosi Jaravikuba	 Curtesy call and introducing the project and the Consultant to conduct the ESIA and RAP Informing him of the processes for ESIA and RAP Reminded importance of the following: HIV and AIDS knowledge sharing Protection of vulnerable especially school girls Provision of employment opportunities to the vulnerable including women and youth Preventing and dealing with issues of sexual exploitation against women and girls Dealing with gender-based violence (GBV) Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee 	The Inkosi was very appreciative of the project because it will bring safe and clean water to the people of his area. He assured NRWB of his support to ensure that the project was successful.
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			Are contractors going to come in with their own work force?
		Introduced the project and the Consultant to conduct the ESIA and RAP	be distributed throughout the whole ADC
23/09/2022	Mwazisi Area Development Committee (ADC) and Area Executive Committee (AEC)	 RAP Informing them of the processes for ESIA and RAP Reminded importance of the following: HIV and AIDS knowledge sharing Protection of vulnerable especially school girls Provision of employment opportunities to the vulnerable including women and youth Preventing and dealing with issues of sexual exploitation against women and girls Dealing with gender-based violence (GBV) Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee 	whole ADC For those living in the higher elevation areas, how will they be assisted with water distribution? We want to know the actual plan of the water project because some VDCs are far from where the pipes are passing? Does compensation of trees include all trees? What power will the boosters use?
			How long will the project be implemented?

		Introduced the project and the	
		Consultant to conduct the ESIA and	
		RAP	
		Informing them of the processes for ESIA and RAP	
		Reminded importance of the following:	
		HIV and AIDS knowledge sharing	
		Protection of vulnerable especially school girls	Welcome the project
24/09/2022	Mwazisi Market Leaders	Provision of employment opportunities to the vulnerable including women and youth	Will there be connections for the market?
		Preventing and dealing with issues of sexual exploitation against women and girls	
		Dealing with gender-based violence (GBV)	
		Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	

			Are people allowed to farm
		Introduced the project and the	once the
		Consultant to conduct the ESIA and RAP	assessment has been done
		Informing them of the processes for ESIA and RAP	Is there any corporate
		Reminded importance of the following:	social responsibility by NRWB
		HIV and AIDS knowledge sharing	Is water just
		Protection of vulnerable especially school girls	passing through our
	Bembe Market Leaders	Provision of employment	area
		opportunities to the vulnerable	With NRWB
		Dreventing and dealing with issues	community
		of sexual exploitation against	have to do
		 Kennided importance of the following: HIV and AIDS knowledge sharing Protection of vulnerable especially school girls Provision of employment opportunities to the vulnerable including women and youth Preventing and dealing with issue of sexual exploitation against women and girls Dealing with gender-based violence (GBV) Formation of Grievance Redress Mechanism (GRM), can be a new or set of the se	themselves as
		Dealing with gender-based violence	with WUA?
		(GBV)	Digging trenches and
		Formation of Grievance Redress Mechanism (GRM), can be a new or	buying pipes
		already existing committee	Is NRWB working with WUA?
			1

		Are schools the
		only places
		being targeted
		by the project
		and have
	Introduced the project and the	schools to be
	Consultant to conduct the ESIA and	supplied
	RAP	already been
	Informing them of the processes for	identified
	ESIA and RAP	How long is the
		project for,
	Reminded importance of the	who is it being
	following:	funded by and
	HIV and AIDS knowledge sharing	how much
	The and And Skilow ledge sharing	money?
	Protection of vulnerable especially	
Bolero Water Users	school girls	Give the ADC
Association (WUA) and	Provision of employment	a oner
Market Leaders	opportunities to the vulnerable	the whole
	including women and youth	nroject as many
		do not know
	Preventing and dealing with issues	the details
	of sexual exploitation against	the details
	women and girls	How will WUA
	Dealing with gender-based violence	and NRWB
	(GBV)	work?
	Formation of Crissiana Dadage	Is NRWB
	Machanism (CPM), can be a new or	working with
	vicchanisin (GKWI), can be a new or	WUA?
	arready existing committee	
		Is there free
		water
		connection as
		the government
		promised?

		Introduced the project and the Consultant to conduct the ESIA and RAP Informing them of the processes for	Will there be involuntary resettlement? What livelihood enhancement activities have been provided to ensure that
27/09/2022	Mzimba District Environmental Sub- Committee (DESC)	Reminded importance of the following: HIV and AIDS knowledge sharing Protection of vulnerable especially school girls Provision of employment opportunities to the vulnerable including women and youth Preventing and dealing with issues of sexual exploitation against women and girls Dealing with gender-based violence (GBV) Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	communities stop degrading the environment? Will there be a NRWB office? Will the project include waste management vehicles for Mzimba? What considerations were put in place to ensure that the stopover is economically viable? How about having one at Enukweni?

	Introduced the project and the	
	Consultant to conduct the ESIA and	
	RAP	Is the water
		free
	Informing them of the processes for	Who will run
	ESIA and RAP	the communal
	Reminded importance of the	ule communat
	following:	water taps?
	10110 11118	In areas where
	HIV and AIDS knowledge sharing	offices will be
	Protection of vulnerable especially	built will
	school girls	people
Thumbi CBO and	Sensor Brits	surrounding
Market Leaders	Provision of employment	that area have
	opportunities to the vulnerable	to be resettled?
	including women and youth	200
	Preventing and dealing with issues	200 communal
	of sexual exploitation against	water taps are
	women and girls	not enough and
	women and girls	communal taps
	Dealing with gender-based violence	should be
	(GBV)	available in
	Formation of Grievance Pedrass	every chief's
	Mechanism (GRM) can be a new or	area (village).
	already existing committee	
	aneady existing commute	

23/09/2022	Chinyolo/Phwezi ADC	Introduced the project and the Consultant to conduct the ESIA and RAP Informing them of the processes for ESIA and RAP Reminded importance of the following: HIV and AIDS knowledge sharing Protection of vulnerable especially school girls Provision of employment opportunities to the vulnerable including women and youth Preventing and dealing with issues of sexual exploitation against women and girls Dealing with gender-based violence (GBV) Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	Is the water going to reach high elevated areas in our ADC's How will compensation work with the project Are all types of trees eligible for compensation For this project do we need to setup new GRM committees? Is the water going to be free or paid? When will the project start? Is money already available for
		Mechanism (GRM), can be a new or already existing committee	Is money already available for the project

23/09/2022	Bumba ADC		How are issues between the contractors and workers going to be handled?
		Introduced the project and the Consultant to conduct the ESIA and RAP	How will payment issues of workers be
		Informing them of the processes for ESIA and RAP	handled? Workers are left unpaid
		Reminded importance of the following:	Are all types of trees eligible
		HIV and AIDS knowledge sharing	for
		Protection of vulnerable especially school girls	How are you
		Provision of employment opportunities to the vulnerable including women and youth	going to deal with the nature of aesthetic value along the
		Preventing and dealing with issues of sexual exploitation against women and girls	project pathway? Is the water going to be free or paid?
		Dealing with gender-based violence (GBV)	
		Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	How will the survey be conducted? How will they be identified?
			Is NRWB working with WUA?

	Introduced the project	and the	How much is
	Consultant to conduct the	ESIA and	the funding for
	RAP		the project?
30/09/2022	Consultant to conduct the RAPInforming them of the pro- ESIA and RAPReminded importance following:HIV and AIDS knowledgeProtection of vulnerable school girlsProvision of er opportunities to the including women and youPreventing and dealing v of sexual exploitation women and girlsDealing with gender-base (GBV)	ocesses for of the e sharing especially mployment vulnerable th with issues n against ed violence	the project? How many people will the project reach? Project seems to target mainly Rumphi, not Mzimba. Why? Are assessments being done only in the affected areas?
	Formation of Grievance Mechanism (GRM), can b already existing committe	e Redress be a new or be	

		Introduced the project and the	Will
	Bumba Headteachers and Market Leaders	Consultant to conduct the ESIA and	installation of
		RAP	water for
		Informing them of the processes for ESIA and RAP	government institutions be subsidized?
		Reminded importance of the following:	How will schools benefit
		HIV and AIDS knowledge sharing	from waste
		Protection of vulnerable especially	management?
		school girls	Was a survey
26/09/2022		Provision of employment opportunities to the vulnerable including women and youth	done to reach all areas where there are water problems
		Preventing and dealing with issues of sexual exploitation against women and girls	What are the mitigation measures
		Dealing with gender based violence	placed for the
		(GBV)	negative
		Formation of Grievance Redress Mechanism (GRM), can be a new or	impacts of the project?
		already existing committee	

		Introduced the project and the	Is the water
	Kanyerere ADC	Consultant to conduct the ESIA and	going to be
		RAP	distributed to
		Informing them of the processes for ESIA and RAP	the further parts of Kanyelele
		Reminded importance of the following:	Will WUA and NRWB work together?
		HIV and AIDS knowledge sharing	Will the water
		Protection of vulnerable especially	be metered or
		school girls	not
23/09/2022		Provision of employment opportunities to the vulnerable including women and youth	
		Preventing and dealing with issues of sexual exploitation against women and girls	
		Dealing with gender based violence (GBV)	
		Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	
		Introduced the project and the Consultant to conduct the ESIA and	Will there be free installation
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	Bwengu Market Leaders	RAP	How can we
		Informing them of the processes for ESIA and RAP	get water in our market
		Reminded importance of the following:	What are the charges for
		HIV and AIDS knowledge sharing	water
26/09/2022		Protection of vulnerable especially school girls	
		Provision of employment opportunities to the vulnerable including women and youth	
		Preventing and dealing with issues of sexual exploitation against women and girls	
		Dealing with gender based violence (GBV)	
		Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	

		Introduced the project and the	Is the water for
		Consultant to conduct the ESIA and	free
		RAP	
		Informing them of the processes for ESIA and RAP	
		Reminded importance of the following:	
		HIV and AIDS knowledge sharing	
	Chikwawa GVH (on	Protection of vulnerable especially school girls	
26/09/2022	behalf of Market Committee)	Provision of employment opportunities to the vulnerable including women and youth	
		Preventing and dealing with issues of sexual exploitation against women and girls	
		Dealing with gender-based violence (GBV)	
		Formation of Grievance Redress Mechanism (GRM), can be a new or already existing committee	

Introduced the project and the Will t	nere be
Consultant to conduct the ESIA and free	water
RAP connec	ions
26/09/2022Phwezi Market Leaders CommitteeInforming them of the processes for ESIA and RAPWhen compet be fini the roat there we HIV and AIDS knowledge sharing Protection of vulnerable especially school girlsWhat compet twice?26/09/2022Phwezi Market Leaders CommitteeProvision of employment opportunities to the vulnerable including women and youthWhat charges waterPreventing and dealing with issues of sexual exploitation against women and girlsDealing with gender-based violence (GBV)Pormation of Grievance Redress Mechanism (GRM), can be a new or	will station shed for d since yon't be station are the for

3.5.4 Stakeholder Analysis

During the process several stakeholders were identified and they can be grouped into the following categories:

a. Direct Beneficiaries:

These are the ones whom the project targets based on the justification as articulated in the project document. They include individual households and business persons in the project area who will benefit from the water supply and waste management services, local community members who will benefit from employment opportunities during the implementation of the project. It also includes institutions who will benefit from the water supply and waste management services, such as the hospital and prison at Rumphi town. These stakeholders should be engaged during the design and construction phases to ensure that there is buy in and cooperation on the project.

Women are a special sub-category in the sense that they are mostly the ones responsible for collecting water in the households. During public consultations, it was very clear from the women that they welcome the project because they are tired of having to fetch unsafe water which is far from their homesteads and also unreliable and erratic in supply when sourced from Water Users Association (WUAs) infrastructure. There is a lot of goodwill towards the project from the women because of this.

Another set of direct beneficiaries are the travellers who will be using the Stopover to be constructed at Phwezi/Mzokoto. They will benefit from clean ablution services.

During the construction phase of the project, there will be opportunities for employment for the local people, starting from the construction of the new intake, to digging of trenches for the water supply network and construction of water tanks, offices, booster pump housing and to the traveller's stopover. The local community members will therefore be an important stakeholder in this. During consultations, they expressed interest in gaining from employment and requested that locals should be employed rather than bringing in people from other areas.

b. Project Affected Persons (PAPs):

These include those people whose assets or properties will be affected by the project directly because they are located either in the route of the water supply or sewer pipelines or an office or booster pump housing will be constructed on their land. At the time of the study, NRWB had mapped out all routes for the water supply network and associated infrastructure including the sites for construction of offices and tanks. In some cases, the process of land acquisition had been initiated. In other cases, the processes had not yet been initiated, the sites had simply been identified.

For the water supply network and sewer network, the NRWB would keep them within the road reserve boundaries (RRB), which is public land. However, there are risks that in some of the areas, the RRB is not very clear because the road may not be gazetted, especially the feeder roads at Rumphi Boma. In such cases, the NRWB may have to negotiate with the PAPs and compensate according to the laws of Malawi. In cases where the road is gazetted, like the M1 from Enukweni to Phwezi, and from Bwengu to Mwazisi Turnoff, the compensation will also have to take into account the fact that there is an RR for utilities. In addition, these two roads are going to be rehabilitated shortly. For the Enukweni to Phwezi road section, compensations have already been made by the Roads Authority. The NRWB will therefore not compensate for the same road. Similarly, the Rumphi to Mwazisi turn-off section of the road is likely to be compensated for by the Roads Authority hence the NRWB has to liaise with the Roads Authority on these matters. During the stakeholder consultations sessions, these issues were explained to the potential PAPs, particularly through the business and market leaders because they are the ones whose structures are located close to the roads.

These stakeholders were targeted during the consultations. The NRWB needs to keep them closely informed and engaged throughout the process because they are also very likely to be customers to access water supply. However, they may also derail the project if they are not handled well during the construction phase.

Those PAPs whose gardens or other assets will be affected through acquisition will also need to be well managed throughout the design and construction phase. There are possibilities of abnormally high expectations in terms of land valuation. The NRWB should therefore ensure that the PAPs in this category are well managed. Construction on the sites should start only when all are in agreement on the said transactions, including the District Councils.

c. Partners to the implementing agency (NRWB):

The NRWB will implement this project with the support of several partners including the financiers of the project and the district councils of M'mbelwa and Rumphi. The departments that will be partnering with the NRWB at the district councils include: Water, Planning and Development, Lands, Education, Prisons and Health. In addition, various (Non-Governmental Organisations (NGOs) and Civil Society Organisations (CSOs) who are interested in water and sanitation in the two districts.

Another set of partners are the local level representatives who are in the various local governance structures such as the ADCs and Business and Market Leaders. These are important to keep engaged throughout the project because they represent the people.

Due to the fact that the water supply network will be within the road reserve, the Roads Authority and District Councils will be another set of partners that the NRWB need to work with.

d. Perceived competitors to the implementing agency (NRWB)

Rumphi district is one of the districts in this country that has for a very long time enjoyed rural water supply through the gravity-fed water supply by the Water Department. Further to this, Rumphi District has empowered communities to establish local level water governance structures known as Water Users Associations (WUAs) who are responsible for managing the water supply. Communities pay a fixed monthly amount to access the water either at a communal water point or at individual households. The proposed project will be implemented in an area where the Nkhamanga Water Users Association operates. To this end, the WUA Committee members are apprehensive, particularly on the role that they will play in the water supply arena. Specifically, the WUA views NRWB as a competitor and has been pressing the NRWB to clearly stipulate how they will be working in the water supply arena, considering that this is the WUA's territory so to say. At the time of the study, the NRWB had not yet worked out how to work with the WUA and had not yet addressed the Committee.

The Community members were of the view that the water from NRWB will be cleaner and safer hence they expressed willingness to pay higher amounts than what is currently charged by the WUAs. The WUA does not treat the water that it supplies to the community members. In addition, due to challenges with the water supply system, despite recent project support to improve supply, the water is only available a few days in a month and only in the early hours of the morning. This puts the WUAs at a disadvantage compared to the NRWB.

The NRWB should therefore aim to address this stakeholder during the design phase in order to clarify the working relationship because this is the stakeholder that is most likely to affect the social contract that the NRWB will have to operate in the area. During construction and implementation, this stakeholder should be closely managed to ensure that there are no challenges emanating from loss of trust.



APPENDIX XIII: PROJECT LOCATION MAPS

Figure 11-4: Location Map index for Project area



Figure 11-5: A1 Project Map Area



Figure 11-6: B1 project area



Figure 11-7: B2 Project Area



Figure 11-8: B3 and B4 Project Areas



Figure 11-9: C1 and D1 Project Areas



Figure 11-10: C2 and D2 Project Areas



Figure 11-11: C4 and D4 Project Areas



Figure 11-12: C4 Project Areas



Figure 11-13: Existing and proposed water supply infrastructure at Rumphi town



Figure 11-14: C5 Project Areas



Figure 11-15: D4 Project Areas



Figure 11-16: D5 Project Areas

APPENDIX XVI: WASTE MANAGEMENT PLAN RUMPHI WATER SUPPLY AND SANITATION SERVICES IMPROVEMENT PROJECT

INTRODUCTION

The Waste Management Plan (WMP) addresses management of all solid and wastewater, including hazardous and non-hazardous waste, produced as a result of project activities within the sites in Rumphi District.

The WMP covers the construction and operational phases. This report constitutes the initial draft which will require amendment and updating during construction and operation phases of the Project.

PURPOSE

The WMP aims to provide guidelines on waste reduction, segregation, collection and disposal practices in accordance with international best practices, to avoid deterioration of the natural environment and negative impacts on the health and safety of communities in the Project Area.

The Project is committed to apply the waste hierarchy and will seek to be a zero-waste discharge facility. This plan is the primary tool to guide employees towards waste management.

WASTE MANAGEMENT OPTIONS - WASTE HIERARCHY

The waste hierarchy presents waste management stages commencing with the most preferable option to the least preferable option. Waste prevention is the most preferred option of prevention, followed by reuse, recycling, recovery and is safe disposal as the last option (Figure 1).



Figure 11-17: Waste Management Hierarchy

These stages are described in more detail below:

Prevention

Waste Generators should ensure there is minimal wastage. This could be achieved through reduction of construction mistakes, ordering the right quantities of materials, getting the right-size materials for the job, proper storage of materials, trying out new building methods and choosing building products with minimal packaging.

Waste Generators should be committed to avoiding the generation of waste and not using hazardous materials. Where the use of hazardous materials is unavoidable, efforts should be made to identify replacement materials that are non-hazardous.

Re-use

Waste Generators should be required to prepare a maintenance management plan which seeks to ensure that all equipment is regularly checked and maintained and refurbished or repaired. In addition, Waste Generators should seek to sell and buy used items, donating them for free or exchanging them.

Recycling

Waste Generators should seek to turn waste into a new substance or product, such as composting of organic wastes to a standard that meets quality controls. This compost could be sold or given to farming communities around the construction and operations sites to facilitate improvements in soil conditions and hence their production levels.

Recovery

Recovery of waste is usually most successful when done in bulk. Therefore, a centralised recovery facility is preferable. The common forms of recovery include composting, anaerobic digestion, incineration with energy recovery, gasification and pyrolysis which produce energy (fuels, heat and power) and materials from waste. It is recommended that composting should be considered for organic solid waste and sludge that will be generated at the wastewaterwater treatment facility.

Disposal

Disposal is deemed the last resort and must occur in an environmentally responsible manner. Disposal results in waste going to landfill or to incineration without energy recovery and is the least preferred environmental option. However, when wastes must go for disposal, this must occur at a suitably designed sanitary waste disposal site.

WASTE CATEGORIES GENERATED IN THE PROJECT

Solid waste generation in the Project will generally include domestic waste, commercial waste, construction and demolition debris, sanitation residue and waste from streets. These wastes will be in solid or semi-solid form and will potentially include very low quantities of industrial

hazardous wastes and bio-medical waste. All industrial hazardous waste and biomedical waste must be disposed of properly by the respective industries and cannot be included in the general waste management system. The main waste categories anticipated are:

- Biodegradable waste (food and kitchen waste, green waste such as vegetables, leaves and fruits; and sludge)
- Recyclable material (paper, glass, bottles, cans, metals, certain plastics, etc.); and
- Inert waste (construction and demolition waste, dirt, rocks, street sweeping, drain silt, debris, etc.)

The sources of waste and waste generators and the anticipated content of the solid waste generated are presented in table 50 below.

Source	Typical waste generators	Solid waste content
Residential	Dwelling units	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, consumer electronics, batteries, oil, tyres, limited household hazardous wastes and sewage waste.
Commercial	Stores, hotels, restaurants, markets, office buildings	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Institutional	Schools, hospitals, government centres	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, rubble, dirt etc.
Municipal services	Street cleaning, water and waste water treatment plants	Street sweepings, drain silt, landscape and tree trimmings, general wastes and sludge.

Table 50: Sources of waste, waste generators and content

WASTE TREATMENT OPTIONS

The primary options for the treatment of solid waste include, in order of environmental benefit:

- Anaerobic Digestion;
- Composting (windrow, aerated static pile, in-vessel and vermi-composting);
- Incineration with or without energy recovery;
- Pyrolysis and gasification;
- Plasma pyrolysis and pelletisation; and
- Reuse Derived Fuel (RDF) for mixture waste.

Since the nature of waste envisaged is mainly organic, bioconversion methodologies are considered the preferred technology.

EXISTING AND PROPOSED WASTE MANAGEMENT INFRASTRUCTURE IN RUMPHI DISTRICT

In Rumphi District, there are no organized and advanced waste management systems such as collection, transport and disposal. The district lacks both solid and wastewater collection and disposal facilities. Solid waste disposed is illegally dumped on open ground. Residents and institutions requiring the service of the vacuum truck get the services from Mzuzu City, some 67 km from the district headquarters. However, the sewage collected is improperly disposed of into the environment.

SOLID WASTE MANAGEMENT IN THE PROJECT AREAS

All Waste Generators within Project Areas will be required to segregate waste at source to ensure the value of the wastes are optimised through recovery, reuse and recycling. By providing an enabling environment the success rate of correct waste practices being implemented are increased.

- Segregation should be by generators and into three main waste streams:
- Wet (biodegradable);
- Dry (plastic, paper, metal and wood); and
- Domestic hazardous wastes (diapers, napkins, empty containers of cleaning agents, mosquito repellents etc.).

Collection of the segregated waste is to be undertaken by an authorised waste collector. As a minimum wet and dry wastes should be segregated (2-bin system) by the waste generators, see Figure 12-18. Source segregation of waste optimises waste processing and treatment technologies. The bio-degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible.



Food wastes of all kinds, cooked and uncooked, including eggshells and bones, flower and fruit wastes including juice peels and house-plant wastes, soiled tissues, food wrappers, paper towels

Paper, cardboard and cartons; Containers & packaging of all kinds excluding those containing hazardous materials; Compound packaging (tetra pack, blisters etc.) and plastics; Rags, rubber, wood, discarded clothing and furniture; Metals, Glass (all kinds), House sweepings and inert (not garden, yard or street sweepings)

Figure 11-18: Example of waste separate of inorganic and organic wastes at source

Construction and demolition waste should be stored separately. Opportunities to repurpose this waste as secondary aggregate to the construction industry should be investigated to ensure this waste is either utilised in the Project Sites or is sold as a product to the construction industry. No construction or demolition waste should be disposed of to landfill. No hazardous wastes shall be permitted to be disposed of outside the boundary of the Project Sites unless being transported to a sanitary landfill. The District Council must place the responsibility of safe disposal of hazardous waste on the generator. It will be the generators responsibility to ensure that the waste collector which will be transporting the waste for disposal is licenced to do so. In addition, the Generator will need to provide evidence in writing from the receiving disposal site of its capacity to recycle or dispose of the waste in an environmentally sound manner. Proof of safe disposal should be provided to the District Council, such as a waste disposal ticket issued and date stamped by the sanitary landfill. This waste stream is anticipated to be small, limited to cleaning materials and small quantities of bio-medical waste since most of the processing to be undertaken on site is for the water supply and waste management and therefore hazardous process materials should be limited.

Within the district there will be primary collection of waste from households, markets and other commercial establishments. During the operation phase, this waste will be taken directly to the treatment sites. Primary collection of solid waste will occur using segregated bins or containers which will be placed on the streets for collection. This waste will be taken to a solid waste intermediate storage facility. The use of an intermediate site allows for the optimisation of transport devices and manpower which in addition allows for timely collection of waste from source and onward treatment. Secondary transportation occurs from the storage area to the landfill site.

The dry waste such as paper and plastic and cardboard and glass are to be recycled. The District Council must provide a site with a covered storage area for recyclable waste. The size of the area provided should be suitable for the bulk storage of up to 7 days of waste generation.

Waste collection from generators within the district will need to occur on a daily basis in order to prevent garbage containers overflowing and waste littering the streets. To maintain a hygienic environment regular waste clearance is required.

PERFORMANCE MONITORING

Inspections

Site inspections must be performed on regular basis by the Health, Safety and Environment (HSE) personnel from the District Council. Inspections will ensure that all commitments in this Waste Management Plans are being enforced and that specific waste management elements are verified.

Data Collection

Implementation of the waste hierarchy principles requires that destinations and quantities of residual matter are monitored. A register of waste material should be maintained to ensure the measurement of eliminated waste and of residual matter sent for reuse, recycling and reclamation.

Waste Audit

After a year of operation, a waste audit should be performed, on all waste data collected, to identify waste streams and fate and develop ways to reduce waste production.

PERFORMANCE INDICATORS

Measurement is an important tool in improving performance, and performance indicators will help the Rumphi District Council define and measure progress towards their goals. The results reflect current conditions and allow orientation and coordination of further actions towards sustainability.

Environmental Audit Results

Environmental auditing is a key process in the implementation of the Environmental and Social Management Plan (ESMP), of which the WMP forms a part. The findings of each audit should be registered in a database, where corrective and/or preventive actions are prescribed, responsibilities assigned to people, deadlines established and necessary resources mobilised. In compliance with the procedure, audit reports should categorise findings as being either "major", "minor" or "observation". The number of findings shall be decreasing every year until the ultimate goal of zero major findings is achieved.

Percentage Waste Generated

During the operational phase, the quantities and types of waste produced should be tracked for each waste generators categories, and activities examined to identify waste reduction opportunities. Specific reduction target ratios should be determined and the rate of waste production is required to reduce annually relative to production volumes.

RESPONSIBILITIES

The roles and responsibilities inherent to the Waste Management Plan are presented in Table 51.

Entity	Responsibilities		
Rumphi	- Enforce the Waste Management Plan.		
District	- Contractually obligate the Waste Generators to meet the requirements of		
Council	the Waste Management Plan.		
	- Manage the Solid Waste Management Area or appoint an appropriate		
	contractor.		
	- Manage the Solid Waste Treatment plant or appoint an appropriate		
	contractor.		
	- Manage the Wastewater Treatment plant or appoint an appropriate		
	contractor.		
Contractors	- Provide a minimum of two garbage receptacles to allow for wet and dry		
	waste segregation. An additional bin for hazardous waste is highly		
	recommended.		
	- Develop a site-specific Waste Management Plan for the activities the		
	Contractor is undertaking.		
	- Site-specific Waste Management Plan must be aligned with the full site		
	waste management plan and must be approved by NRWB and Rumphi District		
	Council prior to work commencing.		
	- Educate all members of staff on the waste hierarchy.		
	- Educate all members of staff on site-specific Waste Management Plan		
	- Education is to be provided to each staff member prior to commencement		
	of work, and regular refresher sessions are to be undertaken in the form of		
	toolbox talks or training sessions throughout the contract period.		

RECORD KEEPING

Data on waste production and disposal should be gathered continually via logbooks and registers. Records should be maintained on site and made available to the authorities and any other party contracted to audit or assess the waste management practices on site. The data should include the final destination of each waste stream and where disposal has occurred proof of safe disposal will be required, such as a date stamped waste disposal ticket issued by a sanitary landfill. A cost should be paid for safe disposal of wastes. Evidence of waste disposal should also be maintained.

REVIEW PROCESS

The WMP is to be reviewed and updated on an annual basis.

APPENDIX XVII STAKEHOLDER ENGAGEMENT PLAN

Introduction

This plan aims at identifying who the stakeholders for the Rumphi Water and Sanitation Improvement Project are and how they are going to be engaged and managed. Project stakeholder management includes processes required to identify people, groups or organisations that could impact or be impacted by the project, to analyse the stakeholders' expectations and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

Stakeholders differ in their influence on the project outcomes. Therefore, there is need for structured analyses of these stakeholders to ensure that none are missed. To increase chances of success, stakeholder identification processes must begin as soon as possible, specifically after the project charter has been approved and the project manager has been assigned.

The Stakeholder Engagement Plan therefore aims at ensuring continuous communication with all stakeholders, including team members, to understand their needs and expectations from the project. Stakeholder engagement is the process of communicating and working with stakeholders to meet their needs and expectations, address issues, and foster appropriate stakeholder involvement. This is done to increase support and minimise resistance from stakeholders.

Stakeholders' engagement involves:

- Engaging stakeholders at appropriate stages to obtain, confirm, to maintain their continued commitment to the success of the project
- Managing stakeholders' expectations through negotiation and communication
- addressing any risks or potential concerns related to stakeholder management and anticipating future issues that may be raised by stakeholders
- Clarifying and resolving issues that have been identified

It helps ensure that stakeholders clearly understand the project goals, objectives, benefits, and risks for the project, as well as how their contributions will enhance project success

Due to the progression nature of projects, stakeholders may change with time. It is therefore important for the Project Manager to regularly review the Stakeholder Engagement Plan to identify which stakeholders are still relevant and which ones should be dropped off the plan.

Stakeholders Identification and Analysis

During the process several stakeholders were identified and they can be grouped into the following categories:

Direct Beneficiaries:

These are the ones whom the project targets based on the justification as articulated in the project document. They include individual households and business persons in the project area who will benefit from the water supply and waste management services, local community members who will benefit from employment opportunities during the implementation of the project. It also includes institutions who will benefit from the water supply and waste management services, such as the hospital and prison at Rumphi town. These stakeholders should be engaged during the design and construction phases to ensure that there is buy in and cooperation on the project.

Women are a special sub-category in the sense that they are mostly the ones responsible for collecting water in the households. During public consultations, it was very clear from the women that they welcome the project because they are tired of having to fetch unsafe water which is far from their homesteads and also unreliable and erratic in supply when sourced from Water Users Association (WUAs) infrastructure. There is a lot of goodwill towards the project from the women because of this.

Another set of direct beneficiaries are the travellers who will be using the Stopover to be constructed at Phwezi/Mzokoto. They will benefit from clean ablution services.

During the construction phase of the project, there will be opportunities for employment for the local people, starting from the construction of the new intake, to digging of trenches for the water supply network and construction of water tanks, offices, booster pump housing and to the traveller's stopover. The local community members will therefore be an important stakeholder in this. During consultations, they expressed interest in gaining from employment and requested that locals should be employed rather than bringing in people from other areas.

Project Affected Persons (PAPs):

These include those people whose assets or properties will be affected by the project directly because they are located either in the route of the water supply or sewer pipelines or an office or booster pump housing will be constructed on their land. At the time of the study, NRWB had mapped out all routes for the water supply network and associated infrastructure including the sites for construction of offices and tanks. NRWB has the completed the identification and acquired land based on the preliminary designs. In addition, a Resettlement Action Plan (RAP) has been prepared to assess likely impacts, outline procedures of compensation for loses by Project Affected Persons (PAPs). The document also provides institutional arrangements for RAP implementation, implementation mechanisms and schedules as well as processes designed for grievance redress, monitoring and evaluation.

For the water supply network and sewer network, the NRWB would keep them within the road reserve boundaries (RRB), which is public land. However, there are risks that in some of the areas, the RRB is not very clear because the road may not be gazetted, especially the feeder roads at Rumphi Boma. In such cases, the NRWB may have to negotiate with the PAPs and compensate according to the laws of Malawi. In cases where the road is gazetted, like the M1 from Enukweni to Phwezi, and from Bwengu to Mwazisi Turnoff, the compensation will also have to take into

account the fact that there is an RR for utilities. In addition, these two roads are going to be rehabilitated shortly. For the Enukweni to Phwezi road section, compensations have already been made by the Roads Authority. The NRWB will therefore not compensate for the same road. Similarly, the Rumphi to Mwazisi turn-off section of the road is likely to be compensated for by the Roads Authority hence the NRWB has to liaise with the Roads Authority on these matters. During the stakeholder consultations sessions, these issues were explained to the potential PAPs, particularly through the business and market leaders because they are the ones whose structures are located close to the roads.

These stakeholders were targeted during the consultations. The NRWB needs to keep them closely informed and engaged throughout the process because they are also very likely to be customers to access water supply. However, they may also derail the project if they are not handled well during the construction phase.

Those PAPs whose gardens or other assets will be affected through acquisition will also need to be well managed throughout the design and construction phase. There are possibilities of abnormally high expectations in terms of land valuation. The NRWB should therefore ensure that the PAPs in this category are well managed. Construction on the sites should start only when all are in agreement on the said transactions, including the District Councils.

Partners to the implementing agency (NRWB):

The NRWB will implement this project with the support of several partners including the financiers of the project and the district councils of M'mbelwa and Rumphi. The departments that will be partnering with the NRWB at the district councils include: Water, Planning and Development, Lands, Education, Prisons and Health. In addition, various (Non-Governmental Organisations (NGOs) and Civil Society Organisations (CSOs) who are interested in water and sanitation in the two districts.

Another set of partners are the local level representatives who are in the various local governance structures such as the ADCs and Business and Market Leaders. These are important to keep engaged throughout the project because they represent the people.

Due to the fact that the water supply network will be within the road reserve, the Roads Authority and District Councils will be another set of partners that the NRWB need to work with.

Perceived competitors to the implementing agency (NRWB)

Rumphi district is one of the districts in this country that has for a very long time enjoyed rural water supply through the gravity-fed water supply by the Water Department. Further to this, Rumphi District has empowered communities to establish local level water governance structures known as Water Users Associations (WUAs) who are responsible for managing the water supply. Communities pay a fixed monthly fee to access the water either at a communal water point or at individual households. The proposed project will be implemented in an area where the Nkhamanga Water Users Association operates. To this end, the WUA Committee members are apprehensive, particularly on the role that they will play in the water supply arena. Specifically, the WUA views

NRWB as a competitor and has been pressing the NRWB to clearly stipulate how they will be working in the water supply arena, considering that this is the WUA's territory so to say. The areas within which the WUA's operate are within the NRWB's gazzetted supply area. The WUA's will be taken over. However, the NRWB is exploring the best possible working arrangement to integrate the WUA into communal water seller association just like in other cities and towns.

The Community members were of the view that the water from NRWB will be cleaner and safer hence they expressed willingness to pay higher amounts than what is currently charged by the WUAs. The WUA does not treat the water that it supplies to the community members. In addition, due to challenges with the water supply system, despite recent project support to improve supply, the water is only available a few days in a month and only in the early hours of the morning. This puts the WUAs at a disadvantage compared to the NRWB.

The NRWB should therefore aim to address this stakeholder during the design phase in order to clarify the working relationship because this is the stakeholder that is most likely to affect the social contract that the NRWB will have to operate in the area. During construction and implementation, this stakeholder should be closely managed to ensure that there are no challenges emanating from loss of trust.

Regulators

In implementing the project, the NRWB will have to obtain several permits and licenses or authorisations. The Malawi Environment Protection Authority (MEPA) is the authority responsible for ensuring that projects are environmentally sustainable. To this end, the NRWB has to ensure that the Environmental and Social Impact Assessment reports as well as Management Plans are submitted to the Authority and all the recommendations therein are being complied with. Another regulator is the National Water Resources Authority, Furthermore, the project is to obtained permits from Physical Planning for project infrastructure design, Malawi Bureau of Standard (MBS), and National Construction Industry Council

Internal Stakeholders (NRWB Staff)

Staff at NRWB are also an important stakeholder and they need to be engaged in order to ensure smooth progression of the project. The Project Manager should schedule briefing sessions with them on a regular basis, through a hybrid of physical and telecommunication so that internal processes of the project can be facilitated expeditiously.

Project Stakeholders Power/Influence and Interest

The project stakeholders have been identified according to the level at which they are operating, their interest in the project, their influence in the project and how they can affect/impact the success of the project.

As per Figure 12-19 below, those stakeholders with Low power/influence and Low interest, they tend to be less important to the project success and hence require minimal effort to satisfy. Those with Low Power/Influence and High Interest need to be shown consideration and regularly kept

informed so that they are satisfied and do not begin to agitate and negatively affect the project. Stakeholders with High Power/Influence and Low Interest will require that their needs are met and they are always kept informed.



Figure 11-19: Stakeholder's Influence/Power and Interest Matrix

Level	Stakeholder	Interest	Power/Influence	Impact on Project
		(On a scale of 1 to 5)	(On a scale of 1 to 5)	(If not well managed)
		1 = Lowest	1= Lowest; 5 =	
		5 = Highest	Highest	
National	Ministry of Water and	Ministry responsible for Water	(4)	High negative: not provide
	Sanitation	(5)		loan guarantee
	Ministry of Finance	(5)	(4)	High negative: not provide authorizations
	Ministry of Lands	Valuation and compensation of assets to PAPs (1)	(1)	Low Negative:
	Roads Authority	Road infrastructure development (1)	(1)	Low Negative:
	Ministry of Local	Rural development	(4)	Low Negative
	Government	(4)		
	Ministry of Labour	Welfare and protection of employees (3)	(2)	Low Negative
	Ministry of Gender	Welfare and protection of women, youth and children (3)	(2)	Low Negative
	National Water Resources	Water abstraction regulation and	(4)	High Negative
	Authority	licensing		
		(4)		
	Malawi Environment	Regulator on environment issues	(5)	High Negative
	Protection Agency	(5)		

Table 52: Rumphi Water and Sanitation Improvement Project Stakeholders

Level	Stakeholder	Interest (On a scale of 1 to 5)	Power/Influence (On a scale of 1 to 5)	Impact on Project (If not well managed)
		1 = Lowest 5 = Highest	1= Lowest; 5 = Highest	
	Electricity Supply Commission of Malawi (ESCOM)	Supplier of power for boosters. Also shares Road Reserve with NRWB as a utility provider.	(1)	Low Negative
Regional	Regional Lands Commission	Supervises assets valuation and compensation. (5)	5	High Negative
District	District Council	Partners with NRWB in implementing the project (sanitation component). Most importantly, playing the supervisory role and facilitating engagements with local communities. (5)	(5)	High Negative
	DESC	Reviews, approves and supervises Environmental issues of project. (5)	(5)	High Negative
	NGOs/CSOs	Partners with NRWB in provision of water and sanitation services (2)	(2)	Low Negative
Community	Traditional Authorities	Custodians of local culture and traditional representatives. They want development in their area. (5)	(5)	High Negative

Level	Stakeholder	Interest	Power/Influence	Impact on Project
		(On a scale of 1 to 5)	(On a scale of 1 to 5)	(If not well managed)
		1 = Lowest	1= Lowest; 5 =	
		5 = Highest	Highest	
	Area Development	Entry points/gatekeepers of	(5)	High Negative
	Committees (ADCs)	development projects. Vital in		
		mobilizing communities for or		
		against projects. Current locus of		
		GRM Committees.		
		(4)		
	Village Development	Facilitators of development at	(5)	High Negative
	Committees (VDCs)	village level. Vital in mobilization		
		of communities for or against a		
		project		
		(4)		
	Water Users Association	Current suppliers of water and may	(5)	High Negative
	(WUAs)	feel threatened by coming in of		
		NRWB with water supply project.		
		Potential partner in water supply.		
		(5)		
	Community members	Potential beneficiaries of water	(5)	High Negative
		supply and sanitation plus other		
		benefits of project. Also bearers of		
		negative impacts of project. Want		
		access to safe and potable water.		
		(5)		
	Project Affected Persons	Loss of assets due to project hence	(5)	High Negative
	(PAPs)	direct bearers of negative impacts		
		of project.		
		(5)		

Level	Stakeholder	Interest	Power/Influence	Impact on Project
		(On a scale of 1 to 5)	(On a scale of 1 to 5)	(If not well managed)
		1 = Lowest	1= Lowest; 5 =	
		5 = Highest	Highest	
	Member of Parliament	Political interest, would like	(4)	High Negative
		development projects in their		
		Constituency		
		(4)		
	Councillors	Political interest, would like	(4)	High Negative
		development projects in their		
		Ward		
		(4)		
Internal	NRWB Staff	Provide support for ease of	(4)	High Negative
Stakeholders		execution of project.		
		(4)		

The NRWB should aim to ensure that all stakeholders are working for the good and success of the project. This will entail ensuring that the impact on the project is positive.

Communication Methods to be used

The crucial component in Stakeholder Engagement is communication. Stakeholders need to be informed about various issues depending on their role, influence and interest in the project. Communication is a multi-pronged process. The NRWB will therefore have to use various methods of communication to engage the stakeholders at different stages of the project. These may include, but not be limited to:

Physical Meetings:

Some stakeholders can only be reached and communicated to through physical meetings. These may include traditional authorities, beneficiaries, project affected persons and partners. Physical meetings work well particularly during the initial stages of the project, i.e. the planning stage, when stakeholders have to be consulted to notify them of the project and get their feedback on various matters. Physical meetings are also ideal when sharing results of studies and when engaging stakeholders in joint monitoring of the project.

Virtual Meetings:

With the advancement of technologies, it is also possible to hold virtual meetings with stakeholders, particularly those who are in areas where technology is reliable. It is possible to hold meetings over the mobile phone through WhatsApp since most people do have this technology even in the villages. The speaker facility enables several people to sit around one phone and hold fruitful conversations. However, this mode is only acceptable when the relations between or among the parties are good. In instances where the relations are not good, physical meetings would have to take precedence over use of the mobile phones for virtual meetings.

Mass briefings through Radio, Television, Flyers and Newspapers:

Another form of communication is through mass briefings which can be carried through radio, flyers, television and newspapers. This mode is suitable for transmitting information about the project where NRWB does not require immediate feedback. It is also suitable for notices of where there might be disturbances to traffic due to project works, who the community can send their grievances to, and also updating on project progress.

Stakeholder Engagement Plan

The NRWB will be responsible for implementing this plan as well as ensuring that there are resources to carry out the various stakeholder engagement activities identified therein.

Stakeholder	How they will be engaged	Frequency	
Government			
Ministry of Water and Sanitation	Formal letter communications	During design of project, then thereafter, as need arises on progress of project	
Ministry of Lands	 Physical meetings/Consultations during ESIA, RAP, ESMP processes Joint physical partners when compensating PAPs therefore present at point of compensation 	As needed during the planning phase of the project	
Ministry of Gender and Social Welfare	 Physical meetings/consultations during project implementation Ministry representatives to be involved in oversight on matters of women and child abuse, sexual harassment, 	As needed during project implementation	
Malawi Drought Recovery and Resilience Project (MDRRP)	Physical meetings, letter and telecommunication	As needed during the project implementation	
Malawi Floods Emergency Recovery Project (MFERP)	Physical meetings, letter and telecommunication	As needed during the project implementation	
Sustainable Rural Water and Sanitation Infrastructure for the Improved Health and Livelihoods Project (SRWSIIHLP)	Physical meetings, letter and telecommunication	As needed during the project implementation	
Malawi Environment Protection Authority (MEPA)	 Physical meetings/Consultations Through telephone, email, letters and reports 	 During ESIA, RAP, ESMP processes, through submission of reports As and when needed to communicate any notifiable challenges with the environment 	
Rumphi Prison	Physical meetings, letter and telecommunication	As needed during project design, implementation and operation since they are beneficiaries	
Stakeholder	How they will be engaged	Frequency	
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Rumphi District Hospital	Physical meetings, letter and telecommunication	As needed during project design, implementation and operation since they are beneficiaries	
Rumphi and M'mbelwa District Council	Physical meetings, letter and telecommunication	As needed during project design, implementation and operation since they are partners	
DESCs	Physical meetings, letter and telecommunication	During ESIA, ESMP and RAP processes (Design stage), and bi- annually during the project to share notes on how the project is progressing based on oversight by DESC.	
NGO/CSO			
Matunkha/Future Vision Afridev	Physical meetings, letter and telecommunicationPhysical meetings, letter and telecommunication	During implementation, bi-annually	
Traditional Authorities			
TAs, GVHs, and VHs	Physical meetings, letter and telecommunication	As and when needed, during ESIA, ESMP and RAP processes (Design stage), during implementation and operation	
Community			
PAPs	Physical meetings, Press and mass communication, telecommunication	As and when needed, during ESIA, ESMP and RAP processes (Design stage), and during implementation	
Beneficiaries	Physical meetings, Press and mass communication, telecommunication	As and when needed, during ESIA, ESMP and RAP processes (Design stage), during implementation and operation	
Political			
Members of Parliament Councillors	Physical meetings, letter and telecommunicationPhysical meetings, letter and telecommunication	As and when needed, during ESIA, ESMP and RAP processes (Design	

Stakeholder	How they will be engaged	Frequency	
		stage), during implementation and	
		operation	
Private Sector			
Water Users Associations	Physical meetings, letter and telecommunication	Frequently, as and when needed during the entire project cycle to ensure that the working relationship is ironed out and always on the same page	
Market and Business Persons	Physical meetings, Press and mass communication, telecommunication		
International Financial Institutions			
African development Bank (AfDB)	Physical meetings, letter and telecommunication	As and when needed during the project cycle	
Internal Stakeholders			
Members of staff at NRWB	Physical meetings, letter and telecommunication	As and when needed during the project cycle	

Conclusion

The Stakeholder Engagement Plan has been prepared with the currently identified stakeholders in mind. As the project progresses, stakeholders, their interests and influence on the project are bond to change. For this reason, there is need to regularly monitor and revise the plan to ensure that it is current and reflective of the situation on the ground. The Project Manager's responsibility will be to ensure that all the stakeholders are kept in the loop and their communication needs are met. This will in turn ensure that the project is successful.

APPENDIX XIII: SEXUAL EXPLOITATION, ABUSE AND HARASSMENT MANAGEMENT PLAN

Introduction

Sexual Exploitation, Abuse and Harassment (SEA/SH) Management plan outlines how the project will put in place the necessary protocols and mechanisms to address SEA/SH risks; and how to address any SEA/SH complaint cases that may arise.

Sexual exploitation: is any actual or attempted abuse of a position of vulnerability, differential power or trust for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another

Sexual abuse: actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.

Sexual harassment (SH): any unwelcome sexual advances, request for sexual favours, and other verbal or physical conduct of a sexual nature

Legislation Related to Sexual Exploitation, Abuse and Harassment

This section describes legislation applicable to sexual exploitation, abuse and harassment issues of the proposed Rumphi Water Supply and Sanitation Improvement Services project.

The National Gender Policy (2015)

Gender mainstreaming into socio economic development plans is one of the enablers for sustainable development worldwide. The Sustainable Development Goals (SDGs) II) recognises the importance of gender and women empowerment in socio-economic development. The National Gender Policy provides guidelines for mainstreaming gender 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. According to the policy, persistent gender inequalities and under-representation of women in decision making positions at all levels, necessitated development and implementation of the gender policy in order to address such gender imbalances and other related issues.

The implementation of the project shall therefore mainstream gender related issues to ensure that beneficial impacts and adverse impacts affecting women and girls are appropriately enhanced and mitigated against, respectively. The project has to integrate consideration of the needs of both males, females and other vulnerable groups in project activities. The potential considerations could be equal employment opportunities to both male and female during the implementation of the project in order to enhance income for both. In addition, membership for various committees, such as VNRMC and WUA, advocates for 50% representation for both sexes are taken into consideration.

National HIV and AIDS Policy (2012)

The policy seeks to address HIV and AIDS issues that have affected socio-economic development especially in the area where the project will be carried out. Even though the issues are more

pronounced in urban areas where there is a higher concentration of economic activities, rural areas such as the targeted project areas have been affected. Economic growth is negatively affected by the issues, and this includes sectors such as agriculture and tourism. Transmission of HIV and AIDS has been prevalent in cases where there have been migration and an increase in disposable income both of which may result from the proposed water supply system and sanitation development. Beside the project shall be implemented at a time when several development projects such as. The proposed project shall therefore address the issues of HIV and AIDS and deter transmission by working with relevant stakeholders such as district health officials, faith leaders and local health officials to sensitize communities and project beneficiaries on prevention measures. Further, Information, Education and Communication (IEC) materials on HIV and AIDS should be utilized.

The National Gender Equality Act (2013)

The Gender Equality Act of 2013 promotes gender equality, equal integration, influence, empowerment, dignity and opportunities for men and women in all functions of the society. It prohibits and provides redress for sex discrimination, harmful practices and sexual harassment. Part IV of the Act also provides quotas in terms of employment opportunities such that an appointing or recruiting authority in the public service shall appoint not less than 40% and no more than 60% of either sex in any department in the public service.

Therefore, when employing people for the implementation of the project activities, the Contractor and the Client will have to ensure that the provisions of this Act are complied with to ensure gender equality in all spheres of socio-economic development. It also emphasizes non-discrimination in labour practices and opportunities, including non-discrimination of physically challenged persons among the categories of vulnerable groups.

The Employment Act (1999)

The Employment Act of 1999 reinforces and regulates minimum standards of employment with the purpose of ensuring equity necessary for enhancing industrial peace, accelerated economic growth and social justice; and for matters connected therewith and incidental thereto. Relevant to the current project is the set minimum wage, fair labour practices, non-discrimination, equal remuneration, and prohibition of employment of children. When employing people for the implementation of the project activities, the developer will ensure that the provisions of this Act are complied with.

Therefore, the implementation of the project shall ensure fairness among employees, prohibit any form of discrimination for example bias towards men, equal pay or wage for equal work among employees. It will also emphasize non-discrimination in labour practices and opportunities, including non-discrimination of physically challenged persons among the categories of vulnerable groups.

Sexual Exploitation, Abuse and Harassment Management Measures

This plan outlines measures which the contractor shall employee to prevent and manage SEA/SH at workplace.

Code of Conduct

The contractor shall ensure that the code of conduct at workplace has been developed and communicated to all workers and those may be affected by the project. The following will need to be implemented for the success of code of conduct:

- Ensure requirements in Code of Conduct are clearly understood by all workers that signing it;
- Ensure that the Code of Conduct is signed by all those with a physical presence at the project site;
- Ensure that all staff are trained on the ethical behaviour obligations under the Code of Conduct:
- Disseminate conduct (including visual illustrations) at the workplace and discuss with employees and local communities;
- Ensure the code of conduct address Sexually Transmitted Diseases (STD), and prevention of Workplace Sexual Harassment (WSH), Sexual Exploitation and Abuse (SEA), Gender-Based Violence (GBV); and
- Ensure that there is there is team that will implement the Prevention of Sexual Exploitation, Abuse and Harassment at Workplace procedure.

Training and Awareness

Training and awareness is a strong step towards behaviour change. In order to properly address sexual exploitation, abuse, and harassment at the workplace the contractor should ensure that all workers, managers, and junior staff are trained and sensitized on the issues. The training and sanitization should target sub-contractors and suppliers and their workers. The contractor can incorporate Sexual Exploitation, Abuse and Harassment training into the regular Occupational Health and Safety toolbox talk with workers, or it can be a stand-alone training effort. The contractors should ensure that training on SEA/SH is thorough and proportional to the SEA/SH associated risk. During project implementation, the contractor should ensure that SEA/SH issues have been communicated to the communities in the project area so that they can learn about the roles and responsibilities of different key stakeholders involved in the project. The processes for reporting allegations of SEA/SH, and the corresponding accountability structures also need to be communicated to the communities. Training of both the communities in the project area and contractor workers allow them to understand the risks of SEA/SH, as well as appropriate mitigation and response measures that have put in place. The contractor should continuously deliver an ongoing basis induction and training on preventing and managing SEA/SH.

At minimum, the contractor will ensure that through training and communication workers and surrounding communities understand the following:

- The meaning of Sexual Exploitation, Abuse and Harassment and how their project can aggravate SEA/SH risks.
- SEA/SH allegation reporting mechanism, accountability structures, and treatment procedures within the workplace and for community members to report cases related to project staff
- Services available for survivors of GBV

Working Spaces and Sanitary Facilities

The contractor should ensure that health and safety facilities should not promote SEA/SH. The contractor should assess the health and safety facilities in order to ensure that:

- There are separate, safe and easily accessible facilities for women and men working on the site;
- Locker rooms and/or latrines should be located in separate areas, well-lit and include the ability to be locked from the inside;
- There is visibly display signs around the project site (if applicable) that signal to workers and the community that the project site is an area where SEA/SH is prohibited;
- As appropriate, ensure public spaces around the project grounds are well-lit; and
- If workers are accommodated, the facilities that are provided need to consider a safe space for men and women for example separate accommodation and wash facilities.

Reporting Mechanism and Service Provision

To ensure that SEA/SH conduct is prevented and properly managed at worksite, the contractor should ensure that there is proper mechanism of reporting. The contractor should ensure that:

- There is an ethical and safe process of receiving, investigating and addressing all allegations of SEA/SH among workers or surrounding communities ;
- There is procedure on how the information will be provided to employees and the community on reporting cases of SEA/SH;
- There is more than one channel of reporting SEA/SH at workplace for instance the use of whistle blower;
- There is procedure of keeping survivor information anonymously;
- There should be proactive and ongoing awareness raising of the reporting mechanism and how to access it;
- The GBV services providers operating in project area (Rumphi and Mzimba Districts) has been identified before commencement of the project in order to ensure that there is an appropriate response mechanisms in place; and
- The investigation and response procedures following a report should be clear, and essential services for survivors should be in place for example, GBV services, health services, and psychosocial support.

Confidentiality

The contractor should ensure that the team handling SEA/SH complaints are professional and ethical. It is essential that the confidentiality and safety of victims be protected by not revealing the information to the third without the owner's consent.

Conclusion

Ensuring that SEA/SH will be well managed or prevented at the workplace, it the responsibility of the project contractor to implement programs that will reduce SEA/SH risk. The contractor should ensure that there is code of conduct put in place and signed by all workers. The contractor should also ensure that all workers and surrounding communities where the project is implemented are

sensitized of SEA/SH and associated risk. Putting in place reporting system in place also crucial. The contractor should ensure that the information provided by the survivor is kept confidential.