# THE UNITED REPUBLIC OF TANZANIA MINISTRY OF WATER AND IRRIGATION



# ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED CLIMATE RESILIENT WATER SUPPLY PROJECT IN BUSEGA, BARIADI AND ITILIMA DISTRICTS, SIMIYU REGION

**FINAL REPORT** 

# JANUARY 22 2017

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MINISTRY OF WATER AND IRRIGATION

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### **EXECUTIVE SUMMARY**

#### **Project Title**

Climate Resilient Water Supply Project in Busega, Bariadi and Itilima Districts, Simiyu Region

#### Location

Busega, Bariadi and Itilima Districts, Simiyu Region

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#### Background

The Ministry of Water and Irrigation (MoWI) is currently implementing the Water Sector Development Programme that aims to improve access to safe water and sanitation facilities in rural and urban areas in Tanzania. Under this programme, MoWI is planning to construct a water supply scheme in Simiyu region from Lake Victoria to the districts of Busega, Maswa, Bariadi, Meatu and Itilima. The project is entitled *Climate Resilient Water Supply Project in Busega, Bariadi and Itilima Districts, Simiyu Region*, hereinafter referred to as the *Simiyu Water Supply Project*.

The project is designed to alleviate the adverse impacts of climate change, which is predicted to worsen the water supply situation in the semi-arid areas of Tanzania. Extracting water from Lake Victoria offers the most reliable and robust approach to improving the water supply coverage in Simiyu region.

As part of the planning and permitting of the Simiyu Water Supply Project, MoWI is committed to carry out an Environmental and Social Impact Assessment (ESIA) process in compliance with the Environmental Management Act No. 20 of 2004 and applicable international safeguard policies and standards.

#### **Project Description**

The Simiyu Water Supply Project will supply treated potable water to the five districts in Simiyu region including Busega, Bariadi, Itilima Meatu and Maswa. The project will be financed and built in two phases. Phase 1 will bring piped water to the towns of Bariadi and Lagangabilili as well as to villages located up to a distance of 12 km from the water supply mains, while Phase 2 will extend the water supply to Mwanhuzi and Maswa. The scope of the current ESIA study is limited to Phase 1.

The main water pipelines will be routed along the main roads and within the 60 m wide road reserve. The standard wayleave requirement for water mains in Tanzania is 10 m and the pipelines are planned to be located at the boundary of the road reserve, i.e. along a 10 m wide corridor at 20-30 m distance from the centre line of the roads.

The planned intake point will be located in Bukabile village, Busega district, at a distance of 175 m from the shore line of Lake Victoria with an extraction at 3 m depth. The water abstraction for Phase 1 amounts to 19,000 m<sup>3</sup>/day. The water treatment plant is planned to be located at a distance of 400 - 500 m from the lake shore and will include installations for full standard water treatment comprising dosing, mixing, flocculation, sedimentation, filtering, disinfections with all necessary tools and equipment for optimal operation of the plant.

In order to transfer the treated water from the water treatment plant to the main command reservoir, a single or two staged pumping scheme will be constructed. The main command reservoir was originally proposed at Ngasamo hill, about 35 km east of the water treatment plant, but alternative locations are currently being explored at Shigala, Nyamatembe or Lwangwe hills due to a planned nickel mine at Ngasamo. The exact location of the command reservoir will not affect the overall project layout and routing of the water mains.

From the main command reservoir, the water will be supplied by gravity towards Bariadi. In order to allow for gravity supply to the secondary reservoirs for village supply, there will be two gravity mains from the command reservoir towards Bariadi and Lagangabilili.

Phase 2 of the project will be implemented after an initial operation period of Phase 1 in order to determine the water demand in the two southern districts of Meatu and Maswa which will then be served either by an extension of the Bariadi and Lagangabilili pipelines or by local water resources.

#### Baseline

#### **Physical Environment**

The geology in the project area is dominated granitoids, migmatites and meta-sediments. The soils are mostly Eutric Planosols except at the intake where heavy black soils dominate and a couple of areas consisting of Chromic Cambisols and Feralic Cambisols.

Simiyu is classified as a semi-arid area with annual average rainfall ranging between 600 mm to 900 mm with moderate temperatures ranging from 18 °C to 31 °C. There is a short rainy season (Vuli) between November and December and a longer rainy season (Masika) during February until May.

There are two notable drainage systems in the region. The northern and western part is drained by Simiyu River which discharges into Lake Victoria (near Nyalikungu town) and covers a total catchment area of 10,800 km<sup>2</sup> and a length of 180 km. Lake Victoria, the source of water for the Simiyu project, has a total surface area of 68,800 km<sup>2</sup>. It is Africa's largest lake and the largest tropical lake in the world. In terms of volume, it ranks as the world's ninth largest continental lake, containing about 2,750 km<sup>3</sup> of water.

The water quality of the supply source, Lake Victoria, and in particular the water quality in the intake area can be characterised as relatively good with compliant values for the majority of the relevant water quality parameters for drinking water.

#### **Biological Environment**

In terms of protected areas, the Simiyu region has one game reserve, namely Maswa which covers an area of 2,880 km<sup>2</sup> along the Serengeti National Park borders, and one wildlife management area (Makao) covering 1,330 km<sup>2</sup> in Meatu district. None of the protected areas are located within the impact zone of Phase 1.

The vegetation in the project area has largely been transformed by human influence and land use including crop cultivation, cattle grazing and wood and timber harvesting for building materials and charcoal making.

The remaining vegetation is therefore predominantly secondary while only small areas retain some of the natural vegetation cover mostly on rocky outcrops (kopjes).

Large and medium sized mammal species in the project area include vervet monkeys, baboons, mongoose, scrub hare, dikdik, bushbuck, rock hyrax and spotted hyena. In addition, 12 small mammal species, 106 bird species, 18 reptile species and 8 amphibian species were recorded. None of the species are considered as globally threatened according to IUCN classifications.

Eight different fish species were reported as occurring in Lake Victoria at the proposed intake site. Three of the identified species are commercial fish species, namely tilapia, Nile perch and silver cyprinid (dagaa). There is no evidence that the intake site constitutes a particularly important habitat for fish or other aquatic organisms.

#### Human Environment

The project is planned to eventually cover all the five districts and about 250 villages in Simiyu region, out of which Phase 1 will serve 136 villages and 40 wards in Busega, Bariadi and Itilima districts. An extensive stakeholder and public outreach campaign has been conducted as part of the ESIA consultation process.

Land use in the project area is dominated by rainfed agriculture and agro-pastoralism. The production system is characterised by small farms applying traditional farming methods with a low level of inputs. The main cash crops grown are cotton, groundnuts and sunflower, while the food crops include maize, sorghum, paddy, sweet potatoes, millet and cassava.

The villages and settlements are scattered along the main roads with high population centres in Bariadi town, Dutwa and Nyang'hanga. Many residential and commercial structures are located in between the boundaries of the former and current road reserve, i.e. at a distance of 22.5 m to 30 m from the centre line of the roads. TANROADS is in the process to relocate all structures within the extended road reserve but compensations have not yet been paid to all the affected property owners.

Water supply for the rural areas relies mainly on shallow wells, small earth dams, a few boreholes (deep wells) and rain water harvesting. The coverage varies from 38% for Busega district up to 58% for Itilima district. Water collection is a major work burden for women and children as they can spend up to several hours per day fetching water.

An archaeological survey was carried out to determine the impacts on cultural heritage resources. A few finds were reported, including grinding stones, grinding hollows and several graves. However, until the detailed project design has been completed, it is not known whether these isolated sites will be affected by the project. One sacred site was confirmed at the proposed location for one of the water reservoirs, namely Isenge holy hill near Dutwa.

#### **Stakeholder Involvement and Public Consultations**

Meetings were held with district officials and department heads in the three districts targeted for Phase 1 (Busega, Bariadi and Itilima) as well as with Bariadi Town Council and the two districts under Phase 2 (Meatu and Maswa). In addition, separate meetings were held with Ward Development Committees in all wards within the planned coverage of Phase 1 (i.e. within the 12 km corridor). A total of 38 village meetings were held with the total number of participants amounting to 3,315 persons. Generally, all stakeholders consulted were supportive of the project but requested MoWI to minimise disruption of people's livelihood activities during implementation. There were also requests to extend the project boundaries beyond the 12 km on either side of the main pipeline. Key institutional stakeholders consulted included, among others:

- TANROADS
- Lake Victoria Basin Water Office

- Tanzania Fisheries Research Institute (TAFIRI)
- Lake Victoria Environmental Management Project
- Maswa Game Reserve
- Simiyu Resident Mining Office
- Red Hill Nickel

#### Impacts and Mitigation Measures

The table below summarises the potential impacts on the physical, biological and human environment from the construction and operation of the proposed project, with and without implementation of proposed mitigation measures.

	Baseline Value Impact Magnitude	Overall Impact		
Impact Source		Without	With	
			Mitigation	Mitigation
CONSTRUCTION PHASE				
Physical Environment				
Topography and landscape	<b>.</b>			
Visual impact	Iviedium	Low negative	-	-
Geology and soils				
Soil erosion	High	Low negative	-	-
Land contamination				
Climate and air quality				
GHG emissions	High	Low negative	-	-
Air pollution				
Noise	lliah	Madium nagativa		
Construction noise	підії	weaturn negative		-
Water resources	Modium High	Low-Medium		_
Water pollution	Wedium-mgn	negative		_
Biological Environment				
Protected areas	Low	Insignificant	0	0
• N/A	2011	insignmeant	•	•
Vegetation	Low	Low negative	_	_
Vegetation clearing				
Terrestrial fauna				
Disturbance from	Low-Medium	Low negative	-	-
construction activity				
Aquatic ecology				
Water pollution at	Medium	Low negative	-	-
Human Environment				
Population	N/A	Medium negative		-
Population Innux				
Settlement patterns	N/A	iviedium-Large		
		negative		
Eanu use	N/A	Medium-Large		
Economic     displacement	N/A	negative		
Employment and	N/A	Low-Medium	+	+
business onnortunities		positive	•	•
Water supply and sanitation				
Pressure on water and	N/A	Low negative	_	_
sanitation facilities				

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		Overall Impact		
Impact Source	Baseline Value Impact Magnitude	Without	With	
			Mitigation	Mitigation
Health and education				
Pressure on health and	N/A	Low negative	-	-
education services				
Safety and security				
Health and safety	N/A	Medium negative		-
Security threats				
Cultural heritage		Medium-Large		
Loss of physical	Medium-High	negative		-
cultural resources				
Tourism	Medium	Insignificant	0	0
• N/A		Ū		
Physical Environment				
Topography and landscape	Medium	Low negative	_	-
Visual Impact				
Geology and solls	lliah	Lever a settine		
<ul> <li>Soli erosion</li> </ul>	High	Low negative	-	-
Land contamination				
	High	Insignificant	0	0
Air poliution				
Noise	High	Insignificant	0	0
Operation noise				
Water resources	Modium High	Low pogativo	_	_
Water withdrawal	Weululii-Ingii	Low negative		_
Biological Environment				
Protected areas				
N/A	Low	Insignificant	0	0
Vegetation				
Establishment of	Low	Low negative	_	_
invasive plant species	-			
Terrestrial fauna				
Habitat loss	Low-Medium	Insignificant	0	0
Aquatic ecology				
Fish entrainment at	Medium	Low negative	_	-
intake		_		
Human Environment				
Population	N/A	Low positivo		
Population growth	N/A	Low positive	т	т
Settlement patterns	N/A	Insignificant	0	0
• N/A	N/A	insignificant	0	•
Land use	N/A	Insignificant	n	0
• N/A		magnitualit	<b>,</b>	l Č
Local economy	N/A	Medium positive	++	++
Economic benefits		incalain positive		
Water supply and sanitation				
Provision of water	N/A	Large positive	++++	++++
supply and sanitation				
Health and education	N/A	Large positive	++++	++++

		Overall Impact		
Impact Source	Baseline Value	Impact Magnitude	Without	With
			iviitigation	wiitigation
<ul> <li>Health benefits from</li> </ul>				
water supply and				
sanitation				
Sanitation				
Safety and security	N/A Low negative	_	_	
<ul> <li>Health and safety</li> </ul>	N/A	LOW negative		
Cultural heritage	Modium High Insignificant	0	0	
• N/A	iviedium-High	insignificant	U	U
Tourism				
Improved tourist	Medium	Low positive	+	+
facilities		-		

Very large negative – – – , Large negative – – –, Medium negative – –, Small negative –, Minimal/no 0, Small positive +, Medium positive + +, Large positive + + +, Very large positive + + +.

The impact rating shows that the Simiyu Water Supply Project will have few and limited adverse impacts combined with significant social and health benefits. The difference between the pre-mitigation impact and the post-mitigation impact rating is thus also minimal, partly because the project design has already incorporated environmental and social considerations. Significant pre-mitigation impacts related to cultural heritage (graves and sacred sites) can be avoided or reduced by adhering to the proposed mitigation measures.

Resettlement is the main concern at the current stage of project planning. A preliminary assessment of the scale of physical displacement has indicated that a total of 568 structures are located within the 10 m wide wayleave for the water mains. This estimate was reached based on a number of assumptions that have not yet been validated, including the exact routing of the pipelines. However, there are several opportunities for minimising the resettlement impact, including:

- Re-routing of the main pipelines in order to bypass the highly populated areas in Dutwa and Nyang'hanga and the urban centre in Bariadi town. This option would reduce the number of affected structures and resettlement costs by an estimated 35-40%.
- Fitting the water mains closer to the road within the boundaries of the former road reserve (22.5 m from the centre line) where TANROADS have already acquired the land and relocated all structures.

Other mitigation measures and recommendations arising from the ESIA study include the following:

- At the water intake, enforce protection of the 60 m buffer zone around the lake shore; establish a protective zone, marked with buoys, in the lake; select construction methods that minimise disturbance on lake's bottom; and design the intake to minimise the possibility of entrainment of fish and other aquatic organisms.
- Use native/excavated material to backfill the trench section around the pipes to minimise the volumes of excess material. Spoil should be disposed of in appropriate approved areas and be subject to landscaping.
- Conduct public health campaigns to mitigate the risks and impacts from population influx and behavioural change during the construction phase.
- Provide labour opportunities for local residents, especially the directly affected households, women and youth.
- Include best practice health and safety provisions in the construction contracts and ensure strict compliance.

• The siting of the primary reservoir at Isenge holy hill must be agreed with traditional leaders or be shifted to another suitable location. Graves shall be relocated in accordance with applicable rules and regulations

#### Analysis of Alternatives

Local surface and groundwater resources are inadequate to satisfy the demand from the growing population. Lake Victoria provides the most reliable source of water supply in the Simiyu region.

Different options have been considered for the siting of the main command reservoir. The original location at Ngasamo hill would interfere with a planned nickel mine. Alternative locations are therefore being explored at Shigala hill, Nyamatembe hills and Lwangwe hills, which are all located in close vicinity to each other. A final decision on the siting of the command reservoir has not yet been reached, but it is likely that the Ngasamo option will be abandoned following an official validation of the mining license.

The exact routing of the water pipelines has not been completed at the current stage of project planning, but the preferred alternatives are described as inputs to the detailed design. The pipes will be installed within the existing road reserves to ensure that physical and economic displacement is avoided or minimised as far as possible.

#### **Environmental and Social Management and Monitoring**

A preliminary Environmental and Social Management Plan (ESMP) and monitoring plan has been prepared in order to guide the implementation of the mitigation measures. The plan will be updated during the detailed design phase and once the construction contractors have been selected.

The sole responsibility for the implementation and outcome of the ESMP rests with MoWI as the project proponent. MoWI is committed to manage all the environmental, health, safety and social risks and impacts identified in the ESIA study.

In order to ensure compliance, the environmental and social mitigation measures and requirements will be incorporated into bidding and contract documents. The project implementation unit will be staffed with professional experts responsible for environmental and social management and monitoring.

The ESMP consists of the following components, as further described in the ESIA report:

- Construction contractors' ESMP
- Community health, safety and security plan
- Stakeholder engagement plan
- Monitoring plan

In addition, a Resettlement Action Plan (RAP) will be prepared and implemented prior to the start of the construction works. The planning and implementation of the RAP shall be guided by the World Bank / IFC safeguard policies and standards and by national legislation.

#### **Cost-Benefit Analysis**

Improved water supply and sanitation services can result in a number of economic and social benefits. The most significant are:

- Reductions in cases and deaths associated with diarrhoeal disease
- Reduction in indirect adverse health impacts through reduced mortality rates and malnutrition
- Benefits resulting from the reduced distance to a safe water such as reduced work burdens and time spent on fetching water

• Economic benefits related to reduced health service costs as well as reduced losses of productive time due to disease and to a reduction in premature mortality

According to international studies, the cost-benefit ratio for attaining universal access to drinking water is 2.5 in the Sub-Saharan region. Combining water supply with improved sanitation would raise the cost-benefit ratio to 2.7. The corresponding figures for Tanzania are 1.4 for improving water supply and 1.32 for improving sanitation.

Thus, an investment of EUR 91.2 million for Phase 1 of the Simiyu project may give an economic return of around EUR 127.7 million, calculated on the basis of the Tanzanian cost benefit ratio.

#### Decommissioning

It is anticipated that the lifespan of Simiyu Water Supply Project will be at least 50 years and probably considerably longer if the scheme is built with high quality pipes. When the operational phase ends, it will be necessary to decommission the scheme. Impacts associated with decommissioning are similar to those of the construction phase. It is therefore recommended that a decommissioning plan will be prepared before the start of the decommission operations, taking into account the applicable legislation and environmental/social conditions prevailing at that time.

#### **Conclusions and Recommendations**

The Simiyu Water Supply Project is designed to provide reliable and safe water supply which is expected to greatly improve the socio-economic conditions in the serviced areas. The project is also considered to be environmentally feasible. On the other hand, the land requirements for project infrastructure will inevitably cause displacement of structures and property. However, as explained above, the resettlement impact can be minimised through detailed design by slightly adjusting the routing of the water pipelines.

In conclusion, the ESIA consultant recommends that detailed planning of the Simiyu Water Supply Project continues under the condition that adequate measures are taken to address the issues arising from the ESIA study, including design issues and all other environmental and social management actions as outlined in the ESIA report.

# ACRONYMS

BARUWASA	Bariadi Urban Water and Sanitation Authority
СВО	Community Based Organisation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLO	Community Liaison Officer
COWSO	Community Owned Water Supply Organisation
DC	District Council
DoE	Division of Environment
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EUR	Euro (€)
EWURA	Energy and Water Utilities Regulatory Authority
GDP	Gross Domestic Product
GCF	Green Climate Fund
ha	Hectare
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KASHWASA	Kahama Shinyanga Water Supply and Sewerage Authority
masl.	Metres above sea level
MAUWASA	Maswa Urban Water and Sanitation Authority
MDG	Millennium Development Goal
MoWI	Ministry of Water and Irrigation
NEMC	National Environment Management Council
NGO	Non-Governmental Organisation
ISO	International Organization for Standardization
N/A	Not available
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
0&M	Operation and Maintenance
РАР	Project Affected Person
PIU	Project Implementation Unit

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PLUM	Participatory Land Use Management
PPE	Personal Protective Equipment
PSC	Project Steering Committee
REA	Rural Energy Agency
RoW	Right of Way
RPF	Resettlement Policy Framework
SEP	Stakeholder Engagement Plan
STD	Sexually Transmitted Disease
TAFIRI	Tanzania Fisheries Research Institute
TANESCO	Tanzania Electric Supply Company Limited
TANROADS	Tanzania National Roads Agency
тс	Town Council
ToR	Terms of Reference
TShs.	Tanzanian Shillings
UNDP	United Nations Development Programme
USD	United States Dollar
UWSA	Urban Water Supply and Sanitation Authority
VIP	Ventilated Improved Pit
VLUMC	Village Land Use Management Committee
VLUP	Village Land Use Planning
WHO	World Health Organization

## 1 INTRODUCTION

#### 1.1 Background

The Ministry of Water and Irrigation (MoWI) is currently implementing the Water Sector Development Programme that aims to improve access to safe water and sanitation facilities in rural and urban areas in Tanzania. Under this programme, MoWI is planning to construct a water supply scheme in Simiyu region from Lake Victoria to the districts of Busega, Bariadi and Itilima. The project is entitled *Climate Resilient Water Supply Project in Busega, Bariadi and Itilima Districts, Simiyu Region*, hereinafter referred to as the *Simiyu Water Supply Project*.

The project will be financed and built in two phases and is planned to eventually cover about 20 % of Simiyu's total area including the five district centres and about 250 villages with up to 55% of the region's total population. Phase 1 will bring piped water to the towns of Bariadi and Lagangabilili as well as to villages located up to a distance of 12 km from the water supply mains, while Phase 2 will extend the water supply to Mwanhuzi and Maswa. The scope of the current ESIA study is limited to Phase 1.

#### 1.2 ESIA Process

As part of the planning and permitting of the Simiyu Water Supply Project, MoWI is committed to carry out an Environmental and Social Impact Assessment (ESIA) process in compliance with the Environmental Management Act No. 20 of 2004. For this purpose, MoWI appointed Multiconsult ASA of Norway in collaboration with NORPLAN Tanzania Limited to carry out the scoping exercise and the ESIA study.

The proposed project is categorised as 21 - Water Supply - according to the First Schedule to the Environmental Impact Assessment and Audit Regulations, 2005. It thus falls under Type A which requires mandatory Environmental (and Social) Impact Assessment (EIA/ESIA).

The Environmental Impact Assessment and Audit Regulations, 2005 requires that an Environmental Impact Assessment Certificate Application Form and Project Brief be submitted for screening by the National Environmental Management Council (NEMC). Accordingly, the Simiyu Water Supply Project was registered with NEMC and the required documentation was submitted on 9 May 2016 (re-submitted on 17 May 2016).

The screening was concluded on 10 June 2016 with the decision that the project requires a full Environmental Impact Assessment (EIA) study including a Scoping Report and draft Terms of Reference (ToR) to be reviewed and approved by NEMC before the start-up of the EIA study (see Appendix 5). The Scoping Report and draft ToR was submitted to NEMC on 10 June 2016.

It should be noted that the compressed timeframe for the ESIA study, which was set according to the deadlines stipulated by MoWI and the potential financiers, had been discussed and agreed with NEMC during the screening process. The ESIA studies therefore continued in parallel with NEMC's scoping review process. The approval of the Scoping Report and ToR was issued on 22 June 2016 (see Appendix 15).

In order to meet the requirements of potential international financiers, the ESIA process has also been carried out in compliance with the applicable World Bank's Operational Policies and IFC's Performance Standards. This ESIA Report, therefore, has been prepared to meet both international and national requirements.

#### **1.3** Objectives of the ESIA Studies

The main objective of the Environmental and Social Impact Assessment (ESIA) is to provide decision-makers with an indication of the likely consequences of the proposed project. Specifically, the ESIA shall:

- Document, in as much detail as possible, the baseline conditions prevailing before the project construction starts;
- Assess and report on the likely magnitude and significance of impacts, both positive and negative;
- Propose mitigation activities to reduce negative impacts and monitoring of important impacts during and after construction;
- Document the consultation process undertaken to inform the Project Affected People (PAP) as well as the attitude of the PAP towards the project;
- Reflect, to the extent practical, the views and wishes of the PAP in the design of mitigation and compensation schemes; and
- Look into different alternatives to the project to meet the intended objectives and discuss alternative methods for developing the project to ensure that the project is justified from a broader environmental perspective.

#### **1.4 ESIA Report Structure**

The ESIA report has been organized in fourteen chapters largely following the format recommended in the Environmental Impact Assessment and Audit Regulations, 2005. The report structure also includes all the items required by the World Bank and IFC.

Following the executive summary and the introduction (Chapter 1), the ESIA report provides a description of the project background and design (Chapter 2) and the study approach and methodology (Chapter 3). Chapter 4 outlines the policy, legal and administrative framework within which the project and the ESIA will be carried out.

Chapter 5 presents the baseline environmental and social conditions, while Chapter 6 contains a summary of the stakeholder engagement process. Chapter 7 provides the prediction and assessment of impacts together with the analysis of alternatives (including the no-project alternative). In Chapter 8, the impact management and mitigation measures are presented. These are further specified in the Environmental and Social Management Plan (ESMP) in Chapter 9 and in the Environmental and Social Monitoring Plan in Chapter 10.

Finally, the ESIA report presents a cost-benefit analysis (Chapter 11), a short description of the decommissioning phase (Chapter 12) and summary and conclusions (Chapter 13). The report also contains references and appendices.

# 2 **PROJECT DESCRIPTION**

#### 2.1 Background

#### **Climate Change Context**

Simiyu region is affected by climate change in the form of more erratic and unpredictable rainfall, rising temperatures and increasing frequency of extreme weather events such as floods and droughts (GOPA 2016). According to GKW Consult (2016d), the mean annual and monthly temperature is predicted to increase by 2 to 2.7 degrees Celsius in Simiyu region by 2090. Already a semi-arid area with annual rainfalls ranging between 600 to 1000 mm, climate change is likely to make the water supply situation even more precarious than it is today. Water supply schemes based on a large and reliable source such as Lake Victoria will contribute to alleviate the adverse impacts of prolonged droughts and other climate changes.

#### Status of Project Design

The Simiyu Water Supply Project has been subject to a parallel process of feasibility design and ESIA study. The final feasibility study was completed in September 2016 (GKW Consult 2016a), and the project was confirmed to be technically and economically feasible. However, due to the large size and complexity of the project, the technical design is still at a conceptual stage without detailed layouts of each component.

This ESIA study is based on the available technical design as presented in the feasibility study, which is considered to meet the minimum standard of information required at the current stage of project planning. The relevant aspects of the project design are described in the present chapter. As a next step, the project will be undergoing tender design. A Resettlement Action Plan (RAP) will be prepared based on the detailed design and land survey.

#### 2.2 Project Objectives and Justification

The Simiyu Water Supply Project is designed in order to supply treated potable water to the following towns, district centres and villages:

- Bariadi (Bariadi district)
- Lagangabilili (Itilima district)
- Mwanhuzi (Meatu district)
- Nyashimo (headquarter of Busega district)
- Maswa (Maswa district)
- Villages within a 12 km zone from the water supply main

Also, rehabilitation/remedial measures for the already existing water supply systems are provided for in order to quickly improve the situation of the water supply in the project areas. The existing situation concerning water resources, water supply schemes and water utilities was assessed in MoWI/KfW (2014) and GKW Consult (2015):

#### Available Water Resources in the Region

*Groundwater:* The hydrogeological investigations carried out during the pre-feasibility study (MoWI/KfW 2014) concluded that there is not sufficient potential of groundwater resources in the weathered and fractured zones of the granite bedrock in order to satisfy the demand of the growing population in the entire region.

*Surface water:* Simiyu region is divided in two main river basins: the northern one draining in Lake Victoria and the southern one draining in Lake Eyasi. The rivers flowing in both basins are seasonal and dry up during the long dry seasons. Storage reservoirs will thus be necessary but, according to GKW Consult (2015), the terrain morphology does not support this option.

*Lake Victoria:* According to MoWI/KfW (2014) and GKW Consult (2015), only Lake Victoria provides a reliable water resource within the Simiyu region in order to cover the water needs of the above mentioned district centres and rural areas.

#### Existing Water Supply Schemes and Utilities

The situation of the existing water supply schemes and utilities was investigated during the preparation of the pre-feasibility and feasibility studies (MoWI/KfW 2014, GKW Consult 2015). Detailed information was collected for the district centres and also the rural areas. According to these studies, the situation differs from district to district but, in general, there is an imperative need for major improvements because the water supply and distribution coverage is clearly insufficient for all the examined districts:

- In Busega district, the villages of Bulima, Bukabile, Malili, Ngunga A, Ngunga B, Mamala, Lukungu and Nyangili are covered by small water supply schemes abstracting water from Lake Victoria. There are also shallow wells and traditional wells, but only 38% of the population have a water source within 400 meters from their house.
- In Bariadi town, the public water supply authority, BARUWASA, covers around one fourth of the total demand in the wards of Somanda, Bariadi, Malambo and Sima. In Bariadi rural, the main water sources are boreholes and traditional hand dug shallow wells. 48% of the Bariadi rural population are served with water from these sources.
- In Itilima district, around 58 % have access to potable water sources which mainly come from boreholes, earth dams and rainwater harvesting tanks.
- Water sources in Maswa district include reservoirs, numerous shallow wells, boreholes and rainwater harvesting tanks. The water supply coverage is 80% for the urban area and 56% for the rural areas.
- Meatu district relies on the Mwanyahina reservoir as its main source of water supply for Mwanhuzi town and the villages of Mshikamano, Bomani, Mwanyahina and Mwambegwa. The water supply coverage for the district is 44%.

The improvements should include (i) repair and rehabilitation of existing facilities, comprising pump stations and treatment plants, storage and distribution in order to at least recover the original capacities, and (ii) development of new water resources together with the necessary storage, transfer and distribution networks.

The proposed Simiyu Water Supply Project is therefore intended to respond to the needs for improving the water supply conditions for the population living in the above mentioned district centres and adjacent rural areas.

#### 2.3 Overall Concept

#### 2.3.1 Project Phases and Options

Water is planned to be abstracted from Lake Victoria and transferred to the above mentioned towns and villages via a long distance pipeline scheme. In case both phases of the project are implemented, the total length of the pipeline will be approx. 260-270 km and the total daily flow is estimated to 111,300 m<sup>3</sup>/day.

According to the draft feasibility study (GKW Consult 2015), taking into account the variations in the routing of the transmission pipelines and the development of the project in phases, the following alternatives were studied:

Option	Description
1	Supply of Busega, Bariadi and Itilima in a first stage via pumping and gravity main; in a second
	stage: laying of a second pipe in parallel (70 km) and extension of transmission main to Maswa
	and to Meatu via Itilima branch
2	Supply of Busega, Bariadi and Itilima in a first stage via pumping and gravity main; in a second
	stage: laying of a second pipe in parallel (70 km) and extension of transmission main to Maswa
	and further to Meatu via Maswa branch
3	Supply of Busega, Bariadi and Itilima in a first stage via pumping and gravity main; in a possible
	second stage: laying of a second pipe in parallel (32 km) and supply of Maswa and Meatu
	through local surface and groundwater resources

#### Table 1: Options considered for the Simiyu Water Supply Project.

Engineering and financial analyses were prepared for the above mentioned options, and it was concluded that Option 2 should be eliminated and a phased approach should be implemented for the project as follows:

- In Phase 1, treated potable water will be supplied up to Busega, Bariadi and Lagaganbilili, and water supply to livestock is excluded. The total length of the water main for Phase 1 is 135 km.
- Phase 2 will commence following the completion of Phase 1 which will take approx. 3 years. It provides for an extension of the water supply to Meatu and to Maswa. Based on the results of further investigations regarding the availability of local water resources in the southern districts, either an extension of the transmission main up to 325 km (Option 1) or the construction/rehabilitation of boreholes and dams will be implemented (Option 3).

It should be noted that Phase 1 is viable without Phase 2 but not vice versa. The layout and geographical coverage of the two project phases are shown in Figure 1 and Figure 2. Note that the exact location of the command reservoir has not yet been decided (see Figure 26).

#### 2.3.2 Wayleave Requirements and Routing of Water Mains

The main water pipelines are planned to be routed along the main roads and within the existing road reserve. For national (trunk) and regional roads, the width of the road reserve is 60 m (i.e. 30 m on each side of the centre line), which is an expansion of the former road reserve width (50 m). TANROADS is currently in the process to secure the expanded portion (i.e. from 22.5 m to 30 m from the centre line) including relocation of structures and payment of compensations to affected property owners.

The standard wayleave requirement for water mains in Tanzania is 10 m (i.e. 5 m on each side of the centre line). The pipelines are planned to be located at the boundary of the road reserve, i.e. along a 10 w wide corridor at 20-30 m distance from the centre line of the roads. It should be noted, however, that permission has not yet been granted by TANROADS, but MoWI will make the necessary arrangements and negotiate the conditions for obtaining the required right-of-way from TANROADS. The written correspondence between MoWI and TANROADS is enclosed in Appendix 17.

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Figure 1: Routing of water main for Phase 1.

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Figure 2: Routing of water main for Phase 2 (Option 1).

#### 2.4 Detailed Description of Phase 1

The technical description presented below is based on the feasibility study (GKW Consult 2016a) and supplementary documentation (GKW Consult 2016b, 2016c).

According to GKW (2016a), Phase 1 of the project includes the following components:

- 1) Lake Victoria water intake with raw water pumping station
- 2) Raw water main
- 3) Water treatment plant
- 4) Pumping stations and pumping main to command reservoir
- 5) Main command reservoir
- 6) Gravity main for supply to Bariadi
- 7) Main for supply to Lagangabilili
- 8) Secondary system to supply villages within the corridor

#### 2.4.1 Lake Water Intake at Bukabile

The planned intake point at Bukabile will be located at a distance of 175 m from the shore line (1,140 masl.), with a total water depth of about 4 m and an extraction at 3 m depth. The water abstraction amounts to 19,000 m<sup>3</sup>/day. The raw water pumping station will either be constructed in form of submergible pumps in the lake or in form of a pumping station onshore. The intake point will be reached by an underwater pipe, a gabion dam, a bridge/landing stage, or a combination of these, depending on costs and ground conditions (to be confirmed in detailed design phase). Example drawings of intake structures are enclosed in Appendix 22 (one drawing of an onshore intake pumping station and two drawings of an intake that is constructed from gabions).

The MoWI design manual defines that intakes in lakes should preferably be 3-4 m below the water surface but at least 1 m above the lake bottom. In lakes with bilharzias risk, the intake point should be a minimum of 80 m from the shoreline with a connecting underwater pipe.

#### 2.4.2 Raw Water Main

The connection to the treatment plant will be via an approx. 600 m long steel pipe, DN 800 mm. Possible up lift of the underwater pipe when empty should be prevented by anchoring. The underwater pipe should be flexible; either the pipe material itself or the joints should give the required flexibility.

#### 2.4.3 Water Treatment Plant

The water treatment plant will be located at a distance of 400 – 500 m from the lake shore line. The needed area for the final phase (year 2035) is about 4 - 4.5 ha.

The treatment plant at Bukabile will include installations for full standard water treatment comprising dosing, mixing, flocculation, sedimentation, filtering, disinfections with all necessary tools and equipment for optimal operation of the plant.

#### **Clarification Process**

The main objective of water treatment is to meet internationally accepted potable water quality standards. The design criteria and standards for the relevant components of the surface water treatment plant are based on the requirements to achieve WHO standards, as specified in the Design Criteria Report.

The recommended water treatment process for Bukabile Water Works shall comprise:

- Coagulation by means of dosing of aluminium sulphate under high intensity mixing conditions
- Flocculation under moderate intensity mixing conditions
- Clarification of flocculated water by making use of sludge blanket type clarifier
- Filtration of clarified water by making use of rapid gravity sand filters
- Disinfection of filtered water by means of chlorine dosing
- Final pH-adjustment by dosing of soda ash

The two most important design criteria for the clarification process in water treatment are the hydraulic retention time and the hydraulic surface loading. Table 2 shows the common range for waterworks and the Consultant's recommendations for the water treatment plant at Bukabile:

**Design Criteria** Unit **Common Range Recommendations for Bukabile** Water Treatment Plant Hydraulic Retention 45 - 90 min. 60 Time Hydraulic Surface Loading m<sup>3</sup>/m<sup>2</sup>\*h Static Clarifier 0.8 - 1.2 1.0 Sludge Blanket  $m^3/m^2*h$ 1.2 - 2.01.5 Type Clarifier  $m^3/m^2*h$ Lamellae Type 2.0 - 3.52.5 Clarifier 2.0 Sludge Volume %age of water flow 1.5 - 3.0

Table 2: Design criteria for clarification process.

The clarification process is one of the two sources for residual waste streams, resulting in settled sludge to be abstracted from the clarifiers. In order to estimate the volume of sludge produced, the above table also indicates the estimated specific sludge production as percentage of the treated water flow.

#### **Design Capacity**

It is suggested that the following figures are applied for the design of the water treatment plant:

Recommended design capacity:  $19,000 \text{ m}^3/\text{d}$  for Phase 1.

#### Filtration Process

The most relevant design criteria for the filtration process in water treatment are shown in Table 3, with the filtration rate being the most decisive design parameter of a new filtration plant.

Rapid gravity sand filters are known as the most appropriate and cost effective solution to remove residual suspended solids (turbidity) out of clarified water.

Furthermore, additional design criteria such as the characteristics and the height of the filter media as well as filter backwashing conditions are also given in Table 3.

Design Criteria	Unit	Common Range	Recommendations for Bukabile Water Treatment Plant
Filtration Rate	m³/m²*h	6-10	8.0
Filter Media			
Characteristics			
Effective Grain Size	mm	0.8 - 1.2	1.0
Uniformity	-	< 1.6	1.4
Coefficient			
Filter			
Characteristics			
Height of Filter	m	1.0 - 1.5	1.2
Media			
Water Level above	m	> 0.6	0.8
Filter Media			
Ratio Width :	W : L	1:1.5-1:2.5	~ 1 : 2.0
Length of Filter			
Filter Backwashing			
Specific Water Flow	m³/m²*h	10 – 20	15
(Air/Water)			
Specific Water Flow	m³/m²*h	20 – 50	30
(Water only)			
Specific Air Flow	m³/m*h	40 - 70	50
(Air/Water)			
Backwash Water	% of water flow	2.0 - 5.0	3.0
Volume			

#### Table 3: Design criteria for filtration process.

Besides the sludge abstracted from the clarifiers, the backwash water is the second main source of waste streams of conventional water treatment plants. The estimated percentage of backwash water if compared to the treated water flow is also given in Table 3.

As for the clarification process described above, more detailed design criteria for individual plant components will be given in the design phase of the project.

#### Chemical Dosing and Mixing for Coagulation/Flocculation and Disinfection

The chemical dosing system comprises both the preparation and dosing of chemicals as well as the provision of appropriate mixing conditions for coagulation, flocculation and disinfection.

Along Lake Victoria, the dosing of aluminium sulphate is mostly chosen as appropriate solution. It is the most cost-effective and readily available coagulation reagent, and will also be used for the water treatment at Bukabile waterworks.

No additional flocculation reagent will be applied, and chlorine will be used further on as disinfection reagent.

For efficient floc formation, two factors are most decisive: the correct dosing of the appropriate coagulation reagent and the optimum hydraulic mixing intensity.

Coagulation – the creation of micro-flocs – requires quick, immediate high intensity mixing for only a short time period, whereas the subsequent flocculation – the agglomeration of micro-flocs to macro-flocs – requires moderate mixing and longer retention times.

Table 4 shows the main design criteria for chemical dosing and mixing, such as recommended dosing rates and optimum mixing conditions.

Design Criteria	Unit	Common Range	Recommendations for Bukabile Water Treatment Plant
Coagulation			
Alum Dosing Rate	g/m³	20-80	40
Hydraulic Retention Time	S	15 - 30	20
Velocity Gradient	s-1	500 - 1,000	700
Flocculation			
Hydraulic Retention Time	min.	15 - 30	20
Velocity Gradient	s-1	20 – 50	30
Disinfection			
Chlorine Dosing Rate	g/m³	1-4	2.5
Chlorine Reaction Time	minutes	20-40	30

#### Table 4: Design criteria for chemical dosing and mixing.

#### Sludge Treatment including Sludge Drying Beds

The two sources for waste streams in conventional water treatment are the sludge abstracted from the clarifiers and the backwash water generated during backwashing of the rapid gravity sand filters. In order to reuse the water, the installation of a water recycling plant, i.e. an appropriate sludge and backwash water treatment plant, is recommended. The drainage water will thus be returned to the head of the water treatment plant. The facilities will comprise:

- Backwash water settling tank
- Sludge drying beds for the sludge from the clarifier and the settled suspended solids generated in the backwash water settling tank

*Backwash water settling tank:* The backwash water tank will be sized to take the volume of one filter backwashing cycle. The installation of two parallel settling tanks is suggested in order not to disturb the settling process of one filter backwash water charge by the discharge of a second charge.

*Sludge drying beds:* The sludge drying beds shall ensure the drying of sludge obtained from the clarifiers as well as of the above mentioned sludge generated in the backwash water settling tanks. The drying beds will be placed next to the water treatment plant. An example drawing of a sludge drying bed is enclosed in Appendix 21. It is expected that around 30 sludge drying beds of 10 x 30 m are required.

#### Table 5: Design criteria for sludge drying beds.

Design Criteria	Unit	Value
Specific Drying Bed Surface	m²/1000 m³ RW	50

*Sludge disposal:* The quantity of sludge will be in the range of 2-40 mg of dried sludge per litre of treated water (i.e. 0.04-0.8 tonnes/day for Phase 1), depending on the raw water quality. Its composition is mainly minerals and it is thus suitable for land application, for example as agricultural fertilizer or it can be reused as filling material in road construction, etc. However, testing will be carried out in order to detect heavy metals, pathogens, or other pollutants originating from the raw water, yet there is no indication at present that the raw water is contaminated. In case the dried sludge cannot be reused, it will be disposed of at an approved landfill.

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Figure 3: Example drawing of water treatment plant.

#### 2.4.4 Pumping Stations and Pumping Main to Command Reservoir

In order to transfer the treated water from the water treatment plant to the main command reservoir, a single or two staged pumping scheme will be installed (depending on the exact location of the main reservoir, see below). The diameter of the pumping main will be DN 700 (Ductile Iron). In order to supply the villages with water, a secondary system will also be established including another pump station at the water treatment plant in order to pump water to Bulima secondary reservoir at a distance of 4.3 km (1,230 masl., V=500 m<sup>3</sup>).

#### 2.4.5 Main Command Reservoir

The main command reservoir was originally proposed at Ngasamo hill. According to GKW Consult (2016a), this location is preferable due to its higher elevation and shorter distance to the settlements to be supplied than the other proposed hills at Dutwa. However, during the scoping and stakeholder consultations for the ESIA study, it was realised that Ngasamo hill has already been earmarked for nickel mining. A new location for the main command reservoir has therefore been explored at Shigala hill, Nyamatembe hills or Lwangwe hills, which are all located in close vicinity to each other. The final decision has not yet been reached, but the exact location would not affect the overall design and routing of the water mains (except at the command area site). The volume of the main reservoir will be 2,000 m<sup>3</sup>. It will be constructed in concrete with rectangular shape.

#### 2.4.6 Gravity Main towards Bariadi and Lagangabilili

From the main command reservoir, the water will be supplied by gravity towards Bariadi. In order to allow for gravity supply to the secondary reservoirs (for village supply), there will be two gravity mains from the main reservoir towards Bariadi.

The first gravity main will provide water to two secondary reservoirs (Isenge and Gagabali) and to Yoma reservoir. Yoma reservoir will be at an elevation of 1,328 masl., have a volume of 1,000 m<sup>3</sup> and will be the main reservoir for Bariadi. The gravity main will be DN 300 / 500, PN 16, and the chosen material is Ductile Iron for pipes larger than DN 300 and uPVC for smaller pipes. The pipelines have an expected lifetime of 40 years.

The second gravity main will provide water towards Lagangabilili. This pipeline will be DN 500, PN 16 and DN 300 (Ductile Iron). From this pipeline, water will be abstracted at Nyangokolwa junction and pumped towards Nyangokolwa secondary reservoir (pumping main of 5.6 km, DN 200, uPVC pipes).

#### 2.4.7 Camp Sites

The siting and design of campsites have not yet been completed. It is however likely that the main camp will be located near the proposed water treatment plant with secondary camps in Bariadi and Lagangabilili. The specifications for the camp will be included in the tender documents and contracts, including environmental, health and safety requirements.

#### 2.5 General Description of Phase 2

According to GKW Consult (2015), the district centres of Mwanhuzi and Maswa are currently using local water resources, and the situation regarding water supply, taking into account quantity and quality issues, "is not as strenuous as in Bariadi". Because of this and also based on engineering and financial analyses, GKW Consult (2015) has recommended a phased approach to project implementation. Phase 1 is already described above, while Phase 2 will extend the water supply to Mwanhuzi and Maswa. It should be noted that Phase 2 will be subject to a separate ESIA study at a later stage.

The phased approach is based on the following reasoning (GKW Consult 2015): Following an initial operation of the Phase 1 system for some ten years, a further extension could be considered. If response

to the system is good and all villages/wards are connected and consuming the expected amount of water, an extension of the system beyond Lagangabilili would only be possible by constructing an additional main pipeline parallel to the pipeline constructed in Phase 1 (and extending the other system components, such as the treatment plant, the pump stations, reservoirs, etc.). If response to the system is lower and villages remain reluctant to connect to the system or use considerably less water than assumed, there are still reserves in the system to extend the supply system towards Mwanhuzi and/or Maswa. There is also the possibility, which is to be investigated, of developing local water resources in order satisfy the water needs of Mwanhuzi and Maswa.

A gravity supply towards Mwanhuzi and Maswa is not possible, and pumping will therefore be required. At Bariadi junction, the main splits, one branch will supply Mwanhuzi (via the Phase 1 main to Lagangabilili), while the second branch will supply Maswa.

#### 2.6 Secondary System to Supply Villages and Wards

A secondary system of reservoirs and pipelines is suggested for water supply to the villages and wards located within a 12 km zone from the water supply main. The proposed concept does not foresee direct water extraction from the main pipeline but village / ward supply via secondary reservoirs. The village connections are not designed in detail at this stage of the project, but the connections from the secondary reservoirs to the wards/villages have been estimated to cover a total distance of approx. 590 km.

The scale and coverage of the secondary system depends on the actual demand in the villages and the process of establishing COWSOs. The design of each secondary connection will be done through a participatory and demand-driven process, whereby the communities themselves identify suitable locations for the water infrastructure including routing of secondary pipelines. The COWSOs will be responsible for operation and maintenance of the water infrastructure and for setting user tariffs, with technical support through the districts and consultants/NGOs. It is assumed that the impacts of the secondary system will be minimal, provided that this bottom-up approach is respected and enforced.

#### 2.7 Construction Activities

The installation of the water pipelines, which constitutes the main construction works (in terms of scale and duration), involves the following steps/tasks: mobilisation, clearing of work strip, trenching, spoil disposal, pipe installing, backfilling, strength testing, clean-up, and work strip restoration. The detailed work schedule has not yet been defined, but it should be noted that the construction works for Phase 1 will take approx. 3 years and even longer for Phase 2 (if implemented).

Clearing of work strip for the pipeline right-of-way is performed in order to provide space for construction equipment, while trenching is performed in order to provide the minimum required cover and side clearance to the pipeline. Spoil removed from the trench is normally left alongside the trench in a spoil bank, unless traffic conditions require immediate transport. Excess soil or rock will be disposed of in appropriate areas or spread over disturbed areas along the pipeline route, if possible. The siting of permanent spoil tips will require approval by the village authorities and the Engineer, giving due consideration to avoidance and mitigation of environmental and social impacts such as physical and economic displacement, visual intrusion and disturbance to natural habitats and cultural sites/objects.

Usually pipe segments are strung on wooden skids alongside the trench. The pipe installation works depend on the pipe material. Backfilling is done, according to the technical specification, using partly native material and partly imported sand or soil. Further, the pipeline is pressurised to a minimum of 1.25 times its design pressure, according to the technical specifications. Clean-up and work strip restoration include recontouring the work strip and repairing roads, drainage, river banks and fences. The number of construction workers will be decided by the contractors. It is expected that the construction works will be divided into several lots and that each contractor will deploy multiple teams for the installation of pipelines, water reservoirs and pump stations. Each team typically consist of 8-15 persons. The expected number of workers for the water treatment plant is 50-70 persons. In total, there will be several hundred workers involved in the construction of the entire water supply scheme during the construction phase (estimated at 3 years for Phase 1). This will require one or more camps for workers' accommodation (not yet planned at the current stage).

#### 2.8 Sanitation and Wastewater Management

The Simiyu project will bring water to settlements that currently have almost no sanitation infrastructure. A comprehensive sanitation component is therefore a prominent part of the project approach (GKW Consult 2016a, 2016c). It includes the whole cycle of wastewater, from the construction of public and school toilets, the improvement of household latrines up to faecal sludge transport, construction of sludge treatment plants and hygiene awareness campaigns.

In view of the increasing scarcity of water resources in Simiyu region, combined with low actual water consumption and intense management requirements of piped sewerage systems, the project will promote locally adapted on-site sanitation, rather than water toilets and high water usage, which would be prerequisite to make a sewerage system viable. The volume of water consumed per household is comparatively low in Simiyu region since the majority of urban population cannot afford to use water to flush toilets. Only 10% (Lagangabillil) to 30% (Bariadi) of the urban population, in total 41,000 people, will have house connections within the investment horizon of 2025, and only a small fraction of those with a house tap will have in-house plumbing, bath rooms, showers, water toilets and would qualify for piped sewerage or for a septic tank. At least 100-350 connected users (not people) per hectare would be required to make a conventional sewerage system economically viable.

The project will promote smart dry toilets that have a mobile superstructure or use dual pits, which either do not need trucking at all, or only rarely. Since it cannot be completely avoided that infiltration even from dry latrines modestly reaches the groundwater, the government usually enforces closure of all shallow wells in urban areas. However, this has not been done in Bariadi and the other towns in Simiyu so far, since the government is currently not able to provide alternative water to the people. Shallow wells are currently used to a large extent in Bariadi and are a dangerous health hazard to people. The government will therefore enforce closing of these shallow wells as soon as it succeeds to deliver appropriate water to the people. With bulk water rather than urban groundwater for direct human consumption, improved toilets will not cause a health and hygiene risks for the urban population.

The future quantity of septage from the five urban centres in Simiyu (Phase and 2) is estimated at 38,000 m<sup>3</sup>/year (Table 6). One or two vacuum trucks will be needed to handle this quantity, assuming that a truck does about 4-8 trips per day. With this limited demand, the project will initially rely on trucking services from Mwanza with minimal operational risk. The sludge will be treated at sludge treatment plants through anaerobic ponds and constructed wetlands and then used as fertilizer for agricultural purposes. Sludge treatment plants are foreseen in three locations; Bariadi, Lagangabilili and Nyashimo. Three decentralized locations are required to facilitate local marketing and usage of the fertilizer and to reduce the risk of fraudulent dumping of the sludge.

Another aspect of utmost importance is the hygiene campaigns on why and how to improve traditional pit latrines, appropriate hygiene behaviour and the reuse of stabilized faecal sludge. The hygiene campaigns are integrated part of the community mobilisation and planning process. The project will raise awareness that climate resilience is only possible if it goes along with improved health conditions. Women are important change agents and, as principal caretakers for newborn and children, also a crucial target group for hygiene sensitization measures. Awareness raising and behaviour change will also be achieved by construction of improved school toilets and so-called sanitation clubs in schools.

#### 2.9 Institutional Arrangements

#### 2.9.1 Construction Phase

During the project construction phase, the management arrangement shall comprise of the following four levels:

- 1. Project Implementation Unit
- 2. Project Steering Committee
- 3. Bulk Water Supplier
- 4. Service Providers

#### **Project Implementation Unit**

The existing UWSAs are weak in terms of capacity to operate and maintain the completed water supply facilities let alone the capacity to implement the proposed water supply project. There will also be need to create and/or cluster new entities with limited experience in project implementation such as UWSAs at Bagangabilili and Nyashimo and COWSOs along the transmission line and the bulk water supplier. Therefore, there is an imperative need for enhancing the capacity of entities at the project level through establishment of a Project Implementation Unit (PIU).

The PIU is meant to be an operation unit supplementing and enhancing the existing skill mix of the project implementing agencies (Bulk Water Supplier, UWSAs and COWSOs) rather than a monitoring body. It is expected to work in tandem with the existing staff with focus on strengthening implementation of project. The focus of the PIU is to enhance the pace and quality of implementation of the project activities.

The main roles and responsibilities of the PIU shall include but not limited to:

- a) Procurement and management of service providers and external experts for implementation of project activities
- b) Project management, coordination and technical support for project implementation
- c) Ensuring the optimal technical quality in project implementation and service delivery
- d) Monitoring of project progress and coordination of the various service providers
- e) Staying abreast with latest development in the areas of expertise and facilitate transfer of relevant information and best practices to staff in the project implementing agencies
- f) Preparation of project implementation reports

The PIU shall consist of following professionals:

- a) One expert engineer qualified and experienced in water resources or civil engineering to be engaged as the manager of the PIU
- b) One expert engineer qualified and experienced in water resources or civil engineering
- c) One expert engineer qualified and experienced in electromechanical engineering.
- d) One community management expert (community liaison officer) qualified and experienced in community organisation and engagement in community based development programmes.
- e) One qualified and experienced professional accountant
- f) One expert qualified and experienced procurement processes and contract
- g) One Information Technology officer
- h) One environmental officer
- i) One office assistant
- j) Two drivers
| Urban Area    | Population<br>(No.) | Water Supply<br>(% Users) |        | Sanitation<br>(No. of Users) |        | Sludge<br>(m³/year) |       | Digestor<br>(m³/day) |        |      |
|---------------|---------------------|---------------------------|--------|------------------------------|--------|---------------------|-------|----------------------|--------|------|
|               |                     | House                     | Yard   | Public                       | Tank   | Latrine             | Tank  | Latrine              | Total  |      |
| Busega        | 14,500              | 20                        | 30     | 50                           | 2,900  | 11,600              | 609   | 2,436                | 3,045  | 1,22 |
| Bariadi       | 59,500              | 30                        | 30     | 40                           | 17,850 | 41,650              | 3,749 | 8,747                | 12,495 | 5,79 |
| Lagangabilili | 10,500              | 10                        | 40     | 50                           | 1,050  | 9,450               | 221   | 1,985                | 2,205  | 0,74 |
| Maswa         | 62,500              | 20                        | 40     | 40                           | 12,500 | 50,000              | 2,625 | 10,500               | 13,125 | 5,25 |
| Mwanhusi      | 33,750              | 20                        | 30     | 50                           | 6,750  | 27,000              | 1,418 | 5,670                | 7,088  | 2,84 |
| Total         | 180,750             | 41,050                    | 61,525 | 78,175                       | 41,050 | 139,700             | 8,621 | 29,337               | 37,958 |      |

#### Table 6: Estimated volume of sludge from private septic tanks and latrines in urban areas.

Notes:

% sludge served by vacuum trucks: 33% for tanks, 10% for latrines

No. of vacuum trucks required: 0.19 for tanks, 0.20 for latrines, 0.40 for total

Sludge generation: 0.21 m<sup>3</sup>/capita/year

10m<sup>3</sup> capacity, 4 trips per day, 365 working days: 14,600 m<sup>3</sup>/truck/year

#### Project Steering Committee

The Project Steering Committee (PSC) is an advisory committee made up of high level stakeholders and/or experts to provide guidance on key issues such as project policy and objectives, budgetary control, resource allocation, and project decisions involving large expenditures. With that regard, the following members shall form the PSC:

- a) Appointed representative of the MoWI. The appointed official shall have to remain the same throughout the project implementation.
- b) Regional Water Adviser for Simiyu regional secretariat. In the event this official is replaced, the new one shall have to undergo project orientation under the guidance of the PIU.
- c) District Water Engineers of the districts in which the project is being implemented. In the event these officials are replaced, the new ones shall have to undergo project orientation under the guidance of the PIU.

The PSC shall provide cross-functional leadership and direction as follows:

- a) Monitor business and strategic issues and provide advice to the project team on those areas that may present a risk to the project or have impact on the project rationale or success
- b) Resolve issues outside the authority or control of the project management, such as priority setting, decision-making and resource commitments that cross organisational boundaries and require agreement from senior stakeholders
- c) Ensure provision of the required resources for planning and delivery of the project
- d) Provide management support, direction and advice to the project management based on the project reporting to the Committee
- e) Actively and overtly support the project and act as an advocate for its outcomes

The PSC shall provide project management governance as follows:

- a) Establish delegation authorities and limits for the project management, with regard to cost, time, resource, quality and scope
- b) Define the acceptable risk profile and risk thresholds for the project
- c) Oversee stakeholder management and change management programs
- d) Oversee the project quality assurance program
- e) Review and approve or reject project plans
- f) Resolve matters of project cost, time, risk, resource, quality and scope escalated to the Committee
- g) Monitor project progress against approved project case, project plans and delegations
- h) Approve project closure

The PSC shall have to maximize project benefits by undertaking the following roles:

- a) Establish how benefits shall be defined and measured
- b) Review and approve or reject change management, and benefits realisation plans
- c) Monitor progress against approved plans
- d) Monitor project outputs for alignment to support agreed outcomes and benefits
- e) Monitor and facilitate the implementation of new operating models
- f) Monitor realization of benefits and report to PCU

The PSC will have a monitoring and advisory role to the PIU. The PSC will meet semi-annually. The first meeting will be convened by the PIU in which the chairman will be elected. The chairman will then call subsequent meetings of the PSC. The cost of the meetings of the PSC will be part of the project costs as the case for PIU.

#### Bulk Water Supplier

It is proposed to establish a bulk water supply and sanitation authority, under the Water Supply and Sanitation Act 2009, similar to that of KASHWASA (Kahama Shinyanga Water Supply and Sewerage Authority). The proposition is made in consideration of the huge investments involved in the construction of the water supply system and the geographical spread of the transmission mains including water treatment plant, pumping stations, and command reservoir.

The bulk water organization shall be responsible for sale of bulk potable water to a cluster of urban water supply and sanitation authorities (UWSAs) of Nyashimo, Bariadi and Lagangabilili towns and organisations to be established to manage water supply to villages along the transmission mains. The bulk water supply and sanitation authority, to be established, shall be responsible for the operation and maintenance of the water treatment plant, pumping stations, transmission mains and the command reservoir. The supply reservoirs and distribution networks shall be operated and maintained by the cluster of UWSAs or legal village level organisations which shall be formed along the transmission mains. MoWI in collaboration with the regional authorities of Simiyu region is responsible for establishment of the bulk water supply and sanitation authority and formalisation of the clustered UWSAs of Nyashimo, Bariadi and Lagangabilili towns.

MoWI in collaboration with the regional authorities of Simiyu region shall be responsible for recruitment of the initial staff for the bulk water organisation to be established. The bulk water organisation is to be headed by a qualified and experienced engineer and supported by the following 18 categories of staff:

- a) One engineer to be responsible for the transmission mains and the command reservoir
- b) One engineer to be responsible for the water treatment plant and pumping stations
- c) Two technicians in electromechanical engineering to be responsible for the water treatment plant and pumping stations
- d) Two technicians in plumbing/works to be responsible for the transmission mains and command reservoir including bulk meter reading
- e) One technician in laboratory services to be responsible for water quality
- f) Four treatment plant and system operators
- g) One staff with degree in business administration to be responsible for business operations
- h) One professional accountant to be responsible for accounting duties and financial reporting
- i) One staff with degree in information systems to be responsible for database management
- j) One staff qualified in office management and secretarial services
- k) Two drivers to be responsible for the organisation's vehicles
- I) One Public Relations expert with experience in community mobilisation and awareness creation

#### Service Providers

The service providers shall comprise of local and foreign experts/firms engaged by PIU to implement the project activities. They will work on the basis of specific contracts.

#### 2.9.2 Operation Phase

During the operation phase, the management arrangement shall consist of the Bulk Water Supplier and the water and sanitation service providers in towns (UWSAs) and rural areas (COWSO).

The PIU and PSC would have relinquished their roles and responsibilities. Monitoring and evaluation for the UWSAs shall be done by EWURA and those of COWSOs by the MoWI in collaboration with the respective local government authorities.

It is envisaged that Phase 1 of the project will require the establishment of two new UWSAs (in addition to the existing Bariadi Urban Water and Sanitation Authority, BARUWASA), namely in Nyashimo and

Lagangabilili, the district centres of the new districts of Busega and Itilima. For the rural villages, COWSOs shall be formed around water supply tanks. An estimated 29 COWSOs will be required for Phase 1.



Figure 4: Organogram for the Bulk Water Supplier.

# 2.10 Government Planning for Infrastructure and Services

As part of the overall project approach, the Government of Tanzania is committed to provide public services and infrastructure in the villages served by the Simiyu water supply scheme. The villages located within the 12 km corridor (on each side of the water mains) will probably be subject to increased in-migration, thus affecting the siting decisions for basic infrastructure (e.g. roads, electricity) and services (health, education, etc.).

In response to the increased demand for public infrastructure and services, the Government will initiate Participatory Village Land Use Planning (VLUP) in all the villages served by the Simiyu water supply project. The VLUP will define and zone different land uses in the villages, including the residential land to be used for current and future development. The VLUP will be attached with bylaws to assist the Village Councils and their respective Village Land Use Management Committees (VLUMC) to manage its implementation.

The zoned residential areas in the proposed and approved Village Land Use Plans are to be proposed for declaration as planning areas with the purpose of urban planning. Declaration of planning areas will be succeeded by preparation of detailed planning schemes (the Town Planning Drawings) that will define and allocate land of different uses in accordance with the prescriptions in the Second and Third Schedules of the Urban Planning Act of 2007. The purpose of preparing detailed planning schemes along the corridor will be to provide parcels of land available for various urban land uses. Surveying the land parcels will follow thereof to define their respective boundaries.

The process has been stipulated into laws of the land, namely the Land Act No. 4 and Village Land Act No. 5 of 1999, the Land Use Planning Act No. 6 of 2007, the Urban Planning Act No. 7 of 2007, and the Local Government (District Authorities) Act of 1982. The institutional framework for guiding the process is well

defined in the mentioned statutes and the government will guide such process in accordance with the laws, and their respective regulations and guidelines.

Preparation and implementation of the VLUPs and detailed planning schemes involves a stepwise process that will be monitored and evaluated by the Planning Authority's Participatory Land Use Management Team, popularly known as the PLUM Team, which comprises eight members coming from sectors of Urban Planning, Land Use Planning, Land Survey and Mapping, Community Development, Forestry, Game, Agriculture, Livestock and Fisheries Development, and Economic Planning and Statistics.

Managing, guiding and facilitating the process is mandated to the Planning Authority (town and district councils) with the respective village governments in the project area. However, success of this process depends also on the involvement of other key actors from the governmental and non-governmental sector, especially in facilitating the process and considering the financial limitations which the council is currently facing.

The process will require capacity building for village organs (Village Councils, VLUMC and the Village Assembly) that will be key players in the process, especially facilitating the participatory VLUP. Financial resources are required to prepare the VLUPs and detailed planning schemes to guide development in the project areas. The costs will be covered by the project.

## 2.11 Time Schedule

The feasibility study was completed in September 2016, and the project is currently seeking financing from the Green Climate Fund (GCF). Following project approval, the detailed design and tender documents is expected to take 6-8 months in total, while the construction period is estimated to take 3 years after contract award(s) inclusive of the defects liability period.

Assuming that approval of the design and tender documents are completed by the first quarter of 2017, tendering could start in mid-2017 with contracts being awarded at the start of 2018. Construction could then start in the second quarter of 2018. The proposed infrastructure for Phase 1 could then be operational by 2020.

## 2.12 Project Cost

Total capital investment for Phase 1 (Option 3), in million Euros (€), and specific capital investment cost per capita, are given Table 7. The project is seeking financing from the Green Climate Fund (GCF).

The costs have been calculated based on the predicted water demand in year 2025. The total water demand was estimated by using the lower estimate for per capita water consumption provided in the design manual of the Ministry of Water and Irrigation. These stipulated rates are 90 I per capita and day for house connections in urban areas, 70 I for yard taps and 25 I for stand-posts. For rural settlements, 60% of the above consumption rates were applied.

#### Table 7: Project cost.

Item	Unit	Phase 1 (Option 3)
Population 2025	No.	263 000
Urban	No.	57 000
Rural	No.	206 000
Total Cost 2017-2025	€ 10 <sup>6</sup>	91,2
	€/capita	377
Bulk Supply	€ 10 <sup>6</sup>	77,3
Treatment	€ 10 <sup>6</sup>	3,9
Pipelines	€ 10 <sup>6</sup>	52,9
Reservoirs	€ 10 <sup>6</sup>	2,7
Pumping Stations	€ 10 <sup>6</sup>	0,7
Supervision	€ 10 <sup>6</sup>	2,8
Capacity Building	€ 10 <sup>6</sup>	1,5
Contingencies	€ 10 <sup>6</sup>	12,9
Distribution 2017-2025	€ 10 <sup>6</sup>	13,9
Urban	€ 10 <sup>6</sup>	6,9
Rural	€ 10 <sup>6</sup>	7

# 3 APPROACH AND METHODOLOGY

## 3.1 Impact Zones and Study Area

The study area has been defined based on a preliminary analysis of the direct (primary) and indirect (secondary) impacts of the proposed project as described above. Accordingly, it has been divided into a direct impact zone and an indirect impact zone. These zones constitute the project's area of influence where risks and impacts will be further analysed.

The direct impact zone covers all areas that will be physically affected by the construction and operation of the Simiyu Water Supply Project. It includes all the infrastructure included in the above project description as well as an approximately 200 m buffer zone surrounding the water mains, intake and water treatment plant, pumping stations and main water reservoirs.

The indirect impact zone consists of an area beyond the direct impact zone where the construction and operation of the water supply scheme may indirectly affect the physical, biological and human environment. The exact size of this zone typically depends on the themes being studied, but for simplicity and consistency it has been defined as the 12 km corridor for the secondary water supply system (see Figure 1). One notable exception is aquatic ecology in the lake where the indirect impact zone covers an extended area around the intake point.

The scope of the current ESIA study is limited to Phase 1 of the project. This is mainly motivated by the long time lag between the two phases and the fact that project financing is currently only targeting Phase 1. It should be noted, however, that baseline data have been collected from the entire project area (corresponding to Option 1), except for the public consultations at ward and village level which have been restricted to Phase 1 only.

# 3.2 General Approach

This ESIA employs a standardised three-step approach to impact assessment in order to make the findings, conclusions and recommendations more objective and transparent. The key principle of the procedure is to combine the 'value' of the affected environment and the 'magnitude' of impacts to arrive at an overall assessment of impact.

- <u>Step 1</u> attempts to attach a 'value', as judged from the baseline situation, for that specific issue or theme within the project area, giving a ranking on a scale from "low" to "high". The setting of value is based on the absolute value, if applicable, and its value in the local, regional, national and international perspective. It also takes into account uniqueness and vulnerability.
- <u>Step 2</u> consists of a description and an identification of the 'magnitude' of the potential impacts on that specific issue or theme. The magnitude is considered in terms of the extent (local, regional, national, international), duration, severity/intensity, reversibility, and probability/risk of the different impact sources. The magnitude is measures on a scale from "large positive" to "large negative" (see Table 8).
- <u>Step 3</u> combines the results from the two first steps based on the criteria illustrated in Figure 5. The outcome of this exercise is the final 'impact assessment' and results in a ranking of the impacts on a scale from "very large positive" to "very large negative". In the summary tables, this ranking is illustrated by "plusses" and "minuses". Uncertainty will be indicated with the symbol ?, and no impact or irrelevant is marked with a 0.

Impact		Definition	
None or Minimal		No detectable change to the environment.	
	Low	A small but detectable and permanent change to the environment; or,	
Positive		A larger short-term / temporary change to the environment.	
and	Medium	A larger, but non-fundamental permanent change to the environment; or,	
Negative A short-term / temporary large change		A short-term / temporary large change to the environment.	
	Large	A fundamental change to the environment.	

Table 8: Definitions of different levels of impact magnitude.

Note: Fundamental changes are those which are permanent, detrimental and would result in widespread change to the baseline environment.

Source: Multiconsult

The three steps for the different topics and themes are described in Chapter 5 (Baseline Conditions) and Chapter 7 (Assessment of Impacts):

- Baseline situation: The value is derived from an assessment of the existing environment (physical, biological and human) at the inception of the construction works. Given the nature of the proposed works and the likely short lead time, the baseline can be considered as the current environmental and social conditions. The specific methodology for collecting and analysing baseline data is presented below. For themes that cannot easily be valued, such as parts of the physical environment (e.g. geology and soils) and the human environment (e.g. population characteristics), the value is by default assumed to be high.
- Assessment of impacts: Based on available knowledge of water supply schemes in general and the
  proposed project in particular, potential impacts can be predicted for each theme under the
  physical, biological and human environment. Following the identification and description of each
  of these impacts, the magnitude of the impacts on each theme is determined (see Table 8). The
  final impact assessment is then summarised at the end of the chapter by combining the baseline
  value and the impact magnitude, as described above.

The assessment of impacts in Chapter 7 is based on the project design but without any additional mitigation measures. In Chapter 8, a post-mitigation (residual) impact assessment is presented taking into account the proposed mitigation measures, i.e. all actions that can eliminate, offset, or reduce potentially adverse environmental and social impacts to acceptable levels.



#### Figure 5: Impact assessment methodology.

Source: Multiconsult

# 3.3 Specific Methodology

#### **Vegetation**

The vegetation survey took place from 27-31 May 2016 and was based on qualitative methods where a car was used to pass through the entire proposed pipeline routes. Along the routes several stops were made at places of interest with respect to remaining natural vegetation. Walking transects and inspections of representative sites for construction of pumping station and water reservoirs were also made. The intake site at Bukabile was also visited and surveyed. An overview of the sampling points is given in Appendix 16.

The vegetation types were classified on the basis of their physiognomic characterization. General identification of plant species was conducted directly in the field by the botanist aided by various plant identification books, most notably the Flora of Tropical East Africa (FTEA).

For the interesting plant species which could not easily be identified in the field, plant specimens were collected pressed and taken to the herbarium of the University of Dar es Salaam for further identification and preservation for future references.

The CITES list (Convention on International Trade an Endangered Species of Wild Fauna and Flora) and the IUCN Red List of Threatened Species, were used to identify the conservation status of identified plant species.

Digital Camera was used to take photographs for illustrations while GPS was used for used for recording the geographical location for the identified vegetation types and key plant species.

#### **Terrestrial Fauna**

During the field visit that took place from 27-31 May 2016, extensive biological investigations were conducted with emphasis on terrestrial and aquatic fauna biodiversity including avifauna, large and medium sized mammals, small mammals, amphibians, reptiles and fish within and around the project area.

The project areas were surveyed using methodologies by Leon et al. (2002) which entailed transect walks and use of indirect and direct methods for registering main groups of terrestrial fauna biodiversity within the project areas. The sampling points were the same as for the vegetation survey (see Appendix 16). The survey methods entailed direct observation of dung and other animal signs along specific transects, key informant interviews and opportunistic collection.

#### Cultural Heritage

Prior to the commencement of field work, background research was conducted including review and evaluation of archaeological, historical and ethnographic literature relevant to the proposed project area and locality in general.

The archaeological survey was aimed at identifying archaeological sites and relics as well as other cultural heritage sites such as graves, burial and religious or sacred sites that may be affected by the proposed project. The survey was extensive rather than intensive. The purpose was to cover as large an area as possible for the purpose of obtaining a good amount of data. In many places, however, the survey was hindered by dense vegetation. Only open places, e.g. farms, roads and foot paths were properly surveyed. The survey techniques involved driving slowly along motorable roads, observing interesting structures and trying to recover artefacts such as potsherds, slag, and lithic fragments along the road, on road cuttings or further off the road where visibility allowed. Attention was also paid to places disturbed by charcoal burners, borrow pits and dumping pits.

Consultations with local communities were conducted in order to find and identify the value and importance of the cultural heritage in the study area. This was done mainly through interviews. The interviews were conducted in Swahili language, so that the informants could express themselves better. In rare cases where people could not speak Swahili, a translator was used. The Ministry of Natural Resources and Tourism, specifically the Division of Antiquities which is the responsible organ for conservation and management of cultural heritages in the country, was also consulted to obtain views and concerns related to the proposed project. Also, the archaeologist consulted some officers of the National Museum and House of Culture for views and concerns.

## 3.4 Limitation and Data Quality

The ESIA study has been carried out over a highly compressed time frame of about two months. Thus, the data cannot be construed as being exhaustive, yet they are considered sufficient for establishing a baseline and predicting the major impacts, mainly due to reliance on a comprehensive stakeholder consultation

process and extensive use of available secondary data. The project's impact zone is not a critical area for biodiversity that would require repeated field surveys.

The data quality for each of the main topics is evaluated in Table 9. Overall, the data presented in this ESIA report are considered to have sufficient quality with respect to both baseline conditions and impact magnitude.

Table 9: Data quality for baseline valuation and impact assessment.

Issue	Baseline	Impact
Physical Environment		
Topography and landscape	High	High
Geology and soils	Medium	Medium
Climate and air quality	Medium	Medium
Noise	Medium	Medium
Water resources	Medium	Medium
Biological Environment		
Protected areas	High	High
Vegetation	High	High
Terrestrial fauna	High	High
Aquatic ecology	Medium	Medium
Human Environment		
Population	High	Medium
Settlement pattern	High	Medium
Land use	High	Medium
Local economy	Medium	Medium
Water supply and sanitation	High	Medium
Health and education	Medium	Medium
Safety and security	High	Medium
Cultural heritage	Medium-high	Medium
Tourism	Medium	High

# 4 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

## 4.1 Introduction

The chapter provides an overview of the applicable national and international policy, legal and administrative framework. The chapter is divided into three sections:

- Policy framework: Relevant national policies and international safeguard policies
- Legal framework: Relevant national legislation and international agreements and conventions
- Administrative framework: Relevant national institutions responsible for implementing the policies and laws

#### 4.2 Policy Framework

#### 4.2.1 National Policies

#### National Environment Policy, 1997

The National Environment Policy (NEP) provides policy guidance for determining priorities within a number of sectors. With regard to environmental assessment it states that "EIA shall be used as a planning tool to integrate environmental considerations in the decision-making process, in order to ensure that unnecessary damage to the environment is avoided". For the water, sewerage and sanitation sector it is stated that the environmental objective is to "support the overall national objective of providing clean and safe drinking water to within easy reach, to satisfy other water needs, to protect water sources and to prevent environmental pollution".

#### National Land Policy, 1997

The national Land Policy provides policy guidance on land tenure, land use management and administration. The overall aim is to promote and ensure a secure land tenure system for economic and social development without upsetting or endangering the ecological balance of the environment. The Policy recognizes the importance of social services such as water supply, road networks, and energy development that take place on land for human benefits. It recommends that these should be done in a right manner so as to protect land for other uses and avoiding land degradation.

#### Water Policy, 2002

The Water Policy recognises water as an important requirement for all humans to maintain health, and to restore and maintain the functions of natural ecosystems. In Section 2, it is stated that water is a basic natural resource for socio – economic development and that it is fundamental for various social –economic development activities such as industrial production, irrigated agriculture, livestock keeping, mineral processing, hydropower production, navigation and recreation and tourism. With regard to domestic water supply it is stated that the coverage in the provision of safe water is undesirably low and that the national economy suffers because of inadequate water supplies to the urban and rural population.

#### National Human Settlements Development Policy, 2002

The overall goal of the National Human Settlements Development Policy (NHSDP) is to promote the development of sustainable human settlement and to facilitate the provision of adequate and affordable shelter to all people, including the poor. Among its many objectives the policy advocates for:

- Environmental protection within human settlements and protection of natural ecosystems against pollution, degradation and destruction in order to attain sustainable development.
- Development of human settlements where everyone has adequate and affordable shelter, which is durable, healthy, safe and legally secure, accessible and which matches with the culture and living habits of the occupants.

#### Wildlife Policy, 1998

The Wildlife Policy provides a framework for conserve and management of wildlife and wetland resources. Any specific provisions to guide water supply projects are not given but the Policy has relevance if water supply schemes impinges on protected areas, wetland and wildlife populations.

#### National Fisheries Sector Policy and Strategy Statement, 1997

The overall goal of the National Fisheries Policy is to promote conservation, development and sustainable management of the fisheries resources for the benefit of present and future generations. The specific goal of protecting productivity and biological diversity of coastal and aquatic ecosystems. The Policy has relevance in relation to water supply if a specific project may have an impact on aquatic habitats and fish populations.

#### Women and Gender Development Policy, 2000

The objective of this policy is to promote gender equality and equal participation and opportunities for men and women. The Policy is relevant for water supply projects as they have a potential to significantly reduce the work burdens of women and children who traditionally are charged with the task of fetching water.

#### Agriculture and Livestock Policy, 1997

The Policy recognises that agricultural activities are critically dependent on environmental resources such as land, water, forest and air among others. It emphasises that the use of these resources can affect directly or indirectly other natural resources through dynamic and complex interrelationships existing in the natural systems. The Policy seeks to provide a framework for the promotion of integrated, sustainable use and management of natural resources such as land, water, soil and vegetation. As water supply is a critical factor for both crop cultivating and livestock raising the Policy is relevant in the context of the Simiyu Water Supply Project.

## The National Health Policy, 2003

The National Health Policy was updated in 2005. It aims at improving the health and wellbeing of the all Tanzanians with focus on those most at risk. Under Section 2.1, which deals with the objectives of the Health Policy, universal access to safe and clean water is mentioned as one of 7 health service goals. Under the heading "Environmental Health and Sanitation" (Sub-section 3.5.2.5) monitoring of water quality and safety is mentioned as one of several activities that supports the achievement of improved sanitation.

#### National HIV/ AIDS Policy, 2001

This policy gives general guidelines on how to prevent, care and support those infected and affected by the HIV epidemic and mitigation of its impacts. The policy guidelines are relevant for all construction projects, including water supply projects, as influx of labourers and camp followers will increase the risk for spread of HIV infections and AIDS.

#### Cultural Policy, 1997

The Cultural Policy covers a wide range of topics relating to both living cultural heritage and historical and archaeological remains ("cultural property"). The policy requires that "all land development shall be preceded by Cultural Resource Impact Studies". The policy guidelines are relevant for the Simiyu Water Supply Project as it will entail construction activities that may impact of both tangible and intangible cultural heritage objects.

#### The Cultural Heritage Policy of 2008

The Cultural Heritage Policy 2008 defines physical cultural resources as any tangible material that represent contemporary, historic, and pre-historic human life ways. Section 2.1 points out that already discovered physical cultural resources shall be preserved and conserved in the National Museum of Tanzania as stipulated in the Museum Act of 1980. Sections 4.2.1 to 6 describes how other stakeholders including government institutions, private sectors and public as whole should be involved in all activities of conservation and management of physical cultural resources. The Policy is relevant for how chance finds of artefacts and other cultural heritage resources are handled and secured in connection with construction projects.

#### National Road Safety Policy, 2009

The policy vision is to have a safe environment for road traffic system which is in accordance with internationally accepted standards. The policy goals are to reduce the occurrence and severity of road crashes as well as reducing road deaths. The policy is relevant for the Simiyu Water Supply Project as it will entail hauling of heavy equipment on the roads in the project area as well as lead to a general increase in the road traffic during the construction phase.

#### The National Employment Policy, 2008

The overall vision of this National Employment Policy is to have society engaged in decent gainful employment capable of generating adequate income to sustain it, and reduce poverty as envisaged by the Tanzania Development Vision 2025, the National Strategy for Growth and the Reduction of Poverty (MKUKUTA), as well as facing the challenges of labour market gaps in the globalized economy. The specific objectives of the policy include:

- 1. Promote equal access to employment opportunities and resources endowments for marginalized and vulnerable groups, including women, youth and People with Disabilities (PWDs), and
- 2. Safeguard the basic rights and interests of workers in accordance with international labour standards.

The policy is relevant for all projects that involves hiring of personnel and workers.

#### National Strategy for Growth and Poverty Reduction, 2005

The National Strategy for Growth and Poverty Reduction (NSGPR) established in 2005 is coordinated under the Poverty Reduction Strategy (MKUKUTA) as a national organizing framework. The NSGPR addresses the aspiration of the Tanzania Development Vision (Vision 2025) for high and shared growth, high quality livelihood, peace, stability, unity, quality education and international competitiveness. NSGRP has been formulated within the context of the UN Millennium Development Goals (MDGs) to be achieved by 2015.

#### Development Vision, 2025

Development Vision 2025 is a long-term development philosophy that articulates a desirable future condition, which the nation envisages it will attain. It describes plausible course of action to be taken for visions achievement. It seeks to actively mobilize the people and other resources towards the achievement of shared goals.

#### Rural Development Strategy, 2001

The strategies have the primary objectives of stimulating growth in the rural economy by building on gains in the national economy and by empowering rural poor people to overcome poverty through better access to land, water, energy, financial resources and markets. The strategy has relevance for the Simiyu Water Supply Project as it will improve access to safe water for a significant part of the Simiyu population and also present employment opportunities during the construction phase.

## 4.2.2 International Safeguard Policies

#### IFC Performance Standards

IFC's Performance Standards are part of IFC's Sustainability Framework (2012 Edition) and define clients' roles and responsibilities for managing their projects and the requirements for receiving and retaining IFC support.

The World Bank also applies the Performance Standards rather than its Operational Policies to private sector led projects involving public-private partnerships (ref. OP 4.03).

The Performance Standards are presented in the table below.

Performance Standard	Purpose / Objectives	Issues Addressed
PS1: Assessment and Management of Environmental and Social Risks and Impacts	Performance Standard 1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project.	The ESIA, including ESMP, provides a basis for the management of environmental and social performance during the planning, construction and operation phase.
PS2: Labour and Working Conditions	<ul> <li>The objective of the Performance Standard 2 is to:</li> <li>Promote fair treatment, non-discrimination, and equal opportunity of workers</li> <li>Establish, maintain, and improve the worker-management relationship</li> <li>To promote compliance with national employment and labour laws</li> <li>To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.</li> <li>To promote safe and healthy working conditions, and the health of workers.</li> <li>To avoid the use of forced labour.</li> </ul>	The ESIA has reviewed the applicable policies and legislation, and included labour and working condition requirements in the ESMP.
<i>PS3: Resource Efficiency and</i> <i>Pollution Prevention</i>	<ul> <li>Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. It aims are: <ul> <li>To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.</li> <li>To promote more sustainable use of resources, including energy and water.</li> <li>To reduce project-related GHG emissions.</li> </ul> </li> <li>To provide guidance on how to achieve the objectives of Performance Standard 3, reference is made to the Environmental Health and Safety (EHS) Guidelines. The EHS Guidelines are technical reference documents with general and industry-specific examples of good international industry practice. When host country regulations differ from the EHS Guidelines, projects are expected to adhere to, and aim for, the most stringent requirements.</li> </ul>	The ESIA has evaluated the existing levels and sources of pollution within the project area. Resource efficiency and pollution prevention have been addressed as part of the ESMP. Guidance has been obtained from the IFC / World Bank Group's EHS Guidelines for Water and Sanitation.
PS4: Community Health, Safety and Security	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. While acknowledging the public	The existing and project-induced risks to community health, safety and security have been evaluated and are reported as part of the ESIA/ESMP.

Performance Standard	Purpose / Objectives	Issues Addressed
	authorities' role in promoting the health, safety, and security of the public, this Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related- activities, with particular attention to vulnerable groups.	
PS5: Land Acquisition and Involuntary Resettlement	<ul> <li>Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood (1) as a result of project-related land acquisition (2) and/or restrictions on land use. The objectives of the Performance Standard are;</li> <li>To avoid, and when avoidance is not possible, minimize displacement by exploring.</li> <li>Alternative project designs.</li> <li>To avoid forced eviction.</li> <li>To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.</li> <li>To improve, or restore, the livelihoods and standards of living of displaced persons.</li> <li>To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.</li> </ul>	The Simiyu Water Supply Project will involve some resettlement and a Resettlement Policy Framework (RPF) has been prepared as part of the ESIA process. A full Resettlement Action Plan (RAP) will be prepared when the detailed technical planning has been concluded.
<i>PS6:</i> <i>Biodiversity Conservation and</i> <i>Sustainable Management of</i> <i>Living Natural Resources</i>	<ul> <li>Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The objective of this Performance Standard is:</li> <li>To protect and conserve biodiversity.</li> <li>To maintain the benefits from ecosystem services.</li> <li>To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.</li> </ul>	A baseline inventory of biodiversity and living natural resources has been established as a result of field investigation and secondary information sources. It describes the natural habitats in the project area and assesses their conservation value and potential status as critical habitats. The predicted impacts have been rated according to significance/magnitude, and mitigation measures have been included as appropriate.

Performance Standard	Purpose / Objectives	Issues Addressed
PS7: Indigenous Peoples	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. The objectives of this policy include;	There are no indigenous peoples in the Phase 1 project area. The Hadzabe people, who identify themselves as indigenous peoples, predominantly live around Lake Eyasi, southeast of the project area.
	<ul> <li>To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.</li> <li>To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.</li> <li>To promote sustainable development benefits and opportunities for Indigenous peoples in a culturally appropriate manner.</li> <li>To establish and maintain an on-going relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.</li> <li>To ensure the free, prior, and informed consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.</li> <li>To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.</li> </ul>	
PS8: Cultural Heritage	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities.	Cultural heritage resources have been evaluated by a qualified specialist as part of the ESIA process. Affected communities have been consulted.

#### Green Climate Fund's Environmental and Social Safeguards

The Green Climate Fund's Environmental and Social Safeguards are presently using the IFC Performance Standards in their lending operations until specific the Fund can develop their own specific standards. All eight performance standards are used as a basic for project scrutiny and analysis in the loan award decision process. A description of the IFC Performance Standards and their implications for the Simiyu Water Supply Project has been given in the preceding section.

## 4.3 Legal Framework

## 4.3.1 National Legislation

## Constitution, 1977–1995 (Revised 1997)

The Constitution of the United Republic of Tanzania recognizes the basic rights for its people for the protection of their life by the society in accordance with the law. Among these rights is the right of every citizen to live in a safe and clean environment. Article 18 is relevant for the consultation and disclosure process of project as it states that every person: (a) has a freedom of opinion and expression of his ideas; (b) has out right to seek, receive and, or disseminate information regardless of national boundaries; and, (d) has a right to be informed at all times of various important events of life and activities of the people and also of issues of importance to the society.

#### Environmental Management Act, 2004 (Cap 191)

The Environmental Management Act Cap 191 is the principal legislation governing environmental management in the country. The Environmental Management Act (EMA) recognises "...the right of every citizen to a clean, safe and healthy environment, and the right of access to environmental resources for recreational, educational, health, spiritual, cultural and economic purposes."

Section 81, subsection 1 in Part VI, requires project proponents or developers to undertake an Environmental Impact Assessment (EIA) at his/her own cost prior to commencement or financing of a project or undertaking. The types of projects requiring EIA are listed in the third schedule of the Act and requires in general projects that are out of character with is surroundings and entails structures of a scale not in keeping with the surroundings to undergo an EIA. Furthermore, projects that involve dams, rivers and water resources are specifically mentioned as a category that will require an EIA. The EMA prohibits any development to be initiated without an Environmental Impact Assessment (EIA) Certificate.

With regard to consultation process Section 89 provides for public participation as well as setting out the requirements for the review of the ESIA through a comprehensive multisectoral stakeholder engagement process.

## The Environmental Impact Assessment and Audit Regulations, 2005

Environmental Impact Assessment and Audit Regulations No. 349 of 2005 were made pursuant to the Environmental Management Act No. 20 of 2004. The regulations provide the basis for undertaking Environmental Impact Assessments (EIA) and Environmental Audits for various types of development projects with significant environmental impacts. In addition, the regulations set out the procedures for carrying out review and approval of Environmental Impact Assessments. It further gives which nature of project and the level of detail required for its environmental impact assessment. Water supply projects are specifically mention in Schedule 1 of the regulations as projects for which an EIA is required (Mandatory List). With regard to disclosure Section 17 of the regulations states that developers or project proponent shall in consultation with the Council, seek the views of any person who is or is likely to be affected by the project.

#### Energy and Water Utilities Regulatory Authority Act (Cap 414)

This Act establishes the Energy and Water Utilities Regulatory Authority (EWURA) and its authority to regulate the operation of energy and water utilities. Along with other functions EUWRA is mandated to:

- Issue, renew and cancel licences;
- To establish standards for goods and services;
- To establish standards for the terms and conditions of supply of goods and services; and to regulate rates and charges;
- To monitor the performance of the regulated sectors in relation to levels of investment, quantity and standard of services, and the cost of services.

For the operation The Simiyu Water Supply Project a licence issued by EWURA will be thus be needed.

#### The Land Act, 1999

The Land Act, 1999 (No. 4 of 1999) provides for the basic law in relation to land other than the village land, the management of land, settlement of disputes and related matters while Village Land Act, 1999 (No. 5 of 1999) provides for the basic law in administration and management of land in relation to land in villages. Regarding stakeholder notification Section 152, sub section (4) requires the applicant of a way leave to notify the following:

- (a) All persons occupying land under a right of occupancy over which the proposed wayleave is to be created, including persons occupying land in accordance with customary pastoral rights;
- (b) All local government authorities in whose area of jurisdiction land over which the proposed wayleave is to be created is located.
- (c) All persons in actual occupation of land in an urban and peri-urban area over which the proposed way leave is to be created;
- (d) Any other interested person.

The implication of this for the Simiyu Water Supply Project is that once the final alignment for the main pipeline has been agreed upon, MoWI should organize for the notification of affected stakeholders.

#### The Land (Forms) Regulations, 2001

The Land Regulations were made under the Section 179 of the Land Act 1999, and provide all specific forms required for management and administration, granted right of occupancy, mortgage, lease, easement and co-occupancy.

#### Land (Compensation Claims) Regulations, 2001

These regulations provide for various aspects relating to claims of compensation and applies to all applications or claims for compensation against the Government or local government authority or any public body or institution under the Land Act. Regulation 4 specifies who may claim compensation. The Land (assessment of value for compensation) Regulation shall apply to any claim or application for compensation by any person occupying land and requires that the Commissioner of land or an authorized officer shall carry out the valuation of the compensation. Section 6 sets out the requirements that shall be followed to ensure participation and involvement of the land subject to compensation including:

- Notification of the occupiers of land subject to compensation by publishing a notice in a public notice board/gazette
- Submission of claims for compensation by the occupiers
- Physical presence of the occupier during the assessment.

#### The Land Acquisition Act, 1967 (Cap 118)

According to the Land Acquisition Act, the Government may acquire any land or any estate or term where such land is required for any public purpose. Land may be acquired for a public purpose and for government scheme as for instance water supply projects. Any land that the Simiyu Water Supply Project will need for its main water pipelines and intake installations will have to be acquired according to the rules established by Land Acquisition Act.

#### The Village Land Act, 1999

The Village Land Act No. 5 of 1999 confers the management and administration of village lands to Village Councils, under the approval of the Village Assemblies, although the Minister of Lands is entitled to decide on the size of land which can be owned by a single person or commercial entity. The Act also provides for the fundamental principles of National Land Policy. The Village Land Act requires coordination with local ward and village authorities for any issues that relates to the management, use and acquisition during the implementation of the Simiyu Water Supply Project.

#### Urban Planning Act, 2007

The Act provides for the orderly and sustainable development of land in urban areas, to preserve and improve amenities, to provide for the grant of consent to develop land and powers of control over the use of land, and to provide for other related matters. Part V, Sections 60 -71, give provisions for land purchase, acquisition and compensation by planning authorities including measures for settlement of disputes.

#### The Water Resources Management Act, 2009

Water legislation has been updated to bring it in line with the National Water Policy, 2002. This current Water Resources Management Act No. 11 of 2009 provides for institutional and legal framework for sustainable management and development of water resources; outlines principles for water resources management; provides for the preventions and control of water pollution; provides for participation of stakeholders and the general public in implementation of the National Water Policy; repeals the Water Utilization (Control and Regulation) Act, 1974 and vests all water in the country to the Government of United Republic of Tanzania and sets procedures and regulations for the extraction of water resources. The Act also sets standards for receiving waters and effluent. Part IV of the Act addresses issues of catchment management while part VII addresses issues related to water abstraction and use, which are all essential in regard to the Simiyu Water Supply Project.

#### Water Works Regulations, 1997

The Water Works regulations provides for creation of water and sewerage authorities for a specifically designated area. The water and sewerage authority may be managed as different types of organizations including a public of private company, a water user association, a co-operative society and a non-government organization (NGO).

The Regulations divide water and sewerage authorities into three categories:

- a) Those which can meet all their all of their direct and indirect costs;
- b) Those which all cost except for salaries for permanent employed staff;
- c) Those which can meet costs except for salaries and electricity for pumping.

With regard to the Simiyu Water Supply Project it is not yet clear what type of Water and Sewerage Authority will be set up.

#### The Water Utilization and Sanitation Act, 2009

The Water Utilization and Sanitation Act (No. 12), 2009, outlines principles for water resources management; provides for the preventions and control of water pollution; provides for participation of stakeholders and the general public in implementation of the National Water Policy. It vests all water in the country to the Government of United Republic of Tanzania and sets procedures and regulations for the use of water resources and for use of water bodies as recipients. In relation to the Simiyu Water Supply Project the Act regulates the abstraction of the supply water as well as release of effluents.

#### Local Government (District) Authorities Act, 1982

The Local Government (District) Authorities Act No. 7 of 1982 provides for, inter alia, the establishment, composition, functions and legislative powers of district, township councils and village authorities. District Councils are in charge of the administration of day-to-day activities within their territories, Wards review and approve the proposed village council projects for further processing by the District Development Committee, while the village council's functions include planning and coordinating activities, assistance and advice to the village residents to undertake and participate in communal enterprises.

#### Protected Public Places and Recreation Areas Act, 1969

The Protected Public Places and Recreation Areas Act No. 38 of 1969 was created to provide a process and mechanism for protecting specific lands as is deemed necessary at the discretion of the Minister.

#### Wildlife Conservation Act, 1974 (Revised 2002)

This Act makes regulates the management and conservation of biodiversity and wildlife and makes provisions for the establishment and management of protected areas in mainland Tanzania. The Act also provides for designation of wildlife corridors, dispersal areas, buffer zones and migratory routes. It also gives restrictions on grazing livestock within game reserves, and regulates on hunting within the controlled game reserves. The Act has relevance for the Simiyu Water Supply Project to the extent it has an impact on wildlife in the project area.

#### Forest Act, 1957

The Forest Act of Tanzania aims at providing for the management of forests, and to repeal certain laws relating to forests and related matters. It provides for the general legal framework for the conservation and management of forests. The Forest Act supports the implementation of Participatory Forest Management which is a strategy to achieve sustainable forest management by encouraging the management or co-management of forest and woodland resources by the communities living closest to the resources, supported by a range of other stakeholders drawn from local government, civil society and the private sector. The Act has relevance for the Simiyu Water Supply Project to the extent it has an impact on forests in the project area

#### The Fisheries Act, 2003

The Fisheries Act provides for the regulation of fisheries and the fishing industry including aquaculture. The Act mandates the government to promote, encourage and support all initiatives leading to the development and sustainable use of the fish stock and aquatic resources through a number of measures and actions, including promotion of sound utilization of the aquatic resources and encouraging the involvement of stakeholders in the planning development and management of fishery resources. The Act has relevance for the Simiyu Water Supply Project as there are artisanal fishing activities taking place at the intake point at Bukabile.

#### Employment and Labour Relations Act, 2004

The Employment and Labour Relations Act No. 6/04 guarantees fundamental labour rights and establishes basic employment standards. The Act provides broad protection against discrimination. Specifically, the Act

mandates that employers "promote equal opportunity in employment and strive to eliminate discrimination in any employment policy or practice. It prohibits direct or indirect discrimination by employers, trade unions and employers' associations on a number of grounds, including gender, pregnancy, marital status or family responsibility, disability, HIV/AIDS and age. Harassment of an employee on any of these grounds is equally prohibited. The Act also requires employers to take "positive steps" to guarantee women and men the right to a safe and healthy environment. The provisions in the Act are relevant with regard to the Simiyu Water Supply Project as a number of workers may be hired by the by the contactors during the construction phase.

#### The Occupational Health and Safety Act, 2003

The Occupational Health and Safety Act makes provisions for the safety, health and welfare of employees and workers within the public and private sector. The Act requires employers to provide protection of both workers and other people against hazards to health and safety at work places and construction sites. Requirements including personal protective equipment. The provisions in the Act will have to be followed by the contractors during the construction of the Simiyu Water Supply Project.

#### The HIV and AIDS (Prevention and Control) Act, 2008

The HIV and AIDS Prevention Act makes provisions for promotion of public health in relation to HIV and AIDS as well as provisions for appropriate treatment, care and support for people living with or at risk of HIV and AIDS. The Act provides for the rights and obligations of persons living with HIV and AIDS including orphans. It promotes public education and programmes on HIV AND AIDS including HIV and AIDS education in work places. The Act also promotes voluntary HIV testing and counselling, and advocates for accessible and professional HIV testing, counselling and communication of results. HIV and Aids prevention activities should be an integral part of the Simiyu Water Supply Project to limit the risk for increased HIV infection rates in the project area.

#### Workers Compensation Act, 2008

The Workers Compensation Act No. 20/2008 provides for compensation to employees for disablement or death caused by or resulting from injuries or diseases sustained or contracted in the course of employment. It applies to both workers in the private and public sector. The employer is obliged to pay compensation irrespective of the cause of the accident. It does not matter whether the incapacity or death was due to recklessness of the worker. Where injury occurs, an employee is entitled to recover medical expenses and lost wages resulting from the disability, be it temporary or permanent. The law allows for compensation to dependants or personal representatives where the worker is dead.

#### The Road Act, 2007

The new Road Act No. 13 of August 2007 sets restrictions about weight and dimensions of the load to be transported using the road network. The maximum allowed tare weight limit is 56 tons including the truck, the width limit is 2.6 m wide and the limit for height of the load is 4.6 m high from the ground. There is a penalty for overloading and special permit is required for the goods exceeding the set width limits.

#### Antiquities Act, 1964

The Antiquities Act of 1964, amended in 1979, includes the principle that no archaeological research can be undertaken without the permission of the Director of Antiquities. According to this Act, local government authorities can pass by-laws for the preservation of archaeological heritage in their area of jurisdiction. Chance finds during the construction phase for the Simiyu Water Supply Project has to be will have to be handled in accordance with this Act.

#### The Museum Act No.7 of 1980

The Museum Act provides for the preservation of movable cultural and natural heritage artefacts. The National Museum of Tanzania established by this Act is charged with the duties of collecting, conserving, displaying and researching on unique materials relating to Tanzania's cultural and natural heritage.

#### The Graves Removal Act No. 9 of 1968

The Graves Removal Act No. 9/1968 provides for the removal of graves from land required for public purposes. The Act states that if any land on which a grave is situated, is required for a public purpose, it may be moved to a different location. The Act states that compensation for the moving of graves shall be limited to the reasonable expenses for removal, transportation and reinstatement of the grave. The Act will be relevant for the Simiyu Water Supply Project to the extent moving of grave will become necessary during the construction phase.

#### The Mining Act, 1998

The Mining Act No. 5 of 1998 provides for prospecting of minerals, mining and dealing in minerals. It also provides for building materials including all forms of rock, stones, gravel, sand, clay, volcanic ash or cinder or other minerals being used for the construction of buildings, roads, dams, and aerodromes or similar works. Extraction of local soil and rock resources during the construction phase for the Simiyu Water Supply project will have to done following the provisions in this Act.

#### The Industrial and Consumer Chemicals (Management and Control), 2003

The Industrial and Consumer Chemical management Act makes provisions for the management and control of the production, importation, transportation, storage and disposal of chemicals excluding medicines, pesticides, radioactive(s), food additives and any other similar substances. Chemicals used during construction and operation of the Simiyu Water Supply Project will have to comply with the provisions of this Act.

## The Local Government (Urban Authority) Act, 1982

This Local Government Act provided the legal foundation for the district and town councils and sets out the duties and functions of the local government authorities. Local authorities will pay an important role for the implementation of the Simiyu Water Supply Project, most notably in connection with consultations and facilitation of necessary resettlement and compensation processes.

#### The Engineers' Registration Act, 1997

This Act (No. 15/1997) requires that only a registered engineers shall engage in professional engineering work or services which includes professional service consultation, planning, design or supervision of construction works. The contractors that will be hired for the Simiyu Water Supply Project will thus have to make sure that they their personnel have the necessary qualifications for performing detailed design work during the construction phase.

## 4.3.2 International Agreements and Conventions

Tanzania is the signatory to a number of international agreements and conventions. The table below list the most important ones and comments on their relevance for the Simiyu Water Supply Project.

Type of Convention	Name of Convention	Relevance to the Project
Biodiversity	UN Convention on Biological Diversity (1992) (Ratified by Tanzania in 1996) UN Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification Particularly in Africa (1994) Cartagena Protocol on Bio-safety to the Convention on Biological Diversity (2000) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973) The Convention of Wetlands of International Importance especially as Water Fowl Habitat (The Ramsar Convention) (1971) (Ratified by Tanzania in 1998) African Convention on the Conservation of Nature and Natural Resources (1968) Lusaka Agreement on Co-operative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (1994)	The project will involve clearing of vegetation, and disturbance to wildlife species. Mitigation measures must be implemented to minimise loss of biodiversity and permanent land degradation. Any endangered species in the project area must be protected from collection and hunting for the purpose of being traded.
Climate Change	UN Framework Convention on Climate Change (1992) Kvoto Protocol (1997)	Improving the water supply situation for people in Simiyu Province may increase their resilience to climate change.
Hazardous Waste, Chemicals and Ozone Layer Protection	Basel Convention on the Control of Trans- boundary Movements of Hazardous Waste and their Disposal (1989) Rotterdam Convention Stockholm Convention on Persistent Organic Pollutants Vienna Convention on Protection of Ozone Layer Montreal Protocol on Substances that Deplete the Ozone Layer (1987) Basel Protocol on Liability and Compensation on Damage Resulting from Trans boundary Movement of Hazardous Waste and their Disposal (2000) Bamako Convention on the Ban of the Import into Africa and the Control of Trans boundary Movement of Hazardous Wastes Within Africa (1990)	All the hazardous wastes generated during the construction of the Simiyu Water Supply project will have to be handled, and disposed of within Tanzania. All imports of chemicals and other additives must comply with national legislation and the applicable international conventions and agreements. No ozone depleting substances or persistent organic pollutants will be permitted for construction and operation of the project.
Cultural and Natural Heritage	Convention Concerning the Protection of World Cultural and Natural Heritage (1972)	Chance finds of cultural artefacts and occurrence of natural heritage sites and objects in the project area will need to be appropriately handled and protected during the planning and construction phase of the project.

# Table 10: International agreements and conventions to which Tanzania is a party.

## 4.4 Administrative Framework

A summary of the institutional and administrative framework through which this project will be implemented is described in the table below. The administrative framework includes all the relevant governmental institutions responsible for enforcing compliance with national standards in their different areas of specialisation.

Table 11: Administrative	framework	for the Simiyu	Water Supply Project.
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Institution	Role and Responsibility
Ministry of Water and Irrigation	Lead implementing agency/project developer
	On behalf of government, manage and oversee project execution including
	ESMP and stakeholder engagement
	Ensure compliance with environmental and social standards
	Spearhead the formation of the bulk water supply organisation as well as
	Urban Water and Sanitation Authorities (UWSAs) in Itilima and Busega
Vice President's Office - (Division	Coordinates Environmental Management Policy, Act and EIA guidelines
of Environment, DoE)	Approval and signing of EIA certificate
National Environment	Approval of ToR, review of EIA
Management Council (NEMC)	Issuing of Environmental Certificate
	Environmental Monitoring and Compliance Auditing
	Advise Government on all environmental matters
Ministry of Works, Transport and	Responsible for the construction sector, including roads and bridges
Communication	Promoting a quality, efficient, environmentally friendly, and cost-effective
	construction industry
Ministry of Energy and Minerals	Coordinator of the energy and mining sector and spearheads the
,	implementation of the sector strategies
Ministry of Natural Resources and	Responsible for sustainable conservation of natural and cultural resources
Tourism	and tourism
Ministry of Labour and	Responsible organ for Jabour management issues including occupational
Employment	health and safety
	Follow up on occupational health and safety issues
	Advice the contractors in regard to national occupational health and safety
	requirements
Ministry of Lands. Housing and	Responsible for land use planning, surveying and demarcating land/parcel/
Human Settlements Development	farms, and provision of land ownership
	Support the project and communities in regard to land use planning.
	surveying and demarcating land/parcel/farms, and provision of land
	ownership
	Support MoWI in the acquisition of wayleaves for the main pipeline
	Support MoWI in the process of land transfer and preparation of residual
	titles for PAPs
Ministry of Livestock and Fisheries	Responsible for the overall management and development of livestock and
Development	fisheries resources
Department of Antiquities	Responsible for preservation of cultural heritage resources
	Provide technical advice in case of chance finds
EWURA	Regulator of the electricity, petroleum, natural gas and water sectors,
	including licensing, tariff and standard setting in respect to water supply
	and sanitation
	Monitor water quality and standards of performance for the provision of
	water supply and sanitation services
	Promote the development of water supply and sanitation services in
	accordance with recognized international standard practices and public
	demand

Institution	Role and Responsibility
TANROADS	Responsible for planning and development of road infrastructure in the
	country, including road reserves
	Guidance on the use and management of road reserves
	Advisory to the contractors in regard to road reserve use and management
	Sharing information with the contractor in regard to surface and
	underground installations in the road reserve
TANESCO	Regulator of electricity transmission and owner of transmission lines
	Give advice to the project developer and contractors in regard to energy
	installations in the road reserve, including safety issues related to
	transmission lines
	Provide power supply to the project facilities like pumping stations, camp
	sites, etc.
Lake Victoria Basin Water Office	Ensure that water resources are managed sustainably through water
	governance and integrated water resources management principles
	Collect water resources data and monitor water levels, use and quality
	Processing of water use permits
	Pollution monitoring and control
	Coordinate establishment of Integrated Water Resources Management
	Plans
Simiyu Region	Provide technical advice and capacity building to Local Government
	Authorities (LGA)
	Ensure that social and economic activities are harmonized and aligned to
	the national development policies and strategies
	Ensure peace and tranquillity prevail in the region by creating enabling
	environment for LGAs to perform their functions
Busega, Bariadi and Itilima	Oversee and advise on implementation of national policies at district level
Districts	Oversee enforcement of laws and regulations
	Advise on implementation of development projects and activities at district
	level
	Monitoring of project activities
Wards	Oversee general development plans for ward level
	Provide information on local conditions and extension services
	Project monitoring in their area of jurisdiction
Villages	Maintain peace and tranquillity
	Protect public and private properties
	Promote social and economic development
	Potential PAPs as a result of the proposed water supply scheme
KfW	Potential financier
	Ensure that funds are available for completion of the project
	Monitor project implementation including environmental and social
	performance
Green Climate Fund (GCF)	Potential financier
	Ensure that funds are available for completion of the project
	Monitor project implementation including environmental and social
	performance

# 5 BASELINE CONDITIONS

#### 5.1 Physical Environment

#### 5.1.1 Topography and Landscape

The project area extends from Lake Victoria across a relatively flat landscape which is only interrupted by isolated hills and rocky outcrops scattered mainly in Busega and Bariadi districts. Lake Victoria is at elevation 1,133 metres above sea level (masl.), while the Simiyu plains range from about 1,200 masl. to 1,300 masl. The natural vegetation is dominated by wooded grassland savannah, but much of the original land cover has been converted into an agricultural landscape characterised by smallholder farms and extensive grazing lands with low tree cover. The southern parts of the project area (Phase 2) in Maswa and Meatu districts consist of semi-arid plains where tree cover is confined to small rivers and stream.

*Conclusion:* The aesthetic qualities of the project's impact zone are typical of the surrounding landscapes and not unique to the region at large. Overall, the value is rated as low-medium.

	Value	
Low	Medium	High
&	‰	



*Figure 6: View from Bulima hill towards the intake site at Lake Victoria.* 



Figure 7: Semi-arid landscape in Meatu district (Phase 2).

## 5.1.2 Geology and Soils

## **Bedrock and Minerals**

The geology in the project area is dominated granitoids, migmatites and meta-sediments (Figure 8). Granitoid or granitic rocks are various types of coarse grained rocks formed by solidification of magma deep within the earth. The minerals granitoides are composed of predominantly feldspar and quartz. Granitoid rocks include granite, quartz monzonite, quartz diorite, syenite and granodiorite. The rock outcrops, commonly called kopjes, which are commonly occurring in the project area, are most probably granite. Kopjes are formed as the softer metamorphic rocks overlaying the granite is weathered away.

In addition to the dominant granitoides, there are a couple of extensive areas with volcanic rocks consisting of mafic volcanics and meta-basalts (Figure 8). Mafic denotes a high content of the dark minerals pyroxene, amphibole, olivine and mica, which gives mafic rock its dark colour. Meta-basalts are basalts that have undergone metamorphosis due to heat and pressure but still retain some of its original basaltic character.

The project area for the Simiyu Water Supply Project has mineral deposits that have a potential for economic exploitation and mining. During the scoping and stakeholder consultations, it was found that land use in the project corridors also involves concessions for nickel mining (see Section 2.4.5). A company known as Red Hill Nickel has had an exploration license and currently holds a 5-year retention license to develop nickel mining at Ngasamo hill (where the command reservoir for the Simiyu water supply scheme was originally proposed) and at Ng'wamangola hill near Dutwa. There is also a potential for an additional mine at Zanzui hill in Bariadi near the border to Maswa. For further details, see Section 7.6.2.



Figure 8: Geological map of Simiyu project area.



Figure 9: Soil map of Simiyu project area.

#### <u>Soils</u>

The main water pipeline from the intake at Bulima is passing through areas with different soil types. At the intake, there is a zone of Vertisols which are heavy black clay soils. This soil type is also commonly called "black cotton soil" because of the fact that it is suitable for cultivation of cotton. However, most of the area that is traversed by the main water pipelines are Eutric Planosols except for a couple of areas consisting of Chromic Cambisols (around Bariadi) and Feralic Cambisols (Figure 9).

Verisols are in general quite fertile soils but due to the high clay content and the type of clay minerals their physical properties make soil management a challenge.

Planosols are normally found in seasonally waterlogged flat lands. Planosols are characterised by a subsurface clay horizon and are in general relatively poor in plant nutrients. However, Eutric Planosols have a higher nutrient content than other Planosols. Planosols support a sparse grass vegetation with scattered shrubs and trees and is normally used for used for extensive grazing. Agricultural land use is normally less intensive than on most other soils under the same climate conditions.

Cambisols do not have a subsurface clay horizon as the Planosols and are therefore better suited for agriculture than the Planosols. They have a relatively high content of nutrients and weatherable minerals compared to other tropical soil types.

Figure 9 shows the distribution of soil types in the project area.

The fact that there are mineral deposits with a potential for economic exploitation plus the fact that the soils in the project area supports livestock keeping and cultivation of a number of food and commercial crops, give a high value to the geology and soils in the project area.

	Value	
Low	Medium	High
‰	‰‰	<u>%</u>

#### 5.1.3 Climate and Air Quality

Simiyu is classified as semi-arid with annual average rainfall ranging between 600 mm to 900 mm (GOPA 2016). The region has moderate temperatures ranging from 18 °C to 31 °C. In Simiyu region, the climate is defined by a short rainy season (*Vuli*) between November and December and a longer rainy season (*Masika*) during February until May. The further away from the lake shores, the more monoidal the climate gets. While Busega and Bariadi receives bi-modal rains, Meatu and Mazwa (Phase 2) receive mono-modal rainfall (GOPA 2016). The annual average rainfall over the project area is shown in Figure 10.

With respect to air quality, there are no major industrial pollution sources in the project's impact zone, and the road traffic and transportation density is low compared to the more populated and urban areas in Tanzania. For this reason, it was not considered necessary to measure the background air quality in the project area, and it is highly unlikely that the airshed is degraded under present conditions.

In conclusion, the ambient air quality is considered as non-degraded and there are no major sources of greenhouse gas (GHG) emissions in the impact zone of the Simiyu Water Supply Project. The value is thus assigned as high with respect to climate and air quality.

*Conclusion:* The climatic conditions in the project area is typical of the region at large, and the ambient air quality is considered as non-degraded. The value is thus assigned as high with respect to climate and air quality.

	Value	
Low	Medium	High
õo	&	% ▲

#### 5.1.4 Noise

No data exist on the present noise situation. However, apart from traffic noise along the roads and urban noise in the main population centres, the background noise levels are considered insignificant. The project's impact zone is therefore not currently affected by significant noise pollution, hence the baseline value is high.

	Value	
Low	Medium	High
%	‰‰‰‰	% <b>^</b>

MINISTRY OF WATER AND IRRIGATION Climate Resilient Water Supply Project in Busega, Bariadi and Itilima Districts Final ESIA Report



Figure 10: Mean annual rainfall in the project area.

#### 5.1.5 Water Resources

#### Water Basin Characteristics

The Simiyu region consists of two notable drainage systems. The northern and western part is drained by Simiyu River which discharges into Lake Victoria (near Nyalikungu town) and covers a total catchment area of 10,800 km<sup>2</sup> and a length of 180 km. It has a seasonal river flow pattern, falling dry from July to October. The tributaries to the Simiyu River includes numerous seasonal creeks, some of which are located within the project's impact zone. The stream flows in the rainy season are in general turbid and carries a relatively high load of suspended material due to the sheet and gulley erosion created by the torrential rains and surface runoff. Phase 1 of the Simiyu project is entirely within this Lake Victoria Basin.

The southern and eastern part of the region forms part of an internal drainage basin and its waters flow towards the seasonal Lake Kitangiri and Lake Eyasi which are at an elevation 100 m deeper than Lake Victoria (GOPA 2016). The major water course is Sibiti River which connects the two lakes and is the main inlet of Lake Eyasi. Despite the fact that Sibiti River flows all year in wetter years, it falls dry in many dry seasons. The remaining rivers and streams dry during the year and are indeed seasonal. Parts of Phase 2 of the Simiyu project belongs to this internal drainage basin.

Lake Victoria, the source of water for the Simiyu project, has a total surface area of 68,800 km<sup>2</sup>. It is Africa's largest lake and the largest tropical lake in the world. In terms of volume, it ranks as the world's ninth largest continental lake, containing about 2,750 km<sup>3</sup> of water. The main components of the lake's water balance are (1) rainfall over the lake (1,858 mm/year), (2) inflows (342 mm/year), (3) lake evaporation (1,595 mm/year), and (4) outflow (524 mm/year) (Sutcliffe and Parks 1999).

Lake Victoria is drained solely by the Nile River near Jinja, Uganda, on the lake's northern shore. The mean annual outflow is approx. 1,000 m<sup>3</sup>/s (1,113 m<sup>3</sup>/s according to Sutcliffe and Parks (1999)), but it is controlled by the operation of dams at the outlet (Owen Falls complex at Jinja). Historically, the outflow was linked with the lake water level, which fluctuated inter-annually by up to 1 m and with a distinct rise from 1961 to 1964 (+ 2.5 m). The regime shift in 1961-1964 has created controversy over what should be considered as the "natural", long-term characteristics of the lake's water level and the Nile River flow.

Regarding ground water, the resources in Simiyu and in the project area have been found to be inadequate both in terms of quantity and quality as concluded in the "Pre-feasibility Study on the Water Supply Options for the Simiyu Region (MoW/KfW 2014).

#### **Climate Change and Lake Victoria**

As noted above, Lake Victoria lake levels have fluctuated considerably over the last decades and is determined by a number of factors including precipitation over the lake, evaporation, tributary inflow and the outflow at Owen Falls.

GKW Consult (2016d) assessed the impacts of future climate change on the lake levels, as the sustainability of the water supply scheme is dependent on future water levels. It is noted that since the late 1990s there has been an overall decline of about 2.5 metres in the lake level as a result of increased water extraction and less rainfall. However, as the lake level is now controlled by the Owen Falls dam at Jinja, the decline is expected not to continue although the flow into the White Nile may be reduced. It is also concluded that the use of climate models (AOGCMs) is not sufficiently accurate to make reliable quantitative predictions about the effects of climate change on the lake hydrology.

Based on extrapolation of historic rainfall and temperature data, the net changes in annual water balance towards the end of this century have been estimated for the Simiyu project area. These results show a slight increase in rainfall over the northern part of the project area (including Lake Victoria), and a slight decrease in the southern area. It is noted that these projections are uncertain but based on the best available data.

With regard to temperature changes, the climatic models give a better reliability than for rainfall. General Circulation Models (GCMs) projected temperatures for 2090 indicate a temperature increase of 2.0 degrees

Celsius for the lowest concentration of  $CO_2$  in the atmosphere (Representative Concentration Pathway 4.5 scenario) and 2.7 degrees Celsius for a higher concentration (Representative Concentration Pathway 6.0 scenario). Increased temperatures may affect wind conditions and mixing of water masses in the lake, which again will have an effect on fish productivity, growth of water weeds (water hyacinth) and algal blooms (GKW Consult 2016d).

#### Water Quality

The water quality of the supply source, Lake Victoria, and in particular the water quality in the intake area, will be decisive for the kind of treatment that the raw water needs to undergo in order to make it suitable for human consumption without any short term or long term risk or adverse health effects. A large gap between the chemical and microbial status of the raw water and the required drinking water quality parameters will require a more comprehensive and elaborate treatment process which again will drive up the installation and operational costs of the water treatment plant. During the feasibility study (GKW Consult 2015), the water quality was sampled at the two potential intake locations for the Simiyu Water Supply Project in Speke Gulf. Water quality results from sampling at Bukabile, the selected intake site, are shown below.

Parameter	Unit	Sampling Depth		WHO WQ	TZ WQ	Bomarke			
		0.5 m	3.0 m	Guidelines*	Standards**	Reffidirks			
Physical									
рН		9.9	8.7	6.5 - 8.5	6.5 - 9.2	Largely compliant			
Temperature	°C	27.2	27.9	20 - 35	20 - 35	Na			
Conductivity	μS/cm	101	93	-	-	Low			
Total Dissolved Solids (TDS)	mg/l	45.5	41.9	1000	-	Low - compliant			
Turbidity	NTU	11.3	12.2	0 - 5	5 - 25	Compliant with TZ st.			
Colour	mg/l	4	4	-	1.5 - 50	Compliant with TZ st			
Total Suspended Solids (TSS)	mg/l	4	8	-	-	Low			
Total hardness	CaCo <sub>3</sub>	28.9	-	500	500 - 600	Low- compliant			
Chemical									
Dissolved Oxygen (DO)	mg/l	10.6	10.2	7.6-14.6	-	Compliant			
Total Phosphorous	mg/l	0.07	0.07	-	-	Low			
Ortho Phosphate	mg/l	<0.002	0.01	-	-	Low			
Total Nitrogen	mg/l	0.27	0.76	-	-	Low			
Total Dissolved Nitrogen	mg/l	0.25	0.69	-	-	Low			
Ammonia (NH <sub>3</sub> )	mg/l	<0.03	< 0.03	2	-	Low			
Nitrite Nitrogen (NO <sub>2</sub> )	mg/l	< 0.004	< 0.004	-	50	Low			
Nitrate Nitrogen (NO <sub>3</sub> )	mg/l	0.06	0.04	-	3				
Total Iron (Fe)	mg/l	0.32	0.3	0.3-1.0	0.3	Largely compliant			
Potassium (K)	mg/l	3.0	3.1	-	-	Low			
Chloride (CL)	mg/l	5.6	3.5	200 - 800	-	Low			
Calcium (Ca)	mg/l	6.0	6.0	-	75 -300				
Magnesium	mg/l	3.4	3.4	-	50 - 100	Compliant -low			
Mercury	mg/l	< 0.001	< 0.001	0.001	-	Compliant			
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	mg/l	<0.4	0.41	-	2-600	Compliant - low			
Manganese (Mn)	mg/l	<0.005	< 0.005	-	0.1 - 0.5	Compliant - low			
Nickel (Ni)	mg/l	<0.02	0.02	-	-	Low			
Lead (Pb)	mg/l	< 0.01	< 0.01	-	-	Low			
Microbial			•						
Chlorophyll a	mg/l	0.03	0.03	-	-				
Total Coliform	CFU/ml*	76	28	<10	-	Non-compliant			
Fecal Coliform	CFU/ml*	12	8	0	-	Non-compliant			
Escherichia coli	CELL/ml*	10	2	0		Non compliant			
(thermotolerant)	Cru/iiil	10	۷	U	-	Non-compliant			

#### Table 12: Water quality results for intake point at Bukabile.

\* WHO drinking water quality standards, \*\* Tanzania Water Quality Standards TZS 789:2008, Source: GKW Consult (2015)
Generally, the water quality at the intake area can be characterised as relatively good with adequate values for the majority of the relevant water quality parameters for drinking water. For instance, the low values for the different parameters for phosphorous and nitrogen content indicate moderate use of fertilizer in the surrounding areas. In terms of microbial status, the levels of coliform bacteria are noncompliant compared to the Tanzanian standards for drinking water but it needs to be kept in mind that these standards apply to treated water delivered to the users, not to raw water sources. Coliform bacteria are common in nature and although faecal coliform and thermotolerant bacteria are present and indicates some local sewerage runoff into the lake, the recorded values are relatively low. With regard to the sampled heavy metals (nickel and lead), the values are below detection level and indicates low industrial pollution of the lake waters. The generally good status of the raw water suggests that the treatment process will not be too demanding and prohibitively expensive. With a low contents of heavy metals and problematic compounds, there should be good chances that the dried sludge from the water treatment plan would be suitable as a soil improvement material that can be distributed to cultivators in the vicinity of the treatment plant. Given the relatively good status of the water quality in Lake Vitoria at the intake area, it is considered to have a high value as a water supply source.

	Value	
Low	Medium	High
&		% •

# 5.2 Biological Environment

## 5.2.1 Protected Areas

In terms of protected areas, the Simiyu region has one game reserve, namely Maswa which covers an area of 2,880 km<sup>2</sup> along the Serengeti National Park borders in Busega, Bariadi, Itilima and Meatu districts plus the Makao Wildlife Management Area covering 1,330 km<sup>2</sup> in Meatu district (Phase 2). These reserves host a wide variety of wildlife such as hippo, lion, zebra, buffalo, wild dog, bushbuck, impala, giraffe and baboon. Due to population increase in the buffer zones of these protected areas, there is a notable interference from the rural population in form of livestock intrusion, occasional poaching and deforestation along the fringes of the reserves (GKW Consult 2015).

The distance from the 12 km corridor surrounding the water mains to the boundaries of the Maswa and Makao protected areas is generally more than 10 km for all sections in Phase 1. However, the 12 km zone covering some villages served by Phase 2 (from Lagangabilili to Mwanhuzi) are partly overlapping with the Maswa Game Reserve. In practical terms, this does not have any significant consequences in terms of impacts as none of the village settlements are located within the game reserve itself.

Notably, the protected area map (Figure 11) shows a few smaller areas being traversed by the main water pipelines in the Phase 2 project area. These areas are gazetted small forest reserves but their present condition and integrity may, to a smaller or larger degree, have been compromised by logging and firewood along with other types of encroachments.

In conclusion, the Simiyu Water Supply Project (Phase 1) is located at considerable distance from the nearest protected areas, and hence the value of the project's impact zone in terms of legal protection status is low.

	Value	
Low	Medium	High
%		‰



Figure 11: Location of protected areas.

# 5.2.2 Vegetation

#### **Project Area Characteristics**

The major part of the vegetation in the project area and in the direct influence zone has been transformed by human influence and land-use including crop cultivation, cattle grazing and wood and timber harvesting for building materials and charcoal making. The remaining vegetation is therefore predominantly secondary while only small areas retain some of the natural vegetation character. These rather small and limited areas can be found on the rocky outcrops, also called kopjes, along roads, farm boundaries and as well as within settlements.

# <u>Flora</u>

The vegetation survey that was carried focused on the Phase 1 project area while the project area for Phase 2 (extension to Mwanhuzi and Maswa district centres) were covered less intensely, using more of a reconnaissance type of survey approach.

The survey recorded and identified a total of 192 plant species distributed on 47 families and 140 genera. The grass family, *Graminea/Poaceae*, is the most broadly represented family with 39 species followed by the represented by the legume family, *Papilionaceae*, with 20 species. Other common families include the mimosa family (*Mimosaceae*) with 12 species, the acanthus family (*Acanthaceae*) with 7 species while the incense tree family (*Burceraceae*), the composite or sunflower family (*Compositae*) and the verbena family (*Verbenaceae*) are represented by 6 species each. The rest of the plant families are represented by a number of species ranging between from one to five. Four of the identified species are endemic to the region while one is on the CITES list.

The number of identified species indicates that the project area supports a high species diversity in spite of the fact that most of the natural vegetation in the area largely has been cleared for human activities.

## **Vegetation Types**

Vegetation is an integrator of environmental factors in that it reflects the climatic, physiographic, edaphic and biotic features pertaining to the land on which it grows. In the project area a total number of five vegetation categories have been identified, including, Acacia-Commiphora woodland, deciduous bushland and thickets, marshland, secondary swamp grassland, cultivations and settlements and riverine forest as detailed below. Figure 12 below shows the estimated coverage of these vegetation types.



Figure 12: Vegetation types in the project area

## Acacia Commiphora Bushland

This vegetation type is common found in small patches on rocky kopjes and along the road from Shigala area up to the end of Phase 1 of the project area. It is dominated by tree species of *Commiphora eminii, Grewia bicolor, Sclerocarya caffra* ssp. *caffra, Erythroxylon emarginatum, Albizia amara* ssp. *sericocephala Acacia tortilis, Euphorbia candelabrum, Acacia fischeri, Adansonia digitata* and *Harrisonia abyssinica*.

This vegetation type is of ecological importance as it supports the growth of some endemic plant species such as *Acacia fischeri, Aloe lateritia* and *Diospyros fischeri*. Also one CITES listed tree species *Dalbergia melanoxylon* (African blackwood) has been identified growing within this vegetation type. In the project area, this vegetation category is frequently found on rocky outcrops (kopjes) where water reservoirs are planned to be located. Within the Phase 1 project area, it is found at locations such as Shigala, Ngasamo hill, Isenye, Gagabali and Iyoma. At Isenye this vegetation type occupies part of the rocky outcrop that today is guarded a sacred place due to the fact that it is the burial site of Sukuma chiefs.

This vegetation type with its species composition is locally and regionally common with no red listed plant species. The endemic and CITES listed species identified there are well distributed and are found in protected areas within the region such as the Maswa Game Reserve.



Figure 13: Acacia-Commiphora deciduous bushland and thickets vegetation at Isenye.

# **Marshland**

This vegetation category is common on the shores of Lake Victoria and covers at the proposed site for the intake and the water treatment plant Bukabile. Dominant plant species include sedge and reed species such as *Cyperus alticulatus, Cyperus grandis, Cyperus alopecuroides* and Cyperus *rotundus*. Reed species include *Typha capensis* and *Phragmites mauritianus*. On small water ponds *Eichhornia crassipes* (water hyacinth) and *Azolla nilotica* dominates. Common grass species include *Eriohloa fatmensis* and *Leersia hexandr*. Large parts of this vegetation category has been cleared for cultivation of vegetables and for rice paddies. This vegetation type is locally and regionally common with no species of conservation concern.



Figure 14: Swamp marshland vegetation at Bukabile with Cyperus grandis (left) and Azolla nilotica with Eichhornia crassipes (right).

#### Secondary Swamp Grassland

This vegetation category is commonly found in patches along the pipeline route all the way from Bukabile intake to Mwanhuzi. It is dominated by grass species and is seasonally inundated. In the project area most of this vegetation type has been converted to rice paddies and cropping land for maize and other field crops. Common grass species include *Heteropogon contorts, Hyparrhenia cymbaria, Echnochloa pyramidalis, Panicum maximum* and *Cynodon dacylon* as illustrated in the pictures below. *Hygrophyla auriculata and Xanthium strumarium* are the dominant herbs in muddy areas. This vegetation category is locally and regional common with no species of conservation concern.



Figure 15: Secondary swamp grassland found at Bukabile (left) and Mwakitandu (right).

## **Cultivated Land and Settlements**

This vegetation type or category is occupying land on which the natural vegetation has been cleared and replaced with annual and perennial agricultural crops in association with planted exotic trees. This vegetation type represents the largest coverage in project area of both phases of the Simiyu Water Supply Project. It is found along the roads the main water pipelines will follow. Most of the crops are annual such as maize (*Zea mays*) Rice (*Oryza sativa*), Pigeon pea *Cajanus cajans*). Perennial tree crops species include pawpaw (*Carica papaya*), mango (*Mangifera indica*) and orange (*Citrus sinensis*). No red listed plant species grooving within this vegetation type have been identified.



Figure 16: Cultivated land and settlements with exotic tree species vegetation at Bukabile (left) and typical building in settlements (Itilima) (right).

## **Riverine Forest**

This vegetation type is characterized by an assemblage of plant species including trees, shrubs, liana and herbaceous plants growing along rivers and water courses. Dominant tree species in this vegetation type includes *Acacia polyacantha, Acacia tortilia, Albizia amara, Ficus sur, Tithonia diversifolia, Tamarindus indica while Lantana camara is the* dominant shrub. In the project area this vegetation category is found near Nyamatembwe village and along Simiyu River. This vegetation type is severely degraded by human activities including timber and firewood collection and support no species of conservation significance as no red listed plant species has been identified.



Figure 17: Riverine vegetation near Nyamatemwe village (left) and Acacia polyacantha (right).

In the Phase 1 project area, the vegetation has overwhelmingly been affected by human activities such agriculture, gazing and wood and timber extraction. This is also the case for the Phase 2 project area although slightly less so as there are some more traces of the natural vegetation left here due to a slightly lower population pressure. In term of biodiversity the vegetation in the total project area for the Simiyu Water Supply Project is considered to have a low value.

	Value	
Low	Medium	High
%		ô

# 5.2.3 Terrestrial Fauna

# Large and Medium Sized Mammals

Large and medium sized mammal species were identified by direct opportunistic observation or indirectly through signs and sounds as well as traces indicating presence such as footprints and faeces. Vervet monkeys, baboons, mongoose and rock hyrax were heard calling and seen in the hill bushland habitats of Ngasamo, Shigala, Isenge, Yoma, Gagabali and Lagangabilili. Anecdotal evidence and signs indicate presence scrub hare, dikdik, bushbuck, rock hyrax and spotted hyena in the Ngasamo, Yoma and Isenge bushland habitats.

Commonly encountered species by villagers in the area include slender, banded and dwarf mongoose, kirk's dikdik, bushbuck, olive baboon, vervet monkey, rock hyrax and scrub hare. Results from the interviews, animal calls and dung and sign survey indicates that the proposed project area harbours at least 33 large and medium sized mammal species from 8 orders and 15 families. Table 13 lists the identified large and medium sized mammals.

Common Nama	Scientific Name	Ordor	Family	IUCN	Evic	lence / M	ethod
Common Name	Scientific Name	Order	Family	status	D. obs.	Signs	Other
Vervet monkey	Chlorocebus aethiops	Primate	Cercopithecidae	LC	×	×	Interview
Olive Baboon	Papio anubis	Primate	Cercopithecidae	LC		×	Interview
Kirk's dikdik	Madoqua kirkii	Cetartiodactyla	Bovidae	LC	×	×	Interview
Bushbuck*	Tragelaphus scriptus	Cetartiodactyla	Bovidae	LC		×	Interview
Bush pig*	Potamochoerus porcus	Cetartiodactyla	Suidae	LC		x	Interview,
Bush duiker*	Sylvicapra grimmia	Cetartiodactyla	Bovidae	LC			Interview
Klipspringer*	Oreotragus oreotragus	Cetartiodactyla	Bovidae	LC			Interview
Warthog*	Phacochoerus africanus	Cetartiodactyla	Suidae	LC			Interview
Buffalo*	Syncerus caffer	Cetartiodactyla	Bovidae	LC		×	Interview
Giraffe*	Giraffa camelopardalis	Cetartiodactyla	Giraffidae	LC			Interview
Sitatunga*	Tragelaphus speki	Cetartiodactyla	Bovidae	LC			Interview
Waterbuck*	Kobus ellipsiprymnus	Cetartiodactyla	Bovidae	LC			Interview
Common eland*	Tragelaphus oryx	Cetartiodactyla	Bovidae	LC			Interview
Greater kudu*	Tragelaphus strepsiceros	Cetartiodactyla	Bovidae	LC			Interview
Impala*	Aepyceros melampus	Cetartiodactyla	Bovidae	LC			Interview
Lesser kudu*	Tragelaphus imberbis	Cetartiodactyla	Bovidae	NT			Interview

Table 13: Large and medium sized mammals recorded during the study.

Common Namo	Scientific Name	Ordor	Family	IUCN	Evic	lence / M	ethod
Common Name	Scientific Name	Order	Failing	status	D. obs.	Signs	Other
Hippopotamus*	Hippopotamus amphibius	Cetartiodactyla	Hippopotamidae	VU			Interview
Spotted hyena	Crocuta crocuta	Carnivora	Hyaenidae	LC		х	Interview
Dwarf mongoose	Helogale parvula	Carnivora	Herpestidae	LC	×		Interview
Slender mongoose	Herpestes sanguineus	Carnivora	Herpestidae	LC	×	×	Interview
Banded mongoose	Mungos mungo	Carnivora	Herpestidae	LC	×	×	Interview
Large-spotted genet	Genetta tigrina	Carnivora	Vivveridae	LC			Interview
Common genet	Genetta genetta	Carnivora	Vivveridae	LC			Interview
Scrub hare	Lepus capensis	Lagomorpha	Leporidae	LC	×	×	Interview, Droppings
Rock hyrax	Procavia capensis	Hyracoidea	Procavidae	LC	×	×	Interview, Droppings
Honey badger	Mellivora capensis	Carnivora	Mustelidae	LC			Interview
Wild cat	Felis silvestris	Carnivora	Felidae	LC	х		Interview
Wild dog*	Lycaon pictus	Carnivora	Canidae	EN			Interview
Leopard*	Panthera pardus	Carnivora	Felidae	NT			Interview
Lion *	Panthera leo	Carnivora	Felidae	VU			Interview
African elephant*	Loxodonta africana	Proboscidea	Elephantidae	VU			Interview
Ground pangolin*	Manis temminckii	Pholidota	Manidae	EN			Interview
Aardvark*	Orycteropus afer	Tubulidentata	Orycteropodidae	LC		×	Interview

\* Occurs mainly inside the Maswa Game Reserve which borders on the project area for Phase 2.

LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered

12 small mammal species in 3 orders and 7 families (Table 14) were either observed or identified through interviews. Some of the recorded species include Multimammate rat (*Mastomys natalensis*), Black rat (*rattus rattus*), mice (*Mus muculus*), giant rat (*Cricetomys gambianus*) and elephant shrew (*Elephantulus sp*). Giant pouched rat (*Cricetomys cf, gambianus*) burrows were observed on a few occasions in forested areas in the proposed reservoir areas at Ngasamo and Yoma hills.

Common Name	Colonalific manage	Ondon	Family	Family IUCN		Evidence / Method		
Common Name	Scientific name	Order	Family	status	D. obs.	Sign	Other	
Cane rat	Canis adustus	Rodentia	Canidae	LC		×	Interview	
Yellow-spotted brush- furred rat	Lophuromys flavopunctatus	Rodentia	Muridae	LC	x			
Four-striped grass mouse	Rhabdomys pumilio	Rodentia	Muridae	LC	х			
Common mouse	Mus muculus	Rodentia	Muridae	LC			Interview	
Black rat	Rattus rattus	Rodentia	Muridae	LC	×	×	Interview	
Multimammate rat	Mastomys natalensis	Rodentia	Muridae	LC	х			
Springhare	Pedetis capensis	Rodentia	Pedetidae	LC	х		Interview	
Climbing mouse	Dendromus sp.	Rodentia	Dendromuridae	LC	×			
Tateril	Taterillus sp.	Rodentia	Muridae	LC		х		
Elephant shrew	Elephantulus sp	Macroscelidea	Macroscelididae	LC			Interview	
Free-tailed bat	Tadarida sp	Chiroptera	Molossidae	LC	х		Interview	
Yellow-winged bat	Lavia frons	Chiroptera	Megadermatidae	LC	х		Interview	

## Table 14: Small mammals recorded during the study.

LC = Least Concern

#### **Reptiles**

A total of 18 species in 10 families were encountered or identified through the interviews and direct observation in the project areas for Phase 1 and Phase 2. Three of the species, African monitor lizard (*Varanus niloticus*), Crocodile (*Crocodylus niloticus*) and African rock python (Python sebae natalensis) are on the CITES Appendix II list. The recorded species include the Red-lipped Herald snake (*Crotaphopeltis hotamboeia*), Black mamba (*Dendroaspis polylepis*), Black-necked spitting cobra (*Naja nigricollis*), Puff Adder (*Bitis arientans*), Southern African Rock Python (*Python sebae natalensis*), Boomslang (*Dispholidus typus*), African monitor lizard (*Varanus niloticus*), Crocodile (*Crocodylus niloticus*), red-headed rock agama (*Agama agama*), tree agama (*Acanthocerus atricollis*), striped skink (*Trachylepis striata*), variable skink (*Trachylepis varia*), tropical house gecko (Hemidactylus mabouia), Cape dwarf gecko (*Lygodactylus capensis*) and Wahlberg's snake-eyed skink (*Panaspis wahlbergi*). Table 15 lists the identified reptile species.

Common name	Sciontific name	Family	IUCN	Evide	nce / M	ethod
common name	Scientific name	Failing	Status	D. obs.	Sign	Other
Monitor lizard	Varanus niloticus	Varanidae	NE	×		Interview
Crocodile	Crocodylus niloticus	Crocodylinae	NE			Interview
African southern rock python	Python sebae	Pythonidae	NE			Interview
Puff adder	Bitis arietans	Viperidae	NE			Interview
Black mamba	Dendroaspis polylepis	Elapidae	NE			Interview
Red-lipped Herald snake	Crotaphopeltis hotamboeia	Colubridae	NE			Interview
Boomslang	Dispholidus typus	Colubridae	NE			Interview
Black-necked spitting cobra	Naja nigricollis	Elapidae	NE			Interview
Red-headed rock agama	Agama mwanzae	Agamidae	NE	×		Interview
Tree Agama	Acanthocerus atricollis	Agamidae	NE	×		Interview
Striped skink	Trachylepis striata	Scincidae	NE	×		
Variable skink	Trachylepis varia	Scincidae	NE	×		Interview
Speckled lipped-skink	Trachylepis maculilabris	Scincidae	NE	×		Interview
Wahlberg's Snake-eyed Skink	Panaspis wahlbergi	Scincidae	NE	×		Interview
Moreau's Tropical house gecko	Hemidactylus mabouia	Gekkonidae	NE	×		
Cape Dwarf Gecko	Lygodactylus capensis	Gekkonidae	NE	×		Interview
Matschie's Dwarf Gecko	Lygodactylus chondradti	Gekkonidae	NE	х		
Striped scrub lizard	Nucrus ornata	Lacertidae	NE	х		

Table 15: List o	f reptile s	pecies recorded	durina the study.
	, p		

NE = Not Evaluated

## **Amphibians**

Eight amphibian species belonging to 7 families were identified in the study areas by either direct observation or by their calls. No species of special conservation concern was recorded. The species were found in wetlands and swamp areas of the project areas. The recorded species were Mascarene grass frog (*Ptychadena mascareniensis*), Anchieta's ridged frog (*Ptychadena anchietae*), African common toad (*Amietophrynus gutturalis*), *Phrynobatrachus bullans*, African Groove-Crowned Frog (*Hoplobatrachus occipitalis*), Lake Victoria Clawed Frog (*Xenopus victorianus*), Common Reed Frog (*Hyperolius viridiflavus*) and Bocage's Tree Frog (*Leptopelis bocagii*). On the IUCN Red List they are all categorised as Least Concern (LC).

# <u>Birds</u>

Bird species recorded in the project area (inclusive of Phase 2) are listed in Appendix 10. Birds were the most diverse fauna group in the project area as in all 106 species belonging to 30 families were recorded. The most well represented avian family in the area is sparrow family (*Passeridae*) followed by crow family (*Corvidae*) and mousebird family (*Muscicapidae*). However, the avian species richness is likely to be larger during the wet season where migration of species arrives in the area. The most frequently observed species in the project areas were ring-necked dove, red-eyed dove, African-mourning dove, emerald-spotted wood dove, African-paradise fly catcher, red-cheecked cordon bleu, common bulbul, cattle egret, grey heron, pied kingfisher and paradise flycatcher. Most of the species in the project areas may be categorised as generalists which include all birds of open country, grasslands and woodlands.

The riparian vegetation, floodplain areas and Lake Victoria in the proposed project areas are important to piscivorous (fish eating) and frugivorous (fruits eating) species, in particular kingfishers, terns, fish eagle, hornbills, doves and pigeons. The riparian vegetation is also important as feeding grounds and cool environments for many bird species. At the proposed intake at Bukabile considerable numbers of long tailed

cormorants, ducks, kingfishers and egrets were observed using the area as a foraging and roosting area. All the observed bird species are listed Least Concern (LC) category in the IUCN Red list.

The terrestrial fauna in the Phase 1 project area is characteristic of an area that is relatively densely populated and where the land-use is dominated by agriculture and settlements. It is therefore only the bird fauna that shows some but limited variability in species. Although the fauna found inside the Maswa Game Reserve is rich and varied this protected area can in all practical terms be considered to be outside both the Phase 1 and Phase 2 project areas. Discounting this fauna found here, the value of the fauna in the total project area, including both phases is considered to have a low value.

	Value	
Low	Medium	High
%		%

# 5.2.4 Aquatic Ecology

## Fish Species

From interviews conducted with local fishermen at Bukabile (intake site) and discussions with Tanzania Fisheries and Research Institute (TAFIRI) staff, a total of 8 different species representing 5 families were identified as occurring in Lake Victoria at the proposed intake site at Bukabile. The table below list the identified species.

Common name	Scientific name	Family	IUCN Status
Nile perch	Lates niloticus	Latidae	LC
Silver cyprinid (dagaa)	Rastrineobola argentea	Cyprinidae	LC
Marbled lungfish	Protopterus aethiopicus	Protopteridae	NE
North African catfish	Clarias mossambicus	Clariidae	LC
Haplochromine	Haplochromis spp.	Cichlidae	NE
Singida tilapia	Oreochromis esculentus	Cichlidae	CR
Nile tilapia	Oreochromis niloticus	Cichlidae	NE
Redbelly tilapia	Tilapia zillii	Cichlidae	LC

#### Table 16: Fish species Identified during the study.

LC = Least Concern, NE = Not Evaluated, CR = Critically Endangered

Three of the identified species are commercial fish species, namely tilapia, Nile perch and silver cyprinid (*dagaa*). There is also a high number of other fish species in Lake Victoria of which many are endemic.

Nile perch (*Lates niloticus*) was introduced to Lake Victoria in the 1950s and is today an important commercial species that is that is being caught for processing and export. However, as an introduced species is controversial in an ecological perspective as it is a predator that has led to the decimation of the rich diversity of hundreds of native species occurring in the lake. Indeed, before the introduction of Nile perch, Lake Victoria had a multi-species fishery of over 500 endemic fish species, the dominant species being the tilapiines and haplochromines.

Silver cyprinid (*dagaa*) is caught in large quantities and is dried and sold either for human consumption or for animal feed. *Dagaa* serves the local markets, but a significant amount is exported to other countries in the region.

The tilapia species found in Lake Victoria such as the Nile tilapia, also supports commercial fisheries. Nile tilapia is also an introduced species which is commonly farmed and breeds easily.

One of the identified tilapia species, Singida tilapia, is listed as Critically Endangered on the IUCN Red List of Species. According to IUCN, Singida tilapia has almost been eliminated from its previous range in Lake Victoria where the population has declined by more than 80% over the past 20 years through predation and competitive exclusion by introduced fish species, most notably by the Nile perch and the Nile tilapia.

The marbled lungfish is a species commonly occurring in a number of African lakes and rivers. The species is of little significance as a source of food but it is used as an aquarium fish species. The North African catfish is important fish species for aquaculture and commercial fisheries.

## **Macroinvertebrates**

No separate investigation and sampling of macroinvertebrates were carried out during the field studies. However, one investigation of the environmental impacts of fish cage culture carried out in Shirati Bay, located north of Speke Bay, by the Tanzania Fisheries and Research Institute (TAFIRI), found that the main groups of benthic macroinvertebrates were molluscs (bivalves and gastropods), insects and worms (Kashindye et al. 2015). At one of the sampling sites bivalves were dominating with the 74 % of the individuals per square meter while gastropods accounted for 16%. The remaining 10% were made up of worms. The bivalves species in the sampling included *Sphaerium nyansae, Sphaerium stuhlmanni, Caelatura alluaudi* and *Caelatura monceti* while gastropods species were represented by *Bellamya costulata, Bellamya unicolor* and *Melanoides tuberculate*. Although no sampling of macroinvertebrates was carried out as part of the present ESIA study, it may be assumed that there are relatively good chances that the species composition of benthic macroinvertebrates at the intake site may be similar to the one found at Shirati Bay.

The value of the aquatic ecology can be assessed both in a natural resource and biodiversity perspective. It should therefore be noted that in this assessment it is the biodiversity that is used as a criteria for assigning value. The fish species diversity in Lake Victoria has, as described above, been significantly affected by the introduction of alien species such as the Nile perch and the Nile tilapia. Due to this introduction, the previous high biodiversity in terms of fish species in Lake Victoria has been severely reduced and many species are in the process of more or less disappearing. The reduced biodiversity has affected the whole lake system, including Speke Bay where the intake for the Simiyu Water Supply Project is located. Overall, the project's impact zone is rated as medium value with respect to aquatic ecology.

	Value	
Low	Medium	High
&	‰‰	‰

# 5.3 Human Environment

# 5.3.1 Administrative Setting

The Simiyu Water Supply Project is planned to eventually cover all the five districts (Busega, Bariadi, Itilima, Meatu and Maswa) and about 250 villages in Simiyu region. However, Phase 1 which is the subject of the present ESIA study, extends from Busega district to Bariadi and Itilima districts, possibly with a few villages in Meatu and Maswa districts. The exact coverage of Phase 1 will depend on the detailed routing of the water mains and the distance to each of the villages (all villages within a 12 km corridor from the water mains are planned to be served). Table 17 shows the list of wards and the number of villages located within

the 12 km corridor. A total of 40 wards and 136 villages have been confirmed within the corridor for Phase 1. The name of each village is given in Appendix 4 and their exact location is shown in Figure 2.

District	Ward	Number of Villages
Busega District	Badugu	4
	Igalukilo	5
	Kabita	5
	Kalemela	3
	Lutubiga	2
	Malili	6
	Mkula	3
	Mwamanyili	5
	Ngasamo	5
	Nyaluhande	3
	Shigala	4
Bariadi District/Town	Bariadi	1
	Bunamhala	6
	Dutwa	6
	Gambosi	3
	Gilya	3
	Guduwi	4
	Ikungulyabashashi	4
	Isanga	1
	Malambo	1
	Matongo	2
	Mhango	3
	Mwadobana	3
	Mwaubingi	2
	Ngulyati	1
	Nyakabindi	7
	Nyangokolwa	6
	Sakwe	2
	Sapiwi	2
	Sima	7
	Somanda	5
Itilima District	Budalabujiga	5
	Bumera	2
	Chinamili	1
	Ikindilo	3
	Lagangabilili	4
	Luguru	1
	Mhunze	2
	Nhobara	1
	Nkoma	3
TOTAL		40 136

Table 17: List of wards and number of villages served by the Simiyu Water Supply Project.

# 5.3.2 Land Tenure

All land in Tanzania is considered public land which the President holds a trustee for its citizens. Five main groups of land tenure types are recognized. These are:

- Village land
- Customary right of occupancy
- Granted right of occupancy
- Leasehold
- Residential licence

# Village land

The Village Land Act recognizes the rights of villages to land held collectively by village residents under customary law. Village land can include communal land and land that has been individualized. Villages have rights to the land that their residents have traditionally used including grazing land, fallow land and unoccupied land. Villages can demarcate their land, register their rights and obtain certificates evidencing their rights.

# Customary right of occupancy

Villagers have a customary right of occupancy for village land that they hold under customary law or have received as an allocation from the village council. Customary rights of occupancy can be held individually or jointly. Customary rights of occupancy are permanent and can be inherited. They can also be transferred within the village or to outsiders with permission of the village council. Village land allocations can include rights to grazing land, which are generally shared. The village council may charge annual rent for village land.

## Granted right of occupancy

Granted rights of occupancy are available for general and reserved land, subject to the restrictions and the terms of the grant. Grants are available for periods up to 99 years and can be made in periodic grants of fixed terms. Granted land must be surveyed and registered under the Land Registration Ordinance and is subject to annual rent. Squatters and others without granted rights may have customary rights to occupy general land, which may be formalized with a residential license or remain un-formalized and insecure.

## <u>Leasehold</u>

Leaseholds are derivative rights granted by holders of granted or customary rights of occupancy. Holders of registered granted rights of occupancy may lease that right of occupancy or part of it to any person for a definite or indefinite period, provided that the maximum term must be at least ten days less than the term of the granted right of occupancy. Leases must be in writing and registered. Short-term leases are defined as leases for one year or less; they may be written or oral and need not be registered. Holders of customary rights of occupancy may lease and rent their land.

## **Residential license**

A residential license is a derived right granted by the state on general or reserved land. Residential licenses may be granted for urban and semi-urban non-hazardous land, including land reserved for public utilities and for development.

## Situation in the project area

Although no specific figures for land tenure types in the project area of Phase 1 is available, it may be assumed that village land and customary right of occupancy are the dominant land tenure types. Only in urban and semi-urban areas leaseholds or residential licences are likely to be found. With regard to the

project area it is therefore reason to believe that properties in Bariadi town may to a certain degree held under a leasehold or a residential licence.

Public infrastructure such as transmission lines and underground fibre optic cables have been accommodated within the road reserve which is administered by TANROADS. There are a number of telecommunication towers in the project area which are being held under leasehold.

# 5.3.3 Population

The population of Simiyu region had according to 2002 National population census a population of 1,156,220. The estimated population growth rate was 2.8% per year. The main ethnic groups in the region are Sukuma (Nyantuzu), Nyiramba, Nyaturu, Hadzabe (Tindiga), and Taturu. The Sukuma are found in most of the districts while Nyaturu and Nyiramba are mostly found in Maswa and Meatu districts. Hadzabe (Tindiga) and Taturu are predominantly living in Meatu district.

The Hadzabe is a small ethnic group who identify themselves as indigenous peoples, and a few hundred of them still live as hunter-gatherers on the western and eastern side of Lake Eyasi. However, the influence zone of Phase 1 is located outside the traditional Hadzabe area.

Table 18 shows the population data per district for Option 1 (i.e. both phases) according the national census 2012. The forecasts for 2015, 2025 and 2035 are based on the recorded growth rate for Simiyu region at 1.8% (GKW Consult 2015).

District	Population 2012	Population 2015	Population 2025	Population 2035
Busega	146,543	154,888	186,347	224,305
Bariadi	240,110	253,712	304,885	366,418
Itilima	176,451	186,529	224,610	270,762
Maswa	114,491	121,203	146,593	177,381
Meatu	156,609	165,282	197,813	236,751
Total	834,204	881,613	1,060,249	1,275,617

#### Table 18: Population data per district.

# 5.3.4 Settlement Pattern

The settlement pattern in the total project area for the Simiyu Water Supply Project is characterised by villages and settlements scattered along the main roads. Most often the villages are occupying both sides of the road, normally extending a couple hundred meters into the countryside. The only significant urban areas are Bariadi town (Phase 1) and Mwanhuzi town (Phase 2) where the population density exceeds 1,000 people per square kilometre. In general, the Lake Victoria shore around the intake site has a higher population density with 500 - 1,000 people per square kilometre. As one moves away from the main roads, the population density tends to drop to 50 - 100. The eastern part of the Phase 2 project area, where the planned water main extends from Langangabilili south to Mwanhuzi district town, has a lower population than the Phase 1 project area. The figure overleaf shows the population densities for the whole Simiyu Water Supply Project area.

It should be noted that the road reserves have not been completely cleared of residential and business structures in all sections. TANROADS is in the process to relocate all structures within the 60 m wide road reserves but compensations have not yet been paid to all the affected property owners. This mostly applies to the urban areas (e.g. Bariadi town) and highly populated centres (e.g. Nyang'hanga and Dutwa), where many structures are located immediately outside the old road reserve boundary, i.e. at a distance of 22.5 m to 30 m from the centre line of the roads.



Figure 18: Section of road reserve in Bariadi town (left) and along Bariadi-Lagangabilili road (right).

# 5.3.5 Land Use

Land use in Simiyu region is dominated by rainfed agriculture and agro-pastoralism. The production system is characterised by small farms applying predominantly traditional farming methods with a low level of input supply (GOPA, 2016). The main cash crops grown are cotton, groundnuts and sunflower, while the main food crops are maize, sorghum, paddy, sweet potatoes, millet and cassava (GKW Consult 2015). The main cropping season is from October to July.

According to GOPA (2016), there is clear indication that the overall number of livestock exceeds the carrying capacity of the land. Land suitable for sustainable livestock keeping in the region amounts to 845,000 ha, thus able to carry around 0.5 million cattle (corresponds to 12 acres for grazing per animal per year). As of March 2016, cattle are estimated to be 1.5 million, goats 750,000 and sheep 290,000. Water is scarce and overgrazing a major challenge, necessitating migration of cattle to other areas (including encroachment to forest reserves and to other districts).

Figure 19 shows the distribution of land uses in the proposed project corridors. Cultivated land together with grassland and bushland for grazing are the two dominant land uses. The urban areas are not clearly shown on the map but the main urban area is Bariadi town (regional centre). In addition comes Meatu and Maswa district centres (Phase 2) plus several ward and village centres along the main roads. Structures are often located immediately outside the road reserve or even partly within the reserve (see above). The crops observed along the roads (and within the road reserve) were mainly seasonal crops as well as sisal and few fruit trees (e.g. mango).

# 5.3.6 Local Economy

The local economy is predominantly agricultural based. In Itilima district, cropping and livestock keeping account for more than 80% of the value of the production while other sectors, most notably trading and small scale and cottage industry production, account for the remaining percentages. Commercial crops in Itilima include cotton, sunflower and yellow grams (peas) while major food crops are maize, sorghum, rice and sweet potatoes. In the rural parts of Bariadi (Bariadi District Council), maize is by far the largest crop with around 50,000 ha in the 2014/2015 cropping season followed by sorghum with around 20,000 ha. Sweet potatoes and rice accounted for 8,000 – 9,000 ha each.

On a regional basis, agriculture (crop cultivation) accounts for 75% of Simiyu's economic output while employing around 80% of the population. Livestock keeping is the second main contributor to the regional

economy with a livestock population of around 1.5 million cattle, 750,000 goats and 290,000 sheep as noted above in Section 5.3.5.

Fishing in Simiyu region is mainly done in Lake Victoria in Busega district, in Lake Kitangiri in Meatu district as well as in rivers and dam reservoirs. Apart from the Lake Victoria fisheries, fishing in other parts in the region is merely for domestic consumption. The commonly caught species include Nile perch, tilapia and Silver cyprinid (see Section 5.2.4). The significance of the Lake Victoria fisheries for Busega district economy is not known, but it may be assumed that it is important for the household economy of a number of families along the lake shore. In addition, there are efforts to increase fish production by breeding fingerlings mainly for tilapia species at Zanzui dam in Maswa district. The produced fingerlings are used for stocking dam reservoirs and ponds for domestic fish farming.

The Gross Domestic Product (GDP) of Simiyu region was estimated to be TShs. 1,959,401 million in 2010 corresponding to around USD 877 million with current exchange rates. This accounted for around 6% of the national GDP. The estimated per capita income in 2010 was TShs. 510,023 corresponding to around USD 230 which puts Simiyu in the middle income category on a national basis.

The industry found in Simiyu region comprises large, medium and small-scale industrial establishments scattered in the region. The large scale and medium size industries comprises of oil mills and ginneries while small scale industries are dominated by flour milling, tailoring, carpentry, welding, garages, printing and food processing industries. In 2013, there were 170 business licenses in Bariadi district, 1450 in Maswa district and 85 in Meatu district.



Figure 19: Land use map of the Simiyu Water Supply Project area.

# 5.3.7 Water Supply and Sanitation

#### Water Supply Sources

The water supply situation for the Phase 1 project area varies in terms of coverage and sources. The information given below has been sourced from the draft feasibility report for the Simiyu Water Supply project (GKW Consult 2015).

In Busega district, the main source there are five small schemes drawing water from Lake Victoria while shallow wells and traditional well are the most common water supply sources. Harvesting of rainwater also contributes to the water supply in the district. Reportedly 38% of the population have a water source within 400 meters from their house.

In Bariadi town, both ground and surface water sources are utilized. The public water supply authority, BARUWASA, covers only the four wards of Somanda, Bariadi, Malambo and Sima. Due to siltation, the Bariadi reservoir built in 1987 can no longer deliver water though the pipe network but people still use it for collection water manually. BARUWASA currently manages nine boreholes which covers around one fourth of the total water demand. To make up for this deficit, people rely on 44 shallow wells and, small earth dams (charco dams) and rainwater harvesting tanks.

In Bariadi rural (Bariadi District Council) the main water sources are boreholes, traditional hand dug shallow wells as well as collection of water by digging down in river beds. Shallow wells and river beds are not year around sources as they tend to dry out during the dry season. There are 10 boreholes, 493 shallow wells (27 are out of use), 25 small earth dams (17 are out of use) and 29 rain harvesting tanks (one out of use). Some 48% of the Bariadi rural population are served with water from these sources.

In Itilima district, around 58 % have access to potable water sources which mainly come from the 738 shallow wells (29 out of use), 14 boreholes 23 small earth dams (8 out of use) and 48 rainwater harvesting tanks.

Water sources in Maswa district include 3 reservoirs (one out of use), 670 shallow wells, 47 boreholes and 93 rainwater harvesting tanks. The water supply coverage is 80% for the urban area and 56% for the rural areas.

Meatu District relies on the Mwanyahina reservoir as its main source of water supply for Mwanhuzi town and the villages of Mshikamano, Bomani, Mwanyahina and Mwambegwa. The water supply coverage for the district is 44%. The other water supply sources are 477 shallow wells, 2 boreholes, 5 sub-surface dams (for storage of groundwater), 1 small earth dam and 59 rainwater harvesting tanks. People also fetch water from streams and rivers such as the Mwanhuzi and Semi rivers.

In general, the water supply for the rural areas within the project area relies mainly on shallow wells, small earth dams, a few boreholes (deep wells) and rain water harvesting. The coverage varies from 38% for Busega district up to 58% for Itilima. This means that the population in the project area are experiencing a significant lack of access to water which is also confounded by the general poor water quality of shallow wells and surface water sources.

Water collection is a major work burden for women and children as they can spend up to several hours per day fetching water.

## **Sanitation**

The water and sanitation authorities for Bariadi and Maswa (BARUWASA and MAUWASA) do not provide sewerage services as this is under the responsibility of the town councils. Mwanhuzi town does presently not have any sewerage system. In the rural areas, households normally have latrines of varying standards.

During the consultations, information about the water and sanitation situation for the wards was collected. The results are shown in Table 19 below.

District	Ward	Water sources	Boiling water	Sanitation facilities / practises	Waste disposal facility
	Ikindilo	SHW	25 %	Pit latrines	-
	Bumera	SHW, river, BH	20 %	Pit latrines	None
	Mhunze	BH, river, SHW	-	Pit latrines, open defecation	None
Itilima DC	Budalabujiga	SHW, river	20 %		None
	Chinamili	SHW, rainwater	10 %	Pit latrines	None
	Luguru	River, SHW	30 %	Pit latrines	None
	Nkoma	Bore holes	35 %	Pit latrines	None
	Lagangabilili	PW, BH, SHW, dam	No	Pit latrines	Yes (temporary)
	Guduwi	SHW, river	10 %	Pit latrines, open defecation	None
	Bunamhala	PW, BHs and river	15 %	Pit latrines, open defecation	None
Bariadi TC	Mhango	SHW, rivers, dam	No	Pit latrines, open defecation	None
	Nyakabindi	SHW, river, rainwater	No	Pit latrines, open defecation	None
	Somanda	PW, BH, SHW, river	40 %	Pit latrines, flush toilets	Some collection
	Banemhi	SH, river, spring	25 %	Pit latrines	None
	Matongo	SHW, rivers, dams	75 %	Pit latrines	None
	Sapiwi	SHW, dams, rainwater	15 %	Pit latrines	None
Dariadi DC	Gilya	SHW, dam, river	10 %	Pit latrines, open defecation	None
Bariadi DC	Ikungulyabashashi	SHW, river	No	Pit latrines, open defecation	None
	Dutwa	SHW, dams, river	20 %	Pit latrines, open defecation	None
	Itubukilo	SHW	No	Pit latrines	None
	Sakwe	SHW, dam, river	No	Pit latrines	None
	Nyaluhande	PW, BHs, spring, river	10 %	Pit latrines, flush toilets	None
	Kiloleli	SHW, reservoir	10 %	Pit latrines	None
	Badugu	PW, BHs, dam	No	Pit latrines	None
	Mwamanyili	SHW, reservoir	No	Pit latrines	None
Duran DC	Ngasamo	SHW, spring, river	No	Pit latrines	None
Busega DC	Kabita	Reservoir, SHW, spring	No	Pit latrines, flush toilets	None
	Kalemela	PW, water, BH, lake	No	Pit latrines	Very few
	Imalamate	SHW, river, spring	10 %	Pit latrines	None
	Malili	SHW, dam, river, spring	43 %	Pit latrines	None
	Igalukilo	PW, SHW, river	20 %	Pit latrines, flush toilets	None

Table 19: Water and sanitation facilities for Phase 1 wards.

SHW = shallow well, BH = borehole, PW = piped water

The results from the ward information collection on water supply and sanitation indicate that traditional wells and shallow wells provide a major part of the water for consumption in the project area. Regarding the treatment of water after collection, it appears that boiling the drinking water is not so common. The responses indicate that this is not practised at all in some wards while in others the percentages of households boiling water is relatively low with only 10 - 30% of the households practising this.

Use of latrines is common and seems to be well established but eight of the wards have also responded that open defecation is common. Eliminating or limiting open defecation is one of the factors that will reduce occurrence of diarrhoea and reduce the risks of other outbreaks of other diseases such as cholera.

Regarding waste management, only Lagangabilili and Somanda within Bariadi town reported to have made arrangements for waste collection and disposal.

## 5.3.8 Health and Education

## <u>Health</u>

In parallel with the consultations in the wards through which the main water supply pipelines will pass information covering a number of fields were collected by interviewing the ward and village leadership. The information collection included the health and education sector. Table 20 sums up the health and education facilities found in each ward along with other essential parameters.

District	Ward	Health Centre	Dispensary	Nearest Hospital	Most Common Diseases
	Ikindilo	1	1	23 km	Malaria, typhoid, UTI*, bilharzia
	Bumera	-	2	28 km	Worms
Itilian a	Mhunze	-	1	50 km	Malaria, diarrhoea, UTI, worms and pneumonia
District	Budalabujiga	-	1	8 km	Typhoid, malaria, UTI, bilharzia
Council	Chinamili	-	3	36 km	Malaria, cholera, typhoid, bilharzia pneumonia
	Luguru	-	1	10 km	Malaria, bilharzia, diarrhoea, cholera
	Nkoma	-	-	40 km	Malaria, UTI diarrhoea
	Lagangabilili	-	1	35 km	Pneumonia, malaria, UTI
	Guduwi	-	1	30 km	Malaria, bilharzia, UTI, worms, pneumonia
Bariadi	Bunamhala	-	1		Malaria, bilharzia, UTI, worms, dysentery
Town Council	Mhango	1	1	13 km	Malaria, bilharzia, UTI, amoeba, diarrhoea, cholera
	Nyakabindi	-	3	18 km	Malaria, typhoid, bilharzia worms
	Somanda	1	1	< 1 km	UTI, typhoid and malaria
Baner	Banemhi	-	1	20km	UTI, malaria, cholera, typhoid, diarrhoea, pneumonia
	Matongo	-	1		HIV/AIDS, malaria and STIs
	Sapiwi	-	3	54 km	Malaria, bilharzia, UTI, diarrhoea, worms, cholera
Bariadi District	Gilya	-	3	57 km	Malaria, bilharzia, UTI, pneumonia, diarrhoea, cholera
Council	Ikungulyabasha shi	-	2	17 km	Malaria, bilharzia, diarrhoea
	Dutwa	-	4	35 km	Malaria, worms, STIs, UTI, bilharzia
	Itubukilo	-	3	25 km	Malaria, dysentery and diarrhoea
	Sakwe	-	1	21km	Malaria, dysentery, UTI, bilharzia and worms
	Nyaluhande	-	1	9 km	Malaria and diarrhoea
	Kiloleli	-	2	25 km	Diarrhoea, cholera, pneumonia and worms
Busega	Mwamanyili	-	1	40 km	Malaria, UTI, diarrhoea
District	Ngasamo	-	1	25 km	Malaria, pneumonia, diarrhoea
Council	Kabita	-	1	8 km	Cholera, malaria, dysentery, amoeba
	Kalemela	-	3	16 km	Typhoid, Malaria, diarrhoea, worms
	Malili	-	3	30 km	Typhoid, malaria, worms
	Igalukilo	1	2	25 km	Typhoid, malaria, UTI

Table 20: Health and education facilities in Phase 1 wards.

\* UTI = urinary tract infections

The health service facilities at ward level predominantly consists of dispensaries which is second lowest level in the Tanzanian health service delivery system. The dispensary normally covers a population of 6,000 to 10,000 people. They are normally staffed by a medical assistant and focuses on both curative and preventive work including vaccination and mother-child-services. There are 40 dispensaries in the wards through which the Phase 1 main water pipelines will run.

There are four health centres in the Phase 1 project area with two of them being located within the Bariadi Town Council area. A health centre is normally intended to cater for a population of up to 50,000 people and shall offer outpatient and in-patient services, maternity care, laboratory, and dispensing and mortuary services. Health centres acts as the first referral centre from dispensaries in its catchment area, supervises dispensaries and keep health service data and records. The desirable staffing includes a doctor, a senior medical assistant and other health workers such as midwives, nurses, and laboratory assistants.

The majority of the wards are within reasonable distances from the district hospitals, the furthest wards being 50 km away. In Simiyu there is no regional hospital but the region has three district hospitals in Bariadi, Maswa and Meatu. In addition there are plans to build district hospitals in Busega and Itilima.

The most common diseases and health ailments in the project area include malaria, bilharzia, cholera and typhoid fever. Cholera and typhoid are diseases that are associated with poor sanitation and unclean drinking water and provision of safe drinking water and water for better personal hygiene and hand washing is one of the prerequisites for addressing these diseases that appears to be common in the project area.

The HIV prevalence rate for Simiyu was in 2012 amounting to 3.6% according to the Tanzania HIV/AIDS and Malaria Indicator Survey for 2011/12 (NBS 2013). For the national level, the HIV prevalence rate was estimated to 5.3% for 2014. It thus appears that the HIV prevalence rate for Simiyu is lower than the national average. For the districts, the rates varies with 5.9% for Itilima in 2012 (Itilima District Profile, 2012), 2.9% in Bariadi (Bariadi District Profile, 2016) and 4.1% in Busega (information from consultation with district).

# **Education**

The Phase 1 project area appears to be reasonably well covered in terms of educational facilities with 124 primary schools and 39 secondary schools. In addition, there is a vocational training college in Bunamhala ward and a teachers college in Igalukilo.

The primary school enrolment rates appears to be high in general with 99% in Itilima district and 100% for Bariadi District Council. This is above the average for the country, reported by the World Bank to be 87% in 2013.

District	Ward	Secondary	Primary	Other Educational Institution
Itilima District Council	Ikindilo	1	1	
	Bumera	2	2	
	Mhunze	1	2	
	Budalabujiga	1	3	
	Chinamili	-	1	
	Luguru	1	2	
	Nkoma	1	4	
	Lagangabilili	1	4	

Table 21: Educational facilities in Phase 1 wards.

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District	Ward	Secondary	Primary	Other Educational Institution
Bariadi Town Council	Guduwi	1	4	
	Bunamhala	2	3	Vocational training college
	Mhango	2	1	
	Nyakabindi	3	7	
	Somanda	-	4	
Bariadi District Council	Banemhi	2	3	
	Matongo	1	5	
	Sapiwi	1	7	
	Gilya	2	5	
	Ikungulyabashashi	1	2	
	Dutwa	2	5	
	Itubukilo	1	4	
	Sakwe	2	3	
Busega District Council	Nyaluhande	1	5	
	Kiloleli	1	7	
	Badugu	1	5	
	Mwamanyili	1	4	
	Ngasamo	1	4	
	Kabita	1	4	
	Kalemela	1	6	
	Malili	1	9	
	Igalukilo	3	8	Mwanza Teachers College

# 5.3.9 Safety and Security

Other than petty thieves, no major security threats were reported in the project area. The thefts included parts for borehole pumps, hence affecting water supply services.

With respect to safety, it is known that health and safety standards on civil engineering projects in Tanzania tend to be below best international standards, resulting in avoidable accidents and injuries to workers.

## 5.3.10Cultural Heritage

## Previous Archaeological Research

Previous archaeological research works reported stone tools earlier in date than Later Stone Age at two sites in Ngasamo vicinity (Soper and Golden 1969). A few tools were found by that research team on the east bank of Duma River tributary north of crossing of what they referred to as 'Ngasamo Goldmine' (Soper 1968, Soper and Golden 1969). Also, between 15 and 1.2 kilometres due west-northwest of Ngasamo, along Nassa road, they discovered artifacts attributed to Middle Stone Age (Soper and Golden 1969). Furthermore, Nyang'oma rock shelter some two kilometres southwest of Shigala village, along Nyashimo to Ngasamo/Bariadi road, two adjacent small rock shelters have rock paintings with a lot of Later Stone Age materials (Soper and Golden 1969, Chaplin 1974). Other materials were recovered from the locality and included Iron Age pottery; vertebrate fossil remains; shell fragments belonging to nacreous fresh-water bivalve; a few shell fragments of large land-snails; and ostrich egg-shells (Soper and Golden 1969). The charcoal sample revealed dates at the lower stratum to be  $2640 \pm 120$  Before Present (B.P.) or 690 Before Christ (Soper and Golden 1969). In addition, at Mwamajo rock shelter, about one kilometre to the south of Shigala village, there is a gong and immediately in the vicinity there is another rock shelter with red paintings, while the floor yielded quartz stone artifacts, iron-smelting remains, pottery remains and bone

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fragments (Chaplin 1974). However, it should be noted here that the above sites are located away from the proposed pipeline route and other water infrastructure.

#### Field Work Results

## Grounding Stones, Grinding Stones and Hollows

The field survey recovered three grinding stones and five grounding stones at Charangi sub-village in Shigala village, Busega district (Figure 20). The site is located approx. 20 m north of the main road. These stones which were used to mill cereals were used from stone age epoch to recent time. Some places were found with grinding hollows at large granite boulders for grinding cereals that were used in prehistoric to contemporary times. For example, a characteristic feature on rocks sighted in Dutwa ward is a grinding hollow that is a depression larger than a cup-mark ground into a flat or a bit convex outcrop of granite bedrock (Figure 20). Groups of depressions aligned in two rows and number of hollows varied from forty hollows and above suggested that as long as grinding hollows have the same overall shape like grinding surface of portable grinding stones, they could be called stationary grinding stones.



Figure 20: Grounding and grinding stones at Shigala village (left) and grinding hollows at Dutwa (right).

# Test pits

At Charangi sub-village, a test pit was dug as a result of the discovery of the above-mentioned graining and grounding stones as well as three graves. The pit was dug 60 cm down using hand held hoe. No relics were found from this pit. Another pit was dug on Ngasamo hill, but the pit could not exceed 30 cm due to the nature of the area. Again, no artifact was discovered.

## Sacred Places

In Simiyu region, there are several sacred areas that include immovable physical objects associated to ritual performance places, for example wells like Luhuhi in Ilula village, Nkindwa biye tree in Ilula village, Magahi well in Isenge village, Isangijo hill at Isenge village, Dutwa well in Isenge village, Nyabusalu well in Igalukilo village and similar others. Like worship areas, they present another avenue for preservation and continued use because people believe in their own accord.

While most of these places are located outside the project areas, two sites can potentially be directly impacted (depending on the detailed design). These are Gambasangu sacred forest at, which is located 6 km south of Lagangabilili (i.e. Phase 2), and Isenge holy hill, which is located exactly where the primary reservoir for Dutwa has been proposed (Phase 1). Traditional leaders in Gambasangu and Isenge villages posit that these sacred sites have the power to heal the body, enlighten the mind and inspire the heart. These areas are considered to be holy and people go there to ask for rain when there is drought, to ask for

forgiveness, to ask for blessings and all other things that need divine power. Traditional leaders in these two villages are of the view that the proposed project should not touch these consecrated places as the impact will be very severe and irreversible. They would like the Government to help them to legally own and conserve the areas.

## Graves and Graveyards

Other findings recovered during field survey are graves and graveyards. Some graves are found within the project's impact zone, e.g. at the roadside in Nyangili village (Figure 21). Through consultation, it was revealed that graves and graveyards are respected and it is unnatural for the Sukuma people to relocate graves. However, the local people pointed out that they have no objection for relocation of their graves as long as they are fully involved in each step.

There were also examples of graves used as places for traditional ceremonies, for example on Ngasamo hill. According to informants in the clan known as Bagasamo (literally meaning people belonging to Ngasamo clan), chief Ngasa was a hunter and cultivated tobacco as well as marijuana around his residence at Ngasamo hilltop. The graves have piles of stones with built up Wasukuma traditional healers' huts (Figure 21). As a clan, they normally convene at least once a year, in September and carry out their traditional religious ceremonies beside the graves. For example, they pray for their wishes for success in mining activities (mostly gold mining because there are artisanal gold miners at Ngasamo village), businesses, farming and the like.



Figure 21: Graves at Nyangili village (left) and Ngasa and his wife's grave at Ngasamo hill (right).

## **Conclusion**

Most local people are strongly attached to their ancestors and they practice traditional culture as part of their religions. Graves and sacred places are highly respected. However, none of the cultural heritage resources have a protected status. Overall, the project's impact zone is rated as medium-high value with respect to cultural heritage.

	Value	
Low	Medium	High
%	‰	%

## 5.3.11Tourism

Tourism in Simiyu region is poorly developed and limited by the lack of hotels and camp sites of a good standard. The project area borders on the Maswa Game Reserve which covers an area of 2,880 square km along the border of Serengeti National Park and the Makao Wildlife Management Area which holds a potential for developing tourism which could bring employment and economic benefits for the local population. The Simiyu Investment Profile (2013) envisages developing the tourism potential by focusing on hunting safaris, game viewing, photography and bird watching while also developing cultural tourism based on visits to historical places and cultural sites for Taturu, Sukuma and Hadzabe communities in Meatu, Maswa and Bariadi districts. Finally, the idea of attracting tourists for water sports and sports fishing in Speke Bay in Busega district is also mentioned as a possibility.

The project's impact zone is rated as medium value with respect to tourism.

	Value	
Low	Medium	High
٥١٥	‰	%

# 6 STAKEHOLDER PARTICIPATION AND INVOLVEMENT

# 6.1 Introduction

This chapter describes the process of the public consultation and participation during the execution of the Environmental and Social Impact Assessment (ESIA) for the proposed Simiyu Water Supply Project. Stakeholder opinions were sought through interviews, group discussions and public meetings. Feedback from these consultations has been taken into account when preparing this ESIA. A summary of issues discussed is given in Section 6.5.

# 6.2 Consultation Objectives

Stakeholder consultations to support the ESIA process were specifically aimed to achieve the following objectives:

- to provide information about the project and its potential impacts to those interested in or affected by the project, and solicit their opinion in this regard;
- to identify additional impacts/issues and possible mitigation measures;
- to verify the significance of environmental, social and health impacts identified;
- to provide opportunities to stakeholders to discuss their opinions and concerns;
- to better understand the people's practices, perceptions and conditions in the project area;
- to manage expectations and misconceptions regarding the project;
- to inform the process of developing appropriate mitigation measures;
- to provide stakeholders an opportunity to contribute towards identification of mitigation measures and the Environmental and Social Management Plan; and
- to analyse gaps identified from the issues.

# 6.3 Stakeholder Identification and Composition

The stakeholder identification was based on a combination of literature reviews and discussions with officials from several institutions within the Government of Tanzania. The main criteria in the stakeholder group selection process were:

- those involved in project preparation;
- those whose activities coincide or overlap with those proposed by the project (such as relevant ministries, environmental and local authority officials); and
- those who may be directly affected by the project (local authorities and the local population in the project area, private companies, conservancies and government institutes found in the project area).

The key stakeholders identified for the Simiyu project have been categorised in Table 22.

Institution	Role and Responsibility
Ministry of Water and Irrigation	Lead implementing agency/project developer
	On behalf of government, manage and oversee project execution including
	ESMP and stakeholder engagement
	Ensure compliance with environmental and social standards
	Spearhead the formation of the bulk water supply organisation as well as
	Urban Water and Sanitation Authorities (UWSAs) in Itilima and Busega
Vice President's Office - (Division	Coordinates Environmental Management Policy, Act and EIA guidelines
of Environment, DoE)	Approval and signing of EIA certificate
National Environment	Approval of ToR, review of EIA
Management Council (NEMC)	Issuing of Environmental Certificate
	Environmental Monitoring and Compliance Auditing

## Table 22: Stakeholder identification.

Institution	Role and Responsibility
	Advise Government on all environmental matters
Ministry of Works, Transport and	Responsible for the construction sector, including roads and bridges
Communication	Promoting a quality, efficient, environmentally friendly, and cost-effective
	construction industry
Ministry of Energy and Minerals	Coordinator of the energy and mining sector and spearheads the
	implementation of the sector strategies
Ministry of Natural Resources and	Responsible for sustainable conservation of natural and cultural resources
Tourism	and tourism
Ministry of Labour and	Responsible organ for labour management issues including occupational
Employment	health and safety
	Follow up on occupational health and safety issues
	Advice the contractors in regard to national occupational health and safety
	requirements
Ministry of Lands, Housing and	Responsible for land use planning, surveying and demarcating land/parcel/
Human Settlements Development	farms, and provision of land ownership
	support the project and communities in regard to land use planning,
	ownership
	Support MoWL in the acquisition of wayleaves for the main nineline
	Support MoWI in the process of land transfer and preparation of residual
	titles for PAPs
Ministry of Livestock and Fisheries	Responsible for the overall management and development of livestock and
Development	fisheries resources
Department of Antiquities	Responsible for preservation of cultural heritage resources
	Provide technical advise in case of chance finds
EWURA	Regulator of the electricity, petroleum, natural gas and water sectors,
	including licensing, tariff and standard setting in respect to water supply and
	sanitation
	Monitor water quality and standards of performance for the provision of
	water supply and sanitation services
	Promote the development of water supply and sanitation services in
	accordance with recognized international standard practices and public
TANDOADC	demand
TANROADS	Responsible for planning and development of road infrastructure in the
	country, including road reserves
	Advisery to the contractors in regard to read reserves
	Advisory to the contractors in regard to rodu reserve use and management
	underground installations in the road reserve
TANESCO	Regulator of electricity transmission and owner of transmission lines
	Give advice to the project developer and contractors in regard to energy
	installations in the road reserve, including safety issues related to
	transmission lines
	Provide power supply to the project facilities like pumping stations, camp
	sites, etc.
Lake Victoria Basin Water Office	Ensure that water resources are managed sustainably through water
	governance and integrated water resources management principles
	Collect water resources data and monitor water levels, use and quality
	Processing of water use permits
	Pollution monitoring and control
	Coordinate establishment of Integrated Water Resources Management Plans

Institution	Role and Responsibility
Simiyu Region	Provide technical advice and capacity building to Local Government
	Authorities (LGA)
	Ensure that social and economic activities are harmonized and aligned to the
	national development policies and strategies
	Ensure peace and tranquillity prevail in the region by creating enabling
	environment for LGAs to perform their functions
Busega, Bariadi and Itilima	Oversee and advise on implementation of national policies at district level
Districts	Oversee enforcement of laws and regulations
	Advise on implementation of development projects and activities at district
	level
	Monitoring of project activities
Wards	Oversee general development plans for ward level
	Provide information on local conditions and extension services
	Project monitoring in their area of jurisdiction
Villages	Maintain peace and tranquillity
	Protect public and private properties
	Promote social and economic development
	Potential PAPs as a result of the proposed water supply scheme
KfW	Potential financier
	Ensure that funds are available for completion of the project
	Monitor project implementation including environmental and social
	performance
Green Climate Fund (GCF)	Potential financier
	Ensure that funds are available for completion of the project
	Monitor project implementation including environmental and social
	performance

# 6.4 Consultation Approach

## Mobilisation strategies

*Letters:* MoWI distributed official letters to regional and district authorities informing them about the proposed project and the upcoming consultation activities and requesting them to further mobilise the lower level stakeholders. Mobilisation letters were also forwarded to the Bariadi Urban Water Supply Authority and the Lake Victoria Basin Water Office. Copies of the information and mobilisation requests are attached in Appendix 6.

*Reconfirmation of appointments:* Prior to the appointment dates, the consultant reconfirmed the appointments by physically visiting the contact persons at each venue at least one day prior to the meeting to verify whether the proposed schedule was still valid for the expected audience.

## Participation and consultation methods

*District and ward meetings:* The consultant together with MoWI representatives held meetings with district officials and department heads in the three districts targeted for Phase 1 (Busega, Bariadi and Itilima) as well as with Bariadi Town Council and the two districts under Phase 2 (Meatu and Maswa). In addition, separate meetings were held with Ward Development Committees in all wards within the planned coverage of Phase 1 (i.e. within the 12 km corridor).

The Consultant team gave a brief background of the project followed by a description of the main components and an overview of the potential impacts. A map of the project layout was used to show the routing of the water pipelines and the location of the different project components. At the end of the presentations, the Consultant requested for the participants' opinions and suggestions. The presentations

were held in Swahili, a language understandable by all participants. Information brochures (in Swahili) were disseminated to give further details of the project (see Appendix 7). Details of the meeting participants are attached in Appendix 3.

*Village meetings:* The respective ward CDOs (Community Development Officers) were mobilised to conduct public meetings in all villages traversed by the water main, i.e. those villages that will be directly affected by land acquisition. The ward CDOs were recruited and trained in conjunction with the ward meetings (see above) before they were deployed into the communities. A total of 38 village meetings were held with a total number of participants amounting to 3,315 persons (see Appendix 2, Appendix 3 and Appendix 4).

*Institutional consultations:* The stakeholder engagement also involved consultations with key institutions. These meetings were done mainly in the form of key informant interviews and brainstorming sessions with the respective representatives of the institutions.

# Consultation schedule

The schedule of the consultation activities undertaken during the ESIA process is shown in Table 23.

Date	Stakeholder
19 May 2016	MoWI and KfW
20 May 2016	Simiyu Regional Commissioner's Office
21 May 2016	Bariadi Urban Water Supply Authority
21 May 2016	Busega District Water Office
23 May 2016	Bariadi District Commissioner's Office
23 May 2016	Busega District Council
23 May 2016	Itilima District Commissioner's Office
23 May 2016	TANROADS – Regional Manager
23 May 2016	TANESCO – Simiyu Regional Office
23 May 2016	Itilima District Council
24 May 2016	Bariadi District Council
24 May 2016	Busega District Commissioner's Office
24 May 2016	Simiyu Resident Mining Office
24-25 May 2016	Itilima DC Wards
25 May 2016	Red Hill Nickel
25 May 2016	Lake Victoria Basin Water Office
25 May 2016	Lake Victoria Environmental Management Project
26-27 May 2016	Bariadi TC Wards
27-30 May 2016	Itilima DC Villages
27 May – 13 June 2016	Bariadi DC/TC Villages
29 May – 3 June 2016	Busega DC Wards
29 May – 3 June 2016	Bariadi DC Wards
29 May – 3 June 2016	Busega DC Wards
30 June 2016	Simiyu Region Game Officer
30 June 2016	Maswa Game Reserve
31 May 2016	Tanzania Fisheries Research Institute (TAFIRI)
25 May 2016	Lake Victoria Environmental Management Project
1-3 June 2016	Busega DC Villages
2 June 2016	Meatu District Council
3 June 2016	Maswa District Council

Table	23:	Schedule	of the	consultation	meetings.
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# 6.5 Summary of the Issues Raised

The main issues raised during the consultation meetings are presented in the table below. Details of the participants and stakeholders consulted are enclosed in Appendix 3 while the minutes of meetings are enclosed in Appendix 2.

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# Table 24: Main issues raised during the consultation meetings.

Issue	Stakeholder Concerns and Questions	Response
Mining at Ngasamo hill	<ul> <li>The consultant was informed that the proposed location for the command reservoir at Ngasamo hill had already been earmarked for a nickel mining project to be developed by Red Hill Nickel. The company has previously had an exploration license and currently holds a retention license valid for 5 years. The ESIA study was completed and there is a compensation plan although compensation packages have not yet been delivered due the delays in project implementation.</li> <li>In addition, more mining potential was identified at Ng'wamangola hill near Dutwa and a potential Phase 2 at Zanzui hill in Bariadi near the border to Maswa.</li> <li>In addition, stakeholders recommended that the project consider measures to control the risk of water pollution, damage and other hazards resulting from the mining processes.</li> <li>It was proposed that the water supply project considers Mwamigunga hill near Dutwa as an alternative location for the command reservoir.</li> </ul>	<ul> <li>Issue to be discussed with the design consultant for assessment of alternative locations. (A new location has later been identified at Shigala)</li> </ul>
Alternative pipeline route	<ul> <li>Stakeholders in Itilima (Chinamili ward) inquired why the pipe does not pass along the northern side of the ward where elevation is higher and it can feed the 24 km southerly as opposed to 12 km on both sides. That way, the main population centre of Nanga could also be 100% covered (as well as many other villages) instead of the current proposal of less than 50% coverage.</li> <li>A potential route for bypassing Bariadi town was proposed, starting from Yoma tank through Matale and connecting to the original route at Kilulu.</li> </ul>	<ul> <li>It was clarified that the main consideration for the pipeline route was to minimise resettlement by using the road reserve. However, the proposal would be presented to the design team for their consideration.</li> </ul>
Utilisation of the road reserve for the water main	<ul> <li>It was highlighted that use of the road reserve for the main pipeline might not be feasible as the road reserve is exclusively for TANRAODS and already utilised by other utilities like TANESCO and TTC in some sections while in other sections, particularly towards Maswa, water supply facilities (charco dams) to the communities are located within the road reserve.</li> <li>The consultant was also informed that currently TANROADS is in the process of clearing buildings out of the road reserve throughout the entire country for purposes of ensuring that they will have land free of encumbrances when they need it. For that reason, the team was advised to consider alternative pipeline routing especially in the rural areas where land is still readily available with minor impacts on resettlement.</li> </ul>	<ul> <li>MoWI to follow up on the issue with TANROADs at national level for consensus on the way forward.</li> </ul>
Other planned developments in the project area	<ul> <li>The consultant was informed that as part of the Dutwa Mining activities on Ngansamo hill, a railway project is being planned to facilitate the transportation of raw materials and products from the mine.</li> <li>The consultant was also informed about a planned railway running through Bariadi district along the main road, as part of the regional interconnection project.</li> <li>The consultant was informed of the expected commencement of the REA phase III project, which will facilitate the extension of the electricity to all non-electrified villages. In order to minimise</li> </ul>	<ul> <li>All issues to be forwarded to the design consultant for consideration and assessment of alternatives.</li> </ul>

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Issue	Stakeholder Concerns and Questions	Response
	<ul> <li>land acquisition, the project relies on the utilisation on the road reserves as well.</li> <li>In Itilima district, the consultant was informed of a large dam project intended to provide water for production to the communities. The District Commissioner requested that the MoWI ensures that the proposed project does not replace but rather complements the dam project for maximum benefit to the livelihoods of the people.</li> <li>The consultant was informed of the proposed international airport project in the villages Igegu and Ng'alita in Bariadi district.</li> <li>There are fiber optic underground cables running along the main roads, within the road reserve, except for the Nyashimo-Ngansamo-Dutwa road.</li> </ul>	
Additional water customers	<ul> <li>A request was submitted for the project proponents to consider inclusion of a separate and dedicated water pipeline to the planned nickel mine. Peak water demand for the mine was estimated at 170,000 l/hr.</li> <li>There is also a planned hospital at Nguno to serve the population of Itilima. Itilima District Commissioner requested that provisions for extending water to this hospital should be factored into the project.</li> <li>Busega district administration complex is under construction at Nyashimo, and a dedicated water pipeline needs to be constructed to serve the district headquarters.</li> <li>The consultant was also informed that Bariadi town will host the regional headquarters for Simiyu region, and regional headquarters are usually the host town of other supporting partners in development. For that reason, Bariadi town boundaries had been expanded to create space for NGOs, utilities, recreational facilities among others. Overall, the project planning team was advised to plan for a rapid growth in population in Bariadi town in the coming 5-10 years.</li> <li>There is a plan for the government to put up an international airport in Igegu village, which in that case should also be served by the proposed water supply scheme.</li> </ul>	<ul> <li>All issues to be discussed with design consultant for consideration.</li> </ul>
Health benefits	• Stakeholders in Busega and Itilima expressed their gratitude to the project especially for the fact that it will help them reduce the incidence of water borne diseases, specifically Schistosomiasis and Gastroenteritis (acute diarrhoea) which are prevalent in the area among children.	Noted
Catchment management	<ul> <li>According to the Acting Water Basin Officer, there is need to harmonize legislation pertaining to land use with the requirements in the Water Resources Act, especially related to the enforcement of the 60 m buffer zone around all water bodies in Tanzania</li> </ul>	<ul> <li>The consultant agreed that this was a crosscutting issue affecting several sectors and deserved attention at policy level.</li> </ul>
Operation and maintenance	<ul> <li>Several stakeholders advocated for a comprehensive and customised plan for operation and maintenance of the project as that has been a major challenge for many of the existing facilities.</li> <li>In Busega district, it was specifically recommended that as part of the O&amp;M strategy, MoWI</li> </ul>	<ul> <li>Issue to be handled by the design consultant together with the relevant stakeholders when defining the</li> </ul>

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Issue	Stakeholder Concerns and Questions	Response
	<ul> <li>considers recruiting plumbers to support the local artisans at community level</li> <li>It was advised that the existing Community Owned Water Supply Organisations (COWSO) should be strengthened to get ready for the upcoming project.</li> <li>Inquiries were made on which entity would have the responsibility for operation and maintenance and whether it was the communities or government that will take the costs of repair.</li> </ul>	<ul> <li>institutional and implementation arrangements.</li> <li>It was clarified that a strategy for operation and maintenance will be developed and communicated in future stages of project development.</li> </ul>
Community mobilisation	<ul> <li>All stakeholders unanimously advocated for the need of information dissemination to the lowest level stakeholders as they will be the direct beneficiaries but will also suffer the negative impacts along the way.</li> <li>On this note, all districts proposed to use their extension staff to support MoWI and the consultant in the project information dissemination process.</li> <li>More clarifications should be given to the people on where exactly the pipeline will pass so that people are aware of the areas and if possible put aside the land and order the owners not to plant perennial crops.</li> <li>Other information dissemination strategies should also be considered, for example radio. On this note, radio stations Radio Free Africa and Sibuka were recommended for use in information dissemination.</li> </ul>	<ul> <li>Agreed. Plans for information dissemination to communities were developed, of which some were during the ESIA process.</li> <li>The next round consultations will clarify exact location of the pipeline, pumping stations and water tanks.</li> <li>Use of radio for information dissemination will be adopted in future phases of project implementation.</li> </ul>
Water connections to public infrastructure	<ul> <li>It was recommended that water pipelines be extended to all schools, health centres, existing cattle dips and water troughs.</li> </ul>	<ul> <li>Issue to be forwarded to the design consultant</li> </ul>
Land acquisition	<ul> <li>The consultant was informed that the process of land acquisition will necessitate direct engagement with the village councils and the private utilisers of the directly impacted land. The process was not expected to be cumbersome given the real felt need for water by all.</li> <li>Project should avoid long timespan between valuation and compensation to minimise the consequential impact on people's livelihoods.</li> </ul>	<ul> <li>Agreed. Strategies to engage communities were devised. Decision to use district extension staff in this exercise was reached.</li> </ul>
Replacement land availability	<ul> <li>The consultant was requested to ensure that physical displacement of households is minimised owing to the fact that village councils do not have land for allocating to displaced households as replacement land. Land in the region has already been distributed among the residents and there is no more general land available.</li> </ul>	<ul> <li>Noted. Project to assess all possibilities of minimising land acquisition.</li> </ul>
Displacement of houses	<ul> <li>WDC leaders suggested that if possible there should be other methods to make sure that the main pipelines do not pass through settled areas because then most houses will be destroyed and this might affect many people.</li> </ul>	<ul> <li>Communities were assured that the project would try all means to minimise physical displacement of households by considering all feasible alternatives.</li> </ul>
Current and future water prices	• In most rural communities within the project area, the prevailing water prices were TShs. 50-100 per 20 litres of dirty and untreated water.	Noted

#### MINISTRY OF WATER AND IRRIGATION

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Issue	Stakeholder Concerns and Questions	Response
	<ul> <li>All stakeholders consulted confirmed that communities were ready and willing to pay for water as long as the price for water does not exceed what they currently pay.</li> <li>It was recommended that an early evaluation of the potential future prices for water be undertaken and the decision be communicated to the stakeholders so that both the communities and private institutions would know how much it would cost them to acquire the water services.</li> <li>There is need to raise awareness of the communities before and during the project construction especially on the issue of water pricing. Short of this, communities (pastoralists) will resort back to unsafe water.</li> <li>Communities indicated a heavy burden on buying water in government project as compared to private owned sources. These are TShs. 2,000 per m<sup>3</sup> at government owned infrastructure of Nyang'anga as compared to TShs. 800 per same unit from Dirworthy and Mtebe.</li> </ul>	
Impact on livelihoods	<ul> <li>It was suggested that construction activities should be scheduled in such a way that they cause minimal impact on people's livelihoods. Preference was to have construction activities in peoples farms scheduled after the peak agricultural season (October-July) to avoid unwanted consequences on household food security and income. The underlying justification behind this proposal was the fact that the region has only one agricultural season and the communities solely depend on rain fed agriculture for all their needs.</li> <li>Stakeholders inquired about the permitted land uses after construction along the main pipeline.</li> </ul>	<ul> <li>Noted. Information to be shared with the design consultant and to be included in the ESMP.</li> <li>No structures or perennial crops will be permitted within the pipeline corridor.</li> </ul>
Employment	<ul> <li>There is a need for employment opportunities to the youth during the construction phase.</li> <li>It was suggested that first priority for employment during construction phase should be given to the youth resident in the project area</li> </ul>	<ul> <li>Noted. The contractors will be required to prioritize local workers including youth.</li> </ul>
Alternative forms of compensation	• It was suggested that agricultural households directly impacted by the project should be given first priority when recruiting workers for the project. That way they will be able to have an alternative source of income during the periods of construction disruptions in their farms.	Noted.
Proximity to protected areas	<ul> <li>There are some protected areas close to the proposed project areas especially in areas surrounding Maswa Game Reserve. There is a potential Wildlife Management Area (Makao) which is formed by seven villages, i.e. Sapa, Iramba ndogo, Mwangudo, Mwabagimu, Mbushi and Makao.</li> <li>The proposed project may lead to habituation of wildlife species especially primates as a result of improper handling of food wastes. This is expected to be critical in areas close to protected areas in particular Maswa Game Reserve.</li> <li>It is advisable to ensure coordination between the project proponent, Maswa Game Reserve, Makao Wildlife Management Area and the regional and district authorities.</li> <li>The project proponent has to abide with the Wildlife Management Area regulations and has to ensure minimal impacts will occur on the protected areas as a result of proposed project.</li> </ul>	<ul> <li>Issues to be taken forward in the planning for Phase 2 of the project.</li> </ul>
Issue	Stakeholder Concerns and Questions	Response
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	• A no hunting policy must be implemented and strict measures have to be taken for all defaulters.	
	• The project proponent has to abide with Protected Areas regulations and has to ensure minimal	
	impacts will occur on the Maswa Game Reserve and its surrounding environs as a result of	
	proposed project.	
Impacts at Bukabile	• The proposed raw water pipe to be installed in the offshore of the lake could create some conflicts	<ul> <li>Issues to be addressed in the impact</li> </ul>
intake	with local artisanal fishermen.	statement.
	<ul> <li>Minimal and short-term impact expected on water quality as a result of the construction activities.</li> </ul>	
Improved water supply	• Almost all stakeholders acknowledged that the project would be a major milestone towards the	Noted
	end of water crisis in the region. Stakeholders are looking forward to a reliable and accessible	
	water supply system, to all communities that will result into improved livelihoods for all.	
Cultural property	• There were concerns on the cultural prayer site at Ng wamalagwini areas and stakeholders	Noted. Issues to be considered in the
	wanted the team to make consideration during construction. However, there was willingness to	detailed design phase.
	<ul> <li>Stakeholders in Itilima informed that they have no designated communal graveward but rather</li> </ul>	
	• Stakeholders in fulling informed that they have no designated communal graveyard but rather graveyards at household level. It was suggested that, with the support of the project and in a	
	culturally appropriate way the communities would be willing to relocate the burial grounds if	
	impacted.	
	<ul> <li>It was recommended that effort should be made to avoid aligning secondary and tertiary pipelines</li> </ul>	
	through graveyards.	
	Before construction of the secondary pipeline, there should be stakeholder consultation	
	(especially elders) to identify special areas, e.g. traditional worship sites.	
	• It was highlighted that the proposed location of the tank at Isenge seemed to be close to the chief	
	grave and clan burial site for "Wagunda" people. They wanted this to be considered as the site is	
	important for rituals. It was proposed that if possible the tank be shifted to Iganulwa schools to	
	avoid the spiritual site.	
	• In Lutubiga WDC (Busega district), it was pointed out that sites where clans perform their cultural	
	rituals might be close the main pipeline route. These are situated at Nyahumbi in Masamba and	
	burial sites located at Madukani areas.	
	Inere is an important ritual site at Unier Deus Ndakama that is used by local people to seek  different cultural convises. It was recommended that this area he adaided during construction	
	unierent cultural services. It was recommended that this area be adolded during construction.	
	and Ibayahuyaga at Ng'ombe va Kisa areas	
Impacts of a delayed	<ul> <li>Stakeholders in Itilima district said that if Phase 2 of the project (especially section to Maswa) is to</li> </ul>	<ul> <li>There is currently no funding available</li> </ul>
Phase 2	be delayed, then most of the villages on the western side of the water main would not benefit	for Phase 2, and expectations must be

Issue	Stakeholder Concerns and Questions	Response
	from the proposed project as they are far outside the 12 km boundary of Phase 1.	managed accordingly.
	• Stakeholders in Bariadi town said that without Phase 2, some wards in the town like Isanga would	The feedback will be shared with the
	not be covered as they are far outside the 12 km boundary of Phase 1.	project developer and design consultant.
Alternative water source	Stakeholders in Itilima said that an alternative water source to serve Maswa implies that the	Issues to be discussed with the project
for Maswa	villages in Itilima that were supposed to be supplied from the pipeline to Maswa will end up not	design consultant.
	being supplied with water at all, unless Phase 1 is expanded.	
Alternative water	<ul> <li>Stakeholders explained that there are no all year round reliable water sources in Meatu. In</li> </ul>	Issue noted and information will be
sources for Meatu	addition to drying up during the dry season, the underground sources also have high	shared with the project proponent for
	concentrations of fluoride and salt, while algae and turbidity are the challenges with surface water	consideration in Phase 2.
	sources. In conclusion, the Meatu District Council indicated their preference for Lake Victoria as	
	the source of water, as it is potentially the only sustainable solution to the prevailing water crisis.	
Voluntary land	• Stakeholders indicated that communities would be willing to freely allow the secondary and	• Noted.
donations for secondary	tertiary pipelines to go through their land without compensation.	
and tertiary pipelines		. Natad Faadhaalista ka ahawad witte
Project completion	<ul> <li>Communities suggested that several contractors be engaged to construct the different sections of the preject to ensure that it is completed within a short time, so as to says the communities from</li> </ul>	Noted. Feedback to be shared with
	the project to ensure that it is completed within a short time, so as to save the communities from	design consultant.
Pouse of exervated	water scalety as soon as possible.	• Noted
material	Stakeholders in Banadi town suggested that excess excavated material (mutrain and rocks) should     be given to the public for use on public and private construction projects	• Noted.
material	<ul> <li>In addition, excess material could be used in the construction of charco dams along the nineline.</li> </ul>	
	which will serve as livestock watering facilities as well as minimizing the need for dumning sites	
Mitigation measures	The project should have a package for awareness campaigns on HIV/AIDS and health and safety	<ul> <li>Noted To be considered in ESMP</li> </ul>
construction phase	during construction phase so as to avoid accidents and to maintain the health of the people in the	Noted. To be considered in Estim.
	area.	
	<ul> <li>Awareness campaigns on health and safety are required for livestock keepers to avoid accidents</li> </ul>	
	during the construction phase.	
	• All foreign workers and visitors during construction phase should abide with the village laws.	
	• The constructors should have their own toilets at the construction sites to avoid diseases related	
	to poor sanitation.	
Private water	• Stakeholders suggested that provisions for private house connections should be incorporated into	Noted. To be shared with design
connections	the project design.	consultant.
12km boundary on	• Almost all stakeholders in all the beneficiary districts expressed their desire to widen the 12 km	Noted. To be forwarded to decision
either side of the	boundary to enable supply of water to the areas at higher elevation that are currently water	makers.
pipeline	stressed without clear alternative reliable sources of water.	

Issue	Stakeholder Concerns and Questions	Response
	• Stakeholders inquired if it would be possible to expand the project in future to ensure supply of	
	safe water to the villages currently outside the 12km boundary.	
Livestock watering	Project was advised to consider inclusion of livestock watering facilities to avoid vandalism of	There is currently no funding available
facilities	project infrastructure in search for water for livestock.	for livestock watering, and it will not be
	• It was proposed to construct cattle troughs to benefit livestock keepers as most of the households	part of Phase 1.
	have many cattle and goats.	• The feedback will be shared with the
	Metering should be considered at livestock watering facilities too.	project developer and design consultant.
	• It was highlighted that there are other water needs, e.g. livestock and farming. Villages have	
	cattle and dipping troughs but have no sustainable water supply.	
Waste disposal	• Team was informed that there are no communal waste disposal areas or sanitation facilities in all	Noted. Sanitation is considered as part
	the beneficiary districts and towns.	of the water supply scheme.
	Poor sanitation coverage was reported almost in all the districts as a result of several factors	
	including costs, traditional practices and geology.	
	It was suggested to incorporate a sanitation component in the project especially at communal     facilities like schools, booth control and market places.	
	Ine need for involvement of sub village chiefs in the determination of location of distribution     paints for both human and livestock facilities was emphasized	Noted
points	points for both numan and investock facilities was emphasised.	
	It was recommended that in future, prior to commencement of construction phase, the chiefla for the distribution of water distribution points in a particular area should be shared with the WDC	
Companyation	The issue of componentian to the meanle was among the maintaining. Stakeholders wars	
Compensation	The issue of compensation to the people was alloing the major topic. Stakeholders were     concerned whether there will be compensation to the affected people. They also wanted to know	<ul> <li>It was clarined that compensation will be paid for all damaged property during the</li> </ul>
	whether the compensation process would consider trees and cash crops like cotton	construction process for all communities
	<ul> <li>It was recommended unanimously in all districts that compensation should be naid prior to</li> </ul>	along the main nineline
	construction. Communities cited examples of projects with delayed compensation and requested	
	that this project should endeavour to avoid delayed payments in order to minimize	
	inconveniences to household livelihoods.	
	• Complaints were also raised about the grievance systems on other projects where conclusions on	
	issues was so slow and people wasted a lot of time following upon the resolution of their issues.	
Water for irrigation	• Inquiries were made on how the project will benefit people who are involved in irrigation schemes	It was clarified that irrigation is not part
	because they are in need of water too.	of the water supply scheme so people
	• Inquiries were made on whether the water project can benefit the irrigation farmers because	should not raise expectations.
	there is a high need for water for irrigation.	
Water safety after	• The people inquired if they will need to boil water again or water will be safe to drink straight	Arrangements for sensitization of
treatment	from the water tap and will not cause any health problems.	communities will be organized prior to

Issue	Stakeholder Concerns and Questions	Response
	<ul> <li>Issue of scepticism on the chemicals that will be applied during water treatment needs a committed awareness program to let people understand treatment means no harm to them.</li> </ul>	project commissioning.
Phased commissioning	<ul> <li>Busega communities inquired whether it will be possible for them to start using water from the project while construction to other areas is still ongoing.</li> </ul>	<ul> <li>Issue of phased commissioning to be forwarded to the project design consultant.</li> </ul>
Security of water supply facilities	• It was highlighted that in the remote areas, the security of water facilities is compromised. In Meatu, it was reported that the challenge with boreholes is theft of parts due to the remoteness of the area. The project proponent was advised to locate distribution components close to the people for security purposes.	<ul> <li>Issue noted and information will be shared with the project developer.</li> </ul>
Contractor's camp	• It was advised that the infrastructure at the contractor's camp be handed over to government so that communities can use such facilities for development activities.	Noted.

# 7 ASSESSMENT OF IMPACTS

## 7.1 Introduction

This chapter describes the potential environmental and social impacts of the proposed Simiyu Water Supply Project. The prediction of positive and adverse impacts is based on the technical design described in Chapter 3, but without any additional mitigation measures.

The impacts (also referred to as 'impact sources') have been grouped according to the theme or environment that they are likely to influence, i.e. the physical, biological and human environment. Hence, each impact is analysed in relation to the baseline conditions described in Chapter 5 (cf. methodology, Section 3.2).

Note that all potential impacts have been listed, even if they only have marginal importance or are unlikely to happen. This has been done in order to document that a complete assessment has been carried out and to help the readers and reviewers to understand the full implications of the proposed project.

## 7.2 Physical Environment

## 7.2.1 Topography and Landscape

## Construction phase

*Visual impact:* The aesthetic impact of infrastructure developments is largely a subjective matter determined by individual preferences. In the case of Simiyu Water Supply Project, there will be significant disturbance to the natural landscape during the construction phase, especially related to excavation works for the water pipelines. However, as the main pipelines will be placed along the roads, the impacts will be confined to areas where the landscape has already been converted from its natural appearance.

## Operation phase

*Visual impact:* During the operation phase, it is assumed that the pipeline corridor has been reinstated to its pre-project condition (either revegetated or maintained as road shoulder). On the other hand, the above-ground infrastructure (water treatment plant, pumping stations, water reservoirs) will become visible features, some of which can be viewed from afar. Also, the spoil tips from the excavations will change the terrain at the spoil disposal sites even though regrading and revegetation is planned. The visual intrusion is unlikely to be considered as a significant disturbance by local people and road users.

*Conclusion:* The magnitude of the impact on topography and landscape is **low negative** during both the construction phase and the operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	&	·····-‰		·····%-····	%
Construction					
Operation			<b></b>		

## 7.2.2 Geology and Soils

## Construction phase

*Soil erosion*: During the construction phase, soils will be impacted by activities like vegetation stripping, grading, soil removal, backfilling, compacting, excavation and disposal of surplus soil, etc. This applies to all project components but especially for the work strip along the water pipelines where the soil surface will be disrupted and excavations will generate excess material (soil, rocks) to be disposed in spoil tips. At the

current stage of project planning, the method of backfilling and the volume of spoil material has not been calculated, and the spoil disposal sites have not been identified. In general, however, exposure of the ground, removal of vegetation cover and excavation of trenches will make the soil liable to erosion by wind and running water. Failure to re-vegetate temporary used land may accelerate soil erosion

*Land contamination:* Construction activities may pose the potential for release of petroleum-based products, such as lubricants, hydraulic fluids and fuels during their storage, transfer or use in equipment. Other hazardous components include paint and other chemicals used in the building process. If such hazardous materials are not contained and handled properly, there is a risk that they can cause soil contamination as well as water pollution (see below).

## **Operation phase**

*Soil erosion*: Soil erosion is expected to be less severe during the operation phase due to a paucity of earthwork activities and re-vegetation of exposed soils. However, erosion and gully formation may occur during heavy rains, especially on steep surfaces around the water reservoirs.

Land contamination: During operation, soil could be impacted due to spillage of hazardous wastes and materials, including hydrocarbons, mainly at the water treatment plant and pump stations. Failure or lack of spill prevention systems and inadequate handling of hazardous waste may cause accidental soil contamination.

*Conclusion:* The magnitude of the impact on geology and soils is **low negative** during both the construction phase and the operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	&	·····-‰	&		00
Construction			<b></b>		
Operation			<b></b>		

## 7.2.3 Climate and Air Quality

## Construction phase

*GHG emissions*: During the construction phase, greenhouse gas (GHG) emissions will be generated from increased traffic and from diesel generators used to supply the construction machinery. However, the emissions are assumed to be insignificant in terms of climate change impact.

*Air pollution:* The main impact to air quality during construction will be from increased dust levels arising from construction machinery, excavations, rock blasting, cement mixing and road transport. Emissions of small particles from diesel trucks as well as road dust are difficult to quantify but the impacts will be intermittent and short term. In addition to emissions of particles, there will be minor emissions of NOx and SO<sub>2</sub> from construction machinery, vehicles and diesel generators.

## Operation phase

*Air pollution:* Air pollution during the operation phase is expected to be very limited. The main source of air pollution will be from vehicle emissions and dust from traffic on unpaved roads. In addition, there might be some dust from construction sites before they are properly re-vegetated. Notably, the pumping stations are expected to be supplied by grid power, which consists of a mix between hydroelectric and thermal generation. The project's power demand is, however, insignificant in terms of air pollution and climate change impacts.

*Conclusion:* The magnitude of the impact on climate and air quality during the construction phase is **low negative**, while it is **insignificant** during operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	‰		&	·····-‰	0
Construction					
Operation					

## 7.2.4 Noise

## Construction phase

*Construction noise:* Noise will be generated from vehicular movements, sand and aggregate processing, concrete mixing, excavation machinery, blasting operations, etc. Also, the presence of personnel will serve as a continuous source of low-level noise emissions. The noise will have a temporary impact which can be significant if next to settlements.

## **Operation phase**

There will be no significant noise from the water supply scheme during the operation phase.

*Conclusion:* The magnitude of the impact on noise during the construction phase is **medium negative**, while it is **insignificant** during operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	&	······	‰		00
Construction		<b>▲</b>			
Operation					

## 7.2.5 Water Resources

## Construction phase

*Water pollution:* During the construction phase, soil erosion from earthworks and runoff of crushed and ground rock material from drilling, blasting, stone crushing, etc. might be drained into receiving water bodies, causing increased turbidity in a limited area around the intake and possibly in rivers and creeks adjacent to construction sites (e.g. at river crossings along the pipeline route). The construction of the raw water intake is also expected to cause disturbance of the lake bottom, resulting in a temporary deterioration of water quality.

In addition, accidental fuel and oil spills from construction machinery, and leaching of ammonia and nitrogen from blasting and soil rock deposits, may cause water pollution in the lake and in rivers and other water sources. Another source of water pollution is represented by batching plants and particularly by the effluent from concrete truck cleaning which consist of wastewater with high pH and contaminants from the concrete additives.

Workers' camps have not yet been planned but they will generate sanitary effluents which are potential sources for microbiological and organic pollution of surface and ground water. The workers' camps will also produce domestic waste, typically estimated at 0.5 kg/capita/day. Unless the waste and wastewater from domestic or construction origin (e.g. scrap metal, wood, plastic, cement bags, used tires and batteries, etc.) is adequately managed, it may result in pollution of water as well as soils.

#### **Operation phase**

*Water pollution:* During the operation phase, the risk of water pollution will be reduced as compared to the construction phase. However, accidental fuel and oil spills could still occur with inadequate handling of hazardous materials and failure of spill prevention systems, mainly at the water treatment plant and pumping stations. A particular issue at the water treatment plant is the use of chemicals for coagulation, disinfection and water conditioning, including chlorination used for water disinfection. The sludge from the clarification process is also a potential source of water pollution although it will be monitored on a regular basis and disposed in a safe manner.

*Water withdrawal:* According to Section 2.4.1, the water abstraction for Phase 1 amounts to 19,000 m<sup>3</sup>/day, which corresponds to 0.22 m<sup>3</sup>/s or 6,935,000 m<sup>3</sup>/year. This is within the same range as many other existing water users in the Lake Victoria Basin including a number of irrigation schemes diverting water from the major rivers (see Appendix 8). It is, however, significantly less than the water abstracted by Kagera Sugar Co. Ltd. (498,565 m<sup>3</sup>/day) on the Kagera River and also less than the water permit held by Kahama/Shinyanga Water Authority (80,000 m<sup>3</sup>/day) which extract water directly from Lake Victoria.

The register of water use permits abstracting water from the Lake Victoria Basin (Appendix 8) shows that the total abstraction by Tanzanian water users amounts to 1,158,993 m<sup>3</sup>/day, of which 20% (232,083 m<sup>3</sup>/day) is sourced from the lake and 80% (926,910 m<sup>3</sup>/day) is sourced from the rivers. These figures are exclusive of the water uses for hydropower (registered on Kikagati Power Company Ltd. and TANESCO, both on the Kagera River) which seem to be based on total 'turbinated' water and not on water abstractions (see Appendix 8). The Simiyu project's share of the total abstraction from Tanzania's portion of the Lake Victoria Basin will thus be 1.6%.

The impacts of water withdrawal from the lake can be considered in at least two ways:

- The pumping for water supply purposes will cause an equivalent reduction in outflows (into the Nile River). For the Simiyu project, the reduction in outflow will be 0.22 m<sup>3</sup>/s, which corresponds to approx. 0.02% of the average outflow.
- The abstracted volume per year can be compared to the historical/natural variations in lake volume and water levels (see Section 5.1.5). For the Simiyu project, the annual water withdrawal will be 20,075,000 m<sup>3</sup>, which is equivalent to a drop in water level of 0.01 cm per year. Compared to the natural fluctuations, this drop is insignificant in the short term. However, as it is a permanent abstraction that will accumulate over time, the impact will increase progressively. Over a period of 100 years, the water withdrawal will cause a reduction in water level by an estimated 1 cm. This is still a very low figure, but it should be interpreted in conjunction with all the other water abstractions which in combination will cause cumulative impacts on the lake's water balance.

It should also be noted that Phase 1 of the Simiyu project is entirely within the Lake Victoria Basin, hence no water is transferred to other drainage basins. A notification letter sent to all riparian countries informing them about the Water Sector Development Programme, of which the Simiyu project is part, is enclosed in Appendix 23.

*Conclusion:* The magnitude of the impact on water resources during the construction phase is **low-medium negative**, while it is **low negative** during operation phase.

Phase	Magnitude				
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	‰	%	&	·····-‰	000
Construction			<b>`</b>		
Operation			<b></b>		

## 7.3 Biological Environment

## 7.3.1 Protected Areas

#### Construction and operation phase

The Simiyu Water Supply Project (Phase 1) is located far from the nearest game reserve and wildlife management area, and will therefore not interfere with legally protected areas.

*Conclusion:* The magnitude of the impact on protected areas is insignificant during both the construction phase and operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	&	······	&	·····%-····	00
Construction					
Operation			<b></b>		

## 7.3.2 Vegetation

## Construction phase

*Vegetation clearing:* All constructions will involve vegetation clearing to prepare the ground for civil works and installations. The largest area to be impacted is the work strip for the water pipelines. However, as most of the land is cultivated, the overall loss of vegetation from land clearing will be limited.

## **Operation phase**

*Establishment of invasive plant species:* One of the effects of disturbance of vegetation and soils (during construction) is the subsequent upsurge of invasive plants (during operation). These have a high potential to suppress the native flora and change the structure and composition of the vegetation as they spread. Exotic and invasive plants may also be introduced to the project area for ornamental reasons. It is difficult to get rid of these species once they have become established, and further introductions of exotic species may cause the spread of more invasive plant species. On a separate note, the well-known invasive plant *Eichhornia crassipes* (water hyacinth) may interfere with the normal operation of the raw water intake, although its growth and spread in the lake will probably not be promoted as a result of the project.

*Conclusion:* The magnitude of the impact on vegetation is **low negative** during both the construction phase and the operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	‰	······	&		00
Construction			<b>▲</b>		
Operation					

## 7.3.3 Terrestrial Fauna

## Construction phase

Disturbance from construction activity: During the construction phase, noise will be generated from vehicular movements, sand and aggregate processing, concrete mixing, excavation machinery, blasting of rocks, etc. Also, the presence of personnel will serve as a continuous disturbance throughout the construction phase. The disturbance is likely to affect wildlife species in general and trigger them to avoid

or escape the project area. However, most of the animals found in the project area can easily escape the construction site and find equally suitable habitats nearby.

#### **Operation phase**

*Habitat loss:* The reservoirs for the Simiyu Water Supply Project will mainly be located on small hills and on kopjes, the characteristic rocky outcrops which are commonly found in the project area. The remaining terrestrial fauna in the area are often found in and around these rocky outcrops as they in general are the only areas with some natural vegetation left. In addition, the rocky outcrops provide some protection and hiding places for small mammals and reptiles. Building reservoirs on these location will entail a small loss of habitat for the terrestrial fauna in general. However, kopjes are common in the project area and the number of them that will be affected by the project is limited.

*Conclusion:* The magnitude of the impact on terrestrial fauna during the construction phase is **low negative**, while it is **insignificant** during operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	%	%	&	·····-‰	00
Construction			<b>▲</b>		
Operation			<b>▲</b>		

## 7.3.4 Aquatic Ecology

#### Construction phase

*Water pollution at intake:* Site preparation at the intake and water treatment plant, including removal of vegetation, earthworks, etc., can cause release of sediment material into the lake water, increasing water turbidity in a limited area around the intake, a known threat to most of the biota (e.g. clogging of fish gills). The construction of the raw water intake is also expected to cause disturbance of the lake bottom, resulting in a temporary deterioration of water quality and hence adverse impacts on fish and other aquatic biota. An additional risk is related to accidental oil leakage from the construction equipment resulting in deterioration of the lake's water quality locally.

## **Operation phase**

*Fish entrainment at intake:* The operation of the water intake will cause a long-term disturbance of the lake environment in its hydraulic zone of influence. One of the direct impacts could be that fish and other aquatic organisms are entrained in the intake, causing fish mortality as well as interference with the normal operation of the intake.

*Conclusion:* The magnitude of the impact on aquatic ecology is **low negative** during both construction phase and operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	%	<u>%</u>	&	<u>%</u>				
Construction								
Operation			<b>▲</b>					

## 7.4 Human Environment

#### 7.4.1 Population

#### Construction phase

*Population influx*: The total number of workers is not known at the current stage but is expected to reach several hundred in peak periods. While many of the unskilled workers will be recruited from the local communities, others will come from outside and be resident in the respective districts for at least three year. In addition to the mainstream workforce, construction activities usually attract job seekers, potential suppliers and camp followers.

Population influx, even though temporary, will put considerable pressure on resources and social services, especially on health and sanitation. An increase in population is usually also associated with a breakdown in social fabrics, norms and practices. This could potentially result into an increased risk of exposure to HIV/AIDS and other STDs.

## **Operation phase**

*Population growth:* The provision of safe and reliable water is likely to cause some population growth triggered by the improved public services and overall economic development. This could be through immigration of job seekers and business entrepreneurs. While such influx will put pressure on local resources and social services over the longer term (ref. construction phase), it must be considered as an overall positive development for Simiyu region at large.

*Conclusion:* The magnitude of the impact on population is **medium negative** during the construction phase and **low positive** during the operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	9 <sub>00</sub>		&	÷	%			
Construction		<b></b>						
Operation			•					

## 7.4.2 Settlement Pattern

#### Construction phase

*Physical displacement:* The water pipelines are planned to be routed along the main roads. However, at the current stage of project planning, the exact alignment of the pipelines is not known, e.g. on which side of the road they will be placed. This is obviously important in terms of assessing the number of affected structures and the scale of physical displacement. An attempt was nevertheless done to count the number of structures located within the planned wayleave. The inventory was based on the following:

- Counting of structures in Google Earth. The satellite images were taken on different dates between 2013 and 2016. The 10 m wide corridor (wayleave for water main) was created in ArcView and exported to Google Earth. Counting was done for only one side of the road (see details in Resettlement Policy Framework).
- Field observations of settlements and types of houses located within the road reserve while driving through the project area. It was noted that some of the structures within the road reserve appeared to have been abandoned and might already have been compensated by TANROADS.
- All affected structures located within the 10 m wide wayleave (and hence, within the road reserve) must be compensated by the Simiyu Water Supply Project and not by TANROADS. The exception would be those structures that have already been compensated by TANROADS (see point above).

The total number of affected structures per district and per project component is shown in Table 25. The majority of structures are located in Bariadi town, Dutwa and Nyang'hanga (Figure 22, Figure 23), but there are also many structures in the smaller villages which have not yet been relocated by TANROADS. The total number of structures may not be significantly different between the two sides of the roads; however, in some places a reduced impact can be achieved by shifting the pipeline corridor from one side of the road to the other. For example, in Bariadi town, the eastern side of the Dutwa-Bariadi road has less structures than the other side (Figure 22).

District		Proj	ect Componei	nt		Total
	Main Water Pipelines	Intake and Water Treatment Plant	Command Reservoir	Primary Reservoirs	Pumping Stations and Balance Tanks	
Busega	138	0	0	0	0	138
Bariaidi	349	0	0	0	0	349
Itilima	81	0	0	0	0	81
Total	568	0	0	0	0	568

*Table 25: Number of affected structures per project component and per district.* 



Figure 22: Sections of water pipeline corridor in Bariadi town. Source: Google Earth (1 June 2014).



*Figure 23: Sections of water pipeline corridor in Dutwa (left) and Nyang'hanga (right). Source: Google Earth (28 February 2016, 9 June 2013).* 

## **Operation phase**

No additional structures will be affected during the operation phase.

*Conclusion:* The magnitude of the impact on settlement pattern is **medium-large negative** during the construction phase, while it is **insignificant** during the operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	&	0		0	%			
Construction		<b>▲</b>						
Operation			<b>▲</b>					

## 7.4.3 Land Use

## Construction phase

*Economic displacement:* The project will acquire land for construction of the intake and water treatment plant including auxiliary facilities, pumping stations, water reservoirs, etc. In addition, it is assumed that TANROADS have not yet acquired the outer portion of their road reserve (i.e. at distance 22.5 m to 30 m from the centre line of the road), and hence that the Simiyu project will have to compensate the affected land owners. It is further assumed that all the land is in use, though some sections may be unutilised land which according to national legislation does not trigger compensation. As can be seen from Figure 24, much of the pipeline corridor is devoid of structures and only involves economic displacement in terms of land loss and disruption of farming. The total land requirements per district and per project component is shown in Table 26. It should be noted that some of the project infrastructure has not yet been planned (e.g. camps, spoil disposal areas) and that the land for the secondary system (i.e. secondary/tertiary water pipes, village water tanks, etc.) is expected to be donated by the village councils and land users who ultimately will benefit from connection to the water pipes (see further details in the Resettlement Policy Framework).

It should be noted that the potential displacement of planned nickel mining at Ngasamo hill will involve major economic losses for the mining company Red Hill Nickel and for government. This issue will have to be addressed separately in the (unlikely) event that the Ngasamo option is maintained as the preferred location for the command area.

District		Proj	ect Componer	nt		Total
	Main Water Pipelines	Intake and Water Treatment Plant	Command Reservoir	Primary Reservoirs	Pumping Stations and Balance Tanks	
Busega	52	5	0.6	0.18	0.3	58.08
Bariaidi	70	0	0	0.24	0.2	70.44
Itilima	16	0	0	1.0	0.1	17.1
Total	138	5	0.6	1.42	0.6	145.62

Table 26: Land requirements (in hectares) per project component and per district.





Figure 24: Sections of water pipeline corridor along Dutwa-Bariadi road (left) and Bariadi-Lagangabilili road (right). Source: Google Earth (1 June 2014).

## Operation phase

No additional land will be required for project operation.

*Conclusion:* The magnitude of the impact on land use is **medium-large negative** during the construction phase, while it is **insignificant** during the operation phase.

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	&				00
Construction		<b>▲</b>			
Operation			<b>▲</b>		

## 7.4.4 Local Economy

#### Construction phase

*Employment and business opportunities:* It is likely that the project will provide some employment opportunities for the local population, both directly and indirectly. Most of the jobs that will be open for the local population will probably be as semi-skilled and unskilled labourers. However, the project will represent an opportunity for unskilled workers to improve their skills and get experience in different trades which will be of value to them at a later stage.

It is also likely that the project will lead to an increase in the local demand for goods and services such as food for construction workers, housing, basic items, transport, etc. This presents an opportunity for the local population to generate some income from provision of different services such as renting out accommodation, food vending and sales of agricultural and other local produce.

## **Operation phase**

*Economic benefits:* During the operation phase, the improvement of the water supply is likely to have an economic effect in the form of reduced work burdens and reduced morbidity and mortality rates for the local population. This will contribute to the release of human and economic resources for investment for in productive and profitable activities.

*Conclusion:* The magnitude of the impact on local economy use is **low-medium positive** during the construction phase and **medium positive** during the operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	%	<u>%</u>	&	<u>%</u>				
Construction				▲				
Operation				<b>▲</b>				

## 7.4.5 Water Supply and Sanitation

## Construction phase

*Pressure on water and sanitation facilities:* Due to the likely population increase associated with the construction phase, existing water and sanitation facilities may locally to be put under more pressure.

## **Operation phase**

*Provision of water supply and sanitation:* Provision of clean and safe water for a significant part of the population in the project area will entail positive effects in several sectors and for the society as a whole. In particular, women and children who are responsible for water collection will benefit greatly from having their work burdens reduced by the improved water supply. Information from the consultations indicates that women in some households may spend up to 6 hours per day to collect water. According to WHO/UNICEF (2010), the main contributor to the overall benefits of drinking water systems is the value of time savings which on the average accounts for almost 70% of the total benefits. Similarly, the project's sanitation component will contribute to significantly improving the current situation characterised by inadequate sanitation practices and coverage.

*Conclusion:* The magnitude of the impact on water supply and sanitation is **low negative** during the construction phase, while it is **large positive** during the operation phase (if properly maintained).

Phase			Magnitude		
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive
	‰	%%	&	·····%	%
Construction			<b></b>		
Operation					

## 7.4.6 Health and Education

## Construction phase

*Pressure on health and education services:* During the construction phase the pressure on health and education services may increase slightly due to increases in population as job seekers and camp followers settle in the area for a longer or shorter time. However, the population increase is likely to be relatively moderate.

## **Operation phase**

*Health benefits from water supply and sanitation:* During the operation phase, the health benefits of the improved water supply and sanitation facilities will start to manifest themselves through reduced morbidity and mortality rates. According to WHO/UNICEF (2010), the health improvements accounts for around 35% of the total benefits associated with water supply and sanitation. The health improvements are caused by a reduction in diarrhoeal diseases, reduced helminth infections (parasitic intestinal worms such as tapeworms, flukes and roundworms) and reduced malnutrition diseases.

With respect to vector borne diseases, there is a potential risk that improved availability of water for consumption and washing may lead to more use of water containers and puddles in villages and near residential housing where mosquitos can breed. This can potentially increase the risk for vector borne diseases, most notably malaria. However, the project design provides for proper construction of water collection points in villages so that water is drained away and infiltrated, and it also includes awareness campaigns related to safe use of water (including how to avoid creating breeding places for mosquitoes).

*Conclusion:* The magnitude of the impact on health and education is **low negative** during the construction phase, while it is **large positive** during the operation phase.

Phase	Magnitude						
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive		
	‰	%		·····-‰	%		
Construction			<b>▲</b>				
Operation					<b></b>		

## 7.4.7 Safety and Security

## Construction phase

*Health and safety:* The Simiyu project covers a large geographical area and will take several years to be constructed. Any infrastructure development of such scale and duration will cause significant health and safety risks to workers as well as the community. The occupational health and safety impacts during construction are common to other large infrastructure projects, but a particular risk (to both occupational and community health and safety) is related to increased traffic on the main roads for the entire duration of the pipe installation works. Additionally, there is a risk that people fall into trenches or excavations, or

slide from the trench when the slope is not properly secured. The use of casual workers with limited exposure to health and safety standards can be considered as an additional risk.

*Security threats:* The current security situation seems to be calm without any major security risks in the community except for petty thieves. However, construction projects tend to attract opportunistic characters who might be involved in criminal activities.

#### **Operation phase**

*Health and safety:* The operation and maintenance personnel will be exposed to a range of health and safety risks that are typically associated with water and sanitation projects, including accidents and injuries, chemical exposure (e.g. chlorine used in water disinfection), hazardous atmosphere, exposure to pathogens and vectors, and noise.

Potential failure of the water treatment plant, main pipelines or storage tanks may involve significant environmental, health and safety risks, e.g. leakage of chemicals (chlorine) used in water treatment, pipeline burst, or accidental overflows from water tanks. However, the design will provide for adequate control and safety systems, including automatic operated valves in the treatment plant and water pipes and installations of spillways on the water reservoirs. Such emergency response systems are key design criteria.

*Conclusion:* The magnitude of the impact on safety and security is **medium negative** during the construction phase and **low negative** during the operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	‰		&					
Construction								
Operation			<b>▲</b>					

## 7.4.8 Cultural Heritage

## Construction phase

Loss of physical cultural resources: There is a risk that certain places of cultural significance will be impacted by the construction and installation works. Several graves have been found along the main roads where the water pipelines will be laid, but which ones that will be affected cannot be known until the detailed routing of the water main has been completed. However, one of the hills which are planned to be used for primary reservoirs has been confirmed to have cultural significance, i.e. Isenge hill near Dutwa. This hill is considered as sacred and traditional leaders requested that the hill be protected.

## **Operation phase**

The project will not have any significant impacts on cultural heritage during the operation phase.

*Conclusion:* The magnitude of the impact on cultural heritage is **medium-large negative** during the construction phase, while it is **insignificant** during the operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	%	<u>%</u>	%%		‰			
Construction		<b>▲</b>						
Operation			<b>▲</b>					

## 7.4.9 Tourism

#### Construction phase

The project will not have any significant impacts on tourism during the construction phase.

#### **Operation phase**

*Improved tourist facilities:* Provision of clean and reliable water supply can be considered as an added advantage for the planned development of tourism in Simiyu region. It provides for potential establishment of tourist hotels and other services in the main towns where travellers pass on the way to the nearby tourist attractions.

*Conclusion:* The magnitude of the impact on tourism is **insignificant** during the construction phase, while it is **low positive** during the operation phase.

Phase	Magnitude							
	Large Negative	Medium Negative	Low/Insignificant	Medium Positive	Large Positive			
	‰	<u>%</u>	&	·····%-····	%			
Construction			<b>▲</b>					
Operation			▲					

## 7.5 Overall Impact Assessment

Table 27 summarises the potential impacts on the physical, biological and human environment from the construction and operation of the proposed Simiyu Water Supply Project.

Table 27: Summary of impact assessment (without additional mitigation).

Impact Source	Baseline Value Impact Magnitude		Overall Impact	
CONSTRUCTION PHASE				
Physical Environment				
Topography and landscape	Madium	Low pogetive	-	
Visual impact	weatum	Low negative		
Geology and soils				
Soil erosion	High	Low negative	-	
<ul> <li>Land contamination</li> </ul>				
Climate and air quality				
GHG emissions	High	Low negative	-	
Air pollution				
Noise	High	Modium pogativa		
Construction noise	підії	ivieulum negative		
Water resources	Medium-High	Low-Medium		
Water pollution	Weddan-High	negative		
Biological Environment				
Protected areas	Low	Insignificant	0	
• N/A	LOW	insignificant	0	
Vegetation	Low	Low negative	_	
Vegetation clearing	LOW	Low negative		
Terrestrial fauna				
<ul> <li>Disturbance from</li> </ul>	Low-Medium	Low negative	-	
construction activity				
Aquatic ecology	Medium	Low negative	-	
Water pollution at intake		Low negative		
Human Environment				

Impact Source	Baseline Value	Impact Magnitude	Overall Impact
Population	N/A	Medium negative	
Population influx	197	wichininegative	
Settlement pattern	N/A Medium-Large		
Physical displacement	,	negative	
Land use	N/A	Medium-Large	
Economic displacement	-	negative	
Local economy	NI / A	Low-Medium	
<ul> <li>Employment and business</li> </ul>	N/A	positive	+
Water supply and capitation			
Pressure on water and	N/A	Low pegative	
sanitation facilities	N/A	Low negative	
Health and education			
Pressure on health and	N/A	low negative	_
education services		Low negative	
Safety and security			
Health and safety	N/A	Medium negative	
<ul> <li>Security threats</li> </ul>	,		
Cultural heritage			
<ul> <li>Loss of physical cultural</li> </ul>	Medium-High	Medium-Large	
resources	-	negative	
Tourism	N	la star ifi sant	•
• N/A	wealum	Insignificant	0
OPERATION PHASE			
Physical Environment			
Topography and landscape	Modium	Low pogativo	
Visual impact	wedium	Low negative	-
Geology and soils			
Soil erosion	High	Low negative	-
<ul> <li>Land contamination</li> </ul>			
Climate and air quality	High	Insignificant	n
Air pollution		monghimedant	, , , , , , , , , , , , , , , , , , ,
Noise	High	Insignificant	0
Operation noise	8		•
Water resources			
Water pollution	Medium-High	Low negative	-
Water withdrawal			
Biological Environment			
Protected areas	Low	Insignificant	0
N/A Vegetation		-	
vegetation	1	1	
Establishment of invasive	LOW	Low negative	-
Torrostrial fauna			
	Low-Medium	Insignificant	0
Eich entrainment at intake	Medium	Low negative	-
Human Environment			
Population			
Population growth	N/A	Low positive	+
Settlement nattern			
N/A	N/A	Insignificant	0
Land use			
• N/A	N/A	Insignificant	0

Impact Source	Baseline Value	Impact Magnitude	Overall Impact
Local economy	N/A	Madium nasitiva	++
Economic benefits	N/A	wedium positive	
Water supply and sanitation			
<ul> <li>Provision of water supply and</li> </ul>	N/A	Large positive	++++
sanitation			
Health and education			
<ul> <li>Health benefits from water</li> </ul>	N/A	Large positive	+ + + +
supply and sanitation			
Safety and security	N/A	Low possible	
<ul> <li>Health and safety</li> </ul>	N/A	Low negative	-
Cultural heritage	Madium High	Incignificant	0
• N/A	Medium-High	insignificant	U
Tourism	Madium	Low positivo	
<ul> <li>Improved tourist facilities</li> </ul>	wedium	Low positive	Ŧ

Very large negative - - -, Large negative - - -, Medium negative - -, Small negative -, Minimal/no 0, Small positive +, Medium positive + +, Large positive + + +, Very large positive + + +.

## 7.6 Cumulative Impacts

## 7.6.1 Introduction

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.

The magnitude of the cumulative impacts can be equal to the sum of the individual effects (additive effect), or can be an increased effect (synergistic effect) or a decreased effect (antagonistic effect).

The cumulative impact includes two components:

- The anticipated future condition arising from the cumulative impacts
- The contribution of the development under evaluation to the cumulative impacts

In order to assess the cumulative impacts, the geographical and temporal scope has to be expanded as compared to the definition of the Simiyu project's area of influence or impact zones.

During the stakeholder consultations, it became clear that there are two interlinked projects that can potentially coincide with the construction phase for the Simiyu Water Supply Project. As mentioned in Section 5.1.2, a company called Red Hill Nickel have acquired a retention licence for the Ngasamo hill area where there are economically exploitable nickel deposits. The project is referred to as the Dutwa project (see Section 7.6.2). The planned mining activities will be an open pit operation, exploiting the lateritic nickel ore deposits in the area. The company is now two years into the five year retention licence and allegedly have plans to start mining activities within three years as the price of nickel presently is not attractive enough to warrant start-up of nickel mining. There is also a second promising nickel deposit at Zanzui, 50 km south of Dutwa (see Section 7.6.2).

The second project is linked to the nickel mining plans and involves building a railway line from the project site at Ngasamo/Dutwa to connect with Tanzania Railways Corporation's central line. The railway connection will be used for shipping out nickel and importing input materials (see further details in Section 7.6.2).

Both these project will be major undertakings that will attract job seekers and people seeking to benefit economically in one way or another from the business opportunities that such projects represent. There is a relatively large chance that these two projects will coincide with the construction phase of the Simiyu

Water Supply Project and thereby producing cumulative impact on the physical, biological and human environment. Some of the potential cumulative impacts are briefly discussed in general terms below but a full cumulative impact assessment for the Simiyu Water Supply Project requires a wider scope and would involve targeted sector studies that cannot be accomplished by a project-specific ESIA study alone.

In terms of water abstraction, the Simiyu Water Supply Project will add to the impacts of a number of already existing and planned water abstraction projects. The two largest water extraction projects are the Kagera Sugar Co. Ltd. and the Kahama/Shinyanga Water Supply Project (see Section 7.2.5).

## 7.6.2 Description of the Proposed Nickel Mine and Associated Facilities

## The Dutwa Project

The Dutwa nickel mining project has been developed by African Eagle Resources through its subsidiary Red Hill Nickel. However, African Eagle Resources recently disposed of substantially all of its subsidiaries but retains a 10% free carried interest in the Dutwa project. The controlling share is now held by Blackdown Resources.

Between 2008 and August 2013, African Eagle Resources spent in excess of USD 26 million on exploration and development of its Tanzanian mineral assets, mainly on the Dutwa project. The exploration activities and feasibility studies were partly financed by IFC, which also performed an environmental and social review of the exploration phase (IFC 2011). The ESIA study was conducted in 2012-2013 along with a compensation plan for project affected people. However, due to delays in project implementation, the compensation packages have not yet been delivered. The studies were undertaken by MTL Consulting Company Limited in compliance with IFC performance standards and NEMC requirements.

The Dutwa project includes Ngasamo hill as well as a nearby hill called Wamangola located about 7 km east of Ngasamo. According to Blackdown Resources (2013), the Dutwa project has a total estimated nickel laterite resource of 106.7 million tonnes at 0.91% Ni which is a readily-accessible, open pitable resource with no significant pre-strip required and a very low waste to ore ratio. The company has proposed to employ atmospheric tank leaching to dissolve the ores (with the addition of sulphuric acid) and recover the nickel. The sulphuric acid will be made in an acid plant at Dutwa. The estimated lifetime of the mine is at least 20 years.

According to IFC (2011), the power will be obtained from a combination of grid electricity (TANESCO), cogeneration from heat produced from sulphur burning and standby generators. It is estimated that the project will require approx. 15-20 MW.

The Dutwa project will require significant freight and transport infrastructure (Blackdown Resources 2013). The nickel and the input materials (mainly limestone and sulphur) are planned to be transported by railway. According to Red Hill Nickel (2012), the limestone reagent will be sourced locally in Tanzania and will require an estimated three trains per day to carry a total amount of approx. 750,000 tonnes per year, while the sulphur will be imported via Dar es Salaam (1-2 trains per day, approx. 325,000 tonnes per year).

The company will rely on the existing central railway line, which is in fairly good condition and requires modest upgrade to accommodate the extra transport load (Red Hill Nickel 2012). There is a need for a spur line to Dutwa, either from Bukwimba (70 km) or by advancing part of the planned Arusha-Musoma line and connecting to the central line at Malampaka (150 km).

The project will draw its water from either Lake Victoria or from a borehole system (Blackdown Resources 2013). According to Red Hill Nickel representatives, the peak demand will be about 170,000 l/hr for the operation of the mine and associated infrastructure.

## The Zanzui Project

Blackdown is also evaluating a second promising nickel deposit at Zanzui, 50 km south of Dutwa. The area was first investigated in the 1980s by the United Nations Development Programme (UNDP), which conducted geophysical, geochemical and mapping work and reporting extensive geochemical nickel anomalies. In 2008 and 2010, African Eagle, following on from the successful drilling at Dutwa, targeted the lateritic cap at Zanzui. Results from the drilling showed lithological similarities to the Dutwa deposit, and the contained metal content was estimated at 219,000 tonnes of nickel and 16,000 tonnes of cobalt.

## 7.6.3 Cumulative Impacts on the Physical Environment

The cumulative impacts on the physical environment during the construction phase may first and foremost manifest themselves in the form of negative impacts on local air quality and increased noise emissions if construction and/or operation activities for the projects occur simultaneously and in the vicinity of each other. The impacts can be expected to be greatest in the Dutwa area which will be subject to nickel mining operations and railway construction, as well as laying of water pipelines.

During the operation phase, the Simiyu Water Supply Project will add incrementally to the impact on water resources in Lake Victoria by existing and future water abstraction projects. As explained in Section 7.6.2, the estimated water demand for the Dutwa mining project is 170,000 l/hr, equivalent to 4,080 m<sup>3</sup>/day, which is likely to be sourced from Lake Victoria, either by the Simiyu project or by a separate water supply scheme to be constructed and operated by the mining company. This additional water demand has not yet been considered in the design of the Simiyu project but should be explored further in the detailed design phase and in conjunction with a possible renewal of the mining license.

The mining operations can potentially have a significant impact on surface and groundwater quality in terms of discharge of hazardous waste and chemicals, which could in turn affect the water quality at the Simiyu water intake and the capacity of the treatment plant to strip the water of pollutants. However, it is assumed that the mining will be operated in compliance with national and international standards for waste management and effluent discharge, thus minimising the risk that water quality is compromised. The considerable distance from the Dutwa mining concessions to the water intake at Lake Victoria (more than 30 km) also suggests that this risk is minimal.

It should be noted that the mining company carried out water quality monitoring during the exploration phase, when water was drawn from nearby ponds during the rainy season and from Duma River all year round (IFC 2011). The average water consumption at that stage was 20,000 l/day (i.e. 20 m<sup>3</sup>/day).

## 7.6.4 Cumulative Impacts on the Biological Environment

The cumulative impacts on terrestrial fauna are predicted to be limited due to the fact that the land use in the project areas is dominated by agricultural activities and grazing to such an extent that there is little left of natural habitats. Due to this, there are no critical wildlife migration routes or sensitive ecosystems that may be impacted by the combined effects of the planned developments. The few and minor cumulative impacts that would occur are likely to be additive, i.e. equal to the sum of the individual project effects, and can be mitigated on a project-by-project basis.

## 7.6.5 Cumulative Impacts on the Human Environment

The most significant cumulative impacts are likely to come within the human environment. With a coinciding project implementation, the influx of workers, job seekers and camp followers can be considerable and may bring about both negative and positive impacts in more than one sector. Whether the impacts will be purely additive, or also synergistic, is at this stage, with limited details on number of workers and location of camps etc., difficult to determine. However, in-migration is likely to create cumulative impacts on infrastructure, services and utilities which, with the already strained local capacity and resources, will be difficult to respond to without coordinated mitigation programmes.

One particularly adverse impact associated with population influx is increased HIV infection rates. This has also been recognised by the mining company which has committed to conduct an HIV/AIDS awareness and prevention programme if the Dutwa project moves into implementation (IFC 2011).

On the positive side, it is likely that the projects will have significant additive and perhaps synergistic effects as not only will the demand for goods provide a boost for the local economy, but the total effect of the projects on the local economy may also lead to establishment of new businesses by local entrepreneurs as well as attracting businesses from other parts of the country.

## 7.7 Analysis of Alternatives

## 7.7.1 Introduction

This section describes and examines the alternatives to the proposed water supply project. While only one project alternative was examined in detail in Sections 7.2 - 7.5, different technical alternatives have been considered during the planning stage, as presented below.

Generally, a comparison of alternatives can help to determine the best method of achieving project objectives while minimising environmental and social impacts. Alternatives should be evaluated and compared on the basis of their potential environmental and social impacts, costs and feasibility.

The present ESIA has been carried out under a constrained project scenario, i.e. the project identification and conceptual design was largely completed prior to the ESIA process. However, certain elements of the design has been adjusted based on the ESIA scoping exercise and detailed studies, as explained below.

## 7.7.2 Alternative Water Sources

The hydrogeological investigations carried out during the pre-feasibility study (MoWI/KfW 2014) concluded that there is not sufficient potential of groundwater resources in the weathered and fractured zones of the granite bedrock in order to satisfy the demand of the growing population. Similarly, GKW Consult (2015) concluded that surface water from rivers is inadequate due to their seasonal flow regimes and unfavourable terrain morphology for construction storage reservoirs. According to MoWI/KfW (2014) and GKW Consult (2015), only Lake Victoria provides a reliable water resource within the Simiyu region in order to cover the water needs of the targeted district centres and rural areas.

The risks and impacts on water resources from lake and river abstractions are equal provided that the water source is located within the Lake Victoria Basin. Any withdrawal of water will cause impact on the total water balance in the basin irrespective of its source (lake or river). The alternative water sources in the three districts (Busega, Bariadi and Itilima) are all found within the catchment of the lake, and hence they do not offer a better environmental (and hydrological) performance than the selected option of pumping water directly from the lake. In addition, it should be noted that the water quality of the local water resources are generally inferior to the lake water.

## 7.7.3 Alternative Locations for the Intake and Water Treatment Plant

Two locations, about 1 km apart, were originally considered for the intake and water treatment plant on the lake shore; one site in Nyang'hanga village and another site in Bukabile village. The two locations are equally suitable in terms of water quality, environmental characteristics and topographic conditions. However, the Nyang'hanha site is closer to the town and has more human activity (landing site for fishing, water collection, and a few structures), whereas the Bukabile site is devoid of settlements with only some agricultural activities (Figure 25). It should also be noted that fishing will not be significantly impacted at Bukabile, as the intake site is not particularly important for fisheries and not used as a permanent landing site for fishing. The Bukabile site has therefore been selected in order to avoid relocation of structure and minimise economic displacement.

The concept considered in the draft feasibility study was based on siting the water treatment plant at a distance 80 - 100 m from the lake shore line (GKW Consult 2015). However, an alternative location was

later identified at further distance from the lake, at higher elevation, in order to minimise the risk of flooding during heavy rains and to allow the flow of waste materials/sludge with natural purification back to the lake. The preferred site, which has been confirmed by GKW Consult (2016a), is located 400 – 500 m from the intake point, immediately south of the Mwanza-Musoma road.



Figure 25: Alternative intake at Nyang'hanga (left) and preferred site for water treatment plant at Bukabile (right).

## 7.7.4 Options for Main Command Reservoir

The original design was based on having the main command reservoir at Ngasamo hill. According to GKW Consult (2015, 2016a), this location is preferable due to its higher elevation and shorter distance to the settlements to be supplied than the other proposed hills at Dutwa. However, during the scoping and stakeholder consultations for the ESIA study, it was realised that Ngasamo hill has already been earmarked for nickel mining (see Section 2.4.5). A new location for the main command reservoir was therefore explored near the planned Shigala primary reservoir (Figure 26). The available options include Shigala hill, Nyamatembe hills and Lwangwe hills, which are all located in close vicinity to each other. The shift in command area location from Ngasamo to either of these alternatives is obviously highly preferable in terms of overall impact on the national economy, although nickel mining is associated with a range of environmental and social risks. The mining project is, however, subject to a separate ESIA study and permitting process. A final decision on the siting of the command reservoir has not yet been reached, but it is likely that the Ngasamo option will be abandoned following an official validation of the mining license.



Figure 26: Alternative locations for command reservoir.

## 7.7.5 Routing of the Main Water Pipelines

The main water pipelines are planned to be routed along the main roads and within the existing road reserve. For national (trunk) and regional roads, the width of the road reserve is 60 m (i.e. 30 m on each side of the centre line), which is an expansion of the former road reserve width (50 m). TANROADS is currently in the process to secure the expanded portion (i.e. from 22.5 m to 30 m from the centre line) including relocation of structures and payment of compensations to affected property owners. However, as this process has not yet been completed, it is expected that the responsibility for resettlement will be handed over to the Simiyu project in case permission is granted to use the outer 10 m portion of the road reserve for installation of the water pipelines.

During the field inventory, it was observed that many residential, commercial and even public structures are located along the boundary of the former road reserve, i.e. at a distance of 22.5 m to 30 m from the centre line of the road. Thus, while it is preferable from a technical point of view to install the water mains along the road (but not too close to the road due to the risk of road expansion in future), the resettlement impact appears to be greater than if the pipelines were routed away from the main roads. The number of affected structures is particularly high in the urban centres and other high population areas. It is therefore recommended that bypass solutions are explored in Bariadi town (including Mahaha and Kilulu villages along the Bariadi-Lagangabilili road), Dutwa (Majengo and Igaganulwa villages) and Nyang'hanga (Bulima village). The other option is to fit the water pipelines closer to the actual road (i.e. within the 22.5 m distance from the centre line) where TANROADS have already acquired the land and relocated all structures. Either of these options must be considered in order to comply with IFC's Performance Standard 5 which requires that physical and economic displacement is avoided or minimised as far as possible by alternative project designs.

## 7.7.6 Phasing of the Project

Several options have been considered for serving all the five districts in Simiyu region. According to GKW Consult (2015), the district centres of Mwanhuzi (Meatu) and Maswa are currently using local water resources, and the situation regarding water supply, taking into account quantity and quality issues, "is not as strenuous as in Bariadi". Because of this and also based on engineering and financial analyses, GKW (2015) has recommended a phased approach to project implementation (see Section 2.3).

The phased approach is based on the following reasoning (GKW Consult 2015): Following an initial operation of Phase 1 system for some ten years, a further extension could be considered. If response to the system is good and all villages/wards are connected and consuming the expected amount of water, an extension of the system beyond Lagangabilili would only be possible by constructing an additional main pipeline parallel to the pipeline constructed in Phase 1 (and extending the other system components, such as the treatment plant, the pump stations, reservoirs, etc.). If response to the system is lower and villages remain reluctant to connect to the system or use considerably less water than assumed, there are still reserves in the system to extend the supply system towards Mwanhuzi and/or Maswa. There is also the possibility, which is to be investigated, of developing local water resources in order satisfy the water needs of Mwanhuzi and Maswa.

From an environmental and social perspective, an extension of the project into Phase 2 is clearly preferable in terms of expanding the water supply (and sanitation) coverage. There is also high expectation in Meatu and Maswa districts that the Simiyu Water Supply Project will also benefit their communities, while in Itilima district there is worry that a delay in Phase 2 would prevent several of their villages from being served by the planned extension to Maswa. As explained above, the demand can be met either by extending the Phase 1 water main, or by constructing an additional main pipeline parallel to the Phase 1 water main, or by developing local water resources. These alternatives will have slightly different impacts in Meatu and Maswa (i.e. the targeted districts for Phase 2), but the key issue pertaining to the current Phase 1 is related to the possible need for extending the system, including expansion of the water treatment plant and constructing another water main through the Phase 1 zone, in order to serve the southern districts in Phase 2. This option will bring construction related disturbances not only to the Phase 2 districts but also to the current impact zone beyond the approx. 3 years planned for Phase 1. It is therefore recommended that Phase 1 is designed and implemented to allow for extension into Phase 2 without causing significant additional impacts in Busega, Bariadi and Itilima.

## 7.7.7 No Project Alternative

Under the "no project" alternative, the proposed Simiyu Water Supply Project would not be constructed and operated, and hence, the identified environmental and social impacts would not occur. However, choosing the no project alternative does not necessarily correspond to maintaining baseline conditions or status quo, as changes may result from other actions.

Continued population growth and demand for potable water will put pressure on other water resources which have been shown to be inadequate for the targeted population. It can be assumed that the environmental and hydrological impacts of abstracting equal amounts of water from other sources within the Lake Victoria Basin would be similar to the effects of pumping water directly from the lake. On the other hand, if the demand cannot be met by means of other water sources, the no project alternative can entail forgoing the cost savings it represents as it also will have a cost side in terms of suppressed economic growth, increased prevalence of water related diseases and associated public health costs.

The only positive aspects of the no project alternative is related to the avoidance of negative impacts in terms of biodiversity physical and resettlement, including economical and physical displacement.

Overall, given that most of the adverse environmental and social impacts can be successfully mitigated, the no project alternative is not considered to be a preferred option when taking all technical, economic, social and environmental aspects into account.

# 8 MITIGATION MEASURES

## 8.1 Introduction

This chapter presents mitigation measures to avoid, reduce or compensate for unwanted negative impacts of the proposed Simiyu Water Supply Project. It also describes opportunities for enhancement of positive impacts. The structure of the chapter follows the structure used in Chapter 7, i.e. mitigation measures are described for each identified impact.

The mitigation measures described in this chapter include both the predetermined design solutions and construction/operation procedures as well as additional mitigation measures which go beyond the agreed project description (ref. Chapter 2). The chapter concludes with a post-mitigation impact assessment which captures the residual impacts remaining after all the mitigation measures have been implemented. The details on how the mitigation measures will be implemented and monitored are further described in the Environmental and Social Management Plan (Chapter 9) and the Environmental and Social Monitoring Plan (Chapter 10), respectively.

## 8.2 Physical Environment

## 8.2.1 Topography and Landscape

## Construction phase

## Visual impact

- Restoration of construction sites to pre-construction state
- Limit vegetation clearance for the water pipelines to the required work strip
- Landscaping of the spoil tips should take advantage of the natural terrain
- Remove the good topsoil first and stockpile it separately for use in replanting and restoration

## **Operation phase**

Visual impact

• N/A

## 8.2.2 Geology and Soils

## Construction phase

## Soil erosion

- Limit vegetation clearance as much as possible
- Stabilise the soil mechanically to reduce erosion potential
- Re-grading of slopes and re-vegetation of exposed areas
- Use native/excavated material to backfill the trench section around the pipes
- Spoil earth/rock should be disposed of in appropriate approved areas

## Land contamination

- Installation of oil separators and secondary containment at fuel storage sites
- Store hazardous materials in properly designed storage facilities

## Operation phase

Soil erosion

• N/A

## Land contamination

• Installation of oil separators and secondary containment at fuel storage sites

• Store hazardous materials in properly designed storage facilities

## 8.2.3 Climate and Air Quality

## Construction phase

GHG emissions

• N/A

## Air pollution

- Spray water on dirt roads to avoid dust dispersion if necessary
- Tarp trucks transporting loose/friable materials to minimize loss during transportation
- Consider covering stockpiles of excavated soils in areas near houses and shops
- Maintain and store piles of loose/friable materials and soil in a suitable manner to minimize dust dispersion

#### Operation phase

Air pollution

• N/A

## 8.2.4 Noise

#### Construction phase

Construction noise

- Schedule noisy activities to daytime hours
- Locate noisy installations in adequate distance to residential areas to meet noise limit values
- Install noise control devices in construction equipment if noise levels exceed the applicable guidelines
- Instruct the workforce to avoid unnecessary noise

## **Operation phase**

**Operation** noise

• N/A

## 8.2.5 Water Resources

#### Construction phase

Water pollution

- Avoid unnecessary soil erosion on the lake shore and at river crossings
- Secondary containment to collect diffuse and accidental spills
- Storage and handling of fuel should be kept away from the lake shore and rivers
- Installation of sanitary water treatment facilities in workers' camps
- Construction methods for intake should be selected to minimize disturbance on lake's bottom

## **Operation phase**

Water pollution

- Conduct testing of dried sludge to determine suitable disposal method
- Secondary containment to collect diffuse and accidental spills
- Enforce protection of the 60 m buffer zone around the lake shore at the intake site
- Establish a protective zone, marked with buoys, in the lake around the water intake
- Minimise use of chemicals by optimising the coagulation/flocculation process

Water withdrawal

• N/A

## 8.3 Biological Environment

## 8.3.1 Protected Areas

• N/A

## 8.3.2 Vegetation

## Construction phase

Vegetation clearing

- Vegetation clearance should be minimised as much as possible
- Limit vegetation clearance for the water pipelines to the required work strip
- Only indigenous plant species should be used for re-vegetation

#### **Operation phase**

## Establishment of invasive plant species

- Removal of invasive plant species during routine maintenance
- Restore disturbed areas immediately after the construction and maintenance works
- Avoid importation of exotic trees and soil from other places (e.g. for restoration or as ornamentals)

## 8.3.3 Terrestrial Fauna

## Construction phase

Disturbance from construction activity

- Schedule noisy activities to daytime hours
- Instruct the workforce to avoid unnecessary noise

## **Operation phase**

Habitat loss

• N/A

## 8.3.4 Aquatic Ecology

## Construction phase

Water pollution at intake

- Avoid unnecessary soil erosion on the lake shore
- Secondary containment to collect diffuse and accidental spills
- Storage and handling of fuel should be kept away from the lake shore
- Construction methods for intake should be selected to minimize disturbance on lake's bottom

## **Operation phase**

## Fish entrainment at intake

• The intake must be designed to minimise the possibility of entrainment of fish and other aquatic organisms

## 8.4 Human Environment

#### 8.4.1 Population

#### Construction phase

#### Population influx

- Establish transparent recruitment procedures to avoid camp followers in form of job-seekers
- Establish a recruitment policy that gives priority to local residents for less specialised services
- Recruitment procedures to be shared with the local authorities for further dissemination
- Opportunities for sub-suppliers and sub-contractors should be awarded to local firms which in turn employ local labour
- Conduct public health campaigns addressing issues of behavioural change, water and sanitation, malaria, HIV/AIDS, etc.

## **Operation phase**

Population growth

• N/A

## 8.4.2 Settlement Pattern

## Construction phase

## Physical displacement

- Negotiate with TANROADS for permission to use the road reserve for the water mains
- Consider re-routing of the main water pipelines to bypass highly populated areas
- Prepare and implement Resettlement Action Plan (RAP) based on the detailed design and in compliance with national and international requirements as outlined in the RPF

## 8.4.3 Land Use

## Construction phase

## Economic displacement

- Allow farmers to harvest their crops prior to construction and to continue growing seasonal crops in the pipeline wayleave
- Prepare and implement Resettlement Action Plan (RAP) based on the detailed design and in compliance with national and international requirements as outlined in the RPF

## 8.4.4 Local Economy

## Construction phase

## Employment and business opportunities

- Priority for recruitment to be given to local residents for less specialised and labour-intensive services
- Opportunities for sub-suppliers and sub-contractors should be awarded to local firms which in turn employ local labour
- Create opportunities for employment of women in both management and casual placements

## **Operation phase**

## Economic benefits

• N/A

## 8.4.5 Water Supply and Sanitation

## Construction phase

Pressure on water and sanitation facilities

- Ensure early start of the project's sanitation component to cater for influx of workers and job seekers
- Provide sufficient water supply and sanitation facilities to workers at all work sites

## **Operation phase**

Provision of water supply and sanitation

• N/A

## 8.4.6 Health and Education

## Construction phase

Pressure on health and education services

- Provide adequate health care to project workers and their families so as to avoid adding additional stress to the existing health facilities
- Conduct public health campaigns addressing issues of behavioural change, water and sanitation, malaria, HIV/AIDS, etc.

## **Operation phase**

Health benefits from water supply and sanitation

• N/A

## 8.4.7 Safety and Security

## Construction phase

## Health and safety risks

- Include best practice health and safety provisions in the construction contracts and ensure strict compliance with national legislation and EHS Guidelines
- Dissemination of traffic management plans in the project area, through campaigns in schools and communities
- Institute speed limits and traffic controls for project vehicles and equipment
- The workers' camp standards in regard to quality, management and provision of basic social services must comply with the IFC/EBRD guidance on workers' accommodation
- Establish a grievance mechanism for workers

## Security threats

- Support local security systems to strengthen community policing and crime-handling measures
- Institute strict control measures for project property, including fencing as required
- Ensure that the conduct of security personnel complies with good international practice
- Establish a grievance mechanism for addressing security-related grievances

## Operation phase

## Health and safety risks

- Ensure compliance to strict occupational health and safety standards
- Design chlorination system in water treatment plant according to national and international standards

• Develop detailed emergency preparedness and response procedures with respect to key infrastructure

## 8.4.8 Cultural Heritage

#### Construction phase

Loss of physical cultural resources

- All culturally sensitive areas shall be avoided in the detailed design
- Graves shall be relocated in accordance with applicable rules and regulations, including proper and early consultation with the affected relatives
- Any chance finds shall be reported to the responsible authority
- The siting of the primary reservoir at Isenge holy hill must be agreed with traditional leaders or be shifted to another suitable location
- A site-specific anthropological/archaeological study shall be undertaken as part of the detailed design and/or RAP if there is indication that the project will interfere with cultural heritage of any ethnic group

## 8.4.9 Tourism

#### Operation phase

Improved tourist facilities

• N/A

## 8.5 Post-Mitigation Impacts

Assuming that all the proposed mitigation measures are implemented, the (pre-mitigation) impact assessment presented in Chapter 7 can be replaced with a post-mitigation (residual) impact assessment as summarised in Table 28. The analysis shows that the environmental and social performance of the Simiyu Water Supply Project is marginally improved when all the mitigation measures have been implemented. The marginal improvement is mainly because most of the important mitigation measures have already been included in the project design and/or construction/operation procedures upon which the pre-mitigation impact assessment in Chapter 7 is based. It is nevertheless critical that all the mitigation measures be implemented in order to maximise the environmental and social performance of the project.

Table 28: Summary of pre- and post-mitigation impact assessment.

Impact Source	Pre-Mitigation Impact	Post-Mitigation Impact
CONSTRUCTION PHASE		
Physical Environment		
Topography and landscape	_	
Visual impact	_	_
Geology and soils		
Soil erosion	-	-
Land contamination		
Climate and air quality		
GHG emissions	-	-
Air pollution		
Noise		
Construction noise		-
Water resources		
Water pollution		Π
Biological Environment		

Impact Source	Pre-Mitigation Impact	Post-Mitigation Impact
Protected areas	0	0
• N/A	U	0
Vegetation		
Vegetation clearing	-	-
Terrestrial fauna		
Disturbance from construction activity	-	_
Aquatic ecology		
Water pollution at intake	-	-
Human Environment		
Population		
Population influx		-
Settlement pattern		
Physical displacement		
Land use		
Economic displacement		
Local economy		
Employment and business opportunities	+	+
Water supply and sanitation		
Pressure on water and sanitation facilities	-	-
Health and education		
Pressure on health and education services	-	=
Safety and security		
Health and safety		-
Security threats		
Cultural heritage		
Loss of physical cultural resources		-
Tourism	•	
• N/A	U	0
OPERATION PHASE	•	
Physical Environment		
Topography and landscape		
Visual impact	-	-
Geology and soils		
Soil erosion	-	-
Land contamination		
Climate and air quality		
Air pollution	U	U
Noise	0	0
Operation noise	U	U
Water resources		
Water pollution	-	-
Water withdrawal		
Biological Environment		
Protected areas	0	0
• N/A	U	U
Vegetation		
Establishment of invasive plant species	-	-
Terrestrial fauna	•	•
Habitat loss	U	U
Aquatic ecology		
Fish entrainment at intake	-	-
Human Environment		
Population		
<ul> <li>Population growth</li> </ul>	+	+

Impact Source	Pre-Mitigation Impact	Post-Mitigation Impact
Settlement pattern	0	0
• N/A	U	0
Land use	0	0
• N/A	U	
Local economy	<b>1</b> 1	++
Economic benefits	тт	
Water supply and sanitation		
<ul> <li>Provision of water supply and sanitation</li> </ul>	++++	++++
services		
Health and education		
<ul> <li>Health benefits from water supply and</li> </ul>	++++	++++
sanitation		
Safety and security	_	_
<ul> <li>Health and safety</li> </ul>		
Cultural heritage	0	0
• N/A	U	
Tourism		
<ul> <li>Improved tourist facilities</li> </ul>	Ŧ	Ŧ

Very large negative – – – –, Large negative – – –, Medium negative – –, Small negative –, Minimal/no 0, Small positive +, Medium positive + +, Large positive + + +, Very large positive + + +.

## 8.6 Mitigation of Cumulative Impacts

Mitigation of cumulative impacts requires collaborative efforts, as it is beyond the capability of any one party to implement all of the measures alone. However, at the present stage of project formulation, there is inadequate information to develop any specific mitigation measures for the potential cumulative impacts. This is particularly due to the uncertainty related to the progress of the Dutwa project. As a general condition, the following management action is required:

• If the implementation of the mining project coincides with the construction phase of the Simiyu project, then conduct a Cumulative Impact Assessment detailing the incremental impacts of the project when added to the nickel mining and the associated railway line

# 9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

## 9.1 Introduction

One of the objectives of the ESIA process is to develop an Environmental and Social Management Plan (ESMP) which outlines the costs, timeframes and responsibilities to implement the mitigation and enhancement measures.

This chapter presents the preliminary ESMP for the Simiyu Water Supply Project based on the information available at the current stage of project development. It is expected that the ESMP will be refined during the detailed design phase and once the construction contractors have been identified. It may also need to be adjusted if the Dutwa mining project (and railway) is implemented in order to address any cumulative impacts (see Section 8.6). Thus, the ESMP will need continuous revision and updating.

The sole responsibility for the implementation and outcome of the ESMP rests with MoWI as the project proponent. MoWI is committed to manage all the environmental, health, safety and social risks and impacts identified in this ESIA study as elaborated below.

## 9.2 Institutional Arrangements

The institutional arrangements for the Simiyu Water Supply Project have not yet been finalised, but the proposed framework is outlined in Section 2.9. Despite the preliminary status of the institutional arrangements, the key project partners for ESMP implementation have been assumed to be as follows:

- Government / Regulator
- Project Implementation Unit (PIU)
- Bulk Water Supplier
- UWSAs and COWSOs
- Contractors
- Consultants and NGOs
- Financiers / Lenders

## **Regulatory Authorities**

For purposes of this project, the regulating body will include all those government institutions responsible for enforcing compliance with national standards in the different areas of specialisation. These will include but not be limited to the following:

- Vice President's Office (Division of Environment, DoE)
- National Environment Management Council (NEMC)
- Ministry of Water and Irrigation
- EWURA
- Lake Victoria Basin Water Board
- Ministry of Natural Resources and Tourism
- Department of Antiquities

## Project Implementation Unit (PIU)

As outlined in Section 2.9, the PIU is meant to be an operation unit supplementing and enhancing the existing skill mix of the project implementing agencies (Bulk Water Supplier, UWSAs and COWSOs). During the construction phase, the PIU will have the primary overall responsibility for the implementation of the ESMP and for ensuring compliance with Tanzanian legislation and international lenders' guidelines for environmental and social performance.

The capacity to manage and monitor environmental and social issues needs to be developed through recruitment of competent staff. For the purpose of ESMP implementation, the PIU will be expected to
establish an Environmental and Social Management Unit and designate two appropriately experienced and qualified persons in charge of the environmental and social management. The two staff shall be assigned as Environmental Officer and Community Liaison Officer (CLO). The CLO shall be supported by several assistants at local level, together forming a Community Liaison Unit.

The Environmental and Social Management Unit will implement the Owner's ESMP (see below), including all operation-related management plans and community relations activities. However, the responsibility for implementing environmental and social mitigation, compensation and monitoring actions could in some cases be delegated to external agencies, e.g. non-governmental organisations (NGOs) or consultants, while the Construction Contractors' ESMP will be implemented by the respective contractors under the supervision of the Environmental and Social Management Unit.

# Bulk Water Supplier

It is proposed to establish a bulk water supply and sanitation authority, under the Water Supply and Sanitation Act 2009, similar to that of KASHWASA (Kahama Shinyanga Water Supply and Sewerage Authority). The bulk water organisation shall be responsible for sale of bulk potable water to urban water supply and sanitation authorities (UWSAs) and to rural organizations (COWSOs) to be established to manage water supply to villages along the transmission mains. The bulk water supply and sanitation authority shall be responsible for the operation and maintenance of the water treatment plant, pumping stations, transmission mains and the command reservoir. During the operation phase, the bulk water supplier will take over the environmental and social management responsibilities from the PIU.

# UWSAs and COWSOs

The UWSAs will be responsible for supplying water and sanitation services in urban areas while the legally constituted community owned water supply organisations (COWSOs) will be responsible for such services in the rural areas along the 12 km corridor of the transmission mains. The UWSAs and COWSOs will be responsible for the operation and maintenance of the supply reservoirs and distribution networks, including installing water meters, charging water fees, maintaining public taps, and supplying water fittings to customers. Technical support will be provided by the district water engineers, consultants and NGOs as required.

# **Contractors**

The contractors will be responsible for avoiding or minimising environmental impacts caused by construction activities. It is expected that the construction works will be divided into several contracts, e.g. intake and water treatment plant, water reservoirs, main pipelines (probably sub-divided into different sections) and pumping stations, etc. Each contractor should be required to have an Environmental, Health and Safety (EHS) Unit, which will be responsible for managing and monitoring the environmental and social mitigation measures in accordance with the contractual obligations. The contractors will also be responsible for ensuring that all sub-contractors are in compliance.

### Consultants and NGOs

The PIU and/or the Bulk Water Supplier is likely to delegate certain tasks to external consultants and nongovernmental organisations (NGOs). Consultants will be needed for some of the specialised monitoring and evaluation activities, while NGOs might be assigned to deliver community health and safety services, livelihood restoration to displaced households, among others. NGOs can also serve as witness to land acquisition and grievance management.

# **Financiers/Lenders**

The Simiyu Water Supply Project is likely to be backed by grants and loans from international financial institutions. However, until the financing structure has been agreed, the roles and responsibilities of financiers and lenders are unknown.

A requirement of lender policies is usually that the project owner engages a Panel of Experts to provide regular oversight of compliance with the relevant safeguard policies and performance standards and a consultant to support the project owner in supervision of works and to carry out capacity building. The financiers will also request for quarterly progress reports.

# 9.3 Construction Contractors' ESMP

# 9.3.1 Introduction

The detailed contractual arrangements for the construction of the Simiyu Water Supply Project have not yet been decided. The Construction Contractors' ESMP therefore applies equally to all the contractors (and sub-contractors). Each contractor will be expected to comply with the relevant requirements within their scope of work.

Based on the requirements in the Construction Contractors' ESMP, each contractor shall develop a detailed Environmental, Health and Safety (EHS) Plan, including an Emergency Preparedness and Response Plan, in accordance with their own policy framework and management systems to ensure that the organisation can fulfil all tasks required to achieve the objectives. The EHS Plan shall indicate how and when the contractor expects to put the mitigation measures listed in the ESMP into practice, as well as how to monitor and report compliance. The overriding principle of the construction management will be to comply with the requirements of ISO 14001:2004 and OHSAS 18001:2007 as well as the environmental and social standards of the financiers and lenders (i.e. IFC's Performance Standards and EHS Guidelines of the World Bank Group).

In order to ensure compliance, the requirements in the Construction Contractors' ESMP should be incorporated into bidding and contract documents, either by placing environmental and social clauses directly into the documents or by attaching the ESMP as a legal condition. Moreover, when evaluating the tender bids, an environmental and social specialist should be assigned to review how each bid has addressed the environmental and social clauses and conditions. The environmental and social criteria should be included as part of the basis for selecting the contractors.

It should be noted that the costs associated with the Construction Contractors' ESMP have not been estimated, as the environmental and social criteria will be included in the tender package upon which the tenderers will develop their base rates. Hence, the costs of the construction-related environmental and social management will be within the contract price. It is recommended that the environmental and social costs, as well as the occupational health and safety costs, are specified in the tenders and that payments to the contractors are made conditional on performance.

# 9.3.2 General Requirements

*Contractor's EHS Plan:* Following the award of the contracts and before the contractor mobilises, the contractor shall prepare a detailed and project-specific EHS Plan to show how the contractor will meet the conditions of the owner's EHS requirements.

*Risk management:* The contractors shall ensure that critical operations within their respective scope of work are systematically identified, analysed, evaluated and documented at the planning stage and by use of a recognised risk assessment method and that adequate control measures are taken. At a minimum, the contractor's risk management should comprise of Job Safety Analysis/Job Hazard Analysis (JSA/JHA) and toolbox talks.

*EHS induction and training:* The contractors shall establish an EHS induction program for all their personnel that are going to work at the project site, including sub-contractor personnel. The contractors shall establish and operate a register of all personnel and visitors that have passed this induction.

*EHS monitoring and inspection:* The contractors shall establish an EHS monitoring and inspection plan in accordance with the Contractor's EHS Plan and in compliance with applicable rules and regulations. The Owner/PIU has the right to participate in the site inspections. EHS topics to be monitored and inspection findings shall be documented. Proper follow-up of inspection findings shall be ensured.

*EHS meetings:* The contractor shall participate in regular EHS meetings with the Owner/PIU. The meetings shall be used to review the effectiveness of the contractor's EHS efforts, to resolve EHS problems relating to current operations, and to provide a forum for planning future construction activities and EHS tasks. The EHS meetings can be held as part of the weekly construction meetings where EHS items shall be included on the agenda.

Incident reporting and investigations: The contractors shall have a documented procedure for reporting and handling of incidents occurring during and outside work hours. All medium and major incidents, including near misses with a potential of major or medium consequences, shall be reported without delay to the Owner/PIU.

*Monthly EHS reports:* The contractors shall provide monthly reports to the Owner/PIU regarding EHS performance and compliance.

# 9.3.3 Specific Requirements

The specific requirements have been summarised as bullet points in Chapter 8 and in the ESMP table in Section 9.6. As explained above, these mitigation measures will be converted to detailed clauses to be inserted into the tender documents and construction contracts. This should be done during the detailed design and once the contracting package has been defined. It is envisaged that the tender documents will address the following key environmental and social issues:

- Landscape and vegetation management
- Soil erosion control
- Solid waste, hazardous waste and wastewater management
- Air pollution control
- Noise management
- Chance finds procedure
- Occupational health and safety
- Traffic and transportation safety
- Security arrangements
- Labour management
- Community relations

As an input to the tender documents, a set of preliminary specifications for soil erosion control, waste management, chance finds procedure, occupational health and safety, and labour management have been outlined below.

### Soil Erosion Control

Sites that are not disturbed by construction activities shall be maintained in their existing condition. Only approved areas due for construction activity shall be cleared for vegetation and topsoil. The area disturbed shall be minimised in order to limit the opportunity to provide a source of erodible material. All exposed surfaces shall be covered with topsoil and replanted or re-seeded, at the Contractor's expense and as directed by the Engineer, at the earliest possible opportunity.

Soil erosion and sediment control practices shall be implemented prior to any major soil disturbance and be maintained until permanent protection is established. The effectiveness of the soil erosion and sediment control measures shall be regularly inspected.

Excavated materials, which are unsuitable for incorporation into the permanent works or are surplus to such requirements, shall be disposed of as spoil dumps in specially designated spoil disposal areas. All stockpiles and spoil dumps shall be stabilised, including provision of drainage and erosion control measures. Wherever possible, the spoil areas shall be shaped or reshaped and treated such that farming is possible after completion of the Works.

### Solid Waste, Hazardous Waste and Wastewater Management

*Solid waste / household waste:* The different types of solid waste shall be separated and disposed of separately. Solid waste generated during construction and at campsites shall be properly treated and safely disposed of only in demarcated waste disposal sites.

A sufficient number of garbage bins and containers shall be made available at the main work sites and camps. The containers shall be marked with clear labels for 'organic', 'paper' and 'other waste' for sorting waste collection.

Garbage and other waste shall be regularly collected and be transported to a designated waste disposal site located at a distance from the nearest village and from watercourses or wells. Only materials approved by the Engineer may be buried.

The waste disposal site shall be protected from contaminating groundwater by an impermeable membrane or clay. When parts or the waste disposal area are full, they shall be sealed and covered by a minimum or 1.5 m of soil, and then re-vegetated.

Suitable sanitary and solid waste collection and disposal facilities or systems shall be provided at all camps, workshops, stores, offices, and long-term main work sites.

*Wastewater management:* The Contractor shall supply and install wastewater treatment facilities for processing and disposal of sewage from the Contractors' housing, camp accommodation, camp amenities, workshops, stores, offices, and other buildings and facilities. The facilities shall be complete with adequate closets, urinals and hand-basins, septic tanks, absorption trenches or other sewerage disposal installations.

The septic tank and/or temporary holding tank(s) shall be kept pumped out at such intervals that the tank(s) will not overflow and contaminate the ground, flowing streams or surface drainage. On completion of the Works, sanitary facilities shall be properly disinfected and all evidence of same including temporary buried tanks and foundations removed from the site.

The Contractor shall install, operate and maintain temporary toilet facilities at all work sites. Toilets (male and female separate) shall be installed at each short-term work site employing 5 workers or more. At least one toilet shall be installed per 20 workers. A distance of at least 15 m to the river has to be kept.

All water discharged from the works and living areas into natural waterbodies from the wastewater treatment facilities shall be chemically tested. The water quality shall comply with the sanitary sewage discharge standards according to IFC's EHS Guidelines.

Hazardous materials and hazardous waste management: All refuelling of heavy equipment and machinery shall be undertaken by a service vehicle, with appropriate safeguards and protection measures to prevent any spillage or contamination by chemical wastes or maintenance oils, lubricants, etc.

All the fuel and hazardous material shall be stored in special designates facilities away from nearby waterbodies. The storage shall be roofed and have a concrete floor with a bund for secondary containment and collection of spills. Storage areas shall be designed such that they will contain 110% of the largest container/vessel stored in the storage area; suitable clean-up equipment and material needs to be on site.

Each storage container should be marked visibly with the necessary precaution signs and the Material Safety Data Sheet needs to be readily accessible to the workers.

The diesel shall be stored in a standard skid tank with secondary containment proving 110% volume of the total capacity of the skid. The skid tank shall be located at least 100 m away from any waterbody. The skid tank shall be inspected at regular intervals to ensure that the diesel is handled in accordance with the specification and that no spillage occurs.

Maintenance of machinery and trucks shall be done in workshop servicing and repair areas away from nearby waterbodies. Storm water runoff from open workshop servicing and repairs areas and bunded storage areas shall be collected and treated in hydrocarbon separation pits/tanks before discharge into drains or waterways.

Spent solvents and oily rags, empty paint cans, used lubricating oils, used batteries, lighting equipment, etc. shall be categorised as a scheduled waste. This scheduled waste is to be stored in containers, with proper bunds, which are able to prevent spillage or leakage of the scheduled wastes into the environment. The containers of the scheduled wastes shall be clearly labelled for identification and warning purposes.

The Contractor shall engage a certified contractor to collect, transport and dispose of all the scheduled waste generated at the project site. Alternatively, this responsibility can be given to the supplier. The Contractor shall verify that each supply/disposal Sub-contractor has adequate arrangements or facilities for proper transport, disposal, treatment or recycling of these wastes.

All employees working with hazardous materials should be trained in hazard identification, safe operating procedures, appropriate materials handling procedures, safe work practices, basic emergency procedures, and (if applicable) special hazards unique to their jobs.

Transportation procedures for hazardous materials should be prepared to be consistent with internationally accepted standards and should cover, at a minimum, the following: (i) ensuring that the nature, integrity and protection provided by packaging and containers used for transport are appropriate for the kind and quantity of hazardous material involved; (ii) ensuring adequate transport vehicle specifications; (iii) routes used; (iv) loading and unloading procedures; (v) informing employees involved in the transportation and training them as appropriate to handle normal operations and emergencies; (vi) using labelling and placarding (external signs in transport vehicles) as required; and (vii) providing the necessary means for emergency response; and (viii) compliance audit procedures.

*Pollution spill contingency plan:* The Contractor shall prepare procedures for handling accidental spills of hazardous materials. The procedures shall include:

- Procedures for immediate actions specified for all relevant hazardous materials used in the construction processes.
- Complete list of equipment available for use in emergency situations.
- Procedures for neighbours and downstream warning in cases of accidental release of hazardous substances.
- Procedures for immediate information to the Engineer in case of discharges and standards for reporting irregular events.
- Program for training of key staff in emergency responses. The training shall be based on various emergency scenarios.

The following principles must be included in the procedures: (a) the source of the leak or spill must be stopped immediately once discovered; (b) the alarm must be raised throughout the site; (c) work on the site must be stopped and all available resources directed into resolving the problem; (d) emergency measures must be taken to contain all remaining material; (e) where appropriate, measures must be taken

to neutralise hazardous substances; (e) the Engineer shall be informed immediately; and (f) site-specific and material-specific details will be given for the disposal of contaminated soil and water, and mitigation of the damage caused.

At a minimum, the Contractor must ensure that storage areas have spill kit, sand, dust, and other appropriate absorbent materials, and a spill containment plan displayed. Staff members in charge of storage area must have appropriate training.

The Contractor shall ensure that all site supervision staff is aware of the procedures and capable of implementing them. In the event of a leak or spillage, the Contractor shall bear all liability whether the plan is implemented or not.

### Chance Finds Procedure

The Contractor shall prepare a detailed chance finds procedure based on the following guidelines:

If any person discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the contractor shall:

- Stop the construction activities in the area of the chance find.
- Delineate the discovered site or area.
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over.
- Notify the Engineer who in turn will notify Division of Antiquities and the responsible local authorities immediately (within 24 hours or less).

Responsible local authorities (i.e. Division of Antiquities and Local Government) are in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by archaeologists. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values as stipulated by the Cultural Heritage Policy of 2008 and Antiquities Act of 1964 amended in 1979.

Decisions on how to handle the finding shall be taken by the Division of Antiquities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage.

Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities, and construction works could resume only after permission is granted from the Division of Antiquities.

### Occupational Health and Safety

*Occupational Health and Safety planning:* The Contractor is required to submit an Occupation Health and Safety (OHS) Plan as part of the Contractor's EHS Plan. As a minimum, the plan must:

- Describe the overall OHS policy of the organisation
- Describe hazards and risks to workers' safety and health arising from the working environment
- Identify which sources of injury and harm that can be eliminated, and identify preventive and/or protective measures that can be implemented in order to avoid those hazards and risks that cannot be eliminated

• Based on this analysis, formulate the company's OHS objectives for the Simiyu Water Supply Project, a plan for achieving each objective, and suitable measurement criteria for confirming that each objective has been achieved

Awareness and training: In order to achieve the objectives defined in the OHS management plan, the Contractor should ensure that personnel on all levels in the organisation are aware of and participate in OHS activities.

The Contractor shall establish and maintain the necessary arrangements to ensure that all persons with OHS responsibilities at all levels are competent to perform their duties and responsibilities. The Contractor shall provide initial and refresher OHS training for all members of the organisation. This training course shall also include education on Sexually Transmitted Diseases (STDs) and their prevention.

*Incidents reporting and investigations:* The Contractor is required to identify, investigate, record and report all incidents including accidents, near misses, diseases, and environmental incidents. The findings and conclusions of every investigation shall be reported to the Engineer without delay. The Contractor shall notify the Engineer immediately when any accident occurs whether on Site or off Site in which the Contractor is directly involved which results in any injury to any person whether directly concerned with the Site or whether a third party. Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.

*Emergency preparedness and response:* The Contractor shall develop an emergency preparedness and response plan, including provisions for first-aid stations, fire-fighting equipment, trained personnel and an evacuation plan in case of emergencies and serious accidents.

The emergency preparedness and response plan shall describe how to provide rapid and effective countermeasures to contain and control incidents and to prevent or limit undesired consequences. The emergency preparedness and response plan shall outline the following:

- Notification and warning procedures, including coordination with Engineer
- Evacuation procedures
- First aid facilities and equipment
- Procedures for rescue of people and treatment of the injured
- System for registration of personnel

Training drills should include rescue, evacuation, first aid, firefighting, communicating and use of communication equipment.

The Contractor shall produce accessible consultation sheets for review in case of emergency situations. These should have phone numbers for police, fire-fighters, hospital, site manager, etc.

*Medical screening:* In order to facilitate placement decisions and early detection of occupational diseases, pre-placement and periodic medical screening of all workers is required. Qualified medical personnel, with the help of an approved checklist, should do this. The Contractor shall keep health records of all the Contractor's personnel.

*Health services:* The Contractor shall provide first-line free qualified medical assistance for the benefit of the Contractor's personnel and their families. In addition, the Contractor shall ensure that there is an ambulance service available.

The Contractor shall provide first aid equipment at each construction site. The Contractor shall ensure that at least two people amongst the Site staff and this for each of the different working areas/working groups, during Site working hours are trained in first aid.

*Malaria and HIV/AIDS prevention:* Special precautions shall be taken by the Contractor at his own expense to keep the incidence of malaria and other diseases as low as possible. The Contractor shall accordingly spray with approved insecticide the interiors of buildings which he occupies within one week of their occupation under the Contract and at two monthly intervals thereafter. Further, the Contractor shall have sufficient number of ultraviolet electronic lamps.

All pools of water and other likely mosquito breeding places within and adjacent to the Works area shall either be eliminated or sprayed in an approved manner.

The Contractor shall provide mosquito nets to workers and prophylactic treatment for malaria.

The Contractor should ensure that his workforce is made fully aware of the causes and dangers of HIV/AIDS and ensure that a supply of condoms is available at all times at his camp facilities.

The Contractor shall provide support and not stigmatise their HIV positive employees.

*Safety equipment and regulations:* The Contractor shall provide proper safety equipment and draw up emergency regulations, including fire and electric shock prevention, stretchers and first aid boxes, together with rescue facilities, as well as properly trained personnel to administer these.

The Contractor shall provide adequate training regarding justification for and use of safety equipment to all workers. The Contractor shall make basic safety equipment available, and enforce use of such equipment during all working operations, which may expose workers to occupational health hazards.

Minimum requirement to Personal Protective Equipment (PPE) for all personnel at site (does not apply to indoor offices and in vehicles) are:

- Protective helmet / hardhat
- Protective footwear/safety boots
- Working clothing with strong colours and wide reflecting bands (similar vests shall be used by visitors)
- Safety glasses or over specs

Additional PPE such as ear, eye and respiratory protection or fall protection shall be provided when required to avoid occupational health incidents or illnesses as stipulated in regulatory requirements, material safety data sheets or Job Hazard Analysis.

The Contractor shall provide hearing protection for all workers working around equipment or at locations with a noise level of 80 dB(A) or more (e.g. heavy equipment and drills, blasting activities). The Contractor shall provide an appropriate instrument at Site to measure noise levels.

All employees working with hazardous materials shall be trained and provided with suitable personal protection equipment (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, sanitary facilities, pre-employment and scheduled periodic medical examinations.

All restricted plant facilities shall be labelled with caution signs, especially those with potential risk for workers. Moreover, all construction areas shall be marked and fenced to avoid accident from unauthorised people.

### Labour Management

The Contractor shall, at the minimum, comply with the national labour and employment law. In circumstances where the national law is not explicit, international practices will take precedence.

The Contractor shall hire local labourers and ensure that local workforce content is as high as possible. The Contractor is required to develop a local employment program to ensure that preference of employment is given to people from the area of influence of the project, provided adequate qualifications. The Contractor shall also develop procedures for equitable selection of the local labour. Preference will be given to Contractors who employ local villagers.

The Contractors shall maintain accurate records in relation to each worker's employment covering issues such as payment of wages and social security, and working hours. The recruitment process shall be transparent and all employees shall be given written contracts. Employees shall be provided with information regarding their rights under national labour and employment law, including their rights related to wages and benefits in a clear and understandable language to the employees at the time of recruitment.

The employment relationship shall be based on the principle of equal opportunity and fair treatment, and not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline.

The Contractor shall provide a grievance mechanism for workers to raise reasonable workplace concerns and ensure that all workers are informed about the grievance mechanism and that it is accessible.

Child labour is not allowed. If the national law has no provision for employment of minors, the international standards will supersede this.

The workers' camp standards in regard to quality, management and provision of basic social services should comply with the IFC/EBRD guidance on workers' accommodation.

A Code of Conduct shall be prepared covering the main rules of interaction with local communities and the rules of conduct in case of conflict situations.

# 9.4 Owner's ESMP

### 9.4.1 Introduction

The Owner's ESMP describes the environmental and social mitigation programme that the PIU and Bulk Water Supplier are responsible for implementing during the construction and operation phase, respectively. It consists of several sub-plans, which will be implemented by the Environmental and Social Management Unit, or be outsourced to service providers, e.g. non-governmental organisations (NGOs).

Each ESMP sub-plan sets out the obligatory mitigation measures based on the available information at the current stage of project preparation. It is expected that they be elaborated further by the Environmental and Social Management Unit, or be translated into Terms of Reference on which NGOs or other service providers can develop their project proposals. The detailed mitigation programme should be formulated into in an Owner's Environmental and Social Action Plan.

In addition to the sub-plans described in the present Owner's ESMP, the PIU and/or the Bulk Water Supplier will develop additional operation-phase management plans as required. For example, the Owner will be expected to develop a waste management plan, an occupational health and safety plan, an employment and human resource management plan, an emergency preparedness and response plan, etc. prior to the commissioning of the Simiyu Water Supply Project. The details of such operation-phase plans will be developed at a later stage and be based on the relevant sections in the Construction Contractors' EHS Plans as well as on MoWI's existing policies and procedures for environmental, health, safety and social management.

As for the Construction Contractors' ESMP, the overriding principle of the Owner's ESMP is to comply with the requirements of ISO 14001:2004 and OHSAS 18001:2007 as well as the environmental and social standards of the financiers and lenders (i.e. IFC's Performance Standards and EHS Guidelines). The Owner will be expected to formulate an environmental policy and to develop an environmental and social management system in compliance with IFC's Performance Standard 1.

# 9.4.2 Construction Supervision

The Owner is responsible to implement an EHS management system for the construction works, ensuring that all contractors comply with the EHS requirements and international safeguard policies and best practices. The Owner shall ensure that the environmental and social mitigation programmes are aligned with the construction schedule and the EHS requirements for the construction works.

The Owner shall insert EHS clauses in tender documents which serve as a basis for selecting contractors and as a benchmark for checking EHS performance during the construction phase. Based on the EHS specifications in the contracts, the Owner shall develop a comprehensive system for compliance monitoring of contractors, including checklists and reporting formats for site inspections and audits (see Chapter 10).

# 9.4.3 Community Health, Safety and Security Plan

# HIV/AIDS

Prior to and during the construction phase, the Owner shall adopt a comprehensive approach to prevent HIV/AIDS and other Sexually Transmitted Diseases (STDs). The approach shall target both workers and the community since human interaction will not only be confined to the project boundaries. The contractors are expected to make arrangements for the workforce through their occupational health and safety arrangements, while the community health and safety measures should include the following:

- Awareness raising and peer education: Targeted campaigns, small group counselling (particularly for commercial sex workers), IEC/BCC along with event organisation, and the use of mass media
- Condom promotion: Free and effective distribution, and education on appropriate use
- Post-exposure prophylaxis (PEP): Provided in the context of dual protection of unwanted pregnancy and HIV
- Ensure that contractors support and do not stigmatise their HIV positive employees
- Voluntary and provider-initiated testing and counselling (VCT/PITC): Provided at static sites and through mobile outreach scheme
- Support existing initiatives to promote HIV preventive campaigns
- Awareness campaigns at schools through drama and film shows
- Sport bonanza for the youth with clear HIV messages

### Sanitation and Waste Management

The Owner shall construct communal sanitation facilities at suitable locations such as schools, churches/mosques, markets and health centres to aid the camp followers access to sanitary facilities. For sustainability purposes, community-based operation and maintenance arrangements shall be instituted and training of the sanitation facility operators shall be provided. The Owner shall also conduct hygiene improvement campaigns at village level and carry out awareness raising about sustainable waste disposal practices. All sanitation interventions need to be handled prior to the commencement of the construction activities.

In the event that the project results into a high population influx in the already underserved project area, it is advisable that the Owner considers supporting the local authorities in the provision of additional water supply facilities to cater for the camp followers' water needs. The siting and location of these facilities should be based on the distribution of the population.

# Traffic Safety Campaigns

The traffic volume on the main roads is currently relatively low, but transportation of equipment and personnel during the long construction phase will significantly increase the risk of traffic accidents especially due to routing of the water pipelines along the roadside. The following activities shall be carried out by the Owner in order to minimise the community health and safety impacts from traffic:

- Ensure that contractor established traffic rules to be followed by his personnel within and outside the project area, including establishment of safe work zones and reduction of allowed vehicle speeds
- Collaborate with the local traffic police to ensure that traffic rules are enforced
- Share project-specific traffic management plans with the local government and communities through school campaigns and meetings with local authorities

### Security Arrangements

Security was not recorded as a major issue for most part of the project area except in Meatu (Phase 2) where theft for water supply facility components was reported. It should be noted, however, that population influx is usually associated with an increased risk of insecurity in whatever form. For that reason the measures below shall be implemented:

- Support local security systems to strengthen community policing and crime-handling measures
- Share relevant information with the communities to ensure that all are aware of the rules and regulations
- Ensure that contractors issue clear instructions to security personnel about permissible actions, boundaries of their authority, and relations with community members.
- Establish a grievance mechanism for addressing security-related grievances with the aim of aiding communities to forward their complaints and receive feedbacks

### **Emergency Preparedness and Response Plan**

In addition to the contractors' emergency preparedness and response plan for the construction phase (see Section 9.3.3), the Owner shall prepare emergency preparedness and response procedures for key infrastructure in order to mitigate occupational and community EHS risks in the operation phase.

As explained in Section 7.4.7, potential failure of the water treatment plant, main pipelines or storage tanks may involve significant environmental, health and safety risks, e.g. leakage of chemicals (chlorine) used in water treatment, pipeline burst, or accidental overflows from water tanks. Some of these risks will be addressed in the detailed design (e.g. control and safety systems, including automatic operated valves in the treatment plant and water pipes and installations of spillways on the water reservoirs) and serve as key design criteria.

The following risks to the communities (and workers) shall be addressed in the emergency preparedness and response plan, among others:

- Integrity failure of reservoirs
- Breaks in the pipeline
- Exposure of treated drinking water with contaminants
- Accidental drowning

The emergency preparedness and response procedures shall be discussed with the potentially affected communities in order to gather their inputs and create awareness of the risks and mitigation measures. The cost of formulating and implementing the emergency preparedness and response plan has been included in the overall project budget.

### <u>Budget</u>

No.	Description	Cost (USD)
1	HIV campaigns	80,000
2	Traffic campaigns	30,000
3	Sanitation and waste management*	
5	Allowances local authorities (traffic and security)	45,000
	Total	155,000

\* Part of project cost (GKW Consult 2016a)

### 9.4.4 Resettlement Action Plan

The Simiyu Water Supply Project is expected to cause physical and economic displacement, as described in Section 7.4.2 and 7.4.3. The magnitude of the resettlement impact can only be determined based on the detailed project design combined with a census and asset inventory, but preliminary calculations of resettlement costs show that the main cost item is compensation for structures. The total number of affected structures has been estimated at 568 for the proposed alignment along the main roads. However, significant savings and reduced impacts can be achieved by re-routing the pipeline corridor in high population areas, especially in Bariadi town (including Mahaha and Kilulu villages along the Bariadi-Lagangabilili road), Dutwa (Majengo and Igaganulwa villages) and Nyang'hanga (Bulima village) where many residential and commercial buildings are located adjacent to the main road and within the road reserve. A total of 127, 60 and 29 structures were counted in Bariadi town, Dutwa and Nyang'hanga, respectively. Assuming that it will be technically feasible to realign the water main around these high population centres (without traversing additional structures along the alternative route), the estimated resettlement cost can be reduced by 35-40%.

Thus, it is clear that relying on the road reserve in these sections does not offer the best alternative in terms of resettlement impact, unless the water pipes can be fitted closer to the actual road (i.e. within the 22.5 m distance from the centre line) where TANROADS have already acquired the land and relocated all structures.

In conclusion, the following steps should be taken in order to minimise displacement and to ensure fair and just compensation:

- The design consultant should explore the possibilities of re-routing the corridor for the water main in order to bypass the highly populated areas in Dutwa and Nyang'hanga and the urban centre in Bariadi town.
- A Resettlement Action Plan (RAP) should be prepared and implemented prior to the start of the construction works. The planning and implementation of the RAP shall be guided by the World Bank safeguard policies on involuntary resettlement (OP/BP 4.12 and IFC Performance Standard 5) and by the national requirements. The framework for the RAP is outlined in the RPF.

### 9.4.5 Stakeholder Engagement Plan

#### Introduction

The implementation of the proposed water supply project for Simiyu region requires direct involvement of a diverse range of stakeholders all with a substantial capacity to have an influence on the project positively or negatively. The geographical scope, nature and impact of activities envisaged coupled with the complexity of the social setting within which it is being planned dictates the involvement of a diverse range of stakeholders in the planning, land acquisition, grievance management, construction, operation and maintenance of the project. In addition, the implementation and execution of the proposed environmental and social mitigation measures might require a multi-sectoral approach to be able to achieve the intended objectives. For this reason, a stakeholder engagement plan (SEP) has been prepared as a guiding document

for ensuring proper coordination and management of all the stakeholder interests and concerns in a prompt and well-coordinated structure.

This stakeholder engagement strategy will apply to both phases and all components of the proposed project including all its secondary systems, and all third parties are expected to adhere to this plan as they execute their assigned activities.

### **Objectives**

The objectives of this stakeholder engagement plan are;

- To identify all potential project stakeholders including their priorities and concerns
- Identify strategies for information sharing and communication to stakeholders in ways that are meaningful and accessible throughout the project cycle
- To specify procedures and methodologies for stakeholder consultations, documentation of the proceedings and strategies for feedback
- To establish accessible and responsive grievance mechanism for the project
- Develop a strategy for stakeholder participation in the monitoring of project impacts and reporting or sharing of results among the different stakeholder groups

### **Regulations and Requirements**

The Stakeholder Engagement Plan is developed as a result of the need to comply with the EIA and Audit Regulations (2005), Land Act (1999), Village Land Act (1999), Land Disputes Courts Act (2002), Land (Compensation Claims) Regulations (2001), Graves Removal Act (1969) and the World Bank / IFC safeguard policies. All these instruments unanimously advocate for meaningful involvement of project stakeholders in decisions that affect them, participatory planning and transparent grievance management mechanisms.

# Project Stakeholders

The list of stakeholders is given in Section 6.3.

### Previous Stakeholder Engagement

The previous stakeholder engagement activities are summarised in Chapter 6.

### **Objectives of the SEP**

- To offer opportunities for stakeholders to raise their concerns and submit their opinions.
- To create avenues for complaints handling and grievance management.
- To create opportunities for information sharing and disclosure
- To create a mechanism for giving feedback to the stakeholders
- To create an avenue for participatory project impacts monitoring
- To foster strong project community relationships
- To promote social acceptability of the project

### Stakeholder Engagement Strategies

The proposed stakeholder engagement program focusses on the time period beyond the ESIA and all the way into operation phase. The SEP will majorly focus on project engagement with lower level stakeholders that are not part of the project organisation. Envisaged activities beyond ESIA include the following:

- Mobilization for project commissioning and start of operation phase (safety sensitization, communication of emergency procedures, sensitization on hygienic water use, etc.)
- Participatory and meaningful involvement in resettlement planning
- Land acquisition
- Livelihood restoration if applicable

- Grievance management
- Mobilization for construction phase (recruitment for employment, acquisition of temporary sites, etc.)
- Construction phase and related supervision and monitoring
- Implementation of the Environmental and Social Management Plan
- Mobilization for project commissioning and start of operation phase (safety sensitization, communication of emergency procedures, sensitization on hygienic water use etc.)
- Project commissioning and handover

Appendix 18 gives the details of the information to be shared/disclosed, formats through which information will be shared, engagement strategy, methodologies to be adopted, commitment tools and frequency, and responsible entity.

### Incorporation of Views of Vulnerable Groups

Generally, the entire population in Simiyu project area could be categorized as vulnerable due to the prevailing high levels of poverty, weather dependent livelihoods and the very poor access to basic services like water. However, in the context of this project the definition of vulnerable groups will be limited to women, children, disabled persons, and the elderly irrespective of gender, seasonal land users and livestock keepers.

Generally, the entire population in Simiyu project could be categorized as vulnerable due to the prevailing high levels of poverty, weather dependent livelihoods and the very poor access to basic services like water. However, in the context of this project the definition of vulnerable groups will be limited to women, children, disabled persons and the elderly irrespective of gender, seasonal land users and livestock keepers.

Across the developing world, it is normally women and children who bear the burden of fetching water. Consultations with the ward leadership and the communities revealed that in some areas, women spend up to 6 hours of their productive time in search for water. In the driest months, the search for water involves starting at dawn (totally dark in this part of the continent) and travelling on average 6 km before reaching a potential water source. In Meatu especially, the search for water also exposes women to several risks like attacks from animals, insecurity and family breakdown. School children were observed going to school with buckets for fetching water since the schools had no access to water supply, therefore the task of collecting water for school activities was allocated to the pupils and that way they end up spending at least 2 hours of their school time searching for water.

Reducing the burden of water collection for women and children, most notably girls, will also have a gender dimension as it has the potential to:

- Increase girls' school attendance, level of education and literacy rates, as they no longer need to miss school to collect water;
- Reduce child and maternal mortality as a result of access to safe water, sanitation facilities and improved hygiene during child birth;
- Reduce physical injury from lifting and carrying heavy loads of water;
- Increase safety, as women and girls do not have to go to remote and dangerous places to defecate or to fetch water during the night.

It should also be noted that livestock farmers struggle most in the dry season where they have to walk long distances to the nearest small earth (charco) dams. The large herds of cattle kept and the competition for water resources further exacerbate the situation.

To ensure that the views of the vulnerable groups are taken into consideration in the planning of the project, efforts were made during the ESIA consultations at community level to solicit for their opinions and contributions on how the project is likely to affect them, and proposals for mitigation. The results of these

consultations were used as input into the ESMP as well as for detailed design consideration. All issues raised have been summarized in the ESIA report, and stakeholders should review it to ensure that the recommendations there are well captured.

It is further recommended that in future stages of project development (detailed design), opinions of women, children and livestock keepers be sought for purposes of gathering their input into key issues like location of standpipes, location of cattle watering facilities, determination of adequate number of taps/water fetching points and distribution of watering points in villages among others. Mobilization of these groups can be through informal discussions at the existing water supply facilities or through formal discussions with community based women associations or NGOs supporting either women or livestock farmers. Key informant interviews with extension workers at ward level could also be useful.

### Incorporation of Proceedings into Management Decisions

The results from the consultation and information sharing meetings will be shared with the project organisation (PIU) as background information to facilitate decision making from an informed point of view. The expressed views of the target groups will be used as basis or foundation upon which interventions will be developed, or refined.

### <u>Timetable</u>

The table below attempts to give indicative deadlines within which the SEP activities should be completed if it is to be effective. In the absence of clear project timelines, it has been assumed that construction will commence in 2017 and that there will be no delays in project execution from June 2016.

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# Table 29: Timetable for stakeholder engagement activities.

No.	Activity	Project Phase	Timeline	Responsibility	Location	Timeline for Incorporation into Company Management System
1	Submission of ESIA report to NEMC	Planning	June/October 2016	MoWI	Dar es Salaam	June/October 2016
2	Information dissemination for communities beyond the main pipeline	Planning	October 2016	MoWI / District and Town Councils	Busega, Bariadi, Itilima	October 2016
3	Disclosure of ESIA results and public hearing if necessary	Planning	October 2016	MoWI, NEMC, KfW	Websites, Districts	October 2016
5	Establishment of Community Liaison Unit	Planning	October 2016	MoWI	Busega, Bariadi, Itilima	October 2016
6	Appointment of Community Liaison Officers	Planning	October 2016	MoWI	Busega, Bariadi, Itilima	October 2016
8	Training of Community Liaison Officers	Planning	October 2016	MoWI	Busega, Bariadi, Itilima	October 2016
9	Mobilization of District Authorities for the land acquisition process	Planning	October 2016	MoWI/PIU (Community Liaison Unit)/Consultants	Busega, Bariadi, Itilima	October 2016
10	Training of WDC and VC ( project specific procedures for grievance handling)	Planning	October 2016	MoWI/PIU (Community Liaison Unit)/Consultants	WDC offices	October 2016
11	Mobilization of communities for the land acquisition process and resettlement planning	Planning	October 2016	MoWI/PIU (Community Liaison Unit)/Consultants	Villages	October 2016
12	Socio-economic surveys	Planning	November 2016	MoWI/PIU (Community Liaison Unit)/Consultants	Villages	December 2016
13	Participatory asset inventory	Planning	November 2016	MoWI/PIU (Community Liaison Unit)/Consultants	Villages	December 2016
14	Disclosure of the results of asset inventory to the PAPs	Planning	December 2016	MoWI/PIU (Community Liaison Unit) and District/Town Councils	Villages	December 2016
15	Submission of RAP report for stakeholder review	Planning	December 2016	MoWI/PIU	Dar es Salaam	December 2016
16	Media notifications for compensation payment	Planning	January 2017	MoWI/PIU (Community Liaison Unit)	District/WDC Offices and Village Council Offices	March 2017

No.	Activity	Project Phase	Timeline	Responsibility	Location	Timeline for Incorporation into Company Management System
17	Media notifications for land take over	Planning	January 2017	MoWI/PIU (Community Liaison Unit)	District/WDC Offices and Village Council Offices	June 2017
18	Community mobilization and sensitization in preparation for construction phase	Pre-construction	February 2017	MoWI/PIU (Community Liaison Unit)& District/Town Councils	Villages	July 2017
19	Periodic stakeholder update meetings and press releases	Construction	Mid 2017- 2020	MoWI/PIU (Community Liaison Unit)& District/Town Councils	Busega, Bariadi, Itilima	At the end of each quarter
20	Feedback to communities	Construction	2017-2020	MoWI/PIU (Community Liaison Unit)	Wards and villages	Monthly
21	Monthly grievance resolution sessions	Construction	2017-2020	PIU and village level grievance committees	Wards and villages	Weekly
22	Quarterly monitoring of the Implementation of agreed upon strategies	Construction	2017-2020	MoWI/PIU (Community Liaison Unit) and District/Town Councils	Construction site	At the end of each quarter
23	Periodic reporting	Construction	2017-2020	MoWI/PIU (Community Liaison Unit) and District/Town Councils		As agreed contractually
24	Community mobilization in preparation for commissioning (information dissemination on emergency procedures, safety considerations, terms and conditions of use, maintenance responsibilities etc.)	Construction	2017-2020	MoWI/PIU (Community Liaison Unit)	Wards and villages	Mid 2020
25	Formation and training of COWSOs	Construction	2017-2020	MoWI/PIU (Community Liaison Unit)	Wards and villages	Mid 2020

### **Resources**

For the successful implementation of the SEP, the PIU will have to establish a Community Liaison Unit. A Community Liaison Officer (CLO) will head this unit. The CLO will collaborate and coordinate with all the identified project stakeholders. The CLO will maintain close relationships with all stakeholders including the directly affected communities through their leadership and elected representatives of the directly affected households. The CLO will be part of the project management team for purposes of ensuring that community related issues are given due consideration when taking management decisions. In addition to external stakeholders, the CLO will closely collaborate with the project internal managers for purposes of consensus on the procedures to follow and ensuring that all disseminate consistent information and adopt uniform approaches.

Given the spatial scope of the project, the CLO will require support from lower local levels. If funds permit, a lower level support structure to the CLO should be considered in form of CLO assistants. These could be part of the staff in the PIU/Bulk Water Supplier/UWSAs. The CLO assistants should liaise closely with the local authorities and COWSOs.

### **Responsibilities**

The responsibilities of the Community Liaison Unit will include but not limited to the following:

- Official representative of the project to the project stakeholders
- Liaison with all project stakeholders
- Responsible for all the project public relations and communications to all the stakeholders including the communities.
- Disseminate information about the grievance mechanisms to all affected communities
- Mediator between the project and the community
- Coordinate of all project community development initiatives
- Identification of local NGOs or CBOs for potential operational partnerships and collaboration with reference to implementation of sensitization campaigns related to preventive mitigation measures
- Together with the technical teams plan for the community related issues
- Monitor the effectiveness of the grievance resolution system
- Ensure that community health and safety issues are prioritized
- Monitor the effectiveness of the community health and safety plan
- Ensure that the contractors EHS units are functional and complaint with the project ESMP and their own stakeholder engagement plans
- Periodically update management on the community affairs and possible dynamics
- Report on all the community related activities including community health and safety initiatives, community development initiatives and grievance handling.
- Follow up on any pending issues in regards to resettlement.

#### <u>Budget</u>

No.	Description	Cost (USD)
1	Establishment of the Community Liaison Unit*	
2	Salaries and wages*	
3	Training of Community Liaison Officers*	
4	Mobilization of district authorities for the land acquisition process	4,000
5	Training of WDC (project specific procedures for grievance handling)	29,600
6	Information dissemination (land acquisition and resettlement planning, grievance management	
	procedures) at community level	40,000
7	Disclosure of the results of asset inventory to the PAPs	40,000
8	Notifications for compensation payment	600
9	Notifications for land take over	600
10	Community mobilization in preparation for construction phase*	
11	Periodic stakeholder update meetings & press releases	12,000

No.	Description	Cost (USD)
12	Feedback to communities	6,400
13	Allowances grievance resolution sessions	100,000
14	Monitoring of the Implementation of agreed upon strategies	160,000
15	Community mobilization in preparation for commissioning (information dissemination on emergency procedures, safety considerations, terms and conditions of use, maintenance responsibilities, etc.)*	
16	Formation and Training of COWSOs*	
	Total	393,200

\* Part of project cost (GKW Consult 2016a)

### Grievance Mechanism

It is inevitable that some groups of people will become negatively impacted in the pre-construction, construction and operation phase. The impact, however, needs to be controlled promptly to avoid unnecessary tensions and conflicts. The strategy to be adopted will promote involvement of the lowest level authorities since they are easily accessible to the people. The strategy will also be a combination of the legal requirements and socially/customarily acceptable practices. Handling of grievances will be the responsibility of MoWI/PIU or its authorised representative.

The objectives of the grievance resolution mechanism will be:

- To create a mechanism through which PAPs can communicate their dissatisfaction or grievances
- To create a mechanism through which the project will be able to pick all the complaints
- To create a mechanism through which the project will systematically, promptly and exhaustively respond to peoples' complaints
- To create an avenue through which the PAPs and the project can together solve problems and handle issues arising
- To create a mechanism in which the project will ensure that all complaints are promptly and adequately attended
- To create a mechanism where the project will receive feedback on what is not going as planned in regard to compensation and resettlement

### Grievance Redress System

Consultations with the affected communities revealed that they already have their own community based systems for grievance redress. The consultant was informed that these structures are within the sub-village (hamlet) structure, through the sub-village leadership and council of elders. The justification for the involvement of the sub-village leadership was the vast knowledge they have in regard to land ownership and their closeness to the affected households.

However, not all cases will be resolved within the traditional system, so other higher authorities have been proposed to follow up on the unresolved cases. It is worth noting that priority will be given to all the community based approaches and efforts will be made to ensure that all complaints are resolved at that level. The judicial system will be used as a last resort.

The proposed grievance redress system will only target cases involving the project and the community. The guiding principles to be followed during grievance resolution will include but not limited to the following: fairness, respect of human rights, compliance with national regulations, consistency with standards, equality, transparency honesty and respect for each other among others.

Based on the above, a five level procedure has been proposed as illustrated in Figure 27.



Figure 27: Grievance redress system.

Level 1: Sub-Village Leadership - PAPs will be expected to submit their complaints in writing on standard forms to the MoWI/PIU Community Liaison Unit directly or through their sub-village leader. The PAPs will be assisted by the village leadership to put their complaints and claims in writing. At this level, received complaints will be registered, investigated and resolved by the project team, together with the sub-village leader and the complainant. A final decision on the way forward will be communicated to the complainant directly. In situations where both parties agree, the case will be closed at this level. Complaints at this level will mainly revolve around identification of rightful owners of property and confirmation of boundaries between households.

Level 2: Village Council - All cases that cannot be resolved at the first level will be referred to the Village Council. In situations where both parties agree, the case will be closed at this level. Complaints at this level will mainly revolve around identification of rightful owners of property and confirmation of boundaries between households.

Level 3: Ward Tribunal - All cases that will not be satisfactorily resolved by the village council will be forwarded to the Ward Tribunal. It should however be noted that the ward tribunal can only resolve cases of up to 3 million shillings worth. Cases with higher value will be forwarded directly from the village councils to the district tribunals. Village authorities will be encouraged to witness the process.

Level 4: District Land and Housing Tribunal - All cases that may not have been satisfactorily resolved by the Ward Tribunal or cases beyond the Ward Tribunals capacity to handle will be forwarded to the District Land and Housing Tribunal if they are land related, and not exceeding 50 million shillings. All complaints accruing out of the compensation value, payment process will be resolved at this level

Level 5: High Court (Land Division) - All cases that will not be satisfactorily resolved by the District Land and housing Tribunal will be referred to the high court.

Level 6: Court of Appeal - PAPs who will be dissatisfied by the resolution of the high court will have a right to appeal in the court of appeal.

### **Complaints Handling Process**

All affected stakeholders will be expected to submit their complaints in writing to either of the following collection points (corresponding to level 1 above):

- Sub-village leader
- Community Liaison Unit (MoWI/PIU)

All received written grievances will be registered in the project developer's database. After registration, the grievance will be assessed and forwarded to the relevant office. The concerned officers will then investigate the validity of the grievance and plan the way forward. A fact-finding mission will be conducted together with the complainant, sub-village leader. Proposals on how the grievance can be resolved will be discussed and the complainant will be advised accordingly.

Upon acceptance by the complainant and the actual implementation of the remedy actions, the complaint will be signed off as resolved. In situations where it will be difficult to reach a consensus the case will be forwarded to higher authorities for further mediation. Figure 28 below illustrates the process of complaints handling.



Figure 28: Process of complaints handling.

### 9.5 Cost Estimate

Budget Item	Cost (USD)
Community Health, Safety and Security Plan	155,000
Resettlement Action Plan	To be determined
Stakeholder Engagement Plan	393,200
TOTAL	548,200

# 9.6 Summary of ESMP

The predicted impacts, proposed mitigation measures, responsible institutions and estimated costs are summarised and outlined in the below table. Note that the cost estimates refer to the detailed budgets given in Sections 9.4 and 9.5.

Impact Source	Mitigation Measures	Implementation Period	Responsibility	Estimated Cost
CONSTRUCTION PHASE				
Physical Environment				
Topography and Landscape				
Visual impact	<ul> <li>Restoration of construction sites to pre-construction state</li> <li>Limit vegetation clearance for the water pipelines to the required work strip</li> <li>Landscaping of the spoil tips should take advantage of the natural terrain</li> <li>Remove the good topsoil first and keep it separate for use in replanting and restoration</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Geology and Soils				
Soil erosion	<ul> <li>Limit vegetation clearance as much as possible</li> <li>Stabilise the soil mechanically to reduce erosion potential</li> <li>Re-grading of slopes and re-vegetation of exposed areas</li> <li>Use native/excavated material to backfill the trench section around the pipes</li> <li>Spoil earth/rock should be disposed of in appropriate approved areas</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Land contamination	<ul> <li>Installation of secondary containment at fuel storage sites</li> <li>Store hazardous materials in properly designed storage facilities</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Climate and Air Quality				
Air pollution	<ul> <li>Spray water on access road to avoid dust dispersion if necessary</li> <li>Tarp trucks transporting loose/friable materials to minimize loss during transportation</li> <li>Consider covering stockpiles of excavated soils in areas near houses and shops</li> <li>Maintain and store piles of loose/friable materials and soil in a suitable manner to minimize dust dispersion</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Noise				
Construction noise	<ul> <li>Schedule noisy activities to daytime hours</li> <li>Locate noisy installations in adequate distance to residential areas to meet noise limit values</li> <li>Install noise control devices in construction equipment if noise levels exceed the applicable guidelines</li> <li>Instruct the workforce to avoid unnecessary noise</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Water Resources				
Water pollution	<ul> <li>Avoid unnecessary soil erosion on the lake shore and at river crossing</li> <li>Secondary containment to collect diffuse and accidental spills</li> <li>Storage and handling of fuel should be kept away from the lake shore and rivers</li> <li>Installation of sanitary water treatment facilities in workers' camps</li> <li>Construction methods for intake should be selected to minimize disturbance on lake's bottom</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)

Impact Source	Mitigation Measures	Implementation Period	Responsibility	Estimated Cost
Biological Environment				
Vegetation				
Vegetation clearing	<ul> <li>Vegetation clearance should be minimised as much as possible</li> <li>Limit vegetation clearance for the water pipelines to the required work strip</li> <li>Only indigenous plant species should be used for re-vegetation</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Terrestrial Fauna				
Disturbance from construction activity	<ul> <li>Schedule noisy activities to daytime hours</li> <li>Instruct the workforce to avoid unnecessary noise</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Aquatic Ecology	1			
Water pollution at intake	<ul> <li>Avoid unnecessary soil erosion on the lake shore</li> <li>Secondary containment to collect diffuse and accidental spills</li> <li>Storage and handling of fuel should be kept away from the lake shore</li> <li>Construction methods for intake should be selected to minimize disturbance on lake's bottom</li> </ul>	Construction phase	Contractors	Included in construction cost (contract requirement)
Human Environment				
Population				
Population influx	<ul> <li>Establish transparent recruitment procedures to avoid camp followers in form of job-seekers</li> <li>Establish a recruitment policy that gives priority to local residents for less specialised services</li> <li>Priority for recruitment to be given to local residents for less specialised services</li> <li>Recruitment procedures to be shared with the local authorities for further dissemination</li> <li>Opportunities for sub-suppliers and sub-contractors should be awarded to local firms which in turn employ local labour</li> <li>Conduct public health campaigns addressing issues of behavioural change, water and sanitation, malaria, HIV/AIDS, etc.</li> </ul>	Pre-construction phase Construction phase	Owner/Contractors	Included in construction cost (contract requirement) <u>Owner's cost:</u> Part of Community Health, Safety and Security Plan (USD 155,000)
Settlement Patterns				
Physical displacement	<ul> <li>Negotiate with TANROADS for permission to use the road reserve for the water mains</li> <li>Consider re-routing of the main water pipelines to bypass highly populated areas</li> <li>Prepare and implement Resettlement Action Plan (RAP) based on the detailed design and in compliance with national and international requirements as outlined in the RPF</li> </ul>	Pre-construction phase	Owner	Part of resettlement cost (to be determined) and stakeholder engagement cost (USD 393,200)
Land Use				
Economic displacement	Allow farmers to harvest their crops prior to construction and to continue growing seasonal crops in the pipeline wayleave	Pre-construction phase Construction phase	Owner	Part of resettlement cost (to be determined) and

Impact Source	Mitigation Measures	Implementation Period	Responsibility	Estimated Cost
	Prepare and implement Resettlement Action Plan (RAP) based on the detailed     design and in compliance with national and international requirements as			stakeholder engagement
	outlined in the RPF			COST (OSD 353,200)
Local Economy	·			
Employment and business	• Priority for recruitment to be given to local residents for less specialised and	Pre-construction phase	Contractors	Included in construction
opportunities	labour-intensive services	Construction phase		cost (contract requirement)
	Opportunities for sub-suppliers and sub-contractors should be awarded to     least finance thick in term and be least laken.			
	Iocal firms which in turn employ local labour			
	casual placements			
Water Supply and Sanitation				
Pressure on water and sanitation	• Ensure early start of the project's sanitation component to cater for influx of	Pre-construction phase	Owner/Contractors	Part of Community Health,
facilities	workers and job seekers	Construction phase		Safety and Security Plan
	Provide sufficient water supply and sanitation facilities to workers at all work     citor			(USD 155,000)
Health and Education	Siles			
Pressure on health and	• Provide adequate health care to project workers and their families so as to	Construction phase	Owner/Contractors	Part of Community Health,
education services	avoid adding additional stress to the existing health facilities			Safety and Security Plan
	• Conduct public health campaigns addressing issues of behavioural change,			(USD 155,00)
Safaty and Sacurity	water and sanitation, malaria, HIV/AIDS, etc.			
Health and safety risks	Include best practice bealth and safety provisions in the construction contracts	Pre-construction phase	Owner/Contractors	Part of Community Health
Theater and survey risks	and ensure strict compliance with national legislation and EHS Guidelines	Construction phase	owner/contractors	Safety and Security Plan
	• Dissemination of traffic management plans in the project area, through	·····		(USD 155,000)
	campaigns in schools and communities			
	• Institute speed limits and traffic controls for project vehicles and equipment			
	• The workers' camp standards in regard to quality, management and provision			
	of basic social services must comply with the IFC/EBRD guidance on workers'			
	Ectablich a griovance mechanism for workers			
Security threats	Support local security systems to strengthen community policing and crime-	Construction phase	Owner/Contractors	Part of Community Health.
	handling measures			Safety and Security Plan
	• Institute strict control measures for project property, including fencing as			(USD 155,000)
	required			
	• Ensure that the conduct of security personnel complies with good			
	International practice			
Cultural Heritaae	Establish a grievance mechanism for addressing security-feldted grievances			

Impact Source	Mitigation Measures	Implementation Period	Responsibility	Estimated Cost
Loss of physical cultural	All culturally sensitive areas shall be avoided in the detailed design	Pre-construction phase	Owner/Contractors	Included in resettlement
resources	• Graves shall be relocated in accordance with applicable rules and regulations,	Construction phase		cost (to be determined) and
	including proper and early consultation with the affected relatives			construction cost (contract
	Any chance finds shall be reported to the responsible authority			requirement)
	• The siting of the primary reservoir at Isenge holy hill must be agreed with			
	traditional leaders or be shifted to another suitable location			
	• A site-specific anthropological/archaeological study shall be undertaken as			
	part of the detailed design and/or RAP if there is indication that the project			
	will interfere with cultural heritage of any ethnic group			
OPERATION PHASE				
Physical Environment				
Geology and Soils				
Land contamination	Installation of secondary containment at fuel storage sites	Construction phase	Owner/Contractor	Included in construction
	Store hazardous materials in properly designed storage facilities	Operation phase		cost (contract requirement)
Water Resources			_	
Water pollution	Conduct testing of dried sludge to determine suitable disposal method	Construction phase	Owner	Included in construction
	Secondary containment to collect diffuse and accidental spills	Operation phase		cost (contract requirement)
	• Enforce protection of the 60 m buffer zone around the lake shore at the intake			
	site			
	• Establish a protective zone, marked with buoys, in the lake around the water			
	INTAKE			
Diala si al Fuerina ant	Inimise use of chemicals by optimising the coagulation/flocculation process			
Biological Environment				
Vegetation	Description of the sector of a standard sector section and the sector sect	Construction shace	Our and Construction	
establishment of invasive plant	Removal of invasive plant species during routine maintenance	Construction phase	Owner/Contractor	included in construction
species	Restore disturbed areas immediately after the construction and maintenance	Operation phase		cost (contract requirement)
	WORKS			
	• Avoid importation of exotic trees and soil from other places (e.g. for			
Aquatic Ecology				
Fish entrainment at intake	The intoke must be designed to minimize the percibility of entrainment of	Pre-construction phase	Owner	Included in detailed/tender
Fish end allinent at intake	The intake must be designed to minimise the possibility of entrainment of     fish and other aquatic organisms	Construction phase	Owner	design
Human Environment				uesign
Safety and Security				
Health and cafety risks	Ensure compliance to strict accurational health and safety standards	Dro construction phase	Owner	Included in detailed /tender
Health and safety fisks	Ensure compliance to strict occupational nearth and safety standards	Construction phase	Owner	dosign and omployment
	Design chiorination system in water treatment plant according to national and     international standards	Operation phase		contracts
	Develop detailed emergency proparedness and response precedures with	operation phase		contracts
	<ul> <li>Develop detailed enlergency preparedness and response procedures with respect to key infrastructure</li> </ul>			

Impact Source	Mitigation Measures	Implementation Period	Responsibility	Estimated Cost
CUMULATIVE IMPACTS				
Cumulative impacts	<ul> <li>If the implementation of the mining project coincides with the construction phase of the Simiyu project, then conduct a Cumulative Impact Assessment detailing the incremental impacts of the project when added to the nickel mining and the associated railway line</li> </ul>	Pre-construction phase	Owner	Part of project's contingency budget

# 10 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

# 10.1 Introduction

This chapter describes the monitoring plan for the Simiyu Water Supply project. The monitoring programme is based on the mitigation measures outlined in Chapter 8 and Chapter 9. As for the ESMP, the monitoring programme will require further refinement and updating during the detailed design phase and in response to any changes in the project context (for example, if the Dutwa mining project is implemented).

The overall responsibility of implementing the monitoring programme rests with MoWI as the project proponent. However, the various monitoring activities will be conducted by the institution implementing the respective management actions, as outlined in the ESMP. The monitoring programme has therefore been divided into a Construction Contractors' Monitoring Programme and an Owner's Monitoring Programme.

The present monitoring programme also outlines the reporting responsibilities, both the owner's requirements towards the contractors and the owner's statutory responsibilities towards the respective government offices, as well as the auditing and evaluation system designed to verify the quality of the monitoring data and enforce compliance with the prescribed standards and requirements.

The objective of the monitoring plan is to:

- Provide checks on the implementation of the mitigation measures (activity monitoring) and early indications of progress, or lack thereof, with respect to achievement of objectives (outcome monitoring)
- Identify corrective measures or the redesign of mitigation measures (proactive action), if the originally planned mitigation measures are not sufficiently effective

The total timeframe of the monitoring period is not time-bound and it should last until the project impacts have been mitigated or fully compensated. In practical terms, the implementation schedule and cost estimates have been set according to the expected time needed to achieve the performance targets.

# **10.2** Construction Contractors' Monitoring Programme

# 10.2.1 Introduction

The Construction Contractors' Monitoring Programme sets out the monitoring responsibilities of the contractors and will be contractually enforced by the owner. The detailed monitoring system should be further elaborated by each contractor and incorporated into their Environmental, Health and Safety Plan (see Chapter 9.3). Consequently, the monitoring costs have not been estimated here, as the construction contractors' monitoring responsibilities will be included in the tender package upon which the tenderers will develop their base rates. The costs of the construction-related environmental and social monitoring will therefore be within the contract price.

# 10.2.2Monitoring Methods

Generally, the monitoring of construction practices and mitigation measures will be based on visual inspections at the construction sites. In addition, the contractors will be responsible for monitoring the outcome of their management actions on the physical, biological and human environment. The proposed performance indicators, the means of verification and the monitoring frequency are described in Table 30. It should be noted, however, that the exact monitoring methods need to be defined and agreed upon at a later stage as part of the Construction Contractors' Environmental, Health and Safety (EHS) Plan.

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# Table 30: Proposed monitoring methodology for the construction contractors.

Management Issue	Performance Indicators	Means of Verification	Monitoring Frequency
Landscape and vegetation	<ul> <li>Quantity and quality of vegetation clearing</li> </ul>	Visual inspections	Weekly inspections
management	<ul> <li>Quality of landscaping at restored sites</li> </ul>	<ul> <li>Photographic documentation</li> </ul>	
	<ul> <li>Plant species used for re-vegetation</li> </ul>	Interviews	
	<ul> <li>Number and location of spoil heaps</li> </ul>		
	Cleanliness of construction site		
Soil erosion control	<ul> <li>Number and location of silt trap fences /</li> </ul>	Visual inspections	Weekly inspections
	sedimentation ponds	<ul> <li>Photographic documentation</li> </ul>	Monthly water quality measurements
	<ul> <li>Water quality parameters</li> </ul>	Interviews	
		Water quality measurements at the intake	
Solid waste, hazardous waste	<ul> <li>Amounts and types of waste generated, sorted,</li> </ul>	<ul> <li>Visual inspections</li> </ul>	Weekly inspections
and wastewater	recycled/reused, treated and disposed	<ul> <li>Photographic documentation</li> </ul>	Weekly wastewater quality
management	<ul> <li>Number, location and status of waste disposal sites</li> </ul>	Interviews	measurements
	<ul> <li>Number and status of toilet facilities</li> </ul>	<ul> <li>Wastewater quality measurements at source (see</li> </ul>	
	<ul> <li>Wastewater quality parameters</li> </ul>	Appendix 12)	
	<ul> <li>Quality of secondary containment structures</li> </ul>		
	<ul> <li>Labelling of hazardous waste</li> </ul>		
	Evidence of pollution spill contingency plan		
Air pollution control	<ul> <li>Frequency of water spraying on roads and stockpiles</li> </ul>	<ul> <li>Visual inspections</li> </ul>	Weekly inspections
	<ul> <li>Evidence that trucks cover loose materials</li> </ul>	<ul> <li>Photographic documentation</li> </ul>	Weekly air quality measurements
	<ul> <li>Location and timing of waste burning</li> </ul>	Interviews	
	<ul> <li>Ambient air quality (PM<sub>10</sub>) at site, schools and health</li> </ul>	• PM <sub>10</sub> measurements at construction sites and roadsides	
	facilities	using standard air sampling equipment (conforming to EC	
		Directive 89/336/EEC and ISO 12103-1) (see Appendix 13)	
Noise management	<ul> <li>Timing of blasting operations</li> </ul>	<ul> <li>Visual and auditory inspections</li> </ul>	Weekly inspections
	Blasting practices	Interviews	Weekly noise measurements, or daily in
	<ul> <li>Evidence of hearing protection used by workers</li> </ul>	Blasting records	case of non-compliance with IFC Noise
	<ul> <li>Evidence of noise control devices</li> </ul>	<ul> <li>Noise level measurements (Leq, dBA) at construction and</li> </ul>	Level Guidelines
	<ul> <li>Noise levels (dB) at site, schools and health facilities</li> </ul>	blasting sites, as well as receptor, using a standard sound	
		level meter (conforming to class 2 according to IEC 61672-	
		1:2002) (see Appendix 14)	
Chance finds procedure	Number of chance finds	Visual inspections	Weekly inspections
	Evidence of chance finds procedures	Photographic documentation	
		Interviews	
Occupational health and	Evidence of occupational health and safety plan and	Visual inspections	Daily monitoring
safety	emergency preparedness and response plan	Interviews	
	<ul> <li>Number of workers trained in safety procedures</li> </ul>	<ul> <li>Photographic documentation</li> </ul>	

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Management Issue	Performance Indicators	Means of Verification	Monitoring Frequency
	Percentage of workers using Personal Protective	Incident reports	
	Equipment (PPE)		
	<ul> <li>Structural integrity of workers' accommodation and</li> </ul>		
	sanitary facilities		
	Access to health services by workers		
	Malaria prevalence rate in workforce		
	HIV/AIDS prevalence rate in workforce		
	Incident statistics (Total Recordable Injuries, Fatalities,		
	Lost Time Injuries, Restricted Work Case, Medical		
	I reatment Case, First Aid Case, Near Miss, Reports on		
Traffic and transportation	Unwanted Occurrences)		Monthly increations and shocks
safoty	• Evidence of traffic and transportation safety plan	Visual inspections	Monthly inspections and checks
salety	<ul> <li>Tranic incident rate (including workers, community and livestock)</li> </ul>	Speed checks     Photographic documentation	
	and investock)	Photographic documentation	
	Observed speed of construction vehicles     Number of drivers trained and equipped with license	• Interviews	
	Number of drivers trained and equipped with incense     Fuidence of signing warpings and controls		
Socurity arrangements	Evidence of signing, warnings and controls		Waakhy inspactions
Security arrangements	Compliance with voluntary Principles on Security and     Human Bights	Visual Inspections     Photographic documentation	weekiy inspections
	Evidence of training of cocurity perconnel in the use of		
	force and arms	• Interviews	
	Number of security related grievances raised by the		
	communities and workers		
Labour management	<ul> <li>Proportion of local population on overall project</li> </ul>	Visual inspections	Weekly inspections
	workforce	Interviews	
	• Proportion of women and youth employees on overall	<ul> <li>Employment contracts</li> </ul>	
	project workforce		
	Evidence of written contracts		
	Number of worker grievances		
	Age of workers		
	Quality of workers accommodation		
	Proportion of unskilled workforce that have had their		
	skills upgraded		
Community relations	Number of community grievances	Visual inspections	weekiy inspections
	Incidence of damages to crops and structures along     the used and transmission line	Photographic documentation	
	the road and transmission line	Interviews	
	<ul> <li>Status of water supply pipes along the road</li> </ul>		

### 10.2.3 Roles and Responsibilities

### **Contractors**

The contractors shall self-monitor their compliance with the Construction Contractors' ESMP. The contractors will perform routine monitoring inspections using pre-established checklists. The self-monitoring system shall be based on the methods outlined in Table 30.

The contractors shall prepare monthly reports to the owner's Environmental and Social Management Unit describing the implementation of the Construction Contractors' ESMP, including key performance indicators, as well as any deviations, incidents or accidents and corrective measures taken.

When a non-conformance is detected and is not, or cannot be, immediately resolved, then a corrective action process will be initiated by the contractor. On completion of the corrective or preventive action, the Company's Environmental and Social Management Unit will confirm and record all the necessary details.

### <u>Owner</u>

The owner will supervise compliance with commitments included in the Construction Contractors' ESMP. This will be achieved by routine inspections of construction activities and review of written documentation. For this purpose, the Environmental and Social Management Unit will prepare inspection checklists and regularly take part in the contractors' self-monitoring inspections.

The Environmental and Social Management Unit will prepare monthly reports on the overall ESMP implementation including the performance and compliance with the Construction Contractors' ESMP. The report will be based on the corresponding monthly reports from the contractors and on the findings from the routine inspections. The monthly report will be submitted to the management and distributed to other relevant stakeholders as appropriate.

The Environmental and Social Management Unit will organise weekly meetings with the contractors where environmental and social performance will be discussed and, where necessary, any additional mitigation measures will be agreed upon.

The Environmental and Social Management Unit will also prepare annual environmental and social management reports to the management and as part of its statutory responsibilities towards the Government. The annual report will include both the Construction Contractors' ESMP and the owner's ESMP performance.

### Government

The concerned government institutions will carry out inspections and audits as they may deem fit. It is envisaged that, inter alia, the following government institutions will take part in the inspections and audits, either separately or jointly:

- National Environment Management Council (NEMC)
- EWURA
- Lake Victoria Basin Water Office

The regional, district, ward and village administrations and their technical officers are expected to take part in joint inspection and monitoring sessions with their national counterparts.

# **10.3 Owner's Monitoring Programme**

### 10.3.1 Introduction

The project owner will be required to monitor the performance of the Owner's ESMP. This section therefore provides an outline of the Owner's Monitoring Programme which will be elaborated further prior to the

start of the mitigation and enhancement programme. The detailed monitoring procedures should be included in the Owner's Environmental and Social Action Plan (cf. Chapter 9.4).

### 10.3.2 Community Health, Safety and Security Monitoring

### Performance Indicators

- Number of health preventive campaigns
- Disease prevalence and incidence
- Number of sanitation facilities
- Number of traffic accidents involving community
- Number of security-related grievances
- Crime rate

### Means of Verification

- Household surveys
- Visual inspections
- Health centre reports

### Monitoring Frequency

Monthly collection of statistics from service providers, health centres, local police and local government.

### **Roles and Responsibilities**

The monitoring will be carried out by the implementing organisation, i.e. either the Environmental and Social Management Unit or the service providers. If the task is delegated to a service provider, then it should submit quarterly reports to the Environmental and Social Management Unit, which in turn will incorporate the latest monitoring data into the regular reports to the management.

The initial data on community health, safety and security shall be collected at the start of the programme and serve as a baseline against which to monitor future progress. The baseline survey shall be included as an integral part of the programme.

### <u>Budget</u>

The community health, safety and security monitoring will either be included in the service provider's costs, or be part of the operation costs of the Environmental and Social Management Unit.

### 10.3.3 Resettlement Monitoring

### Performance Indicators\*

- Total number of eligible PAPs
- Number of PAPs to whom the compensation packages have been disclosed
- Number of households that have consented to their compensation packages
- Number of households that have received their compensation packages
- Number of households allocated replacement land
- Number of households allocated replacement houses if applicable
- Number of households physically resettled
- Number of replacement houses handed over to PAPs
- Number of households enrolled for the livelihood restoration program
- Status on ongoing income restoration activities
- Number of vulnerable households supported during the transition period
- Type of support given to vulnerable households
- Number of grievances received and resolved

- Number of new plots of land legally transferred and registered
- Number of residual titles processed and handed over to owners
- Expenses towards compensation, income restoration, relocation/transition allowance

### (\* List to be developed further in the detailed RAP)

### Means of Verification

- Household surveys
- Minutes of meetings
- Grievance register
- Project reports
- Ongoing engagement

### Monitoring Frequency

The resettlement programme will be monitoring on a continuous basis during its implementation.

### **Roles and Responsibilities**

The Environmental and Social Management Unit will monitor the resettlement programme and submit monthly reports to the management, government agencies and other stakeholders

# <u>Budget</u>

The monitoring of the resettlement programme is part of the operation costs of the Environmental and Social Management Unit.

### 10.3.4 Stakeholder Engagement Monitoring

### Performance Indicators

- Number of stakeholder consultations
- Number of grievances (received, resolved and pending)

### Means of Verification

- Meeting minutes
- Grievance register
- Interviews

### Monitoring Frequency

The performance of the stakeholder engagement will be monitored on a continuous basis.

### **Roles and Responsibilities**

There will not be a separate monitoring system for the stakeholder engagement. However, the issues raised by the stakeholders in consultation meetings and the status of grievances will be included in the regular monthly reports prepared by the Environmental and Social Management Unit.

### <u>Budget</u>

The monitoring of the stakeholder engagement process is part of the operation costs of the Environmental and Social Management Unit.

# 10.4 Reporting System

### 10.4.1 Monthly Reporting

The construction contractors will prepare monthly reports on their environmental and social performance and their compliance with the Construction Contractors' ESMP. The reports will be submitted to the Environmental and Social Management Unit and be based on the monitoring system described in Chapter 10.2.2.

The Environmental and Social Management Unit will compile monthly reports that will be forwarded to the management and shared with the concerned stakeholders. These reports will be based on the monthly reports from the construction contractors and on monitoring data from the owner's environmental and social management programme.

# 10.4.2 Quarterly Reporting

While the construction contractors will be required to report monthly, the various service providers (e.g. NGOs) involved in the execution of the ESMP should report on a quarterly basis. These quarterly reports will be submitted to the Environmental and Social Management Unit and the latest report will feed into the monthly reporting cycle described above.

# 10.4.3 Annual Reporting

The Environmental and Social Management Unit will prepare annual reports on the owner's overall environmental and social management performance. The annual report will be submitted to NEMC and other government agencies as part of the owner's statutory responsibilities towards the Government. The report will also be disseminated to the other project stakeholders.

# **10.5** Auditing and Evaluation

In addition to the monitoring and reporting system described above, the owner should establish an auditing and evaluation system in order to obtain independent verification of its environmental and social performance and external checks on its compliance status.

Audits and evaluations might be commissioned by the government regulators and/or the lenders as they may deem fit. It is assumed that audits/evaluations will either be carried out by external consultants hired directly by the owner, or by a Panel of Experts appointed by the lenders. The costs will be covered by the project's administration budget.

After full implementation of the RAP, a completion audit from a third independent party is required.

# **10.6** Summary of Monitoring Plan

A summary of the proposed monitoring parameters, means of verification, responsibilities and estimated costs are presented for each of the mitigation measure in the below table.

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
CONSTRUCTION PHA	SE				
Physical Environment					
Topography and Lana	lscape				
Visual impact	<ul> <li>Restoration of construction sites to preconstruction state</li> <li>Limit vegetation clearance for the water pipelines to the required work strip</li> <li>Landscaping of the spoil tips should take advantage of the natural terrain</li> <li>Remove the good topsoil first and keep it separate for use in replanting and restoration</li> </ul>	<ul> <li>Quality of landscaping at restored sites</li> <li>Extent of vegetation clearing</li> <li>Number and location of spoil tips</li> <li>Cleanliness of construction site</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement)
Geology and Soils					
Soil erosion	<ul> <li>Limit vegetation clearance as much as possible</li> <li>Stabilise the soil mechanically to reduce erosion potential</li> <li>Re-grading of slopes and re-vegetation of exposed areas</li> <li>Use native/excavated material to backfill the trench section around the pipes</li> <li>Spoil earth/rock should be disposed of in appropriate approved areas</li> <li>Installation of secondary containment at fuel storage sites</li> </ul>	<ul> <li>Extent of vegetation clearing</li> <li>Evidence of soil stabilisation, re-grading and re-vegetation</li> <li>Type/source of material used for back- filling</li> <li>Number and location of spoil tips</li> <li>Number of pollution spills</li> <li>Quality of secondary containment</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> <li>Visual inspections</li> <li>Photographic</li> </ul>	Contractors / Owner Contractors / Owner	Included in construction cost (contract requirement) Included in construction cost (contract
	Store hazardous materials in properly	structures	documentation		requirement)
	designed storage facilities	Evidence of storage facilities for     hazardous waste	Interviews		
Climate and Air Quali	ty				
Air pollution	<ul> <li>Spray water on access road to avoid dust dispersion if necessary</li> <li>Tarp trucks transporting loose/friable materials to minimize loss during transportation</li> <li>Consider covering stockpiles of excavated soils in areas near houses and shops</li> <li>Maintain and store piles of loose/friable materials and soil in a suitable manner to minimize dust dispersion</li> </ul>	<ul> <li>Frequency of water spraying on roads</li> <li>Evidence that trucks cover loose materials</li> <li>Ambient air quality (PM<sub>10</sub>) at site, schools and health facilities</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> <li>PM<sub>10</sub> measurements at construction sites and roadsides using standard air sampling equipment</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement)

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
			Directive 89/336/EEC		
			and ISO 12103-1) (see		
			Appendix 13)		
Noise					
Construction noise	<ul> <li>Schedule noisy activities to daytime hours</li> <li>Locate noisy installations in adequate distance to residential areas to meet noise limit values</li> <li>Install noise control devices in construction equipment if noise levels exceed the applicable guidelines</li> <li>Instruct the workforce to avoid unnecessary noise</li> </ul>	<ul> <li>Evidence of noise control devices</li> <li>Noise levels (dB) in residential areas, schools and health facilities</li> <li>Number of noise related grievances received and resolved</li> </ul>	<ul> <li>Visual and auditory inspections</li> <li>Interviews</li> <li>Grievance register</li> <li>Noise level measurements (Leq, dBA) at construction sites and receptors using a standard sound level meter (conforming to class 2 according to IEC 61672-1:2002) (see Appendix 14)</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) (USD 2,000 for purchase of sound level meters)
Water Resources					
Water pollution	<ul> <li>Avoid unnecessary soil erosion on the lake shore and at river crossing</li> <li>Secondary containment to collect diffuse and accidental spills</li> <li>Storage and handling of fuel should be kept away from the lake shore and rivers</li> <li>Installation of sanitary water treatment facilities in workers' camps</li> <li>Construction methods for intake should be selected to minimize disturbance on lake's bottom</li> </ul>	<ul> <li>Water quality parameters</li> <li>Wastewater quality parameters</li> <li>Number of pollution spills</li> <li>Quality of secondary containment structures</li> <li>Number and location of silt trap fences / sedimentation ponds</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> <li>Water quality measurements at the intake</li> <li>Wastewater quality measurements at source (see Appendix 12)</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) (USD 10,000 for laboratory testing of water and wastewater quality)
Biological Environme	nt				
Vegetation					
Vegetation clearing	<ul> <li>Vegetation clearance should be minimised as much as possible</li> <li>Limit vegetation clearance for the water pipelines to the required work strip</li> <li>Only indigenous plant species should be used for re-vegetation</li> </ul>	<ul> <li>Extent of vegetation clearing</li> <li>Plant species used for re-vegetation</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement)
Terrestrial Fauna					
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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
Disturbance from construction activity	<ul> <li>Schedule noisy activities to daytime hours</li> <li>Instruct the workforce to avoid unnecessary noise</li> </ul>	Evidence of disturbance and animal escape/avoidance	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement)
Aquatic Ecology					
Water pollution at intake	<ul> <li>Avoid unnecessary soil erosion on the lake shore</li> <li>Secondary containment to collect diffuse and accidental spills</li> <li>Storage and handling of fuel should be kept away from the lake shore</li> <li>Construction methods for intake should be selected to minimize disturbance on lake's bottom</li> </ul>	<ul> <li>Water quality parameters</li> <li>Wastewater quality parameters</li> <li>Number of pollution spills</li> <li>Quality of secondary containment structures</li> <li>Number and location of silt trap fences / sedimentation ponds</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> <li>Water quality measurements at the intake</li> <li>Wastewater quality measurements at source (see Appendix 12)</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) (USD 10,000 for laboratory testing of water and wastewater quality, see above)
Human Environment					
Population					
Population influx	<ul> <li>Establish transparent recruitment procedures to avoid camp followers in form of job-seekers</li> <li>Establish a recruitment policy that gives priority to local residents for less specialised services</li> <li>Priority for recruitment to be given to local residents for less specialised services</li> <li>Recruitment procedures to be shared with the local authorities for further dissemination</li> <li>Opportunities for sub-suppliers and sub- contractors should be awarded to local firms which in turn employ local labour</li> <li>Conduct public health campaigns addressing issues of behavioural change, water and sanitation, malaria, HIV/AIDS, etc.</li> </ul>	<ul> <li>Number of job-seekers and camp followers</li> <li>Written recruitment procedures</li> <li>Proportion of local population on overall project workforce</li> <li>Number of health preventive campaigns</li> <li>Disease prevalence and incidence</li> </ul>	<ul> <li>Visual inspections</li> <li>Interviews</li> <li>Health centre reports</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) and community health, safety and security plan cost
Settlement Patterns					
Physical displacement	<ul> <li>Negotiate with TANROADS for permission to use the road reserve for the water mains</li> </ul>	<ul><li>Written agreement with TANROADS</li><li>Total number of eligible PAPs</li></ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> </ul>	Owner	Part of resettlement cost (to be determined) and

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
	<ul> <li>Consider re-routing of the main water pipelines to bypass highly populated areas</li> <li>Prepare and implement Resettlement Action Plan (RAP) based on the detailed design and in compliance with national and international requirements as outlined in the RPF</li> </ul>	<ul> <li>Number of households physically resettled</li> <li>Number of households allocated replacement houses</li> <li>Number of households allocated replacement land</li> <li>Number of grievances received and resolved</li> <li>Number of new plots of land legally transferred and registered</li> <li>Number of residual titles processed and handed over to owners</li> </ul>	<ul> <li>Household surveys</li> <li>Minutes of meetings</li> <li>Grievance register</li> </ul>		stakeholder engagement cost
Land Use				-	
Economic displacement	<ul> <li>Allow farmers to harvest their crops prior to construction and to continue growing seasonal crops in the pipeline wayleave</li> <li>Prepare and implement Resettlement Action Plan (RAP) based on the detailed design and in compliance with national and international requirements as outlined in the RPF</li> </ul>	<ul> <li>Total number of eligible PAPs</li> <li>Number of households that have received their compensation packages</li> <li>Number of households enrolled for the livelihood restoration program</li> <li>Status on ongoing income restoration activities</li> <li>Number of vulnerable households supported during the transition period</li> <li>Type of support given to vulnerable households</li> <li>Number of grievances received and resolved</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Household surveys</li> <li>Minutes of meetings</li> <li>Grievance register</li> </ul>	Owner	Part of resettlement cost (to be determined) and stakeholder engagement cost
Local Economy					
Employment and business opportunities	<ul> <li>Priority for recruitment to be given to local residents for less specialised and labour-intensive services</li> <li>Opportunities for sub-suppliers and sub-contractors should be awarded to local firms which in turn employ local labour</li> <li>Create opportunities for employment of women in both management and casual placements</li> </ul>	<ul> <li>Proportion of local population on overall project workforce</li> <li>Proportion of women employees on overall project workforce</li> </ul>	<ul> <li>Visual inspections</li> <li>Interviews</li> <li>Employment contracts</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement)
Water Supply and Sai	nitation				

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
Pressure on water and sanitation facilities	<ul> <li>Ensure early start of the project's sanitation component to cater for influx of workers and job seekers</li> <li>Provide sufficient water supply and sanitation facilities to workers at all work sites</li> </ul>	<ul> <li>Status and progress of sanitation interventions</li> <li>Number of on-site toilet facilities for workers</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) and community health, safety and security plan cost
Health and Education					
Pressure on health and education services	<ul> <li>Provide adequate health care to project workers and their families so as to avoid adding additional stress to the existing health facilities</li> <li>Conduct public health campaigns addressing issues of behavioural change, water and sanitation, malaria, HIV/AIDS, etc.</li> </ul>	<ul> <li>Evidence of medical services to workers and their families</li> <li>Number of health preventive campaigns</li> <li>Disease prevalence and incidence</li> </ul>	<ul> <li>Visual inspections</li> <li>Interviews</li> <li>Health centre reports</li> </ul>	Contractors / Owner	included in construction cost (contract requirement) and community health, safety and security plan cost
Safety and Security					
Health and safety risks	<ul> <li>Include best practice health and safety provisions in the construction contracts and ensure strict compliance with national legislation and EHS Guidelines</li> <li>Dissemination of traffic management plans in the project area, through campaigns in schools and communities</li> <li>Institute speed limits and traffic controls for project vehicles and equipment</li> <li>The workers' camp standards in regard to quality, management and provision of basic social services must comply with the IFC/EBRD guidance on workers' accommodation</li> <li>Establish a grievance mechanism for workers</li> </ul>	<ul> <li>Number of workers trained in safety procedures</li> <li>Percentage of workers using Personal Protective Equipment (PPE)</li> <li>Traffic incident rate (including workers, community and livestock)</li> <li>Observed speed of construction vehicles</li> <li>Number of drivers trained and equipped with license</li> <li>Evidence of signing, warnings and controls</li> <li>Quality of workers accommodation</li> <li>Incident statistics (Total Recordable Injuries, Fatalities, Lost Time Injuries, Restricted Work Case, Medical Treatment Case, First Aid Case, Near Miss, Reports on Unwanted Occurrences)</li> <li>Number of worker grievances</li> </ul>	<ul> <li>Visual inspections</li> <li>Interviews</li> <li>Photographic documentation</li> <li>Speed checks</li> <li>Incident reports</li> <li>Grievance register</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) and community health, safety and security plan cost
Security threats	<ul> <li>Support local security systems to strengthen community policing and crime-handling measures</li> <li>Institute strict control measures for project property, including fencing as required</li> </ul>	<ul> <li>Compliance with Voluntary Principles on Security and Human Rights</li> <li>Evidence of training of security personnel in the use of force and arms</li> <li>Theft rate for project property</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> <li>Grievance register</li> </ul>	Contractors / Owner	Included in construction cost (contract requirement) and community health, safety and security plan cost

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
	<ul> <li>Ensure that the conduct of security personnel complies with good international practice</li> <li>Establish a grievance mechanism for addressing security-related grievances</li> </ul>	Number of security related grievances raised by the communities and workers			
Cultural Heritage					
Loss of physical cultural resources	<ul> <li>All culturally sensitive areas shall be avoided in the detailed design</li> <li>Graves shall be relocated in accordance with applicable rules and regulations, including proper and early consultation with the affected relatives</li> <li>Any chance finds shall be reported to the responsible authority</li> <li>The siting of the primary reservoir at Isenge holy hill must be agreed with traditional leaders or be shifted to another suitable location</li> <li>A site-specific anthropological/ archaeological study shall be undertaken as part of the detailed design and/or RAP if there is indication that the project will interfere with cultural heritage of any ethnic group</li> </ul>	<ul> <li>Number of affected cultural sites</li> <li>Number of graves affected and relocated</li> <li>Evidence of chance finds procedures</li> <li>Number of chance finds</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Contractors / Owner	Included in resettlement cost (to be determined) and construction cost (contract requirement)
OPERATION PHASE					
Physical Environmen	t				
Geology and Soils					
Land contamination	<ul> <li>Installation of secondary containment at fuel storage sites</li> <li>Store hazardous materials in properly designed storage facilities</li> </ul>	<ul> <li>Number of pollution spills</li> <li>Quality of secondary containment structures</li> <li>Evidence of storage facilities for hazardous waste</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Owner	Included in O&M cost
Water Resources					
Water pollution	<ul> <li>Conduct testing of dried sludge to determine suitable disposal method</li> <li>Secondary containment to collect diffuse and accidental spills</li> <li>Enforce protection of the 60 m buffer zone around the lake shore at the intake site</li> </ul>	<ul> <li>Chemical properties of dried sludge</li> <li>Water quality parameters</li> <li>Wastewater quality parameters</li> <li>Number of pollution spills</li> <li>Quality of secondary containment structures</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Owner	Included in O&M cost (USD 10,000 for testing of dried sludge)

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
	<ul> <li>Establish a protective zone, marked with buoys, in the lake around the water intake</li> <li>Minimise use of chemicals by optimising the coagulation/flocculation process</li> </ul>	<ul> <li>Evidence of protected buffer zone</li> <li>Chemical consumption and waste</li> </ul>	<ul> <li>Water quality measurements at the intake</li> <li>Wastewater quality measurements at source (see Appendix 12)</li> </ul>		
Biological Environme	nt				
Vegetation	1				
Establishment of invasive plant species	<ul> <li>Removal of invasive plant species during routine maintenance</li> <li>Restore disturbed areas immediately after the construction and maintenance works</li> <li>Avoid importation of exotic trees and soil from other places (e.g. for restoration or as ornamentals)</li> </ul>	<ul> <li>Abundance of invasive plant species</li> <li>Status of site restoration</li> <li>List of species used for restoration and ornamental purposes</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Owner	Included in O&M cost
Aquatic Ecology	r				
Fish entrainment at intake	<ul> <li>The intake must be designed to minimise the possibility of entrainment of fish and other aquatic organisms</li> </ul>	<ul> <li>Number of fish and other aquatic organisms entrained at intake</li> </ul>	<ul> <li>Visual inspections</li> <li>Photographic documentation</li> <li>Interviews</li> </ul>	Owner	Included in O&M cost
Human Environment					
Safety and Security					
Health and safety risks	<ul> <li>Ensure compliance to strict occupational health and safety standards</li> <li>Design chlorination system in water treatment plant according to national and international standards</li> <li>Develop detailed emergency preparedness and response procedures with respect to key infrastructure</li> </ul>	<ul> <li>Number of workers trained in safety procedures</li> <li>Percentage of workers using Personal Protective Equipment (PPE)</li> <li>Incident statistics (Total Recordable Injuries, Fatalities, Lost Time Injuries, Restricted Work Case, Medical Treatment Case, First Aid Case, Near Miss, Reports on Unwanted Occurrences)</li> <li>Number of community members who are aware of the emergency procedures</li> </ul>	<ul> <li>Visual inspections</li> <li>Interviews</li> <li>Photographic documentation</li> <li>Incident reports</li> </ul>	Owner	Included in O&M cost
CUMULATIVE IMPAC	TS				
Cumulative impacts	<ul> <li>If the implementation of the mining project coincides with the construction phase of the Simiyu project, then conduct a Cumulative</li> </ul>	Cumulative Impact Assessment (CIA)     report (with mitigation measures and	Project documentation	Owner	Part of project's contingency budget

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Impact Source	Mitigation Measures	Performance Indicators	Means of Verification	Responsibility	Estimated Cost
	Impact Assessment detailing the	monitoring parameters for cumulative			(estimated cost: USD
	incremental impacts of the project when	impacts)			70,000)
	added to the nickel mining and the				
	associated railway line				

# **11 COST-BENEFIT ANALYSIS**

The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation conducted a study titled "Global costs and benefits of drinking-water supply and sanitation interventions to reach MDG target and universal coverage" (WHO/UNICEF 2010). The study was aimed at estimating global, regional and country-level costs and benefits of drinking-water supply and sanitation interventions to meet the Millennium Development Goals (MDG target) in 2015, and to attain universal coverage. The study was based on data from 136 countries and the results aggregated to give averages for the nine regions as well as the global average. The UN Millennium Development Goal (MDG) targets was to halve, by 2015, the proportion of people without sustainable access to safe drinking-water and basic sanitation, with 1990 as the baseline year.

The study concluded that improved water supply and sanitation services can result in a number of economic and social benefits. The most significant are:

- Reductions in cases and deaths associated with diarrhoeal disease;
- Reduction in indirect adverse health impacts through reduced mortality rates and malnutrition;
- Benefits resulting from the reduced distance to a safe water such as reduced work burdens and time spent on fetching water;
- Economic benefits related to reduced health service costs as well as reduced losses of productive time due to disease and to a reduction in premature mortality.

The results of the study showed that the cost-benefit ratio for attaining universal access to drinking water in the Sub-Saharan region was 2.5 while the world average was 2.0. This means that for every US dollar invested in improvement of water supply the economic return would on the average be 2.5 in the Sub-Saharan region. Combining water supply with improved sanitation would raise the cost-benefit ratio to 2.7 for Sub-Saharan Africa. This strongly suggests that to realise the full benefits of water supply it needs to go hand in hand with improved sanitation.

The study also provided figures for each of the countries forming part of the study, and for Tanzania the cost-benefit ratio was estimated to be 1.4 for improving water supply and 1.32 for improving sanitation.

Applying both the cost-benefit ratio for Sub-Saharan Africa and the national ratio for Tanzania for improvement of water supply gives economic returns as shown in Table 31 below.

Item	Phase 1 (Option 3) Million EUR
Capital investment 2017-2025	91.2
Economic return with cost benefit ratio for Tanzania (1.4)	127.7
Economic return with cost benefit ratio for Sub-Saharan Africa (2.5)	228.0

As can be seen from the table above, an investment of EUR 91.2 million may give an economic return of around EUR 127.7 million for Phase 1, calculated on the basis of the Tanzanian cost benefit ratio while the return increases to around EUR 228.0 million if the Sub-Saharan cost-benefit ratio is applied.

# **12 DECOMMISSIONING**

## 12.1 Introduction

It is anticipated that the lifespan of Simiyu Water Supply Project will be at least 50 years and probably considerably longer if the scheme is built with high quality pipes. However, it will be necessary to decommission the scheme when the operational phase comes to an end. This may happen because the water mains and the pipe networks and other technical components, due to wear and tear, cease to function. Other reasons for decommissioning may be that the water supply source, in this case Lake Victoria, becomes inadequate due to changes in climate and/or water quality issues that cannot be rectified. Finally, other and more effective and cheaper ways of providing safe water supply may be developed.

A decommissioning plan will be prepared before the start of the decommission operations, taking into account the applicable legislation and environmental/social conditions prevailing at that time. Due to the obvious uncertainties related to the future scenario, the potential impacts and mitigation measures described below should only be considered as a preliminary analysis.

## **12.2** Decommissioning Process

The decommissioning of the water supply scheme may include demolition of all or parts of the structures including treatment works, pumping stations, reservoirs and pipe networks. As it will be costly to remove the main water pipes, the option of leaving them in the ground will have to be considered. Additionally, digging up the main water pipes will most probably entail environmental impacts and temporary loss of land if the decision to remove them are taken. The issue of reusing installations such as reservoir tanks and building infrastructure will also need to be considered.

All the waste resulting from the decommissioning need to be sorted into re-recyclables and non-recyclables before being disposed of at approved and licenced recycling stations and landfills. The recyclable waste may include pump sets and other metal parts, metal and PVC pipes and other plastic materials, and should only be delivered to licenced recycling companies.

## 12.3 Potential Impacts

Decommissioning may involve blasting, excavation and other activities which will lead to temporary increase in noise and vibration as well as air pollution due to dust emissions. The deconstruction of buildings and dismantling of pumps and electric equipment will also result in the creation of both hazardous and non-hazardous waste which needs to be handled according to waste management regulations.

People working on the water supply scheme will inevitably be laid off but during the decommissioning phase there may be short-term jobs created by the decommissioning works.

The decommissioning works will involve occupational health and safety risks similar to those of the construction phase.

## **12.4** Mitigation Measures

- The decommissioning works shall be undertaken in liaison with the relevant regulatory authorities and adhere to applicable safety guidelines to ensure that the decommissioned facilities do not become a hazard to the public or the environment;
- Restoration of all disturbed sites to pre-construction conditions through landscaping and bioengineering measures;
- Safe disposal of hazardous waste, concrete and similar non-recyclable construction materials, and recycling of scrap metal;
- Provide personal protective equipment and training to all workers, and ensure that all subcontractors abide by the applicable health and safety procedures.

# **13 SUMMARY AND CONCLUSIONS**

### 13.1 Introduction

As part of the planning and permitting of the Simiyu Water Supply Project, MoWI appointed Multiconsult ASA to carry out an Environmental and Social Impact Assessment (ESIA) in compliance with the Environmental Management Act No. 20 of 2004 and applicable international safeguard policies and standards.

The ESIA addresses the environmental and social impacts arising from the construction, operation and decommissioning of the water supply scheme and all its infrastructure. A preliminary Environmental and Social Management Plan (ESMP) sets out how and when the mitigation measures shall be implemented by the various stakeholder including the project proponent and the construction contractors.

## 13.2 Main Findings

The ESIA study shows that the Simiyu Water Supply Project will have few and limited adverse impacts combined with significant social and health benefits. The only main concern at the current stage of project planning is resettlement. A preliminary assessment of the scale of physical displacement indicated that a total of 568 structures are located within the 10 m wide wayleave for the water mains. This estimate was reached based on a number of assumptions that have not yet been validated, including the exact routing of the pipelines. However, there are several opportunities for minimising the resettlement impact, including:

- Re-routing of the main pipelines in order to bypass the highly populated areas in Dutwa and Nyang'hanga and the urban centre in Bariadi town. This option would reduce the number of affected structures and resettlement costs by an estimated 35-40%.
- Fitting the water mains closer to the road within the boundaries of the former road reserve (22.5 m from the centre line) where TANROADS have already acquired the land and relocated all structures.

A Resettlement Action Plan (RAP) will be prepared and implemented prior to the start of the construction works. The planning and implementation of the RAP should be guided by IFC's Performance Standard 5 and by national legislation.

Other mitigation and enhancement measures arising from the ESIA study include the following:

- At the water intake, enforce protection of the 60 m buffer zone around the lake shore; establish a protective zone, marked with buoys, in the lake; and select construction methods that minimise disturbance on lake's bottom.
- Consider an alternative location for the water treatment plant at Bukabile at further distance from the lake and at higher elevation in order to minimise the risk of flooding during heavy rains and avoid wastewater effluents draining into the lake.
- Use native/excavated material to backfill the trench section around the pipes to minimize the volumes of excess material. Spoil should be disposed of in appropriate approved areas and be subject to landscaping.
- Conduct public health campaigns to mitigate the risks and impacts from population influx and behavioural change during the construction phase.
- Provide labour opportunities for local residents, especially the directly affected households, women and youth.
- Include best practice health and safety provisions in the construction contracts and ensure strict compliance.
- The siting of the primary reservoir at Isenge holy hill must be agreed with traditional leaders or be shifted to another suitable location.

## **13.3 Conclusions and Recommendations**

The ESIA forms an important basis for making a decision on whether a project should be implemented or not. Ideally, an ESIA should conclude with a 'yes' or 'no' towards the licensing or approval of the project, and it should specify under which conditions and requirements the project should be implemented.

A range of criteria should be put forward as a basis for the conclusion in the ESIA as to whether a project should be implemented or not, including:

- Is there a need for the project?
- Have various alternatives for meeting the need been considered?
- Is the project environmentally and socially acceptable?

In the case of the Simiyu Water Supply Project, there is a high demand for access to reliable and safe water supply, which is expected to greatly improve the socio-economic conditions in the serviced areas. The project is also considered to be environmentally feasible. On the other hand, the land requirements for project infrastructure will inevitably cause displacement of structures and property. However, as explained above, the resettlement impact can be minimised through detailed design by slightly adjusting the routing of the water pipelines.

In conclusion, the ESIA consultant recommends that detailed planning of the Simiyu Water Supply Project continues under the condition that adequate measures are taken to address the issues arising from the ESIA study, including design issues and all other environmental and social management actions as outlined in the ESIA report.

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