Government of Uganda
Ministry of Water and Environment

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR WATER SUPPLY AND SANITATION PROJECT IN KOBOKO MUNICIPAL COUNCIL; MIDIA AND LOBULE SUB COUNTIES IN KOBOKO DISTRICT

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FINAL REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

SUBMITTED BY:

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ABBREVIATIONS AND ACRONYMS

Acronym or abbreviation	Meaning
µg/L	Microgram per litre
AIDS	Acquired Immunodeficiency Syndrome
BOD	Biochemical Oxygen Demand
Br	Bromine
CBO	Community Based Organisation
Cl	Chlorine
dBA	Decibel
DEA	Directorate of Environmental Affairs
DEM	Digital Elevation Model
DEM	Digital Elevation Model
DI	Ductile Iron
DOSH	Department of Occupational Safety and Health
DRWM	Directorate of Water Resources Management
DWD	Directorate of Water Development
EIA	Environmental Impact Assessment
ES	Environmental Score
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESR	Elevated Storage Reservoir
GoU	Government of Uganda
GSR	Ground Storage Reservoir
HDPE	High Density Polyethylene
HIV	Human Immunodeficiency Virus
IUCN	International Union for Conservation of Nature and Natural Resources
LC	Local Council
$m^3/hr.$	Cubic metres per hour
Masl	Meters above sea level
MBR	Master Balancing Reservoir
MDGs	Millennium Development Goals
MWE	Ministry of Water and Environment
ND	Nominal Diameter
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NWSC	National Water and Sewerage Corporation
PAPs	Project Affected Persons
PAYE	Pay As You Earn
PIA	Project Impact Areas
PPE	Personal Protective Equipment
RIAM	Rapid Impact Assessment Matrix
SR	Storage Reservoir
SRTM	Shuttle Radar Topography Mission

Acronym or abbreviation	Meaning
STIs	Sexually Transmitted Infections
ToR	Terms of Reference
TSS	Total Suspended Solids
UGX	Uganda Shillings
uPVC	Un-Plasticised Polyvinyl Chloride
UTM	Universal Transverse Mercator
UV	Ultra Violet
VIP	Ventilated Improved Pit latrine
WMDP	Water Management and Development Project
WSS	Water Supply System / Water Supply and Sanitation
WTP	Water Treatment Plant

0 EXECUTIVE SUMMARY

0.1 Project background

The Government of Uganda (GoU) through the Ministry of Water and Environment (MWE), with financial assistance from the World Bank, is implementing the Water Management and Development Project (WMDP) in towns and rural growth centres. The Directorate of Water Development (DWD) of MWE is implementing Component 2 in selected small towns and rural growth centres across the country. The objective of Component 2 is to improve the health, living standards and productivity of the population in the project towns, regardless of their social status or income through equitable provision of adequate and good quality water supply and improved sanitation services, at an acceptable cost and on a sustainable basis. This is to be achieved through the provision of infrastructure and commercialized management of installed facilities.

In pursuit of the National Development Plan II (NPA, 2015) and now Vision 2040 (GOU, 2013), the Ministry of Water and Environment (MWE) through the Directorate of Water Development (DWD) and National Water and Sewerage Corporation (NWSC) with World Bank as a co-financier is implementing Water Management and Development Project (WMDP) in Koboko Municipality and other small towns.

0.2 Current water supply and sanitation in Koboko

Currently, only one borehole is in use and its water is not sufficient for the population and certainly cannot satisfy the future demands. The access to safe water in Koboko District is very low. In 2014, access was at only 62% (MWE, 2014) against a target of 77% set by rural water and sanitation investment plan and strategy for 2015.

The existing pipe water supply in Koboko MC is producing 4,996 m³/month, which translates to only 166 m³/day, this clearly falls short of daily demand of 2,971 m³/day. The pipe water supply is characterized by intermittent services with water flowing for only 3 – 6 hours a day while the water points are crowded with long queues of jerry cans. According to interviews with the local communities, the waiting time can be as long as 5 hours in dry season.

0.3 Project location

The project area is located in Koboko Municipality and the surrounding sub-counties of Midia and Lobule in Koboko District (see Figure 1-1). Koboko MC is the headquarters, commercial and the administrative centre of Koboko District. Koboko is a relatively new district that was carved out of Arua District on July 1st, 2005 by an Act of Parliament. This North Western district of Uganda is about 56 km North of Arua Municipality, about 485 km in the North West of Kampala by road, 19 km from the Uganda-South Sudan border and 4 km from the Democratic Republic of Congo (DRC) border.

0.4 Purpose of the ESIA

This ESIA report is to deliver the requirements of the Ministry of Water and Environment (MWE) as spelt out in the terms of references as well as the relevant policies and guidelines of the World Bank. The ESIA sets out to identify potential environmental and

social impacts of the proposed Koboko Water Supply and Sanitation Project at all phases on the biophysical and socio-economic environment at the proposed site and the neighbourhood and to propose appropriate mitigation measures to avoid, eliminate or minimize adverse impacts.

The MWE procured the consultancy services of Survesis and Savimaxx Limited in undertaking ESIA and Resettlement Action Plan (RAP) for Lot 1 and Lot 2 project components.

0.5 Koboko Water Supply and Sanitation Project components and activities

The execution of Koboko WSS Project will include construction of a water intake sump and gabions for river bank protection on River Kochi at UTM 36N coordinates of 0277396E, 0382981N and Water Treatment Plant (WTP) at UTM Coordinates 0277274 m E, 0382328 m N), both in Nyarabu village, Asunga Parish in Midia sub-county. Three boreholes working on the principle of bank filtration and each with capacity to abstract 10 m³/hr will be drilled within a 1 km radius from the WTP and along the bank of River Kochi to augment river water during dry seasons.

A high voltage power line will be extended to the water intake point to provide steady and reliable electricity for powering the lifting pumps. The boreholes will be installed with solar powered pumps to abstract and pump the water to the WTP. The WTP office will be constructed to house an administration room, a room for strainers, valves and flow meter and a room for a diesel generator set to be used as backup power source in case of failure of the photovoltaic plant.

A 750 m long raw water transmission pipe will be laid from the water intake to the WTP while a 9.258 km of pumped clear water transmission mains will be laid to deliver water to the 700 m³ capacity Ground Service Reservoir (GSR) to be constructed on Teremunga Hill in Teremunga Village (at UTM coordinates 0273058 m E, 0379191 m N) to supply wards of Teremunga, Malenga and Godia. The 1,000 m³ capacity Appa Elevated Storage Reservoir (ESR) to be constructed at Police Quarters (at UTM coordinates 0273307 m E, 0376895 m N) to supply the wards of Appa and Mengo and the villages of Ombachi and Dwonga. However, due to funds limitation, only the 7.77 km pure water transmission taking clear water from the WTP pump station to Appa ESR will be constructed in the first phase. The 1.518 km branch of transmission pipeline to Teremunga Hill, Teremunga GSR and all the 41.8 km of proposed distribution network will not be laid in the first phase of the project.

The sanitation facilities to be constructed are: a Feacal Sludge Treatmentplant on 10.298 acres of land in Mindrabe Village at UTM 36N 0277390 m E, 0379008 m N and two waterborne toilets, each with six stances of flush toilets, a urinal, two shower rooms and wash hand basins. One latrine (LAT 1) will be constructed at the Koboko Market at UTM 36N coordinates 0387626N, 274522E) with the second latrine (LAT 2) at UTM 36N coordinates 0376970N, 273484E) in the central square near the Town Hall.

During the operation phase, the water intake will abstract 210 m³/h from River Kochi which will be treated through a conventional water treatment process which include the following operations: aeration, coagulation and flocculation, filtration and disinfection. After disinfection, the clear water will be pumped to the storage reservoirs in Appa and Teremunga hill for distribution by gravity. The backwash water from the WTP will be settled to remove suspended matter and returned to River Kochi.

Faecal sludge from the toilets will be delivered to the co-compost plant by cesspool emptier and discharged into the drying beds where dewatering will take place for at least 14 days. The leachate from the drying beds will percolate into a 110 m² shallow aerobic sewage treatment pond for reduction of nutrients and UV removal of pathogens. The effluent will be discharged into the vegetation buffer within the Feacal Sludge Treatment plant enclosure. In the receiving and mixing area, the dry faecal sludge will be mixed with organic solid waste collected from Koboko Municipality and surrounding areas. For dewatered sludge a volume ratio between sludge and waste ranging between 1:2 and 1:3; while for liquid sludge it should be 1:5 and 1:10. It is it is advisable to have to dewater sludge coming from septic tanks before it is mixed with the organic waste to be composted for about 90 days and sold to farmers as manure.

The total project cost is US $ 11,031,746.

0.6 ESIA Process

The ESIA process involved reviews of existing literature, field visits, ecological surveys within the project area, hydrological and water quality analysis, socioeconomic surveys and consultations with relevant stakeholders. Potential positive and negative impacts were identified, ranked and mitigation measures given. An evaluation of project alternatives was carried out and an Environmental and Social Management Plan (ESMP) prepared.

0.7 Baseline project description

0.7.1 Climate and water resources

Koboko District has a bi-modal rainfall pattern with a wet season, which runs from April to November punctuated with short dry spells in June. August and September are the wettest months with rainfall exceeding 200 mm/month. While December – March period is the dry season. According to FAO (2005), the average annual rainfall varies from 1,312 mm to 1,740 mm with a mean of 1,525 mm. The potential evapotranspiration varies between 100 to 160 mm in January – March period when it exceeds the rainfall because of the high temperatures. The daily temperatures vary between 17 °C and 31 °C with January – March as the hottest period with a maximum daily temperatures reaching 31 °C.

The dominant soils types are the ferrallitic soils which are mainly sandy clay loams and sandy sediments with a strip of lithosols covering vast areas of Koboko MC, Midia and Lobule Sub Counties.

The project areas are at elevations ranging from 964 m to 1,374 m above sea level (MASL) and gently slopes to the North East and East to the project water source. This topography, however, could not be utilized for gravity driven flow in transmission lines but distribution will be by gravity since the reservoirs are at higher elevation or elevated.

Koboko District generally lacks adequate surface and groundwater resources. River Kochi is the main and the most important river. It maintains flows all year around. Rivers such as Urei, Oru, and Atu etc. are small and usually dry up in dry season. As well, the wetland resources of Koboko are very limited. According to the wetland cover map

from NEMA, Koboko District has only 2 km² of seasonal wetland, this makes about 0.2% of the total district land cover.

The flow of River Kochi at the proposed intake point was measured twice (in March and May) and found to fluctuate between 30 l/s and 34 l/s. The low flow analysis on the selected annual minima for the derived flows at the proposed intake point confirms that during the low flow season, the river flow will be less than the water demand. Statistical analysis of the observed low flow of River Kochi reveals that there is a probability that once in every 1.4 years, the flow of River Kochi at planned water intake will be less than the planned abstraction rate of 210 m³/h (58.3 l/s). This clearly shows that there is not enough water in the river to support proposed abstraction rates. On the contrary, during the rainy season, there is a high potential of flooding at the intake point with the flood flow having a chance of exceeding 13 m³/s every year. The water quality analysis found the raw water to have a Total Suspended Solids (TSS) of 9 mg/L and turbidity of 14.3 NTU.

0.7.2 Biophysical environment

Vegetation

An assessment of the plant species recorded 120 species from 98 genera and 43 families were encountered in the project area. There are 46 species for Shrubs, 29 species for Trees and Herbs (26 species), Grasses (13 species) and Climbers with six species. Within the project area, no species of conservation concern as per the IUCN Red List was encountered. However, four species of invasive plants were recorded namely *Senna spectabilis, Lantana camara, Mimosa pigra* and *Parthenium hysterophorus.* The invasive plants displace native species through altered recruitments in natural ecosystems and their spread is often triggered by disturbances in the ecological systems.

Butterflies

A total of 20 butterfly species and 17 genera were identified and distributed among the 52 specimens collected from the project areas. The butterflies were further grouped into four families; four species were Lycaenidae, seven Pieridae, 12 Papilionidae and 29 Nymphilidae. None of the butterfly species encountered were of conservation concern nationally or internationally.

Herps

Three amphibian species and 13 individual amphibians belonging to two families and two genera were recorded i.e. *Amietophrynus kisoloensis, Amietophrynus garmani* and *Ptychadena mascareniensis.* Amphibians were recorded only in one site i.e. water intake out of the five sites surveyed. This is because the water intake is located at the river with riverine vegetation that encourages their breeding. None of the herpetiles recorded in the project area was of conservation concern following the IUCN Red List of threatened species.

Birds

Altogether a total of 24 bird species and 158 individual birds were recorded. The water intake had the highest species richness and abundance yet the water reservoir site had the lowest. These records at the water intake can be attributed to the flowing water, dense vegetation cover and the patches of riverine vegetation along the river.

All species recorded in the area are not of conservation concern as none is on the IUCN Red List of threatened species.

Mammals

Eight mammal species were recorded in the project area. These included one shrew species, four rodent species, one bat species and two primate species. The Water Intake and Water Treatment Plant sites recorded the highest number of species (seven) while the Solid Waste Landfill site recorded the lowest species numbers (three) and the reservoirs recorded four species each. None of the small mammals identified in the project area is of conservation concern.

Socio-economic environment

The provisional National Population and Housing Census 2014 indicates that the total population of the project area (Koboko Municipal Council) is 37,825 of which 18,077 are males and 19,748 are females with an average household size of 6.1 which is far higher than the country's household size of 4.7. The census results further reveal that, there has been a reduction in the population growth rate for Koboko District from 5.6% in 2002 to 3.98% in 2014, which is still slightly higher than the national growth rate of 3.03%.

The ESIA team conducted a socioeconomic survey of the project impacted persons (PIPs) in order to give a general understanding of the communities affected by the proposed water and sanitation project. The survey results indicate the following: -

- 66% of the PIPs are Kakwa by tribe and also a big proportion are Lugbara (44.4%).
- a big proportion of the PIPs are Moslems (83.3%) while only a very small proportion are protestants (16.7%).
- 50% of the household heads were found to be aged between 25 to 44 while the other half are above 45 years of head. No child headed families were encountered in the survey.
- Majority of the PAPs are semi-literate. 55.6% completed Primary level of education while a 4.4% can only read and write. None of them completed secondary level of education.
- 90% of the households have between 1-5 people in their household while only 10% of the PAPs have reported having between 6 to 10 people. No household in the survey reported to have more than 10 people in their homes
- 50% of the PAPs (50%) reported having a chronically ill or aged (vulnerable persons) in their households.
- 90% of the PAPs earn from farming/animal rearing while those 5% are civil servants and another 5% are engaged in business.
- The main economic activity of the PAPs is agriculture. The main crops grown in the project area include beans, cassava, maize, ground nuts and sweet potatoes.

- All the PAPS own radio sets and at least two sets of clothes. The mean size of land owned by each PAP is 3.5 acres with the minimum land size being 2 acres while the maximum is 5 acres. All the land are owned under customary land tenure system with no evidence of ownership.

0.8 Potential impacts

The identified positive impacts majorly aims at improving the living standards and the wellbeing of the residents of Koboko Town and neighbouring communities of Lobule and Godia Sub Counties through increased provision of safe water within an easy reach of the household and boosting the pipe water supply which is currently has only 4% coverage. This will reduce reliance and overcrowding at point water sources, which are prone to contamination. Moreover, the yard taps will be within a short walking distance of 100 m radius and will reduce the burden of carrying water for long distance, further reducing time lost by women and girls in collecting water. Indirectly, the closeness of water near homesteads and reduced time of collecting water will reduce gender related violence and domestic violence against women perpetrated by suspicious husbands. Overall, the increased coverage of safe water is predicted to bring significant positive impacts ranked +4ve while the increased coverage of sanitation facilities will reduce sanitation related disease burdens (+4) and better management of faecal sludge by turning it into the useful compost manure that can be used to improve agricultural yield (+2).

The identified negative impacts were categorized into those affecting the physical, biological and human environments. No major (-5) negative impacts were identified. Koboko WSS Project is predicted to significantly lower River Kochi flows because the proposed intake point does not have adequate flow to meet the demanded water. Abstracting 58.3 l/s from an intake point where flow sometimes gets to 34 l/s or even lower will have a significant negative impact (with RIAM ES rank of -4ve) on the River Kochi. The three boreholes that are planned to be drilled along the river shore and working on bank filtration principle are likely to exacerbate the problem during dry season as they will still be abstracting the river recharge. The impact of excessive abstraction from the boreholes on River Kochi flow is predicted to have a moderate negative impact with a RIAM ES rank of -3ve. The drop in water level or reduction in river flow is predicted to cause moderate negative impact (-3ve) on aquatic organisms, as the reduced water level may lead to loss of aquatic habitat and breeding places. The other moderate negative impacts with -3ve scale include: pollution of River Kochi and soil by backwash effluent, water treatment sludge containing residual aluminium sulphate, spilled water treatment chemicals and sedimentation build up resulting from bank erosion. From the Feacal Sludge Treatmentplant, the effluent from water treatment pond and leachate which may contain heavy metals which are predicted to cause moderate negative impacts (RIAM ES Rank of -3ve) to the receiving environment.

The moderate negative impacts (with RIAM ES Rank -3ve) to the social environment is child abuse and early pregnancy that may be perpetrated by project workers. The influx of migrant workers may promote promiscuity that will lead to increase in spread of HIV/AIDS and other STIs, which may result because of the influx of migrant workers at construction phase. This is predicted to cause negative impacts (RIAM ES Rank of -2ve). Other impacts of the project to the human environment include use of child labour (-2ve), disruption of social, cultural and economic activities by project activities

(-2ve) loss of land and livelihood as a result of land take and destruction of property on proposed sites for water intake, WTP, storage reservoirs, Feacal Sludge Treatment plant and transmission pipelines (-2ve). In addition, occupational health and safety concerns such as lifting heavy objects, handling hazardous materials, poor sanitary conditions in workers camps and work place, emission of foul smell from Feacal Sludge Treatment plant, increased accidents risks are anticipated to cause negative impacts with RIAM ES Rank of -2ve.

For each of these impacts, practical and appropriate mitigation measures were proposed. Example of such mitigation measures acquisition of abstraction permit base on safe yield, abstracting no more than the river flow rate at any instance, developing and implementing source and catchment protection plan, installing stream flow and groundwater monitoring gauges at the downstream of water intake, reinstating excavated soil immediately after excavation, reforestation with indigenous tree species, implementing a solid waste management plan to reduce solid waste generation and ensure appropriate disposal, storage of fuel in approved storage, having a HIV/AIDS policy, conducting awareness campaigns and Voluntary Counseling and Testing of HIV.

0.9 Analysis of alternatives

All project alternatives were analysed. The "No Project" alternative would avoid the negative impacts aforementioned but also the project benefits would be lost.

With the "No Project" alternative, the existing poor water supply and sanitation in the area would continue to exist. In the long term, the no-project scenario would be more disastrous as the more than 38% of the population in Koboko Town would continue using unsafe water, consequently putting them at high risk of contracting and spreading waterborne related diseases. Further, the poor sanitation scenario where the town population is served mainly by pit latrines, which are abandoned when filled up would continue to haunt the cross border town that usually receive an influx of refugees. This will impose more health burden on the local communities and perpetuate poverty as a result of lost revenue and productive hours when sick or attending to a sick family member. In short, Uganda's vision 2040 of having a piped water supply across the country and poverty eradication would not be achieved.

Koboko WSS Project is so important for the socio-economic development of Koboko Municipality as it aims to reduce the water scarcity problems, save production time lost in waiting for water (especially women who wait for more than 5 hours at water points), provide sanitation services that will ensure the public health of the people in town and neighbouring communities. The perceived project benefits outweigh the perceived negative impacts. "No project" alternative cannot replace it in terms of the overall objective. Therefore, the analysis of alternatives focussed on project sites and technology. Different technologies were considered for water treatment process and faecal sludge treatment with the pros and the cons of each analysed to inform technology selection process. The selected technology considered the environmental and social acceptance, the cost and the skills requirement for operation and maintenance of the technology.

0.10 Public consultation and disclosure

It is mandatory that individuals, groups and entities with a stake in any proposed project should not only be informed about the proposed project/site(s) but also be consulted for their views about the likely impacts and any other concerns about the proposed project (Environmental Assessment OP/BP 4.01). At the same time Ugandan laws and regulations also emphases stakeholder participation in development projects (The National Environmental Act, CAP 153 and The EIA regulation).

The methods of consultation such as interviews, in-depth interviews and Focus Group Discussions and questionnaires were used to consult the following stakeholders: - The district technocrats consulted included; Chief Administrative Officer (CAO), District Planners, District Education Officer, District Environmental Officer and the District Community Development Officer. At local level, the L.C. 1 Chair persons of Mindrabe, Nyarabu, Kangai, Mojje and Bulangranga communities as well as residents within the Project Impacted Areas were consulted.

The consulted stakeholders at all levels endorsed the project. They perceive the project as a source of employment, an opportunity to improve access to safe and clean water, improvement in hygiene and sanitation particularly in Koboko Municipal Council, improvement of health and the elimination of water borne diseases, increased revenues and incomes. However, they noted that the project might displace people from their land without adequate compensation, the faecal sludge treatment plant might emit foul smell into the air and insecurity might result because of influx of migrant workers. Also, they were concerned about the increase in traffic and minor accidents resulting from project activities. The views of the stakeholders were considered when identifying project impacts and development of mitigation measures.

0.11 Environmental and social management plan

An Environmental and Social Management Plan (ESMP) has been developed for implementation of mitigation measures and enhancement strategies proposed for identified negative and positive impacts, respectively. It includes monitoring actions with timeframes, assigns specific responsibilities and gives budget estimates.

The management and supervision of the ESMP is strictly the responsibility of the Ministry of Water and Environment as the Developer. During construction the Contractor will be responsible for the day-to-day implementation of the ESMP while during the operation phase, the Scheme Operator (it is not yet known who will operate and manage but could be NWSC) will be responsible for the implementation of the ESMP. The Developer, the Contractor and the Operator should each employ an Environmentalist with relevant academic qualifications and work experience to implement the ESMP. At the local level, Koboko District Local Government and Koboko Municipal Council will be responsible for the day-to-day monitoring of the ESMP in their areas of jurisdiction.

National Environment Management Authority (NEMA) and Department of Occupational Safety and Health (DOSH) will periodically monitor the project as per their constitutional, legal and regulatory mandate. The major activities to be done during monitoring will include site inspection, review of grievances logged by stakeholders and discussions with PAPs, construction workers and the local community

who live near the project facilities in order to get neighbourhood issues. The Local Councils (LC I) of each project site, particularly the Chairman of the Environmental Committee should be involved during each site inspection.

The study discussed procedures for inter-agency coordination in implementation of ESMP, A Chance Finds Procedure for discovering and mitigating project impacts to cultural resources (unknown at the moment) of archaeological and/or paleontological importance and a Grievances Redress Mechanism.

0.12 Conclusion and recommendations

Koboko WSS Project is so important for the socio-economic development of Koboko Municipality as it will increase coverage of safe water and improve sanitation facilities in the town. However, it is likely to lower River Kochi flows because the proposed intake point does not have adequate flow to meet the demanded water. The impact is predicted to be a significant negative impacts (RIAM ES Rank -4ve). The three boreholes that are planned to be drilled along the river shore and working on bank filtration principle are likely to exacerbate the problem during dry season as they will still be abstracting the river recharge. The impact of excessive abstraction from the boreholes on River Kochi flow is predicted to have a moderate negative impact with a RIAM ES rank of -3ve. The drop in water level or reduction in river flow may lead to loss of aquatic habitat and breeding places. The impacts however, have practical mitigation measures such as acquisition of abstraction permit based on safe yields, installation of river flow and groundwater monitoring gauges. Key to mitigating the impact is the development and implementing source and catchment protection plan.

For success and sustainability of Koboko WSS Project, the benefits outlined have to be enhanced. The proposed ESMP are the minimum standards recommended for the Contractor, Scheme Operator and the Client. Addressing the issues identified will upscale project benefits while mitigating the negative impacts identified at all project phases. If any other structures/ expansion not described in this report takes place, it will be considered separate and an ESIA with the project brief will be prepared by the client and submitted to NEMA for approval.

In cognizance of the fact that Koboko is a water stressed area and aware of the desire and enthusiasm the community have for the project, with due consideration of the identified positive and negative impacts of the project and the fact that all negative impacts have practical mitigation measures as drawn in the Environmental and Social Management Plan (ESMP), the ESIA team strongly recommends to NEMA to approve this ESIA to expedite implementation of the project.

1 INTRODUCTION

1.1 Water Management and Development Project (WMDP)

The Government of Uganda (GoU) through the Ministry of Water and Environment (MWE), with financial assistance from the World Bank, is implementing the Water Management and Development Project (WMDP) in towns and rural growth centres. MWE is directly responsible for implementation of WMDP in small towns and rural growth centres whereas the National Water and Sewerage Corporation (NWSC) is responsible for the same in large towns.

WMDP, a three component project whose proposed interventions will contribute to achievement of the National Development Plan II (NPA, 2015), aims at providing safe water and improving sanitation. The three components of WMDP are:

i. Investment in Integrated Water Resources Development and Management;

ii. Infrastructure Investments in Urban Water Supply and Sanitation/Sewerage and Catchment/Source Protection; and

iii. Strengthening institutions for effective project implementation.

The Directorate of Water Development (DWD) of MWE is implementing Component 2 in selected small towns and rural growth centres across the country. The objective of Component 2 is to improve the health, living standards and productivity of the population in the project towns, regardless of their social status or income through equitable provision of adequate and good quality water supply and improved sanitation services, at an acceptable cost and on a sustainable basis. This is to be achieved through the provision of infrastructure and commercialized management of installed facilities. In general, it is envisaged that economic growth will be stimulated in the recipient towns and growth centres.

MWE through DWD is focusing on twelve urban centres of which eight are small towns and rural growth centres, directly under the DWD, and four are large towns under the NWSC. The eight small towns and rural growth centres are further categorized into Lot 1 and Lot 2 towns. Lot 1 towns are Busia, Pallisa and Ngora-Nyero-Kumi. Lot 2 towns are Rukungiri, Katwe-Kabatoro and Koboko.

1.2 Current water supply and sanitation in Koboko Municipality

In 2010, the average access to safe water in the whole Koboko District was 59% with the access to safe water varying from as low as 26% in Koboko MC to 69% in rural areas. Access to piped water supply was only 4%. A slight improvement in access to

safe water was observed in 2014 when overall average access in Koboko District increased to 62% (MWE, 2014). These values however, are still below the target set by Rural Water and Sanitation Investment Plan and Strategy that had aimed to increase provision of safe and adequate water and sanitation facilities at 77% and 90%, respectively, in 2015.

The existing pipe water supply in Koboko MC is producing 4,996 m³/month, which translates to only 166 m³/day; this clearly falls short of estimated daily demand of 2,971 m³/day. The pipe water supply is characterized by intermittent services with water flowing for only 3 – 6 hours a day while the water points are crowded with long queues of jerry cans. Crowding as shown at Ombachi borehole (shown in Plate 1 below) is common at all water points. According to interviews with the local communities, the waiting time can be as long as 5 hours during the dry season. Undoubtedly, the existing system cannot satisfy the daily water demand of the initial year and the shortfall will only worsen in future if no intervention is made.

Plate 1: Long queues at a borehole at Ombachi Primary School.

Koboko Municipality does not have a sewerage system. The town population is served mainly by pit latrines, having a coverage of 73. 8% of the households use pit latrines. Flush toilets and septic tanks serve only administrative buildings. Most of the times, when pits fill up they are abandoned and new ones are built; only few latrines are emptied due to the high cost. There are seven public sanitation facilities; the users' fee is UGX 200 per use. The town has no faecal sludge treatment plant. Sludge exhausted from filled up pit latrines and septic tanks is deposited in an area designated by Municipal Council.

In pursuit of the National Development Plan II (NPA, 2015) and now Vision 2040 (GOU, 2013), the Ministry of Water and Environment (MWE) through the Directorate of Water Development (DWD) and National Water and Sewerage Corporation (NWSC) with World Bank as a co-financier is implementing Water Management and Development Project (WMDP) in Koboko Municipality and other small towns.

1.3 Project location

The project area is located in Koboko Municipality Council (MC) and the surrounding sub-counties of Midia and Lobule in Koboko District (see Figure 1-1). Koboko MC is the headquarters, commercial and the administrative centre of Koboko District. Koboko is a relatively new district that was carved out of Arua District on July 1st, 2005 by an Act of Parliament. This North Western district of Uganda is about 56 km North of Arua Municipality, about 485 km in the North West of Kampala by road, 19 km from the Uganda-South Sudan border and 4 km from the Congo border. The map in Figure 1-1 below shows the project areas.

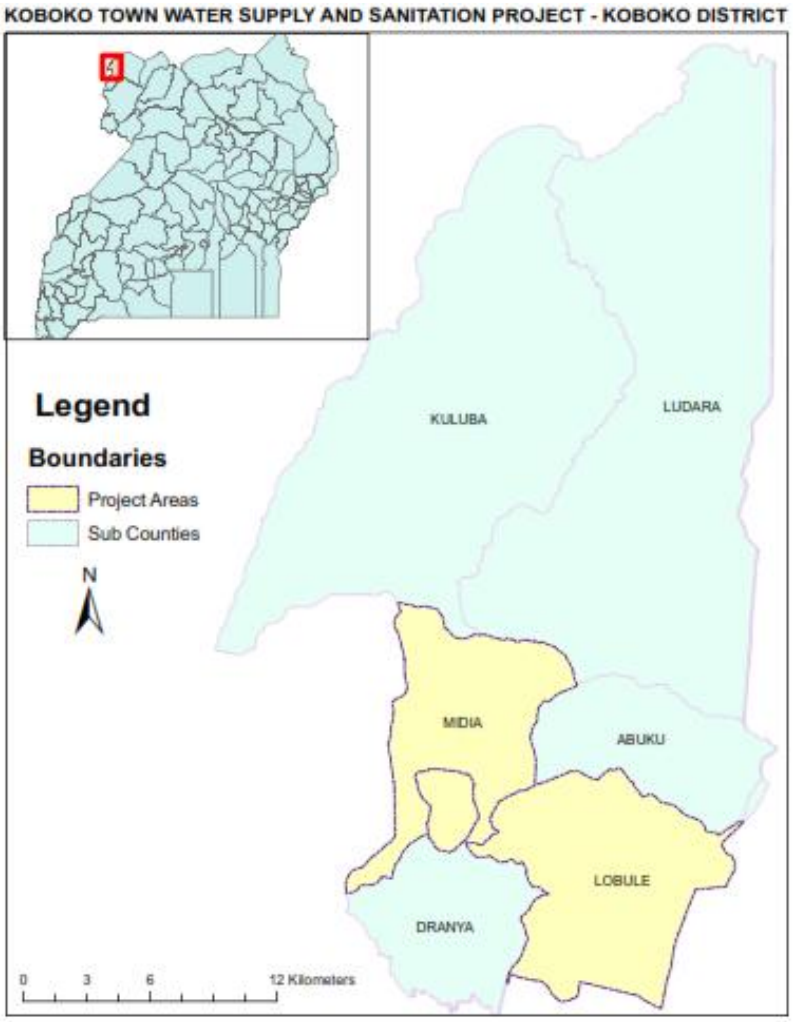

Figure 1-1: Map of Koboko District showing the project areas.

The proposed Koboko MC Water Supply and Sanitation (WSS) Project will abstract water from River Kochi in Nyarabu Village, Asunga Parish in Midia Sub County and treat raw water in a water treatment plant (WTP) to be located near the intake (at coordinates UTM 36N, 0277274E, 0382328N) in Nyarabu Village, Asunga Parish in Midia Sub county. The water will be supplied to areas within Koboko MC and parts of Midia sub-county and villages of Ombachi and Dwonga, Godia Parish in Lobule sub-county. The Feacal Sludge Treatment plant for treating mixture of organic solid wastes and faecal sludge is proposed on a 10.298 acres land in Mindabe Village, Asunga parish, Midia Sub County at UTM 36 N coordinates 0277425E, 0378997N. The layout of the

Koboko Water supply and Sanitation project components are as shown in Figure 1-2 Figure 1-1below

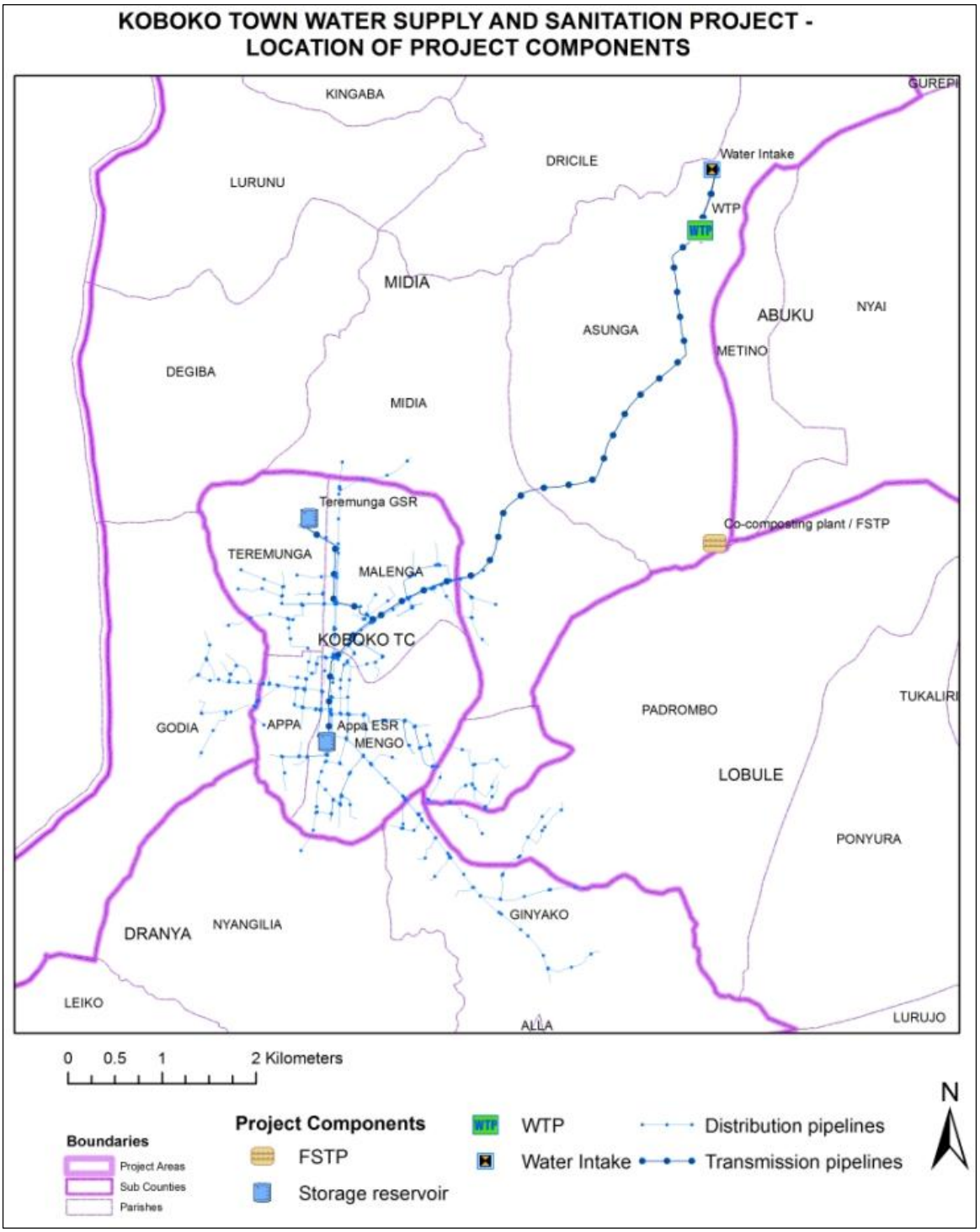

Figure 1-3: Layout of Koboko Water supply and Sanitation Project components

1.4 Need for an ESIA

Section 19 (3) of the National Environment Act CAP 153 made an Environmental Impact Assessment mandatory for all projects or policies that are likely to or will have significant impacts on the environment so that adverse impacts can be identified,

eliminated or mitigated. This project falls under the Third Schedule of the National Environment Act. It involves major changes in land use as stated in Category 1 subsection (c). Section 20 (1) of the National Environment Act states that where a project has been determined to require an ESIA, the Developer shall, after completing the study, prepare an Environmental Impact Statement (EIS) according to the guidelines established by the Authority, and have the EIS submitted to the Authority and/or forward to any other relevant Lead Agency. The MWE procured the consultancy services of Survesis and Savimaxx Limited in undertaking ESIA and Resettlement Action Plan (RAP) for Lot 1 and Lot 2 project components.

1.5 Purpose of the ESIA

This ESIA report is to deliver the requirements of the Ministry of Water and Environment (MWE) as spelt out in the terms of references as well as the relevant policies and guidelines of the World Bank. The ESIA sets out to identify potential environmental and social impacts of the proposed Koboko Water Supply and Sanitation project at all phases on the biophysical and socio-economic environment at the proposed site and the neighbourhood and to propose appropriate mitigation measures to avoid, eliminate or minimize adverse impacts.

1.6 ESIA process

This ESIA was carried out in line with requirements of the legal, policy and regulatory framework of Uganda as well as the World Bank. In addition, this ESIA report was prepared in consultation with the EIA Guidelines for Water Resources Related Projects in Uganda Manual (MWE, 2011). The World Bank policy requirements, in instances that they were more comprehensive, were addressed over and above the requirements of the regulatory framework of Uganda.

The ESIA process involved review of existing literature, field visits, ecological surveys within the project site and the project area, hydrological and water quality analysis of selected water sources, socio-economic surveys and consultations with relevant stakeholders including potential project affected persons. Briefly, the methods may be described as follows:

- Review of relevant literature and secondary baseline data on legislation, policies and guidelines, bio-physical and social environment, including among others, land use in the area, sensitive receptor systems and ecosystems likely to be affected.

- Field studies that included flora and fauna counts and categorisation, receptor systems baseline data including soils and water; detailed field investigations of different spices of birds, herptiles, butterflies, mammals and plants were undertaken. The species numbers and type were used to determine the baseline environmental quality of the project site as far as animals are concerned. The biodiversity status of the site was also determined and will be used as monitoring indicators for the impact of project activities on the site flora.

- An inventory of activities in the neighbourhood likely to be affected by the development and operations of the proposed water treatment plant; Safety and health impacts on workers during construction and operation, including

provision of protective equipment and adequacy of sanitation provisions for the workers.

- Consultations with stakeholders, including the neighbouring local communities, Koboko Municipal Council civil servants (Town Clerk, Health Inspector, Town Engineer) and Koboko District Local Government officials (District Environment Officer, District Water Officer) and lead agencies such as The Directorate of Water resources Management (DWRM), Directorate of Environment Affairs (DEA), Ministry of Water and Environment, Department of Occupational Health and Safety, NWSC and Wetlands Management department, among others.

- Prediction and analysis of environmental impacts resulting from the proposed project, and proposing appropriate mitigation measures and an Environmental Management and Monitoring Plan.

- Preparation of an Environmental and Social Impact Statement and presentation to NEMA for review and approval.

1.7 Project Activities

1.7.1 Construction phase

The execution of Koboko Town WSS Project will include construction of a water intake sump and gabions for river bank protection on River Kochi adjacent to the culvert at UTM 36N coordinates of 0277396E, 0382981N and Water Treatment Plant (WTP) at UTM coordinates 0277274 m E, 0382328 m N), both in Nyarabu village, Asunga Parish in Midia sub-county. Three boreholes working on the principle of bank filtration principle and each with capacity to abstract 10 m³/hr will be drilled to boost the water supply during seasons of low flow in the river. The exact locations of the boreholes are not yet known but they will be located within a 1 km radius from the WTP and along the shoreline of River Kochi.

A high voltage power line will be extended to the water intake point to provide a steady and reliable electricity for powering the lifting pumps while solar powered pumps will be installed at the boreholes site to abstract and pump the water to the WTP. A larger borehole house will be constructed to house an administration room, a room for the strainer, valves and flow meter and a room for a diesel generator set to be used as backup power source in case of failure of the photovoltaic plant.

A 750 m raw water transmission pipeline will be laid from the water intake to the WTP. A total of 9.258 km of pumped clear water transmission pipelines will be laid to deliver water to the 700 m³ capacity Ground Service Reservoir (GSR) to be constructed on Teremunga Hill in Teremunga village (at UTM coordinates 0273058 m E, 0379191 m N) to supply wards of Teremunga, Malenga and Godia and the 1000 m³ capacity Appa Elevated Storage Reservoir (ESR) to be constructed at Police Quarters (at UTM coordinates 0273307 m E, 0376895 m N) to supply the wards of Appa, Mengo and villages of Ombachi and Dwonga.

However, due to funding limitations, only 7.77 km clear water transmission pipeline from the WTP pump station to Appa Elevated Service Reservoir (ESR) will be constructed in the first phase. The 1.518 km branch of transmission pipeline to Teremunga hill, Teremunga GSR and all the 41.8 km of proposed distribution network

shown in Figure 1-4 below will not be laid in the first phase of the project. In the first phase, distribution of water will be through the existing distribution pipeline.

The Feacal Sludge Treatmentplant will be constructed for the management of the faecal sludge and organic component of solid waste from Koboko Municipality and surrounding areas. It will be located on a 10.298 acres of land which is owned and currently operated by Koboko Municipal Council as a solid waste dumpsite (landfill) in Mindrabe village in Asunga parish, Midia Sub County.

In addition to the Feacal Sludge Treatmentplant, the project proposes construction of two waterborne toilets each with six stances flush toilets, a urinal, two shower rooms and wash hand basins in Koboko MC. One latrine (LAT 1) will be at UTM36N coordinates 0387626N, 274522E at the Market place while the second latrine (LAT 2) will be in the central square near the Town Hall at UTM36N coordinates 0376970N, 0273484E). Each of the latrines have separate sections for males and females with provision for disabled persons in each section. It's estimated that the toilets can serve up to 450 persons per day. The effluent from the latrines will be drained to a gravel bed with a vegetation buffer where it will be infiltrated into the soil. The faecal sludge from these waterborne toilets will have to be delivered to the Feacal Sludge Treatmentplant for treatment in a cesspool emptier.

The construction works will entail activities listed below that are postulated to impact on the environment and social setting:

Site hoarding
Prior to any construction activities at the proposed site will be hoarded off with iron sheets or appropriate materials. The purpose of site hoarding at construction sites will be inform the general public of the activities taking place, confine site activities from the public domain and limit the interaction of site wastes and dust with the public. It also reduces construction hazards to the public especially falling or flying debris.

Site clearing, excavations and construction of buildings
The sites are to be cleared to pave way for construction include sites for the water intake, routes to the intake, WTP, the three borehole sites, two reservoir sites, Feacal Sludge Treatment plant and sites for waterborne toilets together with their septic tanks and gravel beds. Additionally, vegetation within a 4 m wide strip of land will be cleared along the proposed 9.258 km of transmission route.

Excavation works for the foundations of buildings and transmission lines will follow site clearance. Large volumes of soils are anticipated to be excavated especially from foundations of buildings at WTP and Feacal Sludge Treatmentplant where very little material will be used for backfilling.

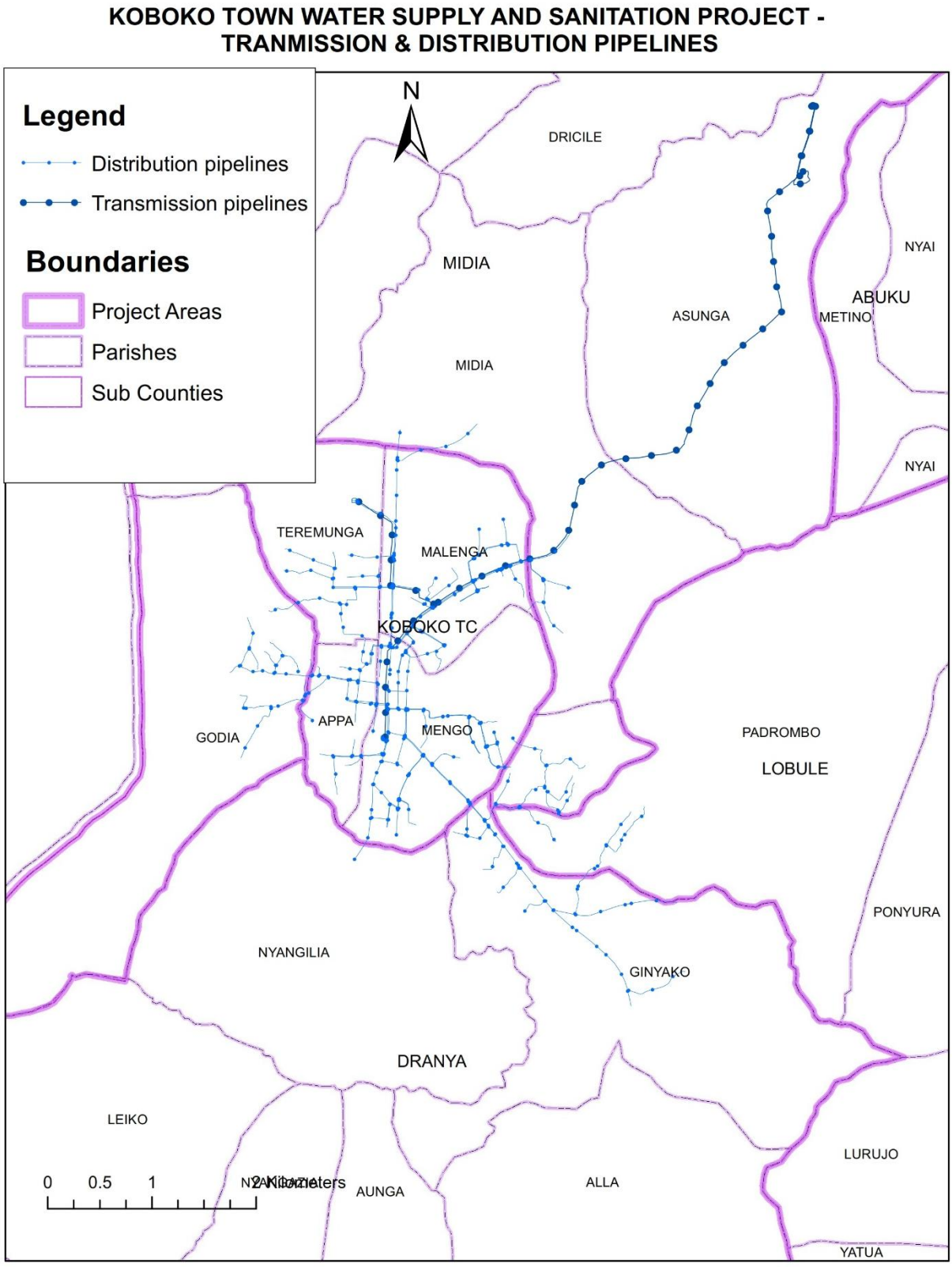

Figure 1-4: Map showing the proposed transmission and distribution pipelines.

Sources of Construction materials and their movement

Some of the construction materials such as sand, aggregate, gravel, hard core and murram will be sourced from the existing and approved local quarries within or near

Koboko District. The project proponent will liaise with the local authorities in the identification of the quarry site. It is the project proponent's intention that only approved quarries be used. Assessments of these quarries areas however, do not form part of the current ESIA.

Other construction materials such as cement, timber, roofing materials, ductile iron (DI) and HDPE pipes, iron bars and pumps will be sourced from authorized distributors and moved to the construction sites. Some of these materials are bulky and will require heavy trucks for haulage between source and construction sites or to disposal sites.

The total project cost is US $ 11,031,746.

1.7.2 Operation and maintenance phase

Water intake operation
During operation, three pumps each with a capacity to discharge 70 m³/h against a head of 38 m will abstract river water (a total of 210 m³/h water in 2030 phase) through suction pipes of Nominal Diameter (ND) 125 mm with strainers and pump to the WTP. When the strainers on the suction pipes get clogged, the backwashing pump will be operated to clean the strainers of the clogged materials. The large materials that would be trapped on the filter screens will be cleaned automatically by the self-cleaning system to be installed.

Water treatment processes
During the operation phase, raw water from River Kochi will be abstracted at a rate of 210 m³/h and pumped to the WTP and treated through several processes including aeration, fine sieving, coagulation and flocculation, filtration and finally disinfection to ensure safe water for human consumption is produced.

A WTP aims to ensure safe water for human consumption is provided at a reasonable cost. To guarantee a high quality of potable water, WTPs have many processes including addition of different chemicals to disinfect and purify water. The types and quantities of chemicals vary widely and will depend on a range of factors including raw water quality; treatment processes employed and treated water quality objectives.

The aeration is aimed to increase the removal of pollutants from water by stripping or oxidizing dissolved metals. After aeration, the water will pass through fine screens of 3 mm spacing to remove any solids in the water.

The coagulation and flocculation process at the Koboko WTP will involve use of aluminium sulphate.

The flocculation and clarification processes will take place in four circular reinforced concrete tanks, with a volume of 23 m³ dimensioned to receive a discharge 70 m³/h. The area of flocculation will be equipped with slow mixers to favour the floc formation while area of clarification will have scrapers to collect the sludge that will settle at the bottom where about 430 kg of sludge are estimated to be collected per day. This sludge together with those from equalization tank will be dewatered on drying beds where its volume will be reduced considerably. The clarified water will be returned to the river while sludge will be dried and disposed.

After flocculation and clarification processes, water will be passed through sand filters to remove any flocculants and suspended solids that may still be in water. The sand filter will be backwashed to remove any retained solids that may clog the filters and reduce the efficiency of filtration process. The backwash water will be clarified to reduce the concentration of Total Suspended Solids (TSS) to less than 50 mg/L before discharging to the river.

Hypochlorite (free active chlorine) has been proposed as the disinfectant in the water treatment process. The clear water from the filtration tanks will be dosed with Free Available Chlorine (FAC) obtainable by reacting a disinfectant in powder, granules or salt tablets with water to generate brine with high a concentration of hypochlorite (free active chlorine) of about 500 mg/L or higher. The chemicals for preparing brine are required in large quantities, and therefore they will be stored onsite in chemical buildings. The dosed clear water will have a residual time of about 2 hours before being pumped to the storage reservoirs. This is called secondary disinfection solely with a purpose to maintain a disinfectant residual in the finished drinking water to prevent regrowth of microorganisms.

The secondary disinfection process does not result in residuals generation; however, water from the clear well may be used to backwash filters. As a result, disinfectant added to the finished drinking water may become part of the filter backwash. About 270 m^3 of filtered water from disinfection tank are planned to be used for backwashing per day. Although the backwashed water will be clarified before releasing to River Kochi, there are chances that dissolved hypochlorite in backwashed water will not be entirely removed.

In addition to running the Water Treatment Plant, the other activities at the WTP will be routine maintenance by electricians and plumbers. Periodically, transmission pipelines will be maintained to fix leakages among other problems.

Human excreta handling at the public toilets

Attendants will regularly clean the toilets and showers. The human excreta will be collected on regular basis from the septic tanks by cesspool emptier and taken to Feacal Sludge Treatmentplant for disposal.

Feacal Sludge Treatmentplant operations

The municipal solid waste will be delivered to the sorting area of the Feacal Sludge Treatment plant in waste skips where biodegradable component will be sorted. The Non-biodegradable component will be landfilled at the existing dumpsite near the Feacal Sludge Treatmentplant. The Feacal Sludge Treatmentplant will be built on part of the land used for landfilling.

Sludge from the toilets will be delivered to the co-compost plant by cesspool emptier. It will be taken to the dry beds for dewatering for at least 14 days. The leachate from the dry beds will percolate into a 110 m^2 shallow sewage ponds for treatment to achieve pathogen removal by UV. The effluent will be discharged into the vegetation buffer around the Feacal Sludge Treatment plant.

In the receiving and mixing area, the dry sludge will be mixed with organic solid waste from the project area. The mixing ratio between sludge and solid waste will depend on the composition of the sludge. For dewatered sludge a volume ratio between sludge and waste ranging between 1:2 and 1:3; while for liquid sludge it should be 1:5

and 1:10. It is it is advisable to have to dewater sludge coming from septic tanks before it is mixed with the organic waste to be composted.

The septage should spend 90 days in the windrows where the composting temperature will reach 55-60 °C to allow the heat to kill pathogens. The 90 days cycle includes the 30 days for decomposition and 60 days for maturation. Considering the 2040 design period, the total amount of material to be composted in 90 days period is 5,713 tons (or 11,426 m^3 by volume). The composting process is expected to result into 70% reduction in mass of the initial material and final compost density of 0.52 tons/m^3 is assumed. By composting in windrows of about 1.5 m high and 3 m wide with a an empty space of 3 m wide between two adjacent windrows, the 31,100 m^2 dedicated for composting windrows is 22% larger than the areas required for composting in 90 days.

Routine turning of the windrows is recommended to maintain an aerobic process so as to eliminate foul smell. The co-compost will be stored before it is sold off to farmers as manure. The key factors affecting the Feacal Sludge Treatment process and/or the resulting compost quality comprise of the following: -

- Carbon to nitrogen ratio
- Moisture content
- Oxygen supply, aeration
- Particle size
- pH
- Temperature
- Turning frequency and
- Degree of decomposition.

Therefore, there will be need for monitoring equipment namely: Thermometer, Oxygen Meter and a Moisture Meter to monitor the composting process. Other essential equipment will include a wheel loader for turning the windrows and trucks to deliver the municipal solid waste. The flow of leachate to the water treatment pond will be by gravity.

2 POLICY, LEGISLATION AND REGULATIONS

2.1 National policies and Laws on environmental and Social Impact assessment

There are several environmental and social policies and laws that will be triggered during the implementation of proposed Koboko WSSP. A list below provides applicable policies, laws and guidelines:

2.1.1 Policies

- Vision Uganda 2040
- Draft National Environment Management Policy, 2014
- National Water Policy, 1999
- National Policy for the Conservation and Management of Wetland Resources, 1995
- Uganda National Land Policy, 2013
- National Health Policy, 2010
- Uganda Wildlife Policy, 2014
- Uganda Forestry Policy, 2001
- National Gender Policy, 1997
- HIV/AIDS Policy 1992

2.1.2 Guidelines

- EIA Guidelines, 1997
- Environmental Impact Assessment Guidelines for water resources related projects, 2011
- The Environmental Audit Guidelines for Uganda, 1999
- The Environmental Impact Assessment Public Hearing Guidelines of 1999
- The Guidelines for Occupational Safety and Health, Including HIV in the Health Services Sector 2008

2.1.3 Laws

- The 1995 Constitution of Uganda (as amended)
- The National Environment Act, Cap 153
- The Water Act, Cap 152
- The Land Act, Cap 227

- The Land Acquisition Act, Cap 226
- The National Forestry and Tree Planting Act, 2003
- The Uganda Wildlife Act, Cap 200
- The Public Health Act Cap 281
- The Occupational Safety and Health Act No. 9, 2006
- The Physical Planning Act, 2010
- Then Local Governments Act, Cap 243
- The Employment Act, 2006
- The Workers' Compensation Act, 2000
- The Children Act, Cap 59
- The Prevention of Trafficking in Persons Act, 2009
- The Penal Code Act Cap 120

2.1.4 Regulations

- The Water Resources Regulations, 1998
- The Water (waste discharge) Regulations, 1998
- The Water Supply Regulations, 1999
- The Sewerage Regulations, 1999
- The Environment Impact Assessment Regulations, 1998
- The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2000
- The Environment (Waste Management) Regulations, 1999
- The National Environment (Delegation of Waste Water Discharge Functions) Instrument, 1999.
- The National Environment (Standards for Discharge of Effluents into Water or on Land) Regulations, 1999
- The National Environment (Noise Standards And Control) Control of Noise Regulations, 2003
- The Employment (Employment of Children) Regulations of 2012

2.2 Key Environmental Policies, Laws and Guidelines

The water source of the project is River Kochi. The Water Intake facility will be in the river at Nyarabu Village and boreholes will also be constructed along the river banks. The project components will affect the water level of the river, Sediment swirl up and water quality degradation. Since the implementation of the project will affect River Kochi, the following laws will be triggered.

Law/Regulation/Guideline	**Key provisions and Relevancy**
The 1995 Constitution of Uganda (as amended)	The implementation of the project will take into consideration of the Constitution that provides for, *inter alia,* matters pertaining to land, natural resources (such as swamps, rivers and lakes) and the environment. Principle XXVII of the Constitution declares that: a) Utilization of natural resources shall be managed in such a way as to meet the development and environmental needs of the present and future generations of Uganda, particularly taking all measures to prevent or minimize damage and destruction to land, air, and water resources resulting from pollution or any other kind of natural resource degradation. b) The state shall promote sustainable development and public awareness of the need to manage natural resources and to ensure that the utilization of the natural resources of Uganda shall be managed in such a way as to meet the needs of present and future generations.
The Land Act Cap 227	The Act requires a person who owns or occupies land to manage and utilize the land in accordance with the environmental laws and other laws listed in Section 43 including the Water Act and National Environment Act.
The National Environment Act Cap 153	The Act provides a list of projects in the third schedule for which an EIA is a requirement. It also provides for guidelines and regulations for undertaking an EIA and emphasizes public participation in the conduct of an EIA. Sections 19, 20 and 21 of the Act lay out the EIA process, and Sections 22 and 23 make it a requirement to undertake environmental audits and monitoring of on-going activities or projects under implementation.

Law/Regulation/Guideline	Key provisions and Relevancy
The Environment Impact Assessment Regulations, 1998	Regulation 2 (2) provides that no developer shall implement a project for which environmental impact assessment is required under the Act and under these Regulations unless the environmental impact assessment has been concluded in accordance with these Regulations.
The EIA guidelines of 1997	The guidelines establish three major phases through which the EIA should be conducted namely; the Screening phase, the environmental impact study phase and thirdly, the decision making phase.
The Environmental Impact Assessment Guidelines for water resources related projects, 2011	The guidelines under Section 3.4.1 requires that in order to avoid excessive abstraction or pollution of the available ground water resources, an assessment be carried out for all those water use projects that are likely to impact on such groundwater resources in rural and small towns' water supply projects. ESIA for this project has been conducted based on the above provisions of the Act, the EIA regulations and the guidelines followed. NEMA will issue an EIA certificate for the Koboko WSSP after reviewing and approving the ESIA.
The Water Act Cap 152	Under Section 18 (2) a person wishing to construct any works or to take and use water is required to apply to the director of the Directorate of Water Development for a permit to do so.
The Water Resources Regulations, 1998	The developer will be required, to apply for surface water and construction permits from DWRM to abstract water from River Kochi
The Physical Planning Act, 2010	The Act regulates the approval of physical development plans and applications for development permission. Section 37 requires an applicant of a development permit to acquire environmental impact assessment certificate in accordance with the National Environment Act before he or she can be granted full approval to develop. The development of the Koboko WSSP is subject to the control of Physical Planning Authority of Koboko Municipality as mandated under S.12 of the Act.

The WTP in Nyarabu Village will release backwash into River Kochi through the wetlands and there will also be discharge of effluents by FSTP in Mindrabe village, Asunga Parish. All these components have impacts on the water quality, aquatic life, and the wetlands along the river banks and Ozubu Central Forest Reserve (CFR). The following laws and regulations will be triggered at the Water Treatment Plant.

Law/Regulation	**Key provisions and Relevancy**
The Constitution of Uganda 1995 (as amended)	Principle XXI requires the Government of Uganda to take all practical measures to promote a good water management system at all levels. Article 39 provides that every Ugandan has a right to a clean and healthy environment.
The Water Act Cap 152	S. 29 (1) provides that a person wishing to discharge waste may apply to the Director for a waste discharge permit in the prescribed manner. S. 31 (1) deals with prohibition of pollution to water and stipulates that a person commits an offence who; unless authorized under Part 5 of the Act, causes or allows waste to come into contact with any water, waste to be discharged directly or indirectly into water and water to be polluted.
The Water (Waste Discharge) Regulations (1998)	Regulation 4 (1) require a person who wishes to discharge effluent or waste on land or into aquatic environment to apply for a waste discharge permit.
The National Environmental (the Standards for Discharge of Effluent into Water or on Land) Regulations of 1999	Regulation 3 and the schedule prescribe maximum permissible standards limits for effluent or waste to be discharged into water or on land. The water treatment plant and the faecal sludge treatment plant have to comply with the standards as specified in the Schedule of the Regulations. The functions of Executive Director NEMA under the Regulations are to ensure that an operator of a plant undertakes pre-treatment of effluent before discharge into any receiving environment. The powers to enforce this Regulation is delegated to the DWD now DWRM.
The Waste Management Regulations of 1999	The Regulations require waste disposal in a way that would not contaminate water, soil, and air or impact public health.

Law/Regulation	Key provisions and Relevancy
	Regulation 5 requires a person who owns or controls a facility or premises, which generate waste to minimise the waste generated by adopting the following cleaner production methods and reduce toxic emissions and wastes. Regulation 14 requires any person who intends to operate a waste treatment plant or disposal site to apply to NEMA for a licence and Regulation 15 to carry out EIA before the plant is established and an operator of a waste treatment plant or disposal site to carry out an annual audit of the environmental performance of the site or plant and shall submit a report to NEMA. The Developer (MWE) will need to apply for a licence to operate the faecal sludge treatment in accordance with the Waste Management Regulations.
The Local Government Act Cap 243	Under Part 4 of the second schedule of the Act, the local government is mandated to ensure the protection of wetlands, the protection and maintenance of local water resources inter alia. The Koboko District Natural Resources/Environmental officers shall in this respect monitor the project implementation to ensure that the back wash water discharged from the WTP and sewage effluent from FSTP meet the required water quality standard of the receiving environments.

Part of land required to be acquired for the WTP is in Ozubu CFR (1.746 acres. Forests in Uganda have legal protection and conservation provided under the National Forestry and Tree planting Act 2003. Establishment of the WTP in the forest will trigger the National Forestry and Tree planting Act 2003.

The National Forestry and Tree planting Act 2003	The Act provides for the conservation, sustainable management and development of forests for the benefit of the people of Uganda. Section 54(1) (a) states that it is a function of NFA to develop and manage all central forest reserves. S. 38 of the Act provides that a person intending to undertake a project or activity, which may, or is likely to

	have a significant impact on a forest, shall undertake an environmental impact assessment. EIA has been undertaken to have sustainable use of the forest reserve and the MWE will be responsible for undertaking new Forest Management Plan for the reserve and look for alternative land where replacement plantation of trees will be carried. This will be part of MWE corporate social responsibility for paying ecosystem services and actively participating in integrated catchment management.

The project has impacts on public health, which though have been mitigated as given in the ESMP. The FSTP will discharge effluent that contains bacteria and heavy metals, which will affect public health. The water project will cause noise, vibrations, and dust emission from excavation of foundations, trenches for transmission and distribution pipelines. These can potentially impact on public health hence triggering the following laws and regulations.

Law/Regulation	**Key provisions and Relevancy**
The Public Health Act Cap 281	Section 7 provides local authorities with administrative powers to take all lawful, necessary and reasonable practicable measures for preventing the occurrence of, or for dealing with any outbreak or prevalence of, any infectious, communicable or preventable disease, to safeguard and promote the public health. Koboko District /Municipal council will take measures, including if necessary, proceedings at law to ensure mitigation of the project impacts on public health within their Jurisdiction.
National Environment (Noise Standards And Control) Control of Noise Regulations, 2003	Regulation 6 established permissible noise levels for a facility. Regulation 12 requires that any owner or occupier of premises whose works or activities are likely to emit noise in excess of the permissible noise levels shall apply to the Executive Director of NEMA for a license to emit noise in excess of the permissible levels. The project Developer will apply for the license from NEMA so as to comply with standards provided under the Regulations.

2.3 Key Social Policies, Laws and Guidelines.

The construction will require both unskilled and skilled labour. These require protection equipment (PPE) and there are likely challenges to arise from the treatment of the workers. Accidents such as fire out breaks at the WTP facility in Nyarabu Village, collapse of facilities at the various facility sites, and injuries may occur during the construction, operational and decommissioning phases of the project. Such employment issues will trigger the following laws.

Law/Regulation	**Key provisions and Relevancy**
The Employment Act No 6, 2006	The Act makes provisions for governing legal statutory instrument for the recruitment, contracting, deployment, remuneration, management and compensation of workers. It mandates Labour Officers to regularly inspect the working conditions of workers to ascertain that the rights of workers and basic provisions are provided and workers' welfare is attended to. Further, it has provisions prohibiting forced labour, discrimination and sexual harassment at workplaces (Part II; Part IV), Providing for labour inspection by the relevant Ministry (Part III) and stipulating rights and duties in employment (weekly rest, working hours, annual leave, maternity and paternity leaves, sick pay, etc. (Part VI). The Developer shall be required to treat workers with fairness and without discrimination and in addition, Koboko District Labour officers shall regularly monitor the Contractor's compliance.
The Occupational Safety and Health Act, 2006	The Occupational Safety and Health Act, 2006 provides for, general duties, obligations and responsibilities of employers, rights and responsibilities of workers and general safety requirements. Section 13 (1) a stipulates that it's the responsibility of the employer to take, as far as is reasonably practical all measures for the protection of his or her workers and the general public from the dangerous aspects of the employer's undertaking at his or her own cost. The employer should ensure, as far as is reasonably practical, that the working environment is kept free from any hazard due to pollution. Section 19 requires an employer to provide adequate and suitable protective clothing and protective equipment to the workers of his or her undertaking. The Koboko WSSP should adhere to occupational safety and health rules according to the mitigation measures suggested

Law/Regulation	Key provisions and Relevancy
	in this report such as workers be trained in health safety, given the PPEs and given access to a first aid kit.

The project may have risk of using children labour at construction sites and therefore the underlying provisions have to be complied with. The following laws relating to protection from child labour will be triggered.

Law/Regulation	Key provisions and Relevancy
The 1995 Constitution of Uganda (as amended)	Article 257 defines a child as any person below the age of 18 years. (*Also Section 2 of the Children Act Cap 59 and the Prevention of Trafficking in Persons Act 2009*) Article 34 (4) of the Constitution provides that Children are entitled to be protected from social and economic exploitation and shall not be employed in or required to perform work that is likely to be hazardous or to interfere with their education, to be harmful to their health or physical, mental, spiritual, moral and or social development.
The Employment Act 2006	Section 32 prohibits employment of a child under the age of twelve years to be employed in any business, undertaking or work place. The Act permits a child of under the age of fourteen years to be employed on condition that work is light work and carried out under supervision of an adult aged over eighteen years and does not affect the child's education. It also requires that the child is not employed in any employment or work which is injurious to his or her health, dangerous or hazardous or otherwise unsuitable and that a child does not work between the hours of 7 p.m. and 7 a.m. The person who employs such a child has to notify a labour officer in writing that the employment or work complies with the above conditions.
The Employment of Children Regulations of 2012	The Regulations also emphasize that a child employed under the age of fourteen years shall not be employed in any business undertaking or workplace, except for light work carried out under the supervision of an adult and where the work does not exceed fourteen hours per week. They prohibit employment of a child to do work which is injurious, dangerous, and hazardous or in the worst forms of child labour. Overtime work is prohibited for a child aged

Law/Regulation	Key provisions and Relevancy
	between fifteen to seventeen years and a child shall not be employed at night between the hours of 7.00 p.m. and 7.00 a.m. The Ministry of Water and Environment will work with the Ministry of Gender, Labour and Social Development to ensure prohibition of child labour by the contractors of the project.

Women and child sexual abuse by contractors is on the rise in Uganda and in undertaking the project activities. Protection ought to be given to Children and women against sexual abuse and therefore the laws below will be triggered.

Law/Regulation	Key provisions and Relevancy
The Penal Code Act Cap 120	Section 129 stipulates that any person who has sexual intercourse with a girl under the age of 18 is guilty of an offence and is liable to suffer death and also stipulates that any person who unlawfully and indecently assaults a boy under the age of 18 is guilty of felony. Section 131 prohibits procurement or attempting to procure a girl for the purpose of commercial sexual exploitation. *(Also Regulation 5 of the Employment of Children Regulations 2012)* Section 123 makes it an offence to have sexual intercourse with a woman without her consent and Section 132 prohibits procuring defilement of women and girls by threats or intimidation or false pretences or false representations or administration of drug, matter or thing with intent to stupefy or overpower.
The Prevention of Trafficking in Persons Act 2009	Section 8 prohibits recruiting a person below 16 years in any form of employment for the purposes of exploitation or introducing or matching any person to another for purposes of sexual exploitation In Implementation of the project, the Ministry of Water and Environment will work with the Ministry of Gender, Labour, and Social Development to make sure that the women and children are not sexually exploited by the contractors. Koboko District Labour officers have a key role in monitoring compliance of the contractors.

2.4 Legal, policy and regulatory framework for resettlement in Uganda

The project involves construction of water supply and sanitation plants and transmission lines that require acquisition of land. This implies that the Central

Government and Local Government have the responsibility to acquire land for the construction of the different project facilities (i.e. water intake, WTP, transmission and distribution mains and FSTP) which means compensation of Project Affected Persons (PAPs). The different types of land tenure and the acquisition processes, under Uganda laws are given below.

2.4.1 Customary land

Much of the land required for the Koboko WSS Project is under customary tenure. This is a system of land tenure whereby the right over land is regulated by local customs. Ownership of land in the area is under the headship of clan leaders who are key decision makers in its use and transfer. The proposed land for the water intake (0.169 acres) owned by Ayila Dada, part of the land for the WTP (1.528 acres) owned by Karala Hussein, the FSTP land (10.298 acres) owned by the Mindrabe community, Teremunga reservoir land (1.478 acres) owned by Midia Pacayo, and land the transmission line land owned by 7 other people is all under customary tenure. Implementation of the project on this land will trigger the laws below.

Law/Regulation	**Key provisions and Relevancy**
The 1995 Constitution	The Constitution restored recognition of the rights of those who held customary land (Article. 237 (3) (a) and (4)).
The Land Act Cap 227	Section 3 (1) of the Act explicitly recognized that customary law should regulate this form of land tenure. It states that customary land tenure shall be governed by rules generally accepted as binding by the particular community. Anyone who acquires land in that community shall also be bound by the same rules except where such rules are repugnant to natural justice, equity and good conscience. The required land therefore shall be acquired as per the customary rules in the respective areas with the involvement Clan leaders, families and local council 1 Chairpersons.

2.4.2 Leasehold land

The land for the proposed Appa Reservoir (0.096 acres) belongs to NWSC that has leased it to Koboko Police Station. Establishment of the Reservoir on this land will trigger the following laws

Law/Regulation	**Key provisions and Relevancy**
The 1995 Constitution of Uganda	Article 237 (3) (d) provides that land in Uganda belongs to the citizens of Uganda and shall vest in them in accordance with the land tenure systems provided for in there under including the leasehold tenure
The Land Act Cap 227	Section 3(5) of the Act provides that leasehold tenure is a form of tenure whereby one party grants to another the right to

Law/Regulation	Key provisions and Relevancy
	exclusive possession of land for a specified period, usually in exchange for the payment of rent. Any owner of land in Uganda whether through freehold, Mailo or customary tenure may grant a lease to another person. The use of the 0.096 acres of land for the reservoir shall therefore require direct negotiations by MWE and NWSC. NWSC has the right to terminate the lease or have mutual adjustments in the lease terms with Koboko Police Station to necessitate development of the project component.

2.4.3 Public land

Part of the Land required for the WTP (1.746 acres) is public land that has a Central Forest Reserve (Ozubu CFR) managed and controlled by the National Forestry Authority (NFA). The proposed land is currently licensed to British American Tobacco (BAT).

S.5 (1) of the National Forestry and Tree Planting Act, 2003 provides that the Government or a local government shall hold in trust for the people and protect forest reserves for ecological, forestry and tourism purposes for the common good of the citizens of Uganda.

Establishment of the WTP in Ozubu CFR will be through either licensing or de-gazetting. S. 44(5) of the Land Act and S. 41 authorizes NFA to grant licenses for use of forests to any interested person without transfer of interest.

Licensing will involve the MWE negotiating with NFA for a license to enter the forest and use forest resources. Licensing will require NFA to cancel the BAT license over the area in accordance with the terms stipulated in the existing license. Special conditions for the new license may be provided by NFA taking into account the WTP impacts on the environment. An annual premium will be paid and the duration may be up to 25 years. However, the land and accessibility remain in the hands of NFA.

De-gazetting will involve NFA surrendering the required piece of land entirely to the MWE. However, this calls for the MWE to pay for the land, prepare an EIA for de-gazetting, including the review of local, national and international legal obligations that require de-gazetting. Both district and national public hearings will be held to get the input of stakeholders. S. 8 (5) of the National Forestry and Tree Planting Act requires a Parliamentary resolution for de-gazetting. The request will therefore be taken to Parliament for debate and once the motion is passed then MWE will have to look for a suitable land commensurate to the land it has acquired and plant trees.

Due to the encumbrances (both legal and procedural) MWE is likely to encounter in acquiring Ozubu CFR land, it is better that the WTP is constructed entirely outside the forest reserve. This means acquiring land from private land owners bordering the forest reserve.

2.5 Compulsory land acquisition

Failure to reach consensus with the freehold and customary owners of land as above invokes government's compulsory land acquisition with adequate compensation. The principle of eminent domain (compulsory acquisition of land) allows Governments to lawfully acquire land for public purposes. The following laws will be triggered in circumstances of compulsory land acquisition.

Law/Regulation	**Key provisions and Relevancy**
The 1995 Constitution (as am ended)	Under Article 26, everyone has the right to own property either individually or in association with others. It further stipulates for compulsory acquisition where it is for public use but this should be done with by prompt payment of fair and adequate compensation prior to acquisition and with a right of access to courts of law.
The Land Act Cap 227	Section 42 provides that the Government or Local Government may acquire land in accordance with the provisions of Article 26 and 237(2) of the 1995 Constitution. Section 77 provides for the computation of compensation for the affected parties.
The Land Acquisition Act Cap 226	The Act governs compulsory acquisition of land for public purposes in addition to the Constitution of Uganda and the Land Act. S.2 (1) of the Land Acquisition Act provides that the Minister is empowered to acquire any land if he is satisfied that the land is required for "Public Purpose". Section 42 the Act makes provision for payment of compensation to any person whose interest in land is extinguished as a result. The Koboko WSS project is in public interest since it is targeted at enhancing sustainable supply of clean and safe drinking water.

The procedure for compulsory acquisition of the land for the Koboko WSSP is as follows:

- The Minister for Lands and Urban Development will authorize Ministry of Water and Environment to find out the suitability of land for the purpose it is being acquired. This includes surveying the land, digging or boring the land for samples, etc. If damage occurs on the land, Government compensates the land owner for the damage (Section 2 of the Land Acquisition Act);

- The Minister then makes a declaration by statutory Instrument (by law) that the land is suitable and a copy of the declaration given to the owner of the land (Section 3 of the Land Acquisition Act);

- The Assessment Officer (this is a public officer appointed by the Minister) orders the marking ,measuring of the land and a plan of the land to be made (Section 4 of the Land Acquisition Act);

- A notice of not less than 15 days is given inviting all people having interest in the land to the assessment officer on a day, time and place specified in order to determine the nature of their claims, the amount of compensation to be paid and any objections they may have to the plan for the land use(Section 5 of the Land Acquisition Act);

- The Assessment officer on the day specified hears the claims and makes an award specifying the true area of the land and the compensation which should be paid to each person having an interest in the land (Section 6(1) of the Land Acquisition Act);

- Compensation is paid basing on the current market price of the land in the area prepared annually by the District Land Board. (Section 59(1) (e)&(f) of the Land Act);

- Any person aggrieved by the award of the Assessment Officer may appeal to the District Land Tribunal or the High court if the Value of the land exceeds 50,000,000/= (Section 76 1(b) &(c) of the Land Act) the Uganda Land Commission then pays compensation for the value of the land if no appeal is made to the Courts of law (Section 6(4) (b) of the Land Acquisition Act).

2.6 World Bank Safeguard Policies

The Koboko WSS Project is supported by the World Bank. The Banks environmental and social safeguard policies requirements have to be met. The operational policies triggered in this project are summarized in the table below.

Table 1 Summary of safeguards policies triggered by the project.

Safeguard Policies Triggered	Reason
Environmental Assessment OP/BP 4.01	OP 4.01 is triggered as the project may have potential adverse environmental and social impacts during construction and operational phase. During construction there will be vegetation clearance, excavations, vehicular movement of construction materials which are likely to cause noise, dust, vibrations, accidents, influx of immigrate labour, child abuse, land take etc. During operation the use of hazardous chemicals like chlorine and Alum are likely to have an impact on the environment and may affect workers causing occupational hazards. The disposal of backwash water, water treatment sludge, faecal sludge and the obnoxious odour from faecal sludge treatment facilitate are likely to cause environment and social impacts.
Natural Habitats OP 4.04	OP 4.04 is triggered due to project activities in ecologically sensitive areas such as the riverine vegetation on the riverbanks of Kochi and a planted tick tree forest in Ozubu Central Forest Reserve.
Forests OP/BP 4.36	OP 4.36 will be triggered because there are potential project impacts on Ozubu Central Forest Reserve. This will be offset through avoidance and/or reforestation specified in Forest Management Plan as recommended n this ESIA.
Physical Cultural Resources OP/BP 4.11	So far in this ESIA, no Physical Cultural Resources like graves, shrines have been found above ground in the project area. However, with excavations, chance finds of archaeological / paleontological value may be found. Hence there is a possibility this safeguard may be triggered by the project.
Involuntary Resettlement OP/BP 4.12	OP 4.12 is triggered due to land take for the, Water Intake, WTP, the FSTP, Teremunga reservoir.
World Bank Policy on Access to Information (July 1, 2010)	This policy will be triggered since there is need for policy on disclosure of information to all the stakeholders. Compliance has been ensured by sharing the information with all the stakeholders such as district technocrats, Town council/Municipal and Local council leaders, and communities among others during the consultations process. Information will remain accessible by them.

3 ENVIRONMENTAL AND SOCIAL BASELINE

3.1 Physical Environment

3.1.1 Climate

Koboko District has a bi-modal rainfall pattern with a wet season that begins from April to November punctuated with short dry spells in June. The June dry period is less pronounced as exhibited in Figure 3-1. August and September are the wettest months with rainfall exceeding 200 mm/month. As shown in Figure 3-1, the dry season run from December to March of the following year. According to FAO (2005), the average annual rainfall varies from 1,312 mm to 1,740 mm with a mean of 1,525 mm. The potential evapotranspiration varies between 100 to 160 mm in January – March period when it exceeds the rainfall because of the high temperatures. The daily temperatures vary between 17 °C and 31 °C with January – March as the hottest period with a maximum daily temperatures reaching 31 °C.

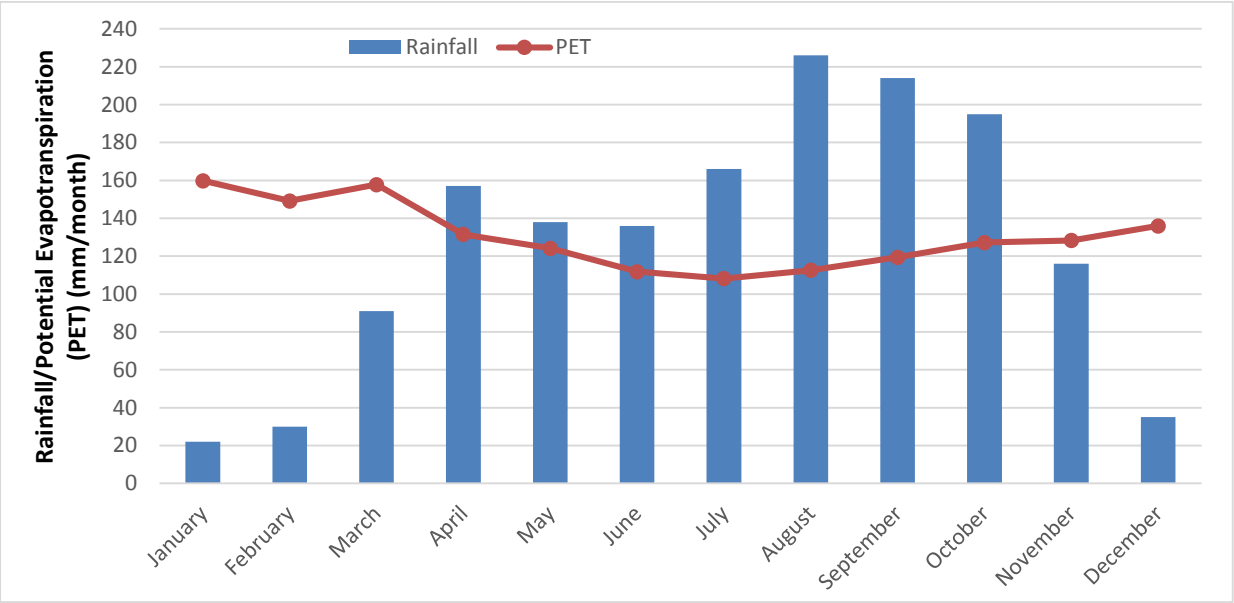

Figure 3-1: The Rainfall and Potential Evapotranspiration (PET) for Koboko Town

Source FAO 2005.

3.1.2 Geology and Soils

Koboko District is underlain by early Proterozoic granitised rocks. The main rock groups are pyroxene gneisses, charnockites and acid gneisses. The dominant soils types are the Ferrallitic soils which are mainly sandy clay loams and sandy sediments with a strip of lithosols covering vast areas of project Sub Counties as shown in Figure 3-2. The lithosols are dark cotton soils, clay loams soils from dark grey to dark which are slightly acidic. They are mainly derived from granite, gneissic and sedimentary rocks (KDLG, 2011).

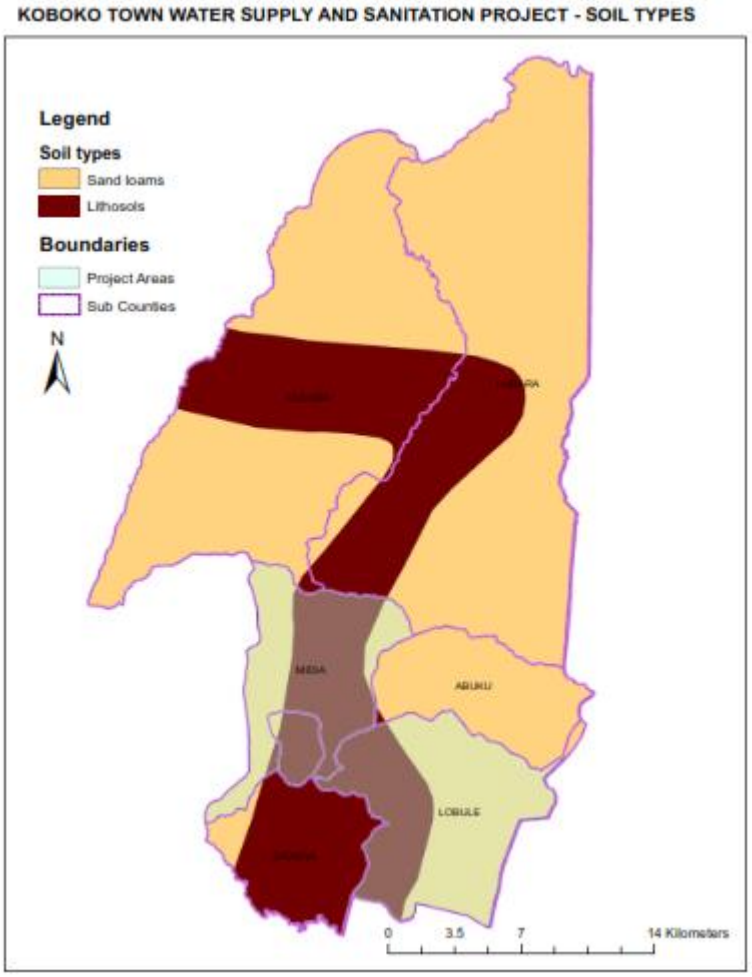

Figure 3-2: Distribution of the soil types in Koboko District

3.1.3 Topography

Koboko District is generally flat with gentle slopes (mostly less than 15%) and elevation that lies between the 881 m and 1,374 m above sea level and slopes to the North East and East as shown in Figure 3-3. This topography, however, could not be utilized for gravity driven flow in transmission lines but distribution will be by gravity since the reservoirs are at higher elevation or elevated.

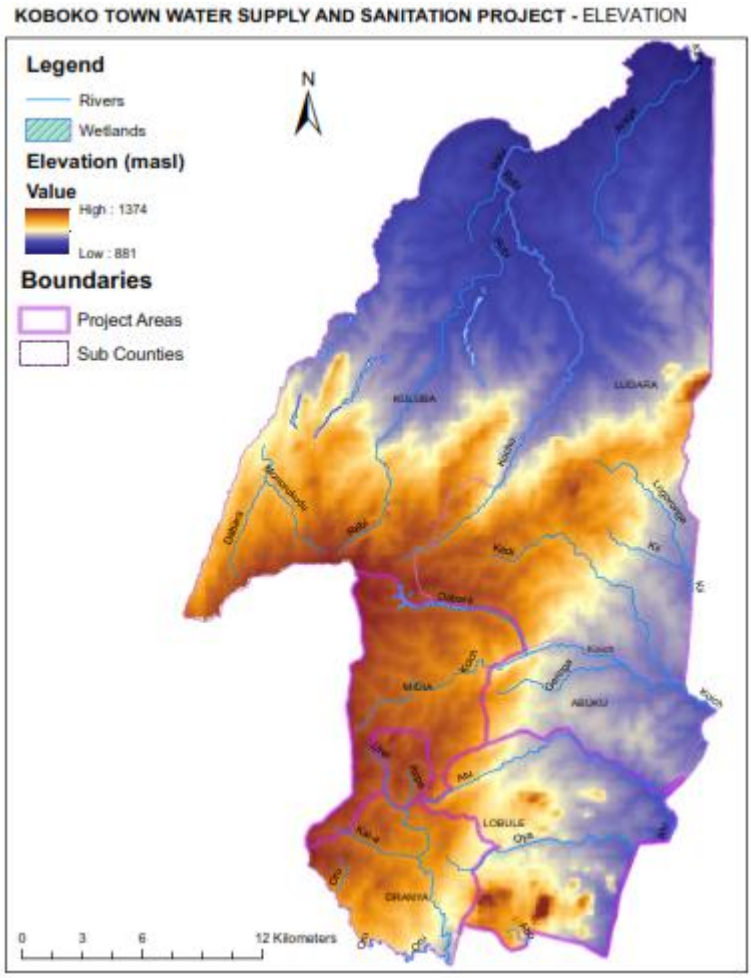

Figure 3-3: Elevation of the project areas using SRTM DEM of resolution 90 m.

3.1.4 Water resources

Koboko District generally lacks adequate surface and groundwater resources. River Kochi is the main and the most important river. It maintains flows all year around. Rivers such as Urei, Oru, and Atu are small and usually dry up in dry season. As well, the wetland resources of Koboko are very limited. According to the wetland cover map from NEMA, It has only 2 km² of seasonal wetland. This represents just 0.2% of the total 760 km² of the District land. Figure 3-4 show the distribution of the water resources. Wetlands play very vital roles in supply water to communities as well as filtering pollutants that would find their way into water courses. This advantage would farther be lost if the project does not conserve the limited wetland resources.

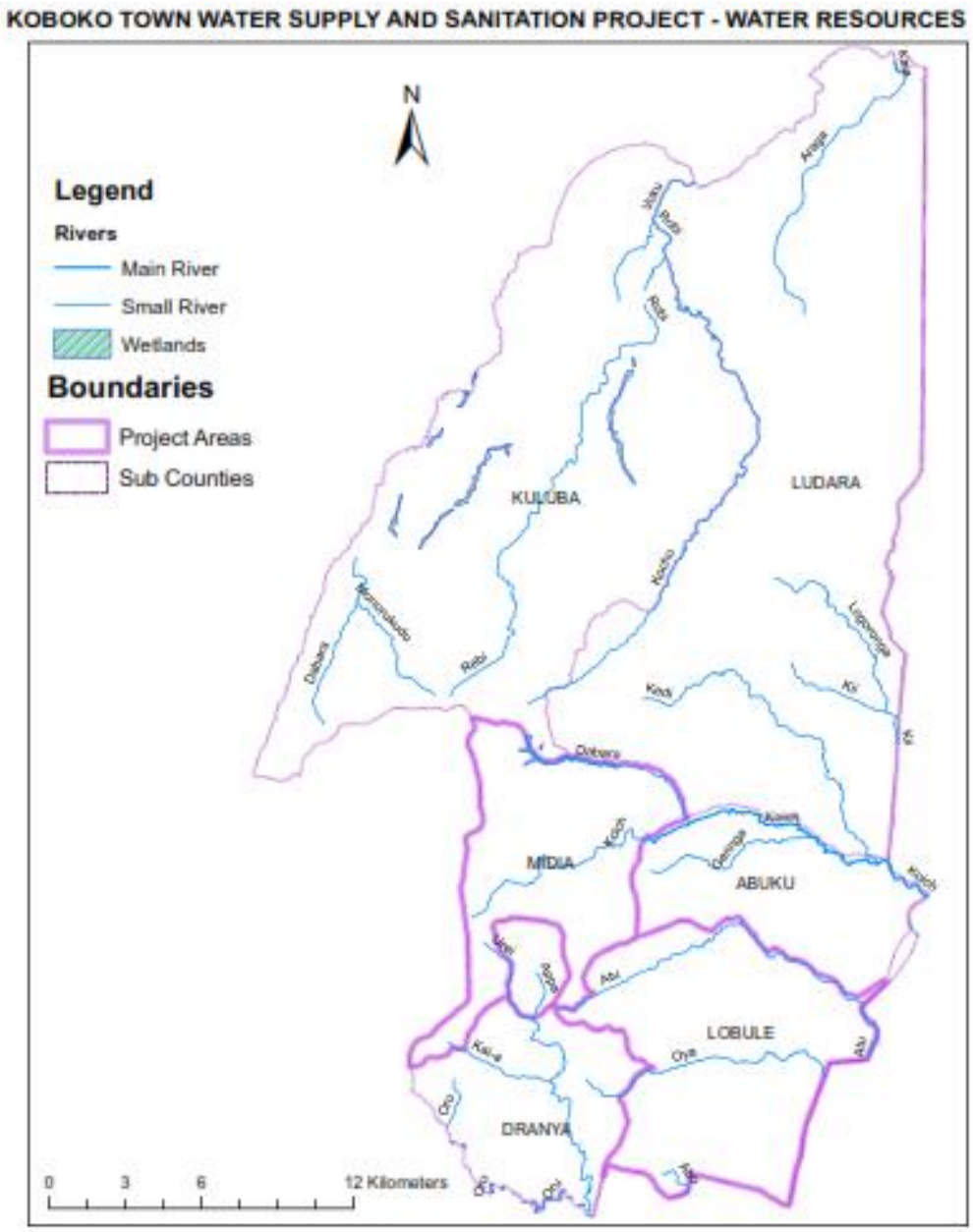

Figure 3-4: Distribution of water resources of Koboko District.

3.1.5 Hydrology of River Kochi

Flow data and trend analysis

River Kochi is gauged in Yumbe District with flow records only available from 1955 to 1978 period but are punctuated with missing data from 1960 to 1970. Additionally the years 1975 and 1978 have missing data for three consecutive months and were therefore omitted from the time series analysis. Since River Kochi has a very short flow record with the last record taken in 1978, flow trends of the nearby River Inyau was studied to understand behaviour of River Kochi especially after 1978. River Inyau has flow records from 1955 to 2014 but it also has missing records from 1959 to 1963 and 1978 to 1998.

Trend analysis of flows from both River Kochi and Inyau shows that both rivers have seasonal variations that reflect differences in seasonal rainfall. Flows peaks occur in August – September period when peak rainfall occurs. As shown in Figure 3-5, Kochi flows exhibit higher peak flows during rainy season but has a lower base flow in dry season unlike River Inyau that has relatively small peak flows but maintains a higher flow in dry season. Perhaps the small wetland coverage in the Kochi basin is responsible for high peak flows in rainy season and very low flows in dry season because there is no storage. Wetlands play a big role in water storage and regulating flood flows. The similarity in the flow patterns of both rivers shown in Figure 3-5, (i.e. peaks and low flow occurring at the same time) is indicative of the fact that both rivers are in the same climatic zone, and rainfall – runoff is the main flow driver.

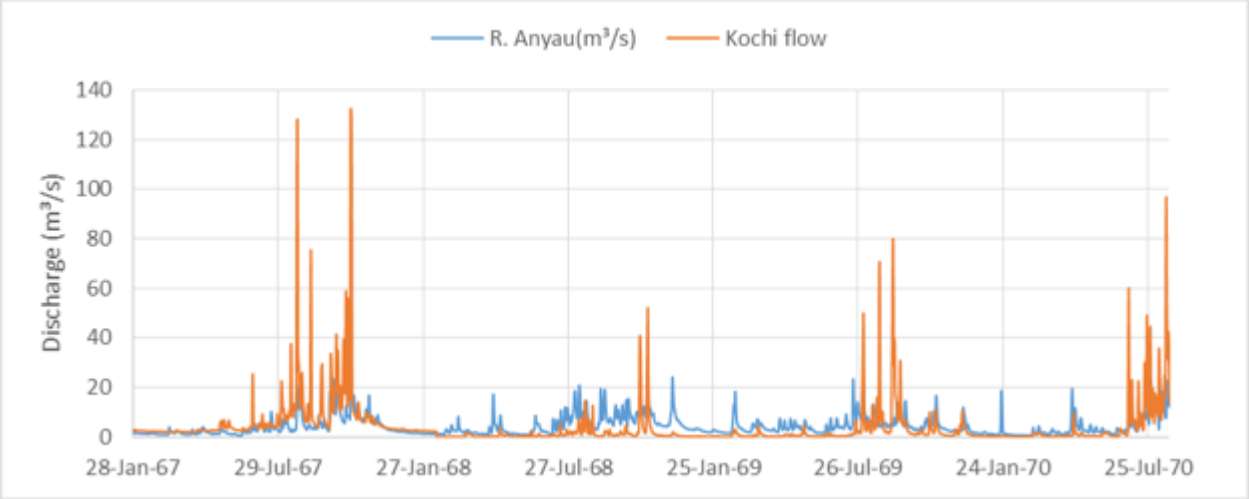

Figure 3-5: Comparison of the flows of river Kochi and Inyau.

As shown in Figure 3-6, a graphical analysis of the annual maximum flow of river Kochi shows a slight decline in the peak flows for the 1955 – 1978 period but the low flows showed significant decline in the same period. Likewise, River Inyau similarly showed a similar pattern with low flows declining for period. Flow from River Inyau from 1999 to 2014 shows even much lower flows in dry seasons. Two reasons can be advanced to explain these scenarios. It appears after 20 years without records, a new gauging station was installed on River Inyau or the old station was repaired. The repair or installation of a new gauging station could have changed the sensitivity and accuracy of the station, therefore it is giving a consistently accurate but lower flow reading in dry season. Secondly, the ever increasing water demand and subsequent abstraction of river water for different uses are perhaps responsible for the observed decline. Whatever the cause, it is factual that a significant decline is observed especially in dry season. The available flow data are short to give a conclusive insight of climate change impacts.

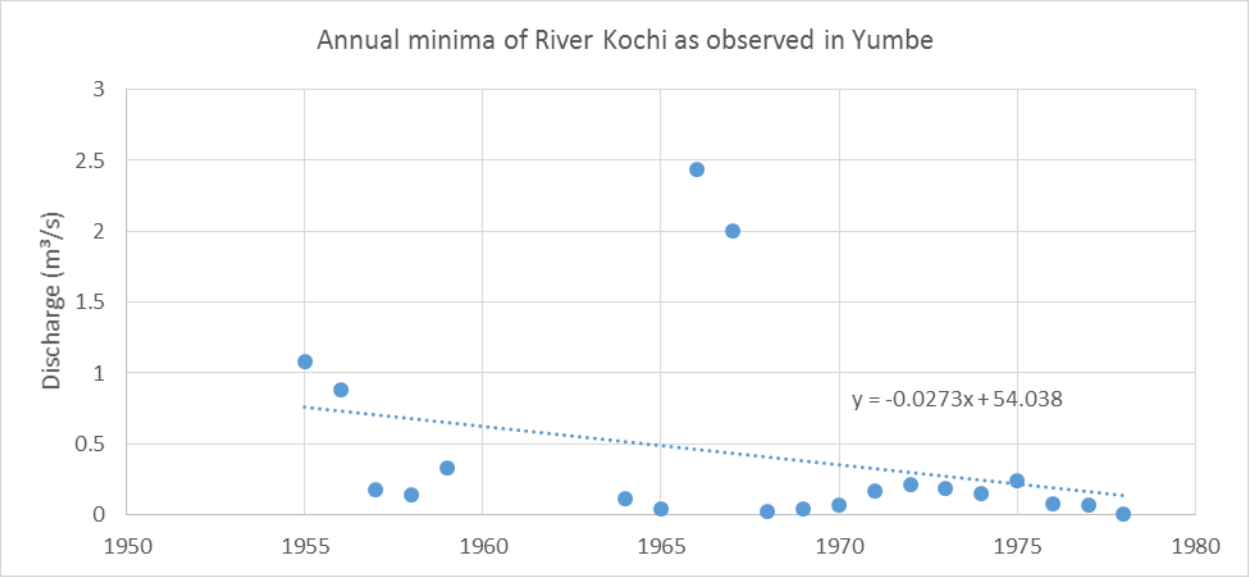

Figure 3-6: Trends of the annual minima of River Kochi flows.

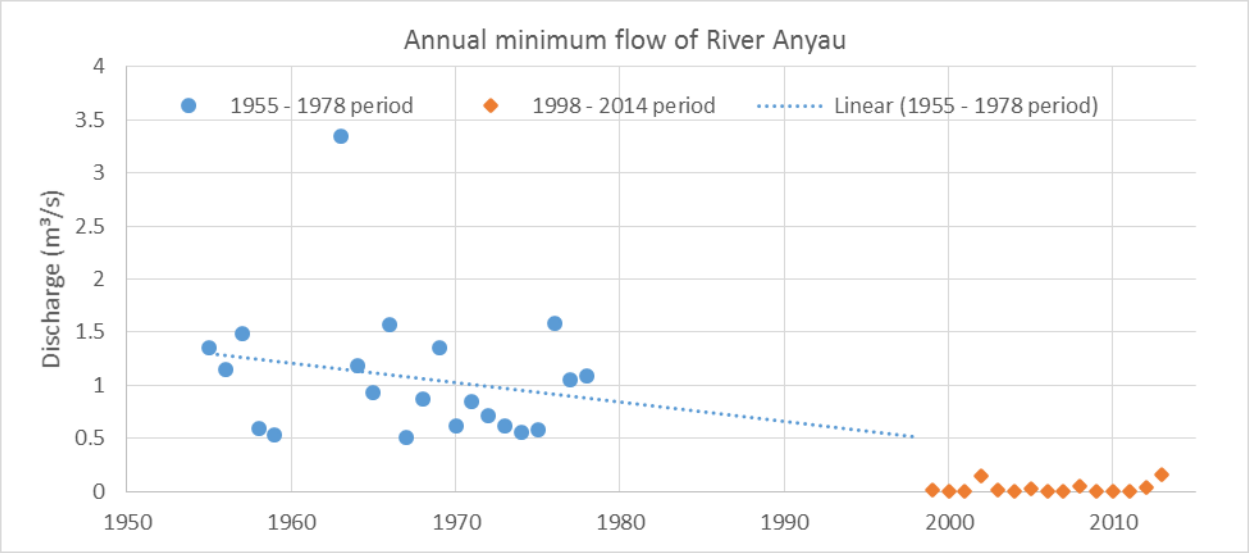

Figure 3-7: The Annual Minimum flow of River Inyau.

River Kochi flows at proposed water intake

The proposed intake for Koboko WSS Project is on a tributary of River Kochi. The catchment area above the proposed intake (at UTM 36N 0277399E, 0382985N) is 34 km² while the catchment area at the gauging station in Yumbe is 838 km². Being a tributary of River Kochi, the catchment above the intake point is assumed homogenous and therefore the flows through the proposed intake point can be estimated by a linear regression method proposed by McMahon et al. (n.d.). The method assumes that the peak and the low flows of the main river and its tributary occur at the same time but the flow magnitude vary depending on the catchment size. The method further assumes that the ratio of discharges is equal to the ratio of catchment areas to some power b. The method is expressed as follows:

$$Q_u = \left(\frac{A_u}{A_g}\right)^b Q_g \qquad \text{Equation 3-1}$$

Where exponent b varies from 0.5 to 0.85 but usually 0.6 is recommended unless stated or determined by local evidence, Q_u is the discharge at ungauged station while Q_g is the discharge at gauged station. Using the above equations, the flows of River Kochi were derived.

Extreme flow conditions

Whereas the mean annual flows are useful for flow studies, stream reliability especially for water supply are best explained by understanding the extreme flows, thus the low and high flows. Therefore, the annual minimum and maximum flows of River Kochi at proposed intake were selected and analysed further. The selected minima and maxima are presented in Table 2.

Table 2: The minima and the maxima of flows of River Kochi at intake point.

Year	Kochi flows observed in Yumbe		Derived flows at proposed intake	
	Maximum flow	**Minimum flow**	**Maxima**	**Minima**
1955	147.781	1.081	21.605	0.158
1956	125.048	0.882	18.282	0.129
1957	89.550	0.179	13.092	0.026
1958	376.079	0.144	54.982	0.021
1959	153.446	0.330	22.433	0.048
1960				
1961				
1962				
1963				
1964	166.299	0.111	24.313	0.016
1965	102.608	0.044	15.001	0.006
1966	45.353	2.437	6.631	0.356
1967	131.846	2.004	19.276	0.293
1968	52.082	0.026	7.614	0.004
1969	80.088	0.042	11.709	0.006
1970	119.404	0.073	17.457	0.011
1971	69.491	0.170	10.159	0.025
1972	76.443	0.214	11.176	0.031
1973	92.604	0.191	13.539	0.028
1974	83.766	0.150	12.246	0.022
1975	149.252	0.238	21.820	0.035
1976	62.161	0.075	9.088	0.011
1977	100.226	0.067	14.653	0.010
1978	210.452	0.003	30.768	0.000

Low flows

A frequency analysis of the annual minima were performed. A log normal distribution was found to fit well the low flow distribution. A scatter plot and a fitted power function are presented in the low flow analysis gives a distribution as shown below in Figure 3-8.

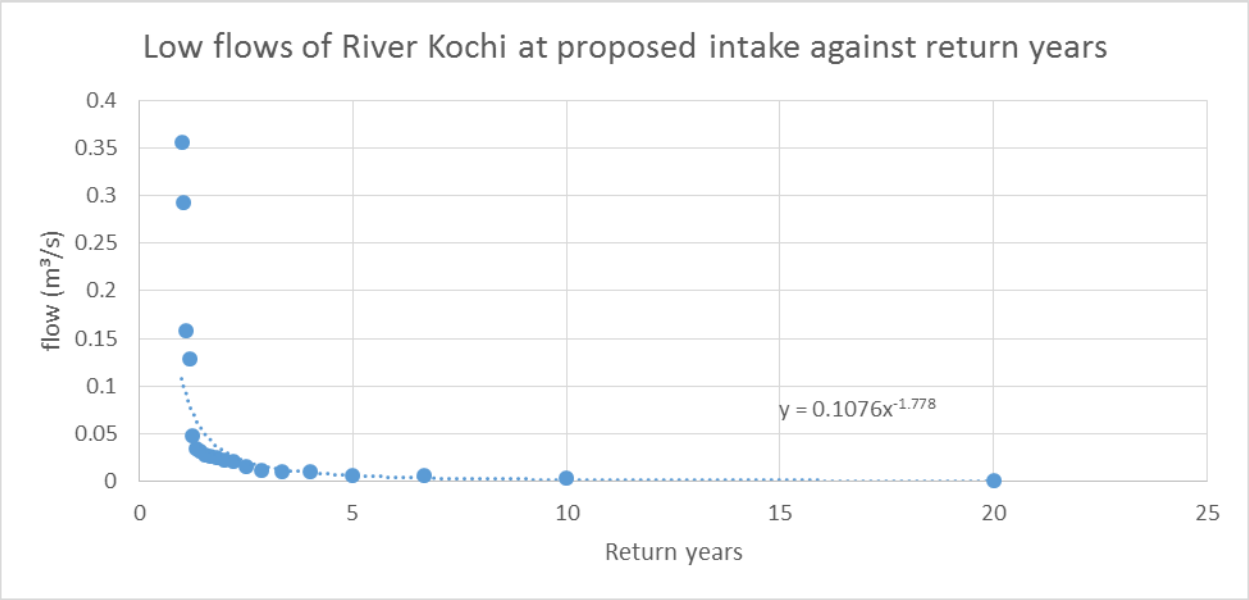

Figure 3-8: Frequency distribution of annual minima flows for River Kochi

The distribution was fitted with a power equation given as follows:

$$y = 0.1076x^{-1.778}$$

Where y is the discharge in m³/s and x is the return period in years

The equations were used to extrapolate the low flows with return periods beyond observation. Table 3 gives a summary of the flows with their respective low flows.

Table 3: Comparison of return periods and low flows of River Kochi

No	Return period (years)	Lowest flow of river Kochi at proposed intake (m³/s)
1	50	0.0001025
2	25	0.00035
3	10	0.00179
4	5	0.0061
5	2	0.0313
6	1.4	0.05833

Field hydrological assessments

During the ESIA field surveys, the flow of River Kochi at proposed intake was measured twice. Pictures taken from site on different occasions shown in Plate 2 give an insight to the flow scenario at the intake point. On both occasions, low flows were observed. The flows measured from the field are presented in Table 4 below.

Table 4: Measured flows of River Kochi at proposed intake point.

No	Date	Flow (l/s)
1	6th March 2015	30
2	26th May 2015	34

Plate 2: Slow flowing water at the proposed intake.

(The upper picture was taken on 26th March 2015 while the lower picture was taken on 25th May 2015, both by ESIA team).

The first measurements were made at the end of dry season in March while the second was during the rainy season but before the peak rainfall of August – September (see Figure 3-1 above for rainfall distribution pattern). The flows between the two periods did not change much, an indication of low flows between March and May.

From Table 3, it's expected that at least once in every 25 years, the lowest daily flow of River Kochi at intake point will be 0.00035 m³/s or lower. This clearly fails a design criteria where a low flow with a 25 years return period is required to be at least two times larger than the water demand. Even the river flow measured during the ESIA surveys highlights that there is no adequate water in the river to support proposed abstraction rates. The designed abstraction rate for Koboko WSS Project is 210 m³/h (or 0.05833 m³/s) for the 2030 phase and is expected to be increased to 280 m³/h (or 0.07778 m³/s) for the 2040 period. Noting from Table 3, the abstraction rate for Koboko in the 2030 phase has a probability of not being met once every 1.4 years. It must be noted that when the environmental flow is considered at 30%, the demand will not be met every year and for most parts of the dry season. Certainly, during the low flow periods, the river cannot support the planned abstraction rate while conserving the required environmental flow.

If River Kochi is experiencing a similar trend as River Inyau where the low flows reduced significantly in the 1999 to 2014 period, then the low flows used for the analysis certainly overestimates the present situation. This would suggest that the actual flows are much lower and the water supply deficit for Koboko WSS project will be worse.

Flood flow frequency

On the other hand, River Kochi experience floods flows during the rainy season. There was evidence that the culverts were flowing full during rainy seasons. To understand the frequency of the flood, frequency analysis were performed on independent peak flows. The independent peak flows were selected using WETSPRO tool (P. Willems, 2004) to eliminate serial dependence effect on analysis. The selected peaks were analysed and found to fit well with Exponential Distribution of the General Extreme Value Distributions (Patrick Willems, 2005). Using exponential distribution equation with computed parameters, extrapolation of the flood flows were done to determine the flood with return periods higher than observed flows periods. The results are shown in Figure 3-9.

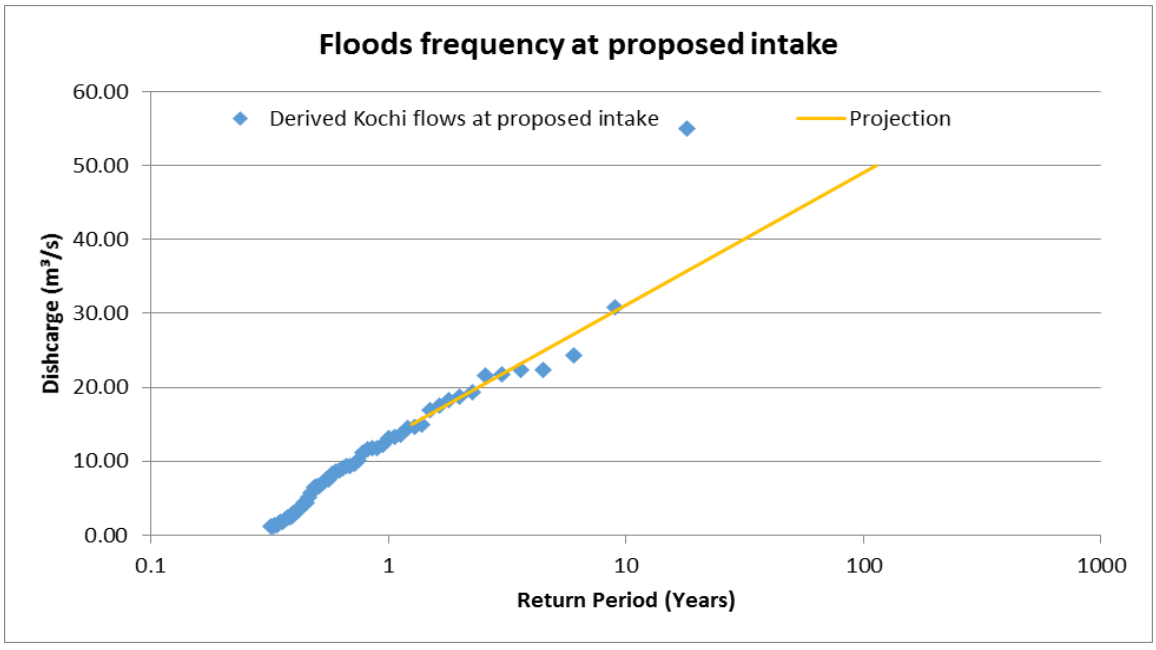

Figure 3-9: The flood frequency of Kochi River at proposed water intake.

Figure 3-9 shows that River Kochi can have a flow of more than 30 m³/s once every 10 years while the flood of more than 10 m³/s can be experienced every year.

Table 5 presents possible flood flows at proposed intake along River Kochi with their respective return periods

Table 5: Comparison of return periods and maximum flow of River Kochi at intake.

No	Return period (years)	Maximum flows of river Kochi (m³/s)
1	500	61.59
2	150	52.22
3	100	49
4	50	43.6
5	10	31.15

The flood frequency shows a possibility of experiencing floods of at least 13 m³/s every year at the proposed intake but the low flow analysis shows a contrary scenario. The flows are so low that every one in five years, there will be a flow that is less than the water supply demands. There is a concern that the available water may not satisfy the water demand nor will it maintain the recommended environmental flow for most times of the dry period.

Water Quality of River Kochi

During the detailed ESIA surveys, the water from River Kochi was sampled from proposed intake point and analysed at the National Water and Sewerage Corporation Central Laboratory, Bugolobi. It's worth noting that sample was done during the dry season. A summary of some quality parameters are presented in Table 6 whereas the analysis certificate with detailed results are presented in APPENDIX 2: WATER QUALITY RESULTS.

In comparison, the water showed a better quality during the ESIA surveys than during Feasibility Study period. The Turbidity, Fluoride and total suspended solids (TDS) loads are lower than was reported during feasibility studies (see Table 7 for quality during Feasibility studies). However, the bacteriological coliforms were so high, well above the drinking water standards. This is indicative of the ranges between which the parameters vary during different seasons. The parameters can be corrected with treatment.

Table 6: The baseline water quality of River Kochi sampled during ESIA surveys.

Parameter	Units	River Kochi	National standards for potable water (Untreated water)
pH		7.31	6.5 – 8.5
Electrical conductivity	µS/cm	106	2500
Hardness	mg/L	40	500
Turbidity	NTU	14.3	10
Total Dissolved Solids (TDS)	mg/L	68	1200
Total Suspended Solids (TSS)	mg/L	9	0
Fluoride: F	mg/L	0	1.5

Chloride -CL	mg/L	2.0	500
Nitrate -N	mg/L	0.3	5.0
Biochemical Oxygen Demand (BOD)	mg/L	6.0	-
Chemical Oxygen Demand (BOD)	mg/L	775	-
Total phosphorous	mg/L	0.16	-
Total Nitrogen	mg/L	0.9	-
Bacterial Coliforms	CFU/100 mL	20	0

Table 7: Water Quality of River Kochi during Feasibility study.

Parameters	Physio-Chemical				
	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	Fluoride F- (mg/L)	Iron: total (mg/L)
Kochi river	45.8	18	27	0.0	2.0
National Standards for Potable Water (Class I)	500	0	5.0	<1.0	<1.0

3.2 Biological environment

3.2.1 Vegetation

A flora assessment recorded 120 species from 98 genera and 43 families from the project area. The distributions of the flora at the different project sites are presented in Table 8. The plant forms from the project areas are distributed as follows: 46 species for shrubs, 29 species for Trees, 26 species for herbs, 13 species of grasses and six species of climbers.

The plants were recorded in two habitat types that were characteristic of *Piliostigma-Combretum-Grewia-Bridelia-Maytenus* and *Brachiaria-Sprobolus spp-Panicum spp-Setaria sphacela* wooded grassland and the herbaceous-weedy species dominated bushy vegetation that constituted of *Tithonia diversifolia, Solanum spp, Ocimum spp, Ricinus communis, Amaranthus spinosa* and the invasive *Parthenium hysterophorus* as dominant species.

Within the project area, there were no species of conservation concern as per the IUCN Red List. However, four species of invasive plants were recorded namely*; Senna spectabilis, Lantana camara, Mimosa pigra* and *Parthenium hysterophorus.* The invasive plants displace native species through altered recruitments in natural ecosystems, and their spread is often triggered by disturbances in the ecological systems. *Parthenium hysterophorus* was the most abundant in the project area, while the rest occurred in limited sub-populations. With increased human settlements and infrastructural development as well as subsistence farming activities in Koboko, the likelihood of invasive plants spread is high.

Table 8: Record of vegetation (flora) encountered at all the project sites.

Family	Species	Plant life form	Species Record in the sites				
			Water Intake	WTP	FSTP	Teremunga GSR	Appa ESR
Mimosaceae	*Acacia hockii*	Shrub	√	√	√		
Mimosaceae	*Acacia gerrardii*	Tree		√			
Mimosaceae	*Acacia polyacantha*	Tree		√			
Mimosaceae	*Acacia sp*	Tree			√	√	
Euphorbiaceae	*Acalypha ornata*	Shrub	√				
Euphorbiaceae	*Acalypha vicaulis*	Shrub		√			
Acanthaceae	*Acanthus pubscens*	Shrub			√		
Amaranthaceae	*Achyranthes aspera*	Herb	√			√	
Zingiberaceae	*Afromomum mildabraedii*	Herb			√		
Agavaceae	*Agave sisalina*	Herb		√		√	
Asteraceae	*Ageratum conyzoides*	Herb	√				
Leguminosae	*Albizia andiantifolia*	Tree			√		
Leguminosae	*Albizia coriaria*	Tree		√			
Amaranthaceae	*Amaranthus spinosa*	Herb			√		
Annonaceae	*Annona senegalensis*	Tree			√		
Euphorbiaceae	*Antedisma venosum*	Tree	√				
Poaceae	*Arundinaria alpina*	Shrub			√		
Asteraceae	*Aspilia africana*	Herb	√	√			
Acanthaceae	*Asystasia gangetica*	Herb			√		
Asteraceae	*Berkeaya spekeana*	Shrub			√		
Asteraceae	*Bidens pilosa*	Herb					√
Palmae	*Borassus aethiopum*	Tree		√	√	√	
Poaceae	*Brachiaria sp*	Grass	√	√	√		√
Euphorbiaceae	*Bridelia scleronuera*	Tree	√		√		
Asteraceae	*Clematis hirsuta*	Climber		√			

Family	Species	Plant life form	Species Record in the sites				
			Water Intake	WTP	FSTP	Teremunga GSR	Appa ESR
Capparaceae	*Cleome gynandra*	Herb					√
verbenaceae	*Clerodendron myricoides*	Shrub			√		
Dioscoreaceae	*Colocasia esculentus*	Herb				√	
Combretaceae	*Combretum collinum*	Tree		√	√		
Combretaceae	*Combretum molle*	Tree		√	√	√	
Commelinaceae	*Commelina africana*	Herb			√		
Asteraceae	*Conyza sumatrensis*	Shrub	√	√	√	√	
Boraginiaceae	*Cordia monoica*	Tree			√		
Amyrridaceae	*Crinum kirkii*	Herb				√	
Curcubitaceae	*Curcubita maxima*	Climber					√
Vitaceae	*Cymphostemma adenocaule*	Climber			√		
Vitaceae	*Cymphostemma cymphopetalum*	Climber			√		
Poaceae	*Cynodon dactylon*	Grass	√		√		√
Cyperaceae	*Cyperus cyperoides*	Herb	√				
Cyperaceae	*Cyperus esculentus*	Herb					√
Solanaceae	*Datura stramonium*	Shrub			√		
Papilionaceae	*Desmodium adscendens*	Herb					√
Poaceae	*Digitaria scalarum*	Grass			√		
Sterculiaceae	*Dombeya rotundifolium*	Shrub	√				
Poaceae	*Eleusine indica*	Grass	√			√	
Poaceae	*Eragrostis sp*	Grass	√			√	
Papilionaceae	*Erythrina abyssinica*	Tree				√	
Myrtaceae	*Eucalyptus sp*	Tree	√	√		√	
Euphorbiaceae	*Euphorbia macrophylla*	Herb			√		
Moraceae	*Ficus brachypoda*	Tree				√	
Moraceae	*Ficus sp*	Tree				√	

Family	Species	Plant life form	Species Record in the sites				
			Water Intake	WTP	FSTP	Teremunga GSR	Appa ESR
Moraceae	*Ficus sycomorus*	Tree				√	
Amaranthaceae	*Gomphrena celesoides*	Herb			√	√	
Tiliaceae	*Grewia mollis*	Shrub					
Tiliaceae	*Grewia smilis*	Tree			√		
Simaroubaceae	*Harrisonia abyssinica*	Shrub			√		
Rhmanaceae	*Helinus mystacinus*	Shrub		√			
Malvaceae	*Hibiscus fuscus*	Shrub			√		
Malvaceae	*Hibiscus ovalifolius*	Shrub			√		
Labiatae	*Hoslundia opposita*	Shrub		√	√	√	
Poaceae	*Imperata cylindrica*	Grass			√		
Papilionaceae	*Indigofera arrecta*	Shrub	√				
Euphorbiaceae	*Jatropha curcas*	Shrub			√		
Cyperaceae	*Kyllinga alba*	Herb	√				
Verbenaceae	*Lantana camara*	Shrub	√	√	√	√	
Labiatae	*Leonitis nepetifolia*	Herb	√				
Labiatae	*Leucas martinensis*	Herb		√			
Capparaceae	*Maeura angolensis*	Shrub			√		
Asteraceae	*Malanthera scandens*	Herb	√				
Anarcadiaceae	*Mangifera indica*	Tree	√			√	
Euphorbiaceae	*Manihot esculenta*	Shrub					
Celestraceae	*Maytenus heterophylla*	Shrub	√				
Celestraceae	*Maytenus senegalensis*	Shrub	√	√	√		
Poaceae	*Melinis repens*	Grass		√		√	
Papilionaceae	*Mimosa pigra*	Shrub	√				
Musaceae	*Musa sapientum*	Tree	√				
Labiatae	*Ocimum rothii*	Shrub		√	√	√	

Family	Species	Plant life form	Species Record in the sites				
			Water Intake	WTP	FSTP	Teremunga GSR	Appa ESR
Polygonaceae	*Oxygonum sinuatum*	Herb			√		
Poaceae	*Panicum maximum*	Grass			√	√	
Poaceae	*Panicum sp*	Grass			√		
Asteraceae	*Parthenium hysterophorus*	Herb		√	√		√
Poaceae	*Pennisetum polystachon*	Grass	√				
Phyllanthaceae	*Phyllanthus capillaris*	Herb		√			
Phyllanthaceae	*Phyllanthus ovalifolius*	Shrub		√			
Caesalpiniaceae	*Piliostigma thoningii*	Tree	√	√	√	√	
Labiatae	*Plectranthus schimperi*	Shrub				√	
Papilionaceae	*Pseudarthria hookeri*	Shrub		√	√		
Meliaceae	*Pseudocedrella kotschyi*	Tree	√		√		
Anarcadiaceae	*Pseudospondias macrocarpa*	Tree	√				
Myrtaceae	*Psidium guajava*	Tree	√	√			
Guttiferae	*Psorospermum febrifugum*	Shrub			√		
Vitaceae	*Rhoicissus tridedanta*	Climber			√		
Anarcadiaceae	*Rhus vulgaris*	Shrub					
Leguminosae	*Rhynchosia minima*	Climber	√				
Euphorbiaceae	*Ricinus communis*	Shrub				√	√
Asparagaceae	*Sansaveria dawei*	Herb			√	√	
Caesalpiniaceae	*Senna obtusifolia*	Shrub			√		
Caesalpiniaceae	*Senna occidentalis*	Shrub			√		√
Caesalpiniaceae	*Senna samea*	Shrub	√	√			
Caesalpiniaceae	*Senna spectabilis*	Shrub	√		√		
Poaceae	*Setaria sphacelata*	Grass		√		√	√
Malvaceae	*Sida acuminata*	Shrub			√		
Malvaceae	*Sida ovata*	Shrub		√	√		√

Family	Species	Plant life form	Species Record in the sites				
			Water Intake	WTP	FSTP	Teremunga GSR	Appa ESR
Solanaceae	*Solanum aculeastrum*	Shrub			√		
Solanaceae	*Solanum incanum*	Shrub			√	√	
Solanaceae	*Solanum macrocarpon*	Shrub			√		
Poaceae	*Sprobolus africana*	Grass				√	
Poaceae	*Sprobolus pyramidalis*	Grass	√			√	√
Bignoniaceae	*Stereospermum kunthianum*	Tree		√	√		
Asteraceae	*Synedrella nodiflora*	Herb			√		
Myrtaceae	*Syzygium cuminii*	Tree	√		√		
verbenaceae	*Tectonia grandis*	Tree				√	
Papilionaceae	*Tephrosia punctatum*	Shrub	√				
Combretaceae	*Terminalia glauscens*	Tree			√		
Apocynaceae	*Thevetia peruviana*	Shrub					
Asteraceae	*Tithonia diversifolia*	Shrub				√	√
Tiliaceae	*Triumfetta rhomboidea*	Shrub	√	√	√	√	√
Caesalpiniaceae	*Tylossema fassoglensis*	Shrub	√				
Asteraceae	*Vernonia amygdalina*	Shrub				√	
verbenaceae	*Vitex doniana*	Tree	√		√		

3.2.2 Butterflies

The standard method of capturing butterflies using a sweep net were used to catch every species encountered. Preliminary identifications of common and familiar species were done in the field, which were later released and for those that could not be identified were stored, labelled and dried in paper envelopes for subsequent identification using the museum collections at Makerere University Zoology Department Museum and standard guides including those of Carson (1963; 1975), Kielland (1990) and Larsen (1991).

A total of 20 butterfly species and 17 genera were identified and distributed among the 52 specimens collected. The butterflies were further grouped into four families; four species were *Lycaenidae*, seven *Pieridae*, 12 *Papilionidae* and 29 *Nymphilidae*. The abundance and the distribution at the different project sites are shown in Figure 3-10.

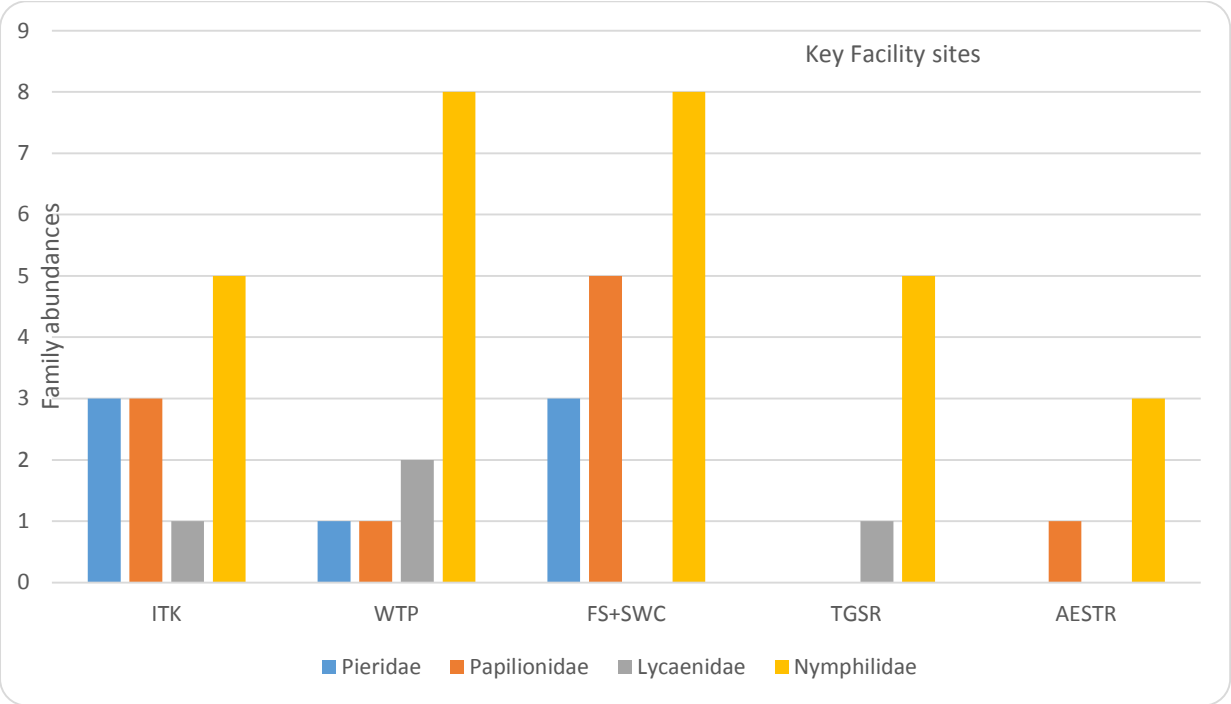

Figure 3-10: Distribution and abundance of butterflies at different project sites.

(Key: ITK – Water Intake, WTP – Water treatment plant site, FS+SWC – Faecal Sludge treatment plant (Feacal Sludge Treatment plant) site, TGSR – Teremunga GSR site, AESTR – Appa ESR).

Forested species identified include; *Bicyclus vulgaris, Pseudardymni hegemone, Graphium philonae Leptosia alcesta inalcesta, Junonia hertia, Graphium angolanus. Bicyclus pavonis, Acraean sykes, Acrae doubledayi* and Papilionidae demodocus are only open savannah grass and woodland specialties identified at both the intake and compositing sites. *Zizeeria knysana, Catopsilia florella oberthi* are the only wide spread in all terrestrial habitats *Hypolimnas misippus, Junonia chorimene, Danaus chryssipus, Colotis aurigineus, Eurema brigitta, E. hecabe* are migratory species. *Acraei rangatanais* is a swamp species identified. Of all species identified none of them will be affected by much by the project activities.

Butterfly study should also be carried out during the rainy season to check for variability in species richness in both rainy and dry seasons. Otherwise the project will have minimal effect of low magnitude on insects/butterflies biodiversity during the implementation stage as along as proper mitigation measures are implemented that include site restoration with endemic nectarous plants which can withstand the climate, so as to maintain the insect community within the project area as well using a multidisciplinary approach to prevent the spread of invasive *Lantana camara* and *parthenium hyperophorous* that are threatening the Insects forage source.

3.2.3 Herps

Three amphibian species and 13 individual amphibians belonging to two families and two genera were recorded i.e. *Amietophrynus kisoloensis, Amietophrynus garmani* and *Ptychadena mascareniensis.* Amphibians were recorded only in one site i.e. water intake out of the five sites surveyed. This is because the water intake is located at the river with shoreline vegetation that encourages their breeding. On the other hand, four reptile species and 30 individual specimen belonging to four families and four genera were recorded. As presented in Table 9, the reptilean species include *Agama, Lygodactylus gutturalis, Trachylepsis straita* and *Lygodactylus gutturalis.*

Table 9: Distribution of reptile species at the project sites

NO	Family	Scientific name	Class	Site					
				WI	WTP	Feacal Sludge Treatment	Teremunga GSR	Appa ESR	Total
1	Agamidae	*Agama agama*	NE	2	0	2	5	3	12
2	Gekkonidae	*Lygodactylus gutturalis*	NE	2	0	1	0	0	3
3	Scincidae	*Trachylepsis straita*	NE	3	2	2	2	4	11
4	Gekkonidae	*Lygodactylus gutturalis*	NE	0	2	0	0	2	4
	Total								**30**

None of the herpetiles recorded in the project area was of conservation concern following the IUCN Redlist of Threatened species. The general herpeto fauna diversity of the project area compared to about 98 amphibian and 150 reptile species known in Uganda is far low. This low herptile diversity in the project area could be attributed to anthropogenic activities in the area i.e. deforestation, agriculture, charcoal burning, settlements and urbanisation. The project is likely to have minimal impacts on the few herpetiles present and their habitat considering the nature of project activities. Impacts anticipated due to vegetation clearance during construction and harassment of reptiles especially snakes caused by people's negative attitude towards them. Minimizing habitat disturbance during construction however, can mitigate project impacts on herps. Also limiting vegetation clearance to where construction will occur, as it scares away some herpetiles, while at the same time use of manual labour as opposed to direct use of excavators/ graders to clear the area, will reduced project impacts on herps.

3.2.4 Birds

Altogether a total of 24 bird species and 158 individual birds were recorded. The water intake had the highest species richness and abundance yet the water reservoir site had the lowest. These records at the water intake can be attributed to the flowing water, dense vegetation cover and the patches of riverine vegetation along the river. The 24 species richness recorded in the project area is however so low when compared to Uganda's 1007 bird species, of which 7 are Endangered, 11 Vulnerable and 26 Near-threatened. Also these project records are far low when compared against the 362 birds particularly known to Budongo Forest Reserve and 476 known to Murchison Falls National Park which are the nearest protected areas to Koboko.

All species recorded in the area are not of conservation concern as none is on the IUCN Red List of threatened species. Basing on the general setup of the project activities and the fact that the project sites are found in already altered habitats, the project is likely to have minimal impacts on the environment and avian species in particular. However, efforts should be taken to minimize as much as possible project impacts on the habitat during construction. This could be by limiting vegetation clearance to areas where development will occur. Habitat restoration after construction by planting native species and wetland restoration is highly recommended.

Table 10: Avian fauna recorded in the project area.

NO	Common name	Scientific name	Site					
			WI	WTP	Feacal Sludge Treatment	Teremunga GSR	Appa ESR	Total
1	African pied wagtail	*Moticilla agiump*	2	1	0	3	2	8
2	Arrow-marked babbler	*Turdoides jardinei*	5	0	0	0	0	5
3	Black- kite	*Milvus migrans*	0	0	2	1	1	4
4	Black-headed weaver	*Ploceus cucullatus*	7	3	2	0	0	12
5	Blue-naped mouse bird	*Colius macrourus*	8	5	4	0	0	17
6	Cattle egret	*Ardeoli ibis*	3	2	0	0	0	5
7	Compact weaver	*Ploceus pachyrhynchus*	3	3	0	0	0	6
8	Crested Guinea fowl	*Guttera edouardi*	5	0	0	0	0	5
9	Fischer's greenbull	*Phyllastrephus fischeri*	2	2	2	0	0	6
10	Golden pipit	*Tmetothylacus tenellus*	0	4	0	0	0	4
11	Great white egret	*Egretta alba*	2	0	0	0	0	2
12	Grey-headed kingfisher	*Halcyon leucocephala*	1	0	0	0	0	1
13	Hadada ibis	*Hagedasha hagedash*	3	0	0	0	0	3
14	Lemon dove	*Aplopelia larvata*	2	2	2	2	0	8
15	Little weaver	*Ploceus luteolus*	4	3	5	0	0	12
16	Mourning dove	*Streptopelia decipens*	2	3	2	2	0	9
17	Pied crow	*Corvus albus*	0	0	3	4	5	12
18	Red –chested sunbird	*Nectarinia erythrocerca*	1	0	1	0	0	2
19	Red-cheeked cordon-bleu	*Uraeginthus bengalus*	0	0	3	2	5	10
20	Slender- billed weaver	*Ploceus pelzelni*	2	0	0	0	0	2
21	White- rumped swift	*Apus cafer*	3	0	0	5	0	8
22	White-browed coucal	*Centropus supercilliosus*	1	0	0	0	0	1
23	Yellow-billed ox pecker	*Buphagus africanus*	3	0	0	0	0	3
24	Yellow-vented bulbul	*Pyconotus barabatus*	5	5	3	3	0	16
	Total							**158**

3.2.5 Mammals

As presented in Table 11, eight mammal species were recorded in the project area. These included one shrew species (*Crocidura olivieri*), four rodent species (*Aethomys hindei, Arvicanthis niloticus, Tachyoryctes splendens, Lemniscomys striatus*), one bat species (*Mops condylurus*) and two primate species (*Chlorocebus pygerythrus, Papio anubis*). The Water Intake and Water Treatment Plant recorded the highest number of species (seven) while the Solid Waste Landfill recorded the lowest species numbers (three) and the reservoirs recorded four species each. None of the small mammals identified in the project area is of conservation concern; hence project activities will have minimum environmental impacts on small mammals. However, habitant restoration by planting indigenous trees species, landscaping using Paspalum grass are sufficient to rehabilitate the project area in order to attract small mammalian biodiversity back into the project area after construction.

Table 11: Mammalian species at the project sites and their IUCN status.

English name	Species name	IUCN status	Water Intake	WTP	Feacal Sludge Treatment	Teremunga GSR	Appa ESR
Rodents & Shrews							
African Giant Shrew	*Crocidura olivieri*	LC	✓	✓	–	–	–
Hinde's Rock Rat	*Aethomys hindei*		✓	✓	–	✓	–
African Grass Rat	*Arvicanthis niloticus*	LC	✓	✓	✓	✓	✓
East African Mole Rat	*Tachyoryctes splendens*	LC	✓	✓	–	–	✓
Striped Grass Mouse	*Lemniscomys striatus*	LC	–	–	✓	✓	✓
Bats							
Angolan Free-tailed Bat	*Mops condylurus*	LC	✓	✓	✓	✓	✓
Primates							
Vervet Monkey	*Chlorocebus pygerythrus*	LC	✓	✓	–	–	–
Olive Baboon	*Papio anubis*	LC	✓	✓	–	–	–
Total No. of Species / Site			**7**	**7**	**3**	**4**	**4**

3.2.6 Raw water intake site

The intake facility is proposed on a private land near River Kochi adjacent to the culvert, at UTM 36 N coordinates 0277399E, 0382979N in Nyarabu Village, Asunga Parish in Midia Sub County. A total of 0.169 acres will be acquired from Ayila Dada. Ayila Dada is the clan leader, owning the land under customary tenure system. The

site is near a culvert located on a murram road. The land is gently flat, sloping to the river. As such, abstraction of the river water requires pumping.

As shown in Plate 3 below, the site is a fallow land with herbaceous-weedy species such as *Setaria sphacelata, Panicum spp, Panicum maximum, Biden pilosa, Pennisetum polyschyon and* bushy vegetation. The dominance of the land with herbaceous layer reflects the seasonal cultivation that is carried out on the land. Altogether, 41 flora species were recorded from the site. Besides this, four families of butterfly were also recorded i.e. *peridae, papilionidae, Lycaenidae* and *Nymphilidae*. Other biodiversity included six herpetiles that constituted three amphibian species *(Amietophrynus kisolensis, Amietophrynus garmani and Ptychadena anchietae)* and the other half reptiles *(Agama agama, Lygodactylus gutturalis and trachylepsis straita)*. Also avian records were taken and these amounted to 20 different species. Seven mammalian species were recorded as well. None of the species records above (both fauna and flora) is of conservation concern since they are not on the IUCN Red list of threatened species.

Plate 3: Vegetation cover at the proposed water intake site.

In general, the World Bank Operational Policies, OP 4.01: Environment Assessment, OP 4.04: Natural Habitats, are triggered as the intake locality is found at a river and these are suitable habitats for some aquatic flora and fauna.

3.2.7 Water treatment plant (WTP)

The water treatment plant will be built at UTM 36 N coordinates 0277275E, 0382330N on 3.274 acres of land in Nyarabu village, Asunga Parish in Midia sub-county. Out of the 3.274 acres of land required for WTP, 1.746 acres belong to Ozubu CFR while 1.528 acres will be acquired from Karala Hussein. The land has a fairly hilly topography to permit gravity flow among the different treatment units of the facility. To avoid further delay that may result from bureaucracy of de-gazetting a Central Forest Reserve or changing land use of public land, the option of shifting the WTP to a nearby private land with a similar terrain is being considered.

Plate 4: The land cover of the proposed site for WTP for Koboko WSS Project.

This site is an open wooded grassland characterized with mainly Acacia spp. It is also used as a livestock grazing area by the locals. Total vegetation was 32 species. Four families of butterflies observed i.e. *Peridae*, *Papilionidae*, *Lycaenidae* and *Nymphilidae*. No amphibian recorded yet two reptiles observed at the site. 11 birds were seen and seven mammalian species were recorded. However, none of the biodiversity recorded in the area belong to the IUCN Red list of threatened species and therefore none was of conservation concern.

In general, the World Bank Operational Policies, OP 4.01: Environment Assessment, OP 4.04: Natural Habitats, are triggered as the water treatment plant locality is a habitat for some aquatic flora and fauna especially at the periphery of the site.

3.2.8 Faecal Sludge Treatment Plant (FSTP)/ Compositing plant

The Feacal Sludge Treatment plant is proposed on a 10.298 acres land in Mindabe Village, Asunga parish, Midia Sub County at UTM 36 N coordinates 0277425E, 0378997N. The land is owned and currently used by Koboko Municipal Council as solid waste dumpsite (landfill) as shown in Plate 5.

Plate 5: Land use and vegetation at the proposed Feacal Sludge Treatment site.

The site shares both wooded grassland and bushy vegetation (dominated by *Parthenium hysterophorus*). The wooded grassland is characterized of *Piliostigma-Combretum-Grewia-Bridelia-Maytenus* and *Brachiaria-Sprobolus spp-Panicum spp-Setaria sphacelata.* There is a wide spread of the congress weed *(Parthenium hysterophorus),* which is an invasive species. The site has a total of 65 species of flora. Three butterfly families were captured (Peridae, Papilionidae and Nymphilidae). No amphibian recorded but three reptiles were recorded at the site i.e. *Agama agama, Lygodactylus gutturalis and trachylepsis straita.* 11 birds were recorded and three mammalian species seen (*Arvicanthis niloticus, Lemniscomys striatus and Mops condylurus).* All the biodiversity in the project area were of less conservation concern according to IUCN Red List of threatened species.

3.2.9 Teremunga Ground Service Reservoir (GSR)

The reservoir is proposed on top of Teremunga hill at UTM 36 N 0273109E, 0379265N in Gbulabulanga village, Teremunga Parish, Koboko Trading Centres. The reservoir requires 1.478 acres of land owned by Midia Pacayo under customary land tenure.

Plate 6: The rocky landscape of the proposed site for Teremunga GSR.

As shown in Plate 6, the site is rocky and undergoing intensive stone mining. 34 plant forms were recorded in the granite rocky habitat lightly covered with grasses such as; *Cynodon sp, Cymbopogon nardus, Imperata spp. The most* dominant of the plant life species are; *Lantana camara, Tithonia diversifolia, Ocimum gratissimum, Plectranthus and Thevetia peruviana*. Two families of butterflies obtained i.e. Lycaenidae and Nymphilidae. Similarly, two reptilian species *(Agama agama and Trachylepsis straita)* sighted at the project area but no amphibian was recorded. Eight bird species were seen at the site and the four mammals observed are: *Aethomys hindei, Arvicanthis niloticus, Lemniscomys striatus and Mops condylurus.* However, none of the fauna and flora recorded in the project and the surrounding areas are of conservation concern according to IUCN 2008 Red List of threatened species.

3.2.10 Appa Elevated Storage Reservoir (ESR)

Appa ESR is proposed at UTM 36 N coordinates of 0273297E, 0376881N at Koboko police headquarters in Central cell, Mengo ward in Koboko Municipality. The reservoir will cover an area of 0.096 acres of the Police station which is under lease hold. It will stand next to an existing storage reservoir that is supply water to the town areas.

Plate 7: Land use of the proposed Appa ESR site at Police Headquarters.

The area is dominant with species of *Panicum maximum, Imperata cylindrica*, *Cynodon dactylon*, and Sprobolus spp with sparse shrubs of Lantana camara, Ocimum sp, *Tithonia diversifolia*, and a few fig trees as shown in Plate 7. In total, 15 plants species were recorded. Being a disturbed habitat, it is lower in fauna and flora biodiversity. Only two families (*Papilionidae* and *Nymphilidae*) of butterfly recorded. No amphibian species were recorded while three reptilians (*Agama agama, Lygodactylus gutturalis and trachylepsis straita*) recorded. Four avian species i.e. *Moticilla agiump, Milvus migrans, Corvus albus and Uraeginthus bengalus* were seen at the site. Likewise, four mammalian species (*Arvicanthis niloticus, Tachyoryctes splenderis, Lemniscomys striatus and Mops condylurus)* were recorded. Regarding the IUCN redlist of threatened species, none of the flora and fauna recorded in the project area was of conservation concern.

3.3 Socioeconomic environment

3.3.1 Demographic Characteristics

The targeted project area is Koboko Municipality. The provisional National Population and Housing Census 2014 indicate that the total population of the project targeted area is 37,825. Of these 18,077 are males and 19,748 are females with an average household size of 6.1 which is far higher than the country's household size of 4.7. The 2014 provisional population census results also revealed that there has been a reduction in the population growth rate for Koboko District from 5.6% in 2002 to 3.98% in 2014, which is still higher than the national growth rate of 3.03%. The high growth rate seen in the 2002 census was due to an influx of refugees from Congo and South Sudan and the return of Ugandans from exile.

3.3.2 Ethnic Composition

The survey results indicate that 66% of the PAPs are Kakwa by tribe and also a big proportion are Lugbara (44.4%) as summarised in Table 12.

Table 12: Ethnic composition of the PAPs

Ethnicity of the PAPs	Percentage
Kakwa	66.6
Lugbara	44.4
Total	**100.0**

Qualitative findings also revealed that the population of Koboko Municipality is largely of urban characteristics and predominantly of Kakwa dialect although other tribes like the Madi, Lugbara and Alur exist. There is also a mixture of the Lendu from Congo and other tribes from South Sudan particularly those along the Ugandan border although the Dinka are significantly more in number than other tribes. It is however important to note that apart from the foreign tribes, all the indigenous ethnic tribes described above are mostly of West Nile origin and may be described as homogenous. Although the dialects may slightly vary, the languages are well understood across the rest of the project area making the area practically homogenous culturally.

However, those many non-Ugandans from DR Congo and South Sudan who have moved to stay in the Municipality could have significant cultural differences with those of the indigenous tribes. At the time of the ESIA survey, the district was hosting a refugee population of about 5,000 people from DR Congo and a big number of these and South Sudanese nationals have settled in rented houses especially in the municipal council and Midia Sub County. The project implementation team should take note of the cultural differences of the refugee population in the project area particularly those related to water hygiene and sanitation. Where necessary, sensitisation activities should be implemented to minimise the potential of possible cultural clashes.

3.3.3 Religion

Survey results show that a big proportion of the PAPs are Moslems (83.3%) while only a very small proportion are Catholics (16.7%) as presented in Table 13. This represents

oneness and may facilitate quick mobilisation since they come together as Moslems. The mosques can therefore be used as a medium of communication. Majority of the PAPs being of one religion is also good since there may not be many cultural differences that may be an obstacle to the implementation of the project.

Table 13: Religion of PAPs

Religion of the PAPs	Percentage
Catholic	16.7
Muslim	83.3
Total	**100.0**

3.3.4 Age of the Household Head

The age of the household head was sought. Results show that half of the respondents (50%) were aged between 25 and 44 years (see Table 14).

Table 14: Age composition of the PAPs.

Age composition of the PAPs	Percentage
25-34	16.7
35-44	33.3
45-54	16.7
55+	33.3
Total	**100.0**

This represents a young population, with a potential for increased population. Therefore services should be planned to meet the potential demand. In addition it implies that these are energetic people and if well mobilised for meetings let alone work where manual labour is required, they can be very useful. However, a significant proportion (33.3%) were aged 55 years and above and it is important to note that these are already above the life expectancy ceiling. These could be among the vulnerable groups that may need special assistance.

3.3.5 Education and Literacy Levels

Majority of the PAPs are semi-literate. This is because more than half (55.6%) only completed primary level of education while a big proportion of them (44.4%) can only read and write. This implies that none of the PAPs went beyond primary education. The details are shown in Table 15 below:

Table 15: Education and literacy level

Literacy level	Percentage
Illiterate	0.0
Can read and write	44.4
Completed primary	55.6
Completed secondary	0.0
Diploma	0.0
Total	**100**

The level of education has an implication on PAPs capacity to understand and to comprehend technical issues related to compensation and resettlement during sensitisation.

3.3.6 Average household size

Most of the households reported to have between 1-5 people in their household with only a few reporting to have between 6 to 10 people. No household in the survey reported to have more than 10 people in their homes. This implies that the people who live in a household on a permanent basis are not very many. Consequently, the proposed project is not going to affect large household size as indicated in Table 16 below:

Table 16: Household size.

Gender	Household size			
	1-5 people	6-10 people	Above 11 people	Total
Males (%)	60.0	5.0	0.0	65.0
Female (%)	30.0	5.0	0.0	35.0
Total (%)	**90.0**	**10.0**	**0.0**	**100**

3.3.7 Existence of Vulnerable People in a Home

Vulnerable groups usually have limited number of productive assets and for this reason they are easily affected by external shocks and risks (resettlement). Moreover, due to their vulnerability, they normally have severe limitations in their coping mechanisms. The survey included a question on the existence of vulnerable persons in a home. Findings show that half of the PAPs (50%) have a vulnerable person(s) in their households. However, as indicated in Figure 3-11 below, two categories of the vulnerable groups were identified in this survey namely, the aged people and those who are chronically ill.

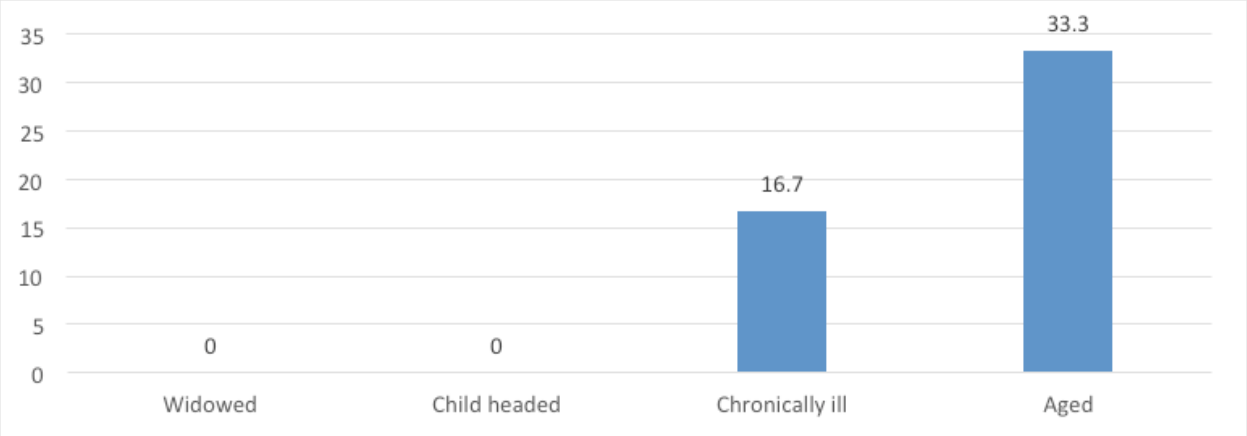

Figure 3-11: Vulnerability of the PAPs.

However, results from the survey revealed that there are no PAPs who will lose large pieces of their land or structures that can result into physical displacement. Therefore on this project, there will be no physical displacement of PAPs to necessitate relocation and consequently, the possibility of vulnerable groups losing their accommodation or livelihood is not anticipated to arise. However a number of the

PAPs are quite elderly while a significant number is chronically ill. Whereas these people are eligible for compensation, they will be given additional/special assistance to rightfully get their compensation, protected from opportunistic relatives, open up Bank Accounts for them, and continuous detailed explanations. Such special assistance will be given by the Project Sociologist and Lawyer, assisted by next-of-kin, and the local leaders.

3.3.8 Gender Division of Labour

Gender analysis was done in terms of identifying the different roles of men and women. It helped to identify the gender roles, activities, needs and opportunities for the communities that might be involved in the proposed project.

Qualitative findings reveal that due to culture and gender socialisation, the women and the girl child are specialised as care givers in their homes. Consequently, activities such as preparing food, bathing children, feeding children and cleaning the house, knitting clothes, cutting grass for thatching a house, grinding on the stone are specific for the women in both urban and rural project areas.

On the other hand, men play a dominant role in production activities, ownership of productive assets and marketing of the agricultural produce. Making of hoes for gardening, grazing of animals, digging pit latrines and slaughtering animals are some of the specific roles for the men. Even in terms of asset ownership, household assets are primarily owned by men though women still have the opportunity to access and/or use them. Cash money, furniture and shops are controlled by both husbands and women. It was also the duty of women and children to collect water.

3.3.9 Household economy

Access to income

At a general level, as indicated in the socio-economic feasibility study report, commercial and trade activities take place in Koboko Municipality particularly at Koboko Central Market. In the surroundings of Koboko Municipality the main economic activity is agriculture. The main crops grown in the area include beans, cassava, maize, groundnuts and sweet potatoes.

Currently there are several activities that take place along the nearby rivers, key among these being washing vehicles directly in the river. Industrial development such as small-scale agroindustry or other potential industrial activities has not yet taken place in the project area, mainly due to the lack of services like electricity supply.

Findings from the ESIA socioeconomic survey corroborates the results from the feasibility survey indicating that majority (90%) of the HH practice mixed farming, which involves keeping small numbers of livestock alongside cultivation. Other economic activities for HH heads and their spouses according to the questionnaire are civil service and casual labour in equal proportions as indicated in Table 17 below.

Table 17: Production activities.

Production activities/occupation	Percentage
Farming/animal rearing	90.0
Business	5.0

Production activities/occupation	Percentage
Civil servant	5.0
Causal labour	0.0
Salaried employee	0.0
Fishing	0.0
Total	**100**

Other activities that were observed happening directly in the river, which can potentially influence its quality, include sand mining and grazing. Some people also practice fishing in the river.

Findings from the HH questionnaire further revealed that the average monthly income of PAPs that comes from farming is UGX 1,600,000 which is equivalent to USD 490 based on the prevailing exchange rate. There are also many households earning between UGX 100,000 to UGX 300,000 per month as indicated in Table 18 below:

Table 18: Average income from farming activities in the last 12 months by PAPs.

Statistic	Value (UGX)
Average	1,600,000
Mode	100,000
Minimum	100,000
Maximum	300,000

Type of Crops Grown

Qualitative survey findings show that the main economic activity for most of the affected people is agriculture. The main crops grown in the project area include beans, cassava, maize, groundnuts and sweet potatoes. This is confirmed by findings from the household questionnaire that established that (90%) of the respondents were growing seasonal crops and rearing animals.

The project will have minimal impact of agriculture activities because of the crops grown are annual, which can be harvested as the project starts and planting can continue immediately the pipes are laid.

Access to and Utilization of Fuel

According to the survey findings, firewood was the only mentioned (100%) source of energy used by the PAPs. Other forms of fuel like electricity, charcoal, biogas, natural gas and solar are not used. The basic use for firewood is cooking and hardly any household uses fuel for production process. The level of fuel usage confirms a rudimentary economy.

Electricity is currently not used because at the time of the survey, Koboko Municipality was not yet connected to the national power grid although it was reported that government has embarked on extending electricity from Nyagak hydro station to the district. However, a few individuals in Koboko MC generate thermal electricity and they supply power to households in close vicinity which is mainly used for lighting. The main complaint reported was that power from thermal generators has low power quality because it fluctuates a lot which is not good for appliances. Thermal engines also burnout a lot and in the process they emit carbon dioxide which is harmful to

human health. These thermal engines were also reported to be in poor condition and as a result, they produce a lot of noise and vibration. Therefore, with the national power grid extension, it is expected that the number of generators and illegal wiring will reduce in Koboko MC.

Communication and Information Technology

All people that were surveyed have access to radio (100%) but very few (16.7%) have mobile phones. No one reported to have access to fixed phones. Therefore, the radio is main source of information in the project affected communities.

Responding to the question of number of items owned by members of the households, all respondents mentioned that they owned at least two sets of clothes. Similarly, majority (83.3%) of them own any means of transport as indicated in Table 19 below:

Table 19: ICT item ownership.

Do you own the ICT item below	Yes	No
Radio	100.0	0.0
Mobile phone	16.7	83.3
Fixed phone	0.0	100
Other items owned household members		
At least two sets of clothes	100.0	0.0
Own any transport equipment	83.3	16.7

Access and Ownership of Land

All people reported that they own land communally and men were reported to have control over the land. The average number of acres owned is 3.5 acres (see Table 20) located near the road reserves and/or else. This implies that the project will not affect all the available land owned by the household.

Table 20: Average land in areas owned by the PAPs.

Statistic	Value
Average	3.50
Mode	4.00
Minimum	2.00
Maximum	5.00

3.3.10 Land Tenure

The dominant land tenure in the project area is customary / Kibanja tenure system (100%). The project Affected people (PAPs) however tend to confuse customary with public as they assume that customary land is "public land!" There are no permanent buildings/structures within the land where the transmission mains will pass. Under this customary arrangement, all people in the project area mentioned that they own the land they are currently occupying. No one is a licensee or a co-tenant. Status of land ownership can be a proxy indicator of wealth or poverty.

However, this being a patrilineal society, the sons of the father inherit land and not the daughters. Women therefore tend to be excluded from owning land, although they

are given the right of use. The women use the land for growing food, collecting firewood and grass (ADLG, 2010). Survey findings also revealed that most of the residents do not have/ hold certificates of ownership of land but people who want to have private ownership of land can apply for lease offer from government. However, before Government can grant private lease to any single individual, it has to ascertain that there is no customary claim over the land in question. Usually consultations with the elders, neighbours and opinion leaders in such areas are encouraged. Consultations with district leaders revealed that the district land management office is encouraging people to apply for private land ownership so that people can hold land in perpetuity and hence reduce the incidents of land grabbing and wrangles due to the relatively strong cultural cohesion of the area.

However, it is important that the project implementation takes into full account of the existing land tenure systems as well as other crucial issues regarding land ownership and compensation procedures. Presently, the management and control of land in Uganda is regulated by the 2013 Land Act, which recognizes four tenure systems, namely: Customary, Mailo, Freehold, and Leasehold.

3.3.11 Evidence of Land Ownership

Regarding documentation, although all respondents indicated that they owned the land, which they are currently occupying, none of the landowners indicted that they have evidence of land ownership.

3.3.12 Access to Education

Koboko District has 23 pre-primary schools, 96 primary schools and 18 secondary schools, which total up to 137 schools. However, although the Department of Education is one of those that are most funded in the district, this sector is also faced with a number of challenges that limit promotion and provision of quality education to all pupils of school-going age and those at higher levels of learning. The major challenges cited are those associated with the introduction of UPE programme namely inadequate infrastructure and institutional materials as well as poor quality of teaching.

Additionally, very few schools in the district give out sanitary facilities to the girls. Consequently, many girls drop out of schools particularly when they are not able to get sanitary facilities from their parents or guardians. This is the obvious trend as elsewhere in the country where the girls' enrolments in schools are lower compared to boys due to their high school dropout rate. The district also lacks adequate financial resources to undertake regular inspection and supervision and as a result, most teachers and the children report late at schools which lead to limited time for their interaction. Other challenges mentioned included child labour particularly during tobacco harvesting season and over drinking by the teachers.

Therefore the illiteracy and low educational attainment is still a problem in the district, which has adversely affected business success, innovations and level of labour productivity in the district. Also this is no exception for the people in the project impacted area as majority have low levels of education and this could probably be the reason why the biggest population of the district are cultivators.

Additionally, there are 11 technical colleges 7 government aided and 4 privately owned schools which help those who can't make it to advanced level. However this results into low incomes due to poor yields and thus people end up in excessive poverty.

3.3.13 Access to Water

Findings from the feasibility socio-economic survey indicate that the water supply system of Koboko MC is managed by the private company APT Services. The scheme relies on four production wells with submersible pumps. Currently only borehole number 1 (70 m-deep) and 4 (90 m-deep) are in use. The water from the boreholes is pumped to a central elevated reservoir of 163 m^3 capacity, and from there it is then distributed in the network. The pipe network is made of plastic pipes (PVC > 100 mm, HDPE for lower diameters).

The reservoir is made of pressed steel and is located opposite the Municipal Council offices and at the time of the survey, it was observed to be in good condition. The Reservoir takes 10 hours to get filled with water from the boreholes. Consequently, the water is distributed through the pipe network for only 3 to 6 hours per day, during which the consumers store the water needed for the day. Only few households have roof tanks but most households store water by filling jerry cans. All consumer connections are metered and the customers are charged proportionally to the registered consumption.

Apart from piped water, community members with in the project area also access water from various types of water sources. According to the survey findings presented in Table 21, more than a half of the PAPs (57.1%) get water from protected springs. Other available sources include lake, rainwater and rivers all in equal proportions (14.3%). The fact that some people still fetch water for household consumption from open water sources like rivers and lakes is a good justification for the new proposed water supply project in the area.

Table 21: Major source of water for domestic use.

Water source	Percentage
Lake	14.3
River	14.3
Protected spring	57.1
Rain water	14.3
Total	**100.0**

3.3.14 Water Production Supply Challenges

Findings from the feasibility study indicate that the total amount of water pumped and distributed in the network is not sufficient to satisfy the water demand for the current population and hence future population. The water yield of a single borehole is also reported to be decreasing with time. Recently Barifa borehole's wall collapsed. The borehole was put back in operation, though the yield has inevitably decreased.

There are also 17 protected springs within the Municipal Council. However, the yield of most of the springs was reported to decrease during dry seasons and the quality to deteriorate in rainy seasons. Consequently, a large part of the population relies on the

untreated and turbid water of springs, thus exposing themselves to the risk of contracting waterborne diseases.

3.3.15 Access to Sanitation

Koboko Municipality does not have a sewerage system. The town population is served mainly by pit latrines, having a coverage of 73. 8% of the households use pit latrines. Flush toilets and septic tanks serve only administrative buildings. Most of the times, when pits fill up they are abandoned and new ones are built; only few latrines are emptied due to the high cost. There are seven public sanitation facilities; the users' fee is UGX 200 per use.

The town has no faecal sludge treatment plant. Sludge exhausted from filled up pit latrines and septic tanks is deposited in an area designated by Municipal Council.

3.3.16 Disease Prevalence in the Project area

Household illnesses were investigated in order to find out the most common diseases and causes of chronic illnesses in the project area. Chronically ill people were identified and reported as one of the vulnerable groups in the project area. The most commonly reported illness was malaria (71.4%), followed by cough / flu (28.6%). Most commonly reported chronic illnesses included high blood pressure (39.3%), ulcers (21.1%), diabetes (10.7%), then asthma, cancer, hydrocephalous, Tuberculosis and HIV/AIDS.

3.3.17 Knowledge about HIV/AIDS

The PAPs knowledge level about HIV/AIDS was observed to be very high. All of them were able to correctly and accurately enumerate the different ways through which one can get HIV/AIDS. High knowledge level about the different ways through which one can contract HIV/AIDS was demonstrated when nearly all the PAPs were able to mention mother-to-child transmission, having unprotected sex, sharing of sharp instruments and blood transfusion.

Asked whether they knew how one can avoid catching HIV/AIDS, prevention of mother to child transmission; transfusion, using a condom, avoiding use of sharp instruments, abstinence and being faithful are among the many responses that were generated as indicated in Table 22 below:

Table 22: knowledge about the causes and how HIV/AIDS can be avoided.

Knowledge on the causes of HIV/AIDS	**Percentage**
Unprotected sex with infected person	27.8
Mother to child transmission	33.3
Sharing sharp instruments	22.2
Infected blood transfusion	16.7
Total	**100**
Knowledge on how HIV/AIDS can be avoided	**%**
Using condoms	22.2
Safe child birth	22.2
Avoid sharp instruments	27.8

Abstinence	22.2
Faithfulness	5.6
Total	**100**

3.3.18 Disruption Access to Land

As has already been mentioned, a total number of 22 people are going to be affected by the proposed water supply project. Majority (17) of these are within the transmission mains, 2 by the water treatment plant, 2 by the water reservoir and 1 by the intake (see Table 37 for PAPs whose land will be taken. However, findings from this socio-economic impact study indicate that the average size of land owned by the household is 3.5 acres. Based on this finding, the project will not result in total land-take at the project sites because the transmission lines cannot take 3.5 acres. Given that the average land holding is 3.5 acres, it is unlikely that the 4-metre wide space required for the transmission mains will result in displacement of people.

However, a separate question in the questionnaire probing whether they are residing on the affected piece of land or not yielded results (presented in Figure 3-12) which show that for majority of the households (98%), the affected land is their principal place of residence. Similarly, all PAPs indicated that they are currently farming on the land affected by the project. Subsequently, during the construction phase, the water supply project will result into significant economic loss of PAPs since majority of them reside on land affected by the project and are currently deriving their livelihood from that land.

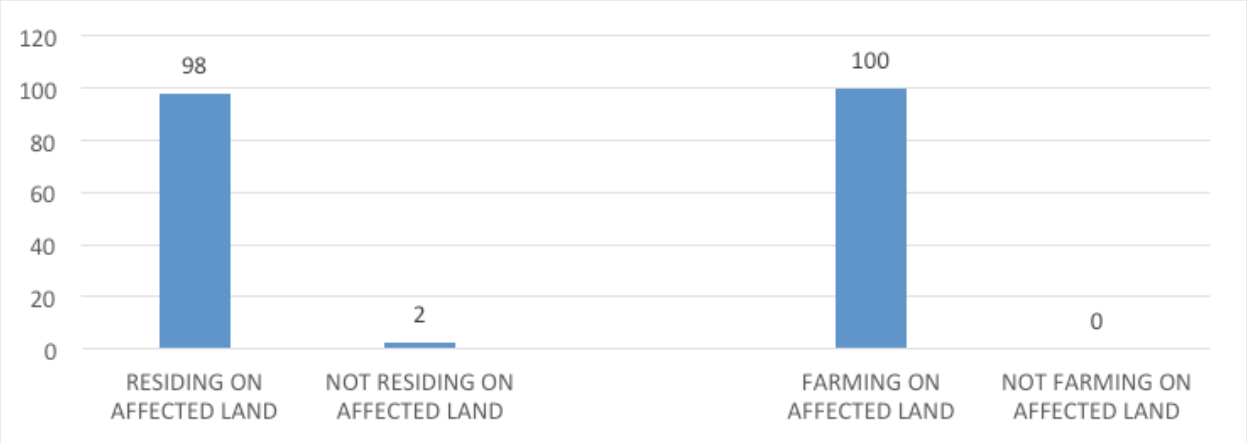

Figure 3-12: PAPs residing and farming on affected land.

It is however assumed that restrictions to land access which shall result into economic interruption by the people along the transmission lines shall be temporally and only during the construction phase. After construction, the affected people are expected to regain unencumbered access to their land and continue to use it to maintain their livelihood. Moreover, it is mainly annual crops that are grown on the affected land.

3.3.19 Cultural/religious facilities to be potentially affected by the Project

Places of culture and religious significance play an important role in people's lives, especially in the rural areas. The places of cultural and religious significance that are

currently and regularly being used are: Mosques (83.3%) and Catholic Churches (16.7%).

Based on the socioeconomic study findings, this project will not destroy the available places of worship. No one in the survey reported that they have graves within the affected plots.

However, within interactions with the affected communities, it was repetitively mentioned that the Kakwa are known to perform cultural rituals. Such rituals were performed for spiritual healing and for blessings. Even within the project affected communities, there are known places where clan leaders meet for cultural functions. In all the community meetings conducted, community members mentioned the importance of involving the cultural leaders in project implementation. They noted that the project should financially support the cultural leaders to perform rituals that shall bless and enable project activities to move on smoothly.

4 PUBLIC CONSULTATION AND DISCLOSURE

4.1 Rationale

It is prerequisite for World Bank funded projects to consult the public. It is mandatory that individuals, groups and entities with a stake in any proposed project should not only be informed about the proposed project/site(s) but also be consulted for their views about the likely impacts and any other concerns about the proposed project (Environmental Assessment OP/BP 4.01). At the same time Ugandan laws and regulations also emphases stakeholder participation in development projects (The National Environmental Act, CAP 153 and The EIA regulation).

Standard methods for the rapid collection of public information using both qualitative and quantitative methods were used. These included but not limited to the following: - interviews, in-depth interviews and Focus Group Discussions. Questionnaires guided the consultations. The district technocrats consulted included; CAO's, District Planners, District Education Officer, District Environmental Officer and the District Community Development Officer. At local level, the L.C. 1 Chairpersons of Mindrabe, Nyarabu, Kangai, Mojje and Bulangranga communities as well as residents within the Project Impacted Areas were consulted.

The agenda of the consultations varied depending on the purpose of the meeting. Nonetheless, the agenda included: opening prayer, self-introduction, communication from the Environmentalists (both from the MWE and the Consultants), consultants' dissemination of the purpose of the meeting, consultations and discussions, and closing remarks by the chair. The district level consultation meetings were conducted in English and the community level meetings were conducted in English-Local language translation. Details of the public consultations are given in the Minutes recorded in APPENDIX 3: MINUTES OF CONSULTATION MEETINGS. Below are the key findings from stakeholders consulted.

4.2 Stakeholder Analysis

Stakeholders are simply defined as individuals, groups and entities that are affected by a development activity either directly or indirectly or those that may exert either positive or negative influence on the project. Those that are directly affected are known as primary stakeholders whilst those that are affected indirectly are known as secondary stakeholders. Stakeholders in any project will include individuals, various social groups, formal and informal agencies in the public, private and voluntary sector that includes NGOs/CBOs.

The categories of stake holders that were identified include; technocrats at the district, L.C. authorities and residents within the vicinity of the proposed site. At the district headquarters, the technocrats that were consulted include;

- CAO's
- District Planner
- District Education Officer
- District Environmental Officer

- District Community Development Officer

At local level, the L.C. 1 Chairpersons of Mindrabe, Nyarabu, Kangai, Mojje and Bulangranga communities as well as residents within the PIA were consulted Plate 9.

4.3 Key Issues raised at Municipality and District Level

Most of the stakeholders at various levels generally knew about the project and nearly all of them felt that the water supply project was a good intervention in their area. Findings from the community meetings and focus group discussions (FGD) established that project affected communities had accepted the project although they were scared of losing their land which to many was the major source of their livelihood. A number of people who attended the meetings regardless of their varying levels and magnitude of impacts endorsed the project. They perceive the project as a source of employment, an opportunity to improve the road network for easy access to social services, easy access to safe and clean water, improvement in hygiene and sanitation particularly in Koboko MC, improvement of health and the elimination of waterborne diseases, increased revenues and incomes. They also said that they cannot refuse development but they need adequate compensation for their land and employment opportunities.

> *"We believe we shall get jobs from the project and even our small businesses shall boom,"* ***(community meeting-Mindrabe).***
>
> *"Some people whose land shall be taken by the project shall get money from the project and set up businesses in town, "****(community meeting-Mindrabe).***
>
> *"We think we shall get first priority when giving out jobs for constructing the intake facility, "****(community meeting at the intake)***
>
> *"Our brothers and sisters who stay in Koboko MC shall get good quality water,"* ***(community meeting at the intake.)***

In effect several stakeholders at various levels perceive the proposed project as a potential source of several opportunities but also adversities. A detailed discussion of the views of the stakeholders follows below.

Pictures taken during the meetings and FGD are given in the plates that follow (Plate 8 up to Plate 13).

Plate 8: FGD Women Bulk Reservoir Teremunga Village.

Plate 9: Meeting at intake, Nyarabu village, Asunga Parish.

Plate 10: Men at intake, Nyarabu village, Asunga Parish.

Plate 11: Youth at Bulk Reservoir Teremunga Village.

Plate 12: Lining up for water Koboko Municipal Council.

Plate 13: FGD Men at Solid Waste Dump Site.

4.3.1 Displacement of people

This issue was repetitively mentioned by both the technocrats and local people. The major concern was around compensation and the general process involved in compensation.

> *"The pipes might go through our land, destroy our crops and trees and they do not compensate us," (**community member- Nyarabu).***
>
> *"The biggest challenge shall be about land acquisition because we shall have to compensate the people whose land is be taken by the project. The people who cultivate in the road reserves should not be a problem because that land belongs to government. But where people's land is affected, we must pay them adequately because these days' people know the value of land. The project has to be careful and cautious when compensating people. We have just gone through compensation processes on other projects and people shall compare their rates with those who have just received their compensation from other projects," **(As narrated by Koboko District Development Officer).***
>
> *"The most important thing however, is to ensure that people are engaged at all times and those whose land shall be taken by the project are paid adequately," (**Sub-county chief-Midia).***

As highlighted from the quotations above, the affected communities are more concerned about their land and how they will be compensated if they are to lose their land. This concern was vehemently brought out in the meetings. The affected communities are also not fully aware of the valuation procedures and consequently the compensation criteria. The consultants attempted to respond to their concerns although further sensitisation is needed especially before the compensation exercise begins.

At the time of carrying out this ESIA, the process of developing a Resettlement Action Plan (RAP) had not been finalized but based on the designs, the number of families that are going to be directly affected by the project is expected to be very low. It is also anticipated that there will be no physical relocation of PAP's. What is expected is that there will be land procurement, compensation for crops and social disruption.

4.3.2 Pollution

Community members at the proposed Feacal Sludge Treatment plant site complained about the bad smell that shall come out of plant. They anticipate that there will be excessive smell and diseases in the area which points to the need for sensitization.

> *"I think that there shall be a lot of pollution which might be risky for our people. The sewage plant shall be very dangerous in this community because due to bad smell, we shall surfer from many diseases". **(Community member-Mindrabe).***

4.3.3 Security

This concern emerged particularly from communities surrounding proposed sites for project facilities. The main concern was that once the project sets off it will lead to

increased population in their respective communities and they feared that this would spark off insecurity, which can escalate crime.

> *"When a project like this comes to the area, many people come as labourers to work. Some of them might be thieves and this is likely to increase insecurity in our community,"* ***(Community member-Mindrabe).***

The stakeholders requested that all casual labourers be hired from the community through a gender sensitive process. Women and youth should be given chance to access employment of their choice. This will curb redundancy, raise their incomes and reduce crime in the PIA in the long run.

4.3.4 Traffic and other minor accidents

The residents of the area anticipate that traffic accidents are likely to escalate during construction phase. This is because heavy truck drivers tend to be very fast while ferrying heavy materials. Children and residents from the community may not be used to heavy traffic volumes. Therefore, any kind of reckless driving may spark off accidents. Apart from people, they feared that their animals shall also face the same problem.

> *"Accidents might increase due to speeding trucks. Our animals might die,"* ***(Community member-Mindrabe).***

As a mitigation measure, some stakeholders contended that drivers should be cautioned about over speeding. This being a rural area they should be extra careful whilst others feel that there should be community sensitization about the ongoing project so that precaution is taken.

4.3.5 Increase of diseases and promiscuity

Construction of the Koboko WSS Project will exert direct negative short term impacts in project impacted area (PIA) particularly during the construction phase. During consultations, community members identified the potential of the project to increase HIV/AIDS. It is hoped that unaccompanied youth who will come to their area to work and the experts on the project might exploit the women and girls in the community due to high poverty levels in the PIA; hoping to get money from them and the expert contractors. This ends up escalating HIV and STDs in the areas of establishment.

> *"The workers who will come from other places might come with HIV/AIDS and they spread it to our people,"* ***(community member-Mindrabe).***

Based on this, communities should be sensitized on the potential of the project to increase HIV/AIDS. The project should have to include in its design a program of awareness and control of the spread of HIV/AIDS and other diseases such as malaria, TB and diarrhoea. Stakeholders also suggested that the contractor play his part in talking to his team and the community and carry out sensitization about HIV/AIDS issues to try and mitigate the likely problems that come with HIV/AIDS.

4.3.6 Physical cultural sites

The communities were asked to identify cultural sites or features of cultural significance with in or near the project area that could be affected by the project.

Although there were no such sites mentioned, from the meetings and key informant interviews conducted, it emerged that graves are such properties of significant cultural importance. Several things have to be done to exhume and bury the bodies in other places. These are cultural rituals, which have to be performed to cleanse and respect their culture so that the dead may rest in peace. Consultations also revealed that for all development projects of this nature, cultural leaders have to be involved; by supporting them to perform cultural rituals aimed at blessing the activities of the project.

> *"Before we start implementing the project, we need to ask for the blessings of their leaders. The Nyarabu clan leaders shall ask for a lamb to give blessings to the project because this land belongs to this clan"* ***(Chairman LC III-Midia Sub-county).***
>
> *"The most important issue however is that culturally, people believe that for all projects of this nature, the elders must be consulted and facilitated to hold a function which is meant to bless the project activities. For this function to take place, these cultural leaders might ask for a sheep and cassava floor from the project."****(As narrated by the Deputy District Chairman Koboko).***

The communities were informed that their graves and cultural rituals by the leaders shall be given enough attention during the project design.

4.4 Conclusions

The community discussions and stakeholder interviews showed that the potentially affected communities by the Koboko WSS Project will support the project if the compensation exercise is implemented in a professional, fair and transparent manner. The community and the key stakeholders have expressed support for the project since they expect it to accrue benefits such as enhancement of the reliability of water supply in Koboko Municipal Council and some parts of Midia Sub-county which will promote development and employment creation for themselves or their children during construction because reliable water supply is expected to attract investors. Despite the anticipated benefits, the project will lead to various negative social and economic impacts. It is recommended that the Contractor implements all the mitigation measures suggested in the ESIA report. To ensure that the project is managed perfectly to a logical conclusion, the contractor should make the necessary budgetary provisions to ensure that mitigation commitments in the ESIA as well as in the RAP and monitoring programs stated herein are effectively implemented. In addition, public consultation and sensitisation should continue during the disclosure period, in order to capture any other issues that could have been left out during the consultation exercise.

5 ANALYSIS OF ALTERNATIVES

5.1 Siting and design alternatives

5.1.1 Water source alternatives sites

There are numerous water sources in Koboko District ranging from groundwater source such as springs and boreholes to rainwater harvesting, and surface water from rivers. Rainwater harvesting however, is very limited because most households do not have capacity to install large storage tanks to have enough water for use during dry season.

According to Studio Galli Ingegneria (SGI)(2014), there are 20 boreholes and 17 springs within Koboko Municipal Council. Five out of the 20 boreholes however, are reported to have high levels of iron while the yields of the other boreholes are reported to be reducing with time. This scenario was evidenced in Barifia production well where the yield reduced to 11 m³/h from 15 m³ at the time of construction. It is still unclear whether the yield reduction is resulting from well clogging or falling groundwater levels. As observed at Majimuzuri spring and neighbouring springs in Malenga ward, the spring yields reduce significantly during dry season meanwhile in rainy season, the water quality deteriorates significantly. The reduction in yield of groundwater sources in dry season is evidence that groundwater sources cannot sustainably meet the rising water demand.

Feasibility study considered the following rivers as alternative sources; Kochi, Oru and Inyau. River Oru was discarded because it had a very low flows. The 7 days flow with a 95% chance of being exceeded was 0 m³/s, this definitely does not meet any demands.

From analysis of River Inyau flow, the 7 days flow with a probability of being exceeded 95% of the time (abbreviated D7Q95) was found to be 0.232 m³/s (Studio Galli Ingegneria (SGI), 2014) but the actual flow could be lower or reducing with time because the observed flow in the 1999 – 2013 period is lower than flows recorded for the period 1955 to 1978 which was used in the analysis. The other concern is that River Inyau is already supplying Arua Municipality with water (a competing use). It is further feared that abstracting River Inyau would result in prohibitively high investments and operation costs because the shortest distance from River Inyau to Koboko MC is 25 km and the pumping head will have to be as high as 300 m. For these reasons, River Inyau was discarded from among the feasible sources. Additionally there is a proposed small hydropower scheme on River Inyau at Okulacere Falls, in Waddi/Adari Village, Ndaapi Parish, Omugo Sub-county, Terego County in Arua District. This has potential of changing the river flow regime and may adversely affect the water supply.

5.1.2 Water intake point alternative sites

After discarding River Inyau as a feasible water source, River Kochi was the best of the options and a feasible source. The choice of the optimal intake point was iteratively done. Five points A, B, C, D and E (defined further in the Table 24) were considered. The selection criteria were: a point that would provide adequate water to meet the demand with the least investment and operational costs.

On the basis of the least Investment and Re-Investment Capital Costs, lowest Operation and Maintenance costs, lowest Per Capita Investment & Re-investment Cost, Location E with a catchment of 34 km² and 11 l/s as the flow that can be exceeded 95% of the time, was selected. Plate 14 shows details of proposed intake point. The option C with a dam has the potential of meeting the demand but was discarded because of its high initial investment costs as compared in Table 24 below.

Plate 14: Pictures showing flow at proposed water intake point.

Since it is apparent that all the sites with the exception of site C with a dam will not be able to meet demands at certain times of the year, three boreholes, each with at least a yield of 10 m³/h will be constructed near the intake to augment supply during dry season. The boreholes are not yet sited but to ensure a yield of at least 10 m³/h, they will be located near the river bank to benefit from bank filtration. This solution may be short-lived considering the continuous fall in groundwater levels and drying of springs within Koboko. The long term solution to the water problem lies in creating a dam or a reservoir to store excess flood water for use during the dry season.

The water from River Kochi was sampled during rainy season when the poorest water quality was expected. The results of the quality analysis done at NWSC Laboratory, Bugolobi are in Table 23.

Table 23: Water quality analysis results for River Kochi Water Source.

Parameter	**Units**	**River Kochi**	**National standards for potable water (Class I)**
Turbidity	NTU	27	5.0
Total Dissolved Solids (TDS)	mg/L	45.8	500
Total Suspended Solids (TSS)	mg/L	18	0.0
Fluoride: F	mg/L	0.0	1.0
Iron: Total	mg/L	2	<0.20

(Studio Galli Ingegneria (SGI), 2014).

Table 24: Comparison of the different sites for the location on the water intake.

		Alternative sites for the water treatment plant site					
No	**Selection criteria**	**A (3.452013°N; 31.086507°E) at Gborokolongo Parish in Lobule Sub County**	**B (3.464973°N; 31.052016°E) at Nyori-Cheku Parish in Lobule Sub County**	**C (3.469767°N; 31.029177°E) at Nyai Parish in Lobule Sub County**	**C with a Dam (3.469767°N; 31.029177°E) at Nyai Parish in Lobule Sub County**	**D (3.462938°N; 30.996577°E) at Metino Parish in Lobule Sub County**	**E (3.456423°N; 30.992396°E) at Asunga Parish in Midia Sub County**
1	Catchment area (km²)	144	74	60	60	40	34
2	Flow with 95% probability of exceedance l/s)	45	23	19	19	12	11
3	Distance to WTP (km)	12.5	7.37	4	4	0.75	0.75
4	Investment Cost (millions UGX)	37,981	33,333	29,966	108,331	25,706	25,240
5	Per Capita investment cost (UGX)	598,676	525,424	472,345	1,707,587	405,191	397,849
6	Re- Investment cost (millions UGX)	7,347	7,339	7,329	7,229	7,299	7,297
7	Per Capita Re-Investment cost (UGX)	82,055	81,966	81,849	80,734	81,494	81,514
8	Per capita O&M Cost (UGX/year)	12,261	10,967	10,146	14,489	7,950	7,638

Studio Galli Ingegneria (SGI), 2014

5.1.3 Water treatment plant alternative sites

In choosing a site for WTP, the design team considered the following technical criteria: firm soil conditions for WTP site, suitability of the site for gravity flow of the treatment process, accessibility to the site, distance to the main consumption area and low energy cost. In due consideration of the aforementioned, two sites were proposed for WTP.

- WTP Option 1 was proposed at 750 m from the intake in Nyarabu Village, Asunga Parish at a point with UTM 36 coordinates (0382328N, 0277274E).
- WTP Option 2 was proposed at coordinates 3.437845° N; 30.988138° E.

WTP Option 2 was rejected because it would require higher pumping costs because of its long distance from the intake (it is 2.7 km from intake). It would also necessitate installing costly high pressure rated pipes. None of the fauna at this site was of conservation concern as they are common and abundant.

Out of the 3.274 acres of land (shown in Plate 15) required for the WTP, 1.746 acres was later found to be part of the Ozubu Central Forest Reserve (CFR) which was leased to British American Tobacco (BAT). To avoid the long bureaucracy involved in de-gazetting a forest reserve which can potentially delay the project, it has been recommended that the WTP be shifted to a nearby private land with similar terrain and environmental characteristics.

Plate 15: Part of the site proposed for WTP.

5.1.4 Storage reservoir alternative sites

The choice of suitable sites for storage reservoirs were focused on the following; a place with high elevation where water would flow by gravity to other storage reservoirs or consumers, firm soil conditions for construction and accessibility to the site. For the Teremunga water supply zone, the Teremunga hill at UTM36N coordinates (0379191N, 0273058E) in Teremunga village was the most suitable location because of

its high elevation and potential to have water flow by gravity to consumers. The proposed site (shown in Plate 16 on the left) is on a rocky hill with very little vegetation and low fauna abundance. Therefore, the project impact at this site is anticipated to be low because the habitat is already disturbed by quarrying activities and the communication masks constructed on the hill.

The most suitable location for the reservoir for the Appa water supply zone is at UTM36N coordinates (0376884N, 0273296E) in Central Cell, Mengo Ward in Koboko Municipal Council. The proposed site is the police station near the existing reservoir for Koboko water supply scheme. This is already a disturbed habitat as evidenced by the low biodiversity observed (see Plate 16 on the right). The detailed ecological assessments of the sites are presented in section 3.2, section 3.2.9 and section 3.2.10 of this report.

Plate 16: Location for Teremunga reservoir (left) and Appa Reservoir (right).

5.1.5 Feacal Sludge Treatmentplant site

With the guidance of the client, the choice of suitable sites for Feacal Sludge Treatment plant were guided by the following; sites with topography that would easily be adapted to permit gravity flow between different components, firm soil conditions for construction of treatment structures and facilities, accessibility to the site and distance to the main consumption area.

Several sites were considered, fortunately the land that is currently own and operated by the Town Council as a landfill was suitably chosen because of its gentle topography, accessibly, size and most importantly, it is already owned and operated by the Koboko Municipal Council for a similar purpose – waste disposal.

The proposed Feacal Sludge Treatmentplant site is in Mindabe Village, Mindabe Parish at UTM36N coordinates 0379008N, 0277390E). The site registers the lowest mammalian species diversity (only three) probably because of the high spread of *Parthenium hysterophorus* (Congress Weed) in the site. Congress weeds is so aggressive in colonizing new areas, yet many animals' species and humans are allergic to it. Most importantly, the flora, birds, reptiles, amphibian and butterflies surveys shows that none of the species found are of conservation concern by IUCN. Therefore, project impact on natural resources at the site is expected to be minimal except for the risk of aiding the spread of congress weeds during construction.

5.2 Technology selection alternatives

5.2.1 WTP process technology selection alternatives

The type of treatment operation performed at a drinking WTP and treatment chemicals used depends largely on the contaminants present in the source water (EPA, 2011). The treatment process to improve River Kochi water quality (presented in Table 6 and APPENDIX 2: WATER QUALITY RESULTS) to meet Uganda Drinking Water Standards requires filtration to remove suspended solids, aeration, coagulation/flocculation, clarification, filtration and disinfection to treat bacterial coliforms, improve turbidity and water colour among other water quality enhancements. The succeeding paragraphs discuss and analyse technology options that could be adopted in the water treatment.

Aeration

Aeration brings water and air in close contact in order to remove dissolved gases (such as carbon dioxide) and oxidizes iron, hydrogen sulphide and volatile organic chemicals (VOCs). During aeration, constituents are removed or modified before they can interfere with the treatment processes. Aeration oxidizes dissolved metals and result into solid oxides of the metals that can be removed by filtration. Further, aeration removes the flat taste of water. However, excessive addition of oxygen may make the water corrosive.

Aerators simply bring water and air in close contact. They fall into two categories. They either introduce air to water, or water to air. The water-in-air produce small drops of water that fall through the air. The air-in-water method creates small bubbles of air that are injected into the water stream. All aerators are designed to create a greater amount of contact between air and water to enhance the transfer of gases and increase oxygenation leading to oxidation.

The aeration method chosen for this project is air-in-water method where pressure aerators are used to inject air/oxygen into the raw water. Each of the three raw water inlet pipes will be fitted with a venturi type of air suction pipes. The oxidization rate are dependent on oxygen concentration and the pressure used. This method favours pressure filtration that is designed for this system. Besides the aeration system is simple and requires a much smaller space as compared to cascade or cone aerators for water-in-air method.

Coagulation/flocculation

Coagulation or flocculation is a process in water treatment used to separate the suspended solids portion from the water. The suspended particles vary considerably in source, composition charge, particle size, shape, and density.

The small particles are kept in suspension by the action of physical forces on the particles themselves. Most solids suspended in water possess a negative charge and, since they have the same type of surface charge, repel each other when they come close together. Therefore, they will remain in suspension rather than clump together and settle out of the water.

Coagulation and flocculation occur in successive steps intended to overcome the forces stabilizing the suspended particles, allowing particle collision and growth of

floc. Coagulation involves addition of metal salts (with opposite charges) to neutralize the charges that keep the solids suspended in the water. Once the neutralization is complete, the particles can begin to grow. The flocculation stage is a subsequent stage after coagulation. It is characterized by gentle and slow mixing of water with coagulant and allows growth of flocs into large visible suspended materials that can settle and be removed in a sedimentation process or clarifiers. For this project, flocculation will occur in clarifiers with slow mixers. The sludge will extracted and treated further.

The choice of coagulant chemical depends upon the nature of the suspended solid to be removed, the raw water conditions, the facility design, and the cost of the amount of chemical necessary to produce the desired result. Generally, there are two types of coagulants added to raw water i.e. inorganic coagulants or metal salts such as aluminium sulphate/chloride and ferrous sulphate/chloride and polymers such as polyelectrolytes. In Table 25 are comparison of the pros and cons of the available flocculants.

Table 25: Comparison of the pros and cons of available coagulants.

	Inorganic coagulants (aluminium/ferrous sulphate/chloride)	**Polymers (polyelectrolytes)**
Pros	• Widely available and relatively cheap. Offer the lowest price per unit weight and are widely available, thus most commonly used; • insoluble at normal drinking water treatment operating conditions, thus very little metal is carried into finished product; generally settles readily;	• Effective over a wider pH range than inorganic coagulants; • can be applied at lower doses; • produce smaller volumes of more concentrated, rapidly settling floc; floc formed from use of a properly selected polymer will be more resistant to shear, resulting in less carryover and a cleaner effluent;
Cons	• Require corrosion-resistant storage and feed equipment; • may alter the pH of water since they consume alkalinity, thus need for liming; • Sludge exhibits poor compaction traits, ranging from 0.5 to 2 percent solids (ASCE/AWWA, 1997), thus difficult to dewater; sludge is biologically inert (inorganic) with little organic content and have little value as a fertilizer/soil conditioner; • Large volumes of settled floc must be disposed of in an environmentally acceptable manner.	• several times more expensive than inorganic coagulants; • selection of the proper polymer for the application requires considerable jar testing under simulated plant conditions, followed by pilot or plant-scale trials; • All polymers must be approved for potable water use by regulatory agencies.

Although polyelectrolytes are a more environmental friendly coagulant, its cost is prohibitively high to allow provision of safe water at relatively low cost. Therefore, inorganic coagulant (aluminium sulphate in particular) is favoured for treatment of water from River Kochi because it is readily available at a relatively lower cost.

The sludge is usually stable, dense, and inert. It dewaters readily, depending on the ratio of calcium (Ca) to magnesium (Mg) and on the amount of gelatinous solids present in the sludge. The sludge handling mechanisms proposed are sludge treatment which include thickening, drying and sludge caking for safe disposal by an authorized agent.

Aluminium sulphate is the choice of coagulant for virtually all the water treatment processes requiring coagulation in Uganda. This indicates the presence of a large number of laboratory technicians that have been trained and have practiced in this field, especially within NWSC. Despite the above reservations, the use of aluminium sulphate is well established and no serious environmental problems have been reported in more than 100 years of its use in Uganda.

Filtration

After solids settling and clarification, the source water passes through filters to remove finer particles and metals. Various types of filter media may be used by WTPs, including permeable fabric and porous beds (EPA, 2011). In Table 26 below is a comparison of suitable types of filters for WTP of the scale of Koboko water supply project. Filters types such as membrane filters, Diatomaceous earth filters and multimedia filters were not discussed as they are both too expensive and not suitable for the situation.

Table 26: Technology analysis of filter types.

Filter type	Characteristic	Pros/cons	Cons
Slow sand filter	Consists of a bed of fine sand above a gravel layer and under drain system; used for low-flow rates.	Sand can be removed, washed and returned to the filter.	Slow, so requires large filter areas Not suitable for high turbidity source waters as the sand traps microorganisms that break down algae, bacteria, and other organic matter.
Rapid sand filter (also known as rapid gravity filter)	Consists of a bed of sand above several layers of gravel in varying sizes in a filter box with gravel support and under drain system. The sand used is generally 0.4 to 0.6 mm in diameter. This is larger than the sand used in slow rate filtration. The coarser sand in the rapid filters has larger voids that do not fill as easily.	Rapid sand filters have filter rates 40 time those of slow sand filters.	Back washing required, hence energy (electricity) is needed. This adds cost to water treatment.
Pressure filter	Similar to rapid sand filters but the operation is housed within a cylindrical tank and the water passes through the filter while under pressure generated by a pump rather than by gravity.	Has lower installation and operation costs in small filtration	The backwash process cannot be observed. Cracking of the filter media can occur easily, thus allowing water Have limited applicability in removal of iron and manganese. Generally, less reliable compared to rapid sand filter

Adapted from Minesota Rural Water Association (2009)

The rapid sand filter was chosen because of the benefits highlighted in the Table 26.

Disinfection

The objective of disinfection is to kill disease-causing organisms present in the water. Historically, chlorine was the disinfectant used, but more recently other chemicals such as chlorine dioxide, chloramines, and ozone have been used to purify water. Non-chemical methods of disinfection include heat and radiation (e.g. ultraviolet light (UV)). The application of UV disinfection for source water treatment is limited because turbidity and suspended solids that can render it ineffective (EPA, 1999). Thus, UV has not been analysed for this project. Table 27 below compares the different disinfectants that can be adopted for use in this project.

Table 27: Technology analysis of disinfection types.

Criteria	**Disinfectant**			
	Chlorine	**Chloramines**	**Chlorine dioxide**	**Ozone**
Persistency	Persistent chemical (used locally and for transport across long distance).	Persistent chemical (used locally and for transport across long distance).	Less persistent chemical (used locally and for transport across long distance).	Non persistent chemical (used locally at production plant).
Disinfection by-products	More than 500 by-products identified that are formed by reaction with organic matter; most products are halogenated (Cl, Br, I) organics; most relevant organic halogenated by-products are Trihalomethanes, Haloacetic acids, Haloacetonitriles, Haloketones, and Haloaldehydes; Trihalomethanes are regulated in Europe; Both Trihalomethanes and Haloacetic Acids are regulated in the US.	Nearly no halogenated organic by-products formed; negligible reaction with organic matter, except halogen transfer to nitrogen amines; some halogenated organic by-products formed with trace of chlorine or chlorine in excess; Ammonia is formed if used in excess, thus nitrite formed from bacterial oxidation of ammonia.	Nearly no halogenated organic by-products; significant reaction with organic matter leading to no halogen transfer; some halogenated organic by-products formed with excess of chlorine used or chlorine formed in-situ.	Nearly no halogenated organic by-products; significant reaction with organic matter leading to no halogen transfer; some halogenated by-products formed with excess of chlorine used or chlorine formed in-situ; main halogen by-product is bromate; it's difficult to fulfil the legal limit for its formation, thus many WTPs have replaced the ozonation step.

Criteria	Disinfectant			
	Chlorine	**Chloramines**	**Chlorine dioxide**	**Ozone**
Oxidant demand rate	Chloramine > Chlorine > Chlorine dioxide > Ozone			
Disinfection efficiency	Ozone > Chlorine dioxide> Chlorine > Chloramine NB: efficiency order can be changed by local conditions e.g. disinfectant consumption rate, biofilm protection, etc.			

As compared in Table 27 above, ozone is the most efficient disinfectant but it is a less persistent disinfectant, thus the water may become unsafe at the consumer premises if contamination occurs along transmission/distribution lines and at reservoirs. And due to difficulty involved in fulfilling the legal limit for the formation of bromate during the process of ozonation, most WTPs do not employ ozonation. Chlorine and chloramines are more effective in secondary disinfection in comparison to chlorine dioxide (Less persistent chemical). Lastly, although the combined residual from chloramines lasts longer than chlorine residuals, chloramines are not as effective as other germicidal agents.

Despite being a less persistent disinfectant, Chlorine dioxide (hypochlorite) has been proposed for treating water in this project because of its high disinfection efficiency and the ease of handling it. The disinfectant is stored in granules and only prepared when needed. This is an advantage over chlorine gas which is more toxic and has to be stored in standard cylinders.

However, in Uganda, chlorine is the key form of disinfectant employed in most water treatment plants. Should chlorine be adopted later as a disinfectant, the operators should be aware of the following: -

- Chlorine gas is a very persistent disinfectant suitable for disinfection where the water has to be conveyed over long transmission and distribution distances. However, chlorine gas is toxic and has a density greater than air, thus gas leaks accumulate and present significant safety concerns. It also causes irritation to the eyes, nasal passages and respiratory system. Chlorine gas must be carefully handled because it may cause acute health effects and can be fatal at concentrations as low as 1000 ppm (SDWF, Undated).

- Furthermore, the use of chlorine for disinfection of drinking water produces microgram per litre (μg/L) quantities of halogenated methane compounds (e.g., trihalomethane). The halogenated methane compounds, known as disinfection by-products, are suspected to be carcinogens (Chlorine Chemistry Council, 2003). EPA limits the amount of total trihalomethanes in drinking water to 0.08 mg/L (EPA, 2008b). Free chlorine in backwash water is directly toxic to aquatic organisms and can react with naturally occurring organic compounds in receiving waters to form toxic compounds such as trihalomethane.

- Chloramines (or combined residual chlorine), formed when chlorine reacts with ammonia, have been demonstrated as disinfectants, although they are not as effective as other germicidal agents (EPA, 2011a). The combined residual from chloramines lasts longer than chlorine residuals and can remain chemically stable in water from hours to days. Backwash water from chloramines are highly

toxic to fish and other organisms which live in water. However, these substances are not found to be bio-accumulative (transfer up the food chain) (Environment Canada, 2002).

The key advantage of chlorine use is that it is well tested, having been used in almost all water treatment plants in the country and its handling processes are therefore well practised. It is not by luck that no serious accident involving chlorine has been reported in the country in the recent times. The cadre that is able to handle chlorine is available in NWSC and other service providers.

5.2.2 Alternative sanitation systems

There are several sanitation systems that are used in urban areas. The technologies analysed for their suitability include onsite sanitation facilities such as Pit latrines, Ventilated improved pit latrines which is an improvement of pit latrines to control flies and odour, pour flush latrines which uses a small amount of water than a fully water borne toilet and Ecological Sanitation (ECOSAN) toilets. These sanitation systems are the most feasible and affordable among the low income communities. Through sensitization and enforcement, their coverage could be improved. The only challenge is that current practice of abandoning filled up latrines and constructing new ones, means more land will be required in future. Therefore, the authorities have to encourage change in the direction of technologies that are sustainable and compatible with the future.

Septic tanks, cesspits and vaults technologies are gaining popularity among the wealthy class and as more are septic tanks are built, the need of regular collection and treatment of sludge quickly arises.

5.2.3 Faecal Sludge Treatment Options

A number of domestic wastewater treatment technologies exist. These technologies tend to employ a combination of physical and biological techniques, in addition to being tailored to small or large scale Person Equivalent (PE). Since this project targets a municipality (i.e. medium to large PE) in a developing country with warm temperatures, a number of low cost treatment techniques could be employed, including activated sludge system, waste stabilization ponds, aerated lagoon system and constructed wetlands. Additionally, a Feacal Sludge Treatment plant with makes compost from a mixture of faecal sludge and organic waste is a viable option as it can recover manure from waste that would ordinarily be landfilled. Composting is consistent with the new waste management approaches that recommend Reduction, Reuse and Recycling of waste. Co-composting is the controlled aerobic degradation of organics using more than one feedstock (faecal sludge and organic solid waste).

Reliable energy supply is a challenge in developing countries, Uganda inclusive, thus energy intensive wastewater treatment systems such as activated sludge and aerated lagoons may not be sustainably operated. Waste stabilization ponds and constructed wetlands could be opted for given that they are low energy based systems. Table 28 present comparisons of the waste water / faecal sludge treatment technologies suitable for Koboko Municipality.

Table 28: Technology analysis of different types of faecal sludge treatment plants.

Criteria	Co-composting	Waste Stabilization ponds (WSPs)	Constructed wetlands
System characteristics	Co-composting is the controlled aerobic degradation of organics using more than one feedstock (Faecal sludge and Organic solid waste). Faecal sludge has a high moisture and nitrogen content while biodegradable solid waste is high in organic carbon and has good bulking properties. The feedstock are mixed to utilize the benefits of each feedstock to optimize the process and the product. For dewatered sludge, a ratio of 1:2 to 1:3 of dewatered sludge to solid waste should be used. Liquid sludge should be used at a ratio of 1:5 to 1:10 of liquid sludge to solid waste.	Waste Stabilization Ponds (WSPs) are large, manmade water bodies with three types of ponds: (1) anaerobic, (2) facultative and (3) aerobic (maturation). The anaerobic pond is made deep making the entire depth anaerobic. Through the anaerobic processes, it reduces solids and BOD as a pre-treatment stage. In a series design of WSPs the effluent from the anaerobic pond is transferred to the facultative pond, where further BOD is removed. A facultative pond is shallower than an anaerobic pond and both aerobic and anaerobic processes occur within the pond. An aerobic pond is commonly referred to as a maturation, polishing, or finishing pond because it is usually the last step in a series of ponds and provides the final level of treatment. It removes pathogen with UV from the sunlight that hit the shallow pond bottom	A Free-Water Surface Constructed Wetland is a series of flooded channels that aims to replicate the naturally occurring processes of a natural wetland, marsh or swamp. As water slowly flows through the wetland, particles settle, pathogens are destroyed, and organisms and plants utilize the nutrients. Free-Water Surface Constructed Wetlands can achieve high removals of suspended solids and moderate removal of pathogens, nutrients and other pollutants such as heavy metals. Shade from plants and protection from wind mixing limit the dissolved oxygen in the water, therefore, the technology is only appropriate for low strength wastewater.
Pros	Easy to set up and maintain with appropriate training Provides a valuable resource that can improve local agriculture and food production	WSPs are among the most common efficient methods of wastewater treatment around the world. They are appropriate for rural communities that have large, open	Aesthetically pleasing and provides animal habitat High reduction in BOD and solids; moderate pathogen removal

Criteria	Co-composting	Waste Stabilization ponds (WSPs)	Constructed wetlands
	High removal of helminth eggs possible (< 1 egg viable egg/g TS) Can be built and repaired with locally available materials Low capital cost; low operating cost Potential for local job creation and income generation No electrical energy required	unused lands, away from homes and public spaces. High reduction in pathogens Can be built and repaired with locally available materials Low operating cost No electrical energy required No real problems with flies or odours if designed correctly	Can be built and repaired with locally available materials No electrical energy required No real problems with flies or odours if used correctly
Cons	Long storage times Requires expert design and operation Labour intensive Requires large land area (that is well located)	They are not appropriate for very dense or urban areas. Requires expert design and supervision Variable capital cost depending on the price of land Requires large land area Effluent/sludge requires secondary treatment and/or appropriate discharge	May facilitate mosquito breeding Long start up time to work at full capacity Requires large land area Requires expert design and supervision Moderate capital cost depending on land, liner, etc.; low operating costs

Adapted from (Tilley, Lüthi, Morel, Zurbrügg, & Schertenleib, 2008)

Both waste stabilization ponds and constructed wetlands are simple to operate and have low maintenance cost, thus tailored to developing countries. However, constructed wetlands are poor in removing phosphorus, unless special materials are incorporated in the substrate. Waste stabilization ponds is common and there are vast experience in its operation in Uganda, however, water borne toilets are not yet well developed in Koboko Municipality to optimally utilize the potential of waste stabilization ponds. They would require a well-developed and an efficient sludge collection system such as a central sewerage system. Unfortunately, pit latrine is the main faecal sludge management facility in Koboko, making up to 73.8% of sanitation facility. Such as central sewerage system and a waste stabilisation ponds would require about fifty eight billions, eight hundred and sixty million Uganda shillings (UGX 58,860,000,000) to construct (Studio Galli Ingegneria (SGI), 2014).

The Waste Stabilization ponds may become feasible in future but in the current scenario with limited water borne toilet in the Municipality and the financial constraints of the project, a Feacal Sludge Treatment plant was recommended for treatment of faecal sludge and organic waste from the Municipal solid waste. It's envisaged that the compost from the Feacal Sludge Treatment plant would also improve agricultural productivity in the area. The estimated total cost of the public sanitation facilities and the Feacal Sludge Treatmentplant in the first phase (2030 phase) is three billion, nine hundred and sixty million Uganda shillings (UGX 3,960,000,000) but would require an additional one billion, seven hundred and fifty seven million Uganda shillings (UGX 1,757,000,000) for the 2040 phase.

5.3 The "No Project" alternative project justification

Broadly, the "No project" alternative and the "Project" or Action alternative were considered in the analysis to the weigh the project benefits and negative impacts against the "No project" alternative.

5.3.1 Negative impacts obviated if the project is not implemented

The key benefits of the no-project option are: -

- The water resource potential of the proposed water supply source, River Kochi would remain unchanged as water will not be extracted.
- Short-term impacts such as noise, dust generation, vibrations, etc., emanating from construction activities would be avoided.
- Temporary inconveniences emanating from construction activities such as temporary road closure for pipeline crossings, would be avoided.
- The loss of the relatively small amounts of agricultural land to the construction of water intake, water treatment works, faecal sludge treatment works, and storage reservoirs would be avoided.
- The limited odour nuisance associated with well managed Faecal Sludge Treatment Plants would be avoided.

- The health risks associated with handling of harmful water treatment chemical hypochlorite (chlorine derivate) would be avoided.

- Social problems associated to immigrant workers such cultural clash, introduction of foreign behaviour, rise in promiscuity, elopement and child abuse would be obviated.

5.3.2 The need for an improved water supply system

In the short term, the existing poor water supply and sanitation in the area would continue to exist. In the long term, the no-project scenario would be more disastrous as the more than 38% of the population in Koboko District would continue using unsafe water, consequently putting them at high risk of contracting and spreading waterborne and poor sanitation related diseases. This will impose more health burden on the local communities and perpetuate poverty as a result of lost revenue and productive hours when sick or attending to a sick family member. In short, Uganda's vision 2040 of having a piped water supply across the country and poverty eradication would not be achieved.

Specifically, the areas of Koboko Town, parts of Midia Sub County and villages of Ombachi, Dwonga and Godia parish in Lobule Sub County would be denied the following benefits: -

- improved standard of living through increased coverage and provision of potable water,

- stimulated social economic development as a result of reduced walking distance and time (and consequences e.g. possibility to rape girls and women when going to fetch water over long distances)

- employment to the local residents, especially the unskilled labourers (and to a smaller extent skilled labourers) during construction and the operation phases of the project

- Reduced household expenditure on treatment of waterborne diseases

- Bringing water closer to homesteads and will henceforth reduce community violence related to moving at night in search for water, overcrowding and jostling at water points and will also indirectly contribute to enhancement of public order.

5.3.3 The need for an improved sanitation facilities

This project seeks to construct two water borne toilets each with 6 stance flush toilets, urinal and shower boxes and a Feacal Sludge Treatment plant for a better management of faecal sludge and organic waste from the municipal solid waste. The "no project" alternative poses more risk of water contamination, spread of pathogens and water borne diseases. The "No Project" alternative would further deny the residents of Koboko Municipality the following benefits of the project:

- Reduced incidences of diarrheal and other water borne diseases; this leads directly to lower rates of mortality and morbidity, especially of among children

- Greater school attendance by the girl children since they are more comfortable with cleaner and safer toilets; this leads to increased gender awareness and improvement;

- Reduced costs for collection and disposal of faecal and organic waste from homesteads; this leads to improved environmental sanitation

- Cleaner and more conducive environment for urban activities such as sports, markets, public places, etc.;

- Employment opportunities at all stages of the project – from construction, operation and marketing of the services

- Increased revenue to the local authority through sale of compost manure.

5.3.4 Conclusion on the "No project" alternative

Koboko water supply and sanitation project is so important for the socio-economic development of Koboko Municipality as it aims to reduce the water scarcity problems, save production time lost in waiting for water (especially women who wait for more than 5 hours at water points), provide sanitation services that will ensure the public health of the people in town and neighbouring communities.

The project is so important that it's perceived benefits outweigh the perceived negative impacts. "No project" alternative cannot replace it in terms of the overall objective.

6 IDENTIFICATION AND ANALYSIS OF POTENTIAL IMPACTS OF THE PROJECT

6.1 Introduction

Following desk studies, site investigations, views obtained through public consultations and our professional experience in similar assignments, the potential significant environmental and social impacts of the proposed Koboko water supply and Sanitation project were identified and presented.

The key infrastructural facilities to be setup comprise: intake works; water treatment plant facility; transmission and distribution pipes; reservoirs; and the faecal sludge treatment plant. The impacts (both positive and negative) are identified at all phases of the project i.e. construction, operation and maintenance.

6.2 Impact areas

The project affected persons are those whom project facilities such as intake, WTP, storage reservoirs, transmission routes and Feacal Sludge Treatment plant are proposed on their land and/or whose properties will be destroyed by the project. The project facilities are located in Nyarabu village, Mindrabe village, Gbulabulanga village and Central cell in Mengo Parish while the transmission lines pass through several villages as shown in Figure 1-4. These areas will receive primary impacts resulting from project activities.

Although the transmission routes are planned along the road reserves, transmission segments to the intake, WTP and storage reservoirs will pass through private land. The RAP assessment proposed a four metre wide stretch of land along the transmission through private land for acquisition and compensation of crops that would be affected.

6.3 Key Activities and Potential Impacts

6.3.1 Site clearing, excavations and construction of buildings

The vegetation from the sites for the water intake, routes to the intake, WTP, the three reservoir sites, Feacal Sludge Treatment plant and sites for water borne toilets will be cleared to pave way for construction. Additionally, the vegetation within a 4 metre wide width along the 9.288 km stretch proposed for transmission pipelines and 41.8 km proposed for distribution networks will be cleared before excavations. After vegetation clearance, activities such as excavation of foundations and transmission routes; site hoarding; haulage of materials to and from the construction site; boreholes drilling; electromechanical work, and construction of building will be undertaken.

6.3.2 Water intake

Construction of the river gabion, sump and pump installation will encompass among others the following activities: vegetation clearance, excavation of river bank, transport of construction materials such as aggregates to site, electromechanical installation etc. The loose soils that characterises the water intake site, unless controlled may potentially pollute the water sources.

River Kochi will potentially experience continuous and cumulative drop in river water flows and groundwater levels. The proposed abstraction rate for the first stage (i.e. 2030 phase) is 210 m³/h which is equivalent to 58.33 l/s yet during dry season, the river flow can reduce to as low as 30 l/s. As discussed in Section 3.1.4, at some seasons of the year, there will be inadequate flow in the river. The boreholes planned to work on bank filtration principles to augment the raw water from the river may further reduce the river flow. This is anticipated to have a significant negative impact on the water resources and associated aquatic organisms.

6.3.3 Water treatment plant works

The raw water will undergo a conventional water treatment process, which will involve screening of particulate matter, aeration, coagulation and flocculation, filtration and disinfection with hypochlorite. The flocculant of choice is aluminium sulphates. The WTP will have a quiet operation as flow through the water treatment units will be gravity driven. The noise level is anticipated to be low as grid electricity is planned to power WTP lift pumps, however, during power outage, generators maybe used, so noise and environmental emissions from combustion engines are predicted to be minimal or intermittent.

The backwash effluent from WTP will be discharged to River Kochi at a rate of about 11 m³/hr. The backwash water may pollute the receiving water because of its high content of aluminium sulphate from the coagulation and flocculation process in the water treatment. In addition, the thickened sludge from water treatment process usually has a high content of nutrients, heavy metals and aluminium sulphate, which unless appropriately handled and safely disposed of, can pollute the watercourses and the soil.

The social impacts at the construction phase of the intake and water treatment plant will include construction of access road, land take hence will interfere with current land use of agriculture and forestry. This could minimally disrupt the livelihoods of PAPs. There will be noise, dust and vibrations during construction. The influx of immigrant labour may change the social networks in the project area.

6.3.4 Reservoirs at Teremunga Hill and Appa ESR at Police Headquarters

The reservoirs will store and distribute clean water to the surrounding communities by gravity. The 700 m³ capacity Teremunga GSR will supply clean water to the wards of Teremunga, Malenga and Godia while the 1,000 m³ capacity Appa ESR will supply the wards of Appa, Mengo and villages of Ombachi and Dwonga villages. The reservoirs will ensure continuous supply of water even at peak demand and during periods of intake and WTP maintenance and service works.

Little noise (splashing) is anticipated from the reservoirs as the flow of water is gravity driven. Other than sealing the land surfaces on which the reservoirs are seated, they will be enclosed with a perimeter fence to limit unauthorised access to the area. The storage reservoirs are generally small to cause significant obstruction to site and visibility of beautiful scenes.

Maintenance teams will visit the sites occasionally and a guard will routinely monitor the tanks but will not be stationed on the site. This increased human presence in the area will have some social consequences.

The tanks are built of robust materials and should last a long time until they are decommissioned and dismantled. Although exceptionally rare, a tank could collapse and flood the nearby low lying areas. To ensure this possibility of rupture of the tank does not harm the community, drainage channels will be constructed downhill to harmlessly take the water to nearby streams. These channels will be located on land acquired by the project and will be cleaned and maintained by the plant staff.

To enhance community acceptance and ownership, local guards may be drafted in to carry out maintenance of the drains and for guard duties.

6.3.5 Transmission and distribution pipelines

The pipeline will be laid underground and landowners will continue to cultivate and graze on the land without any encumbrance except during maintenance works where pipelines may have to be excavated and replaced. This encumbrance will be felt along the entire length of the transmission pipelines. Land take will be minimal because the mains will be laid strictly along the road reserve. In exceptional instances the transmission mains taking water to the reservoirs will not follow the road reserve but will pass through private land. In total, only 0.363 acres of land will be acquired for transmission lines.

6.3.6 Feacal Sludge Treatment plant

The Feacal Sludge Treatment plant will be constructed in Mindabe Village, Asunga Parish, Midia Sub County at UTM 36 N coordinates 0277425E, 0378997N. The land is fairly flat but with no stream. The effluent will be discharged to the vegetation buffer that is planned around the Feacal Sludge Treatment plant.

The deliveries of faecal sludge to the Feacal Sludge Treatment plant will be by cesspool emptiers while organic waste will collected in skips and delivered by self-loading trucks. Since the toilets and waste collection points are spread across the town council, the cesspool trucks and skip collectors may emit foul smell along their routes and emit dust from the murram roads as they deliver faecal sludge to the plant.

The Feacal Sludge Treatment plant will dewater the mixture of faecal sludge and organic waste in drying beds. The leachate drained from the faecal sludge will be treated in a small aerobic water treatment plant within the Feacal Sludge Treatment plant unit before discharging into the environment. The 110 m^2 shallow water treatment pond is designed to have a retention time of 30 days to reduce the organic load and shallow enough to allow ultraviolet treatment of pathogens. The maximum designed flow is 1 m^3/day however, the discharge is anticipated to be low because of the irregular sludge delivery that is associated with cesspool delivery.

The treated wastewater will be discharged to the adjacent vegetation buffer within the fence of the Feacal Sludge Treatment plant. The effluent is anticipated to cumulatively load the environment with remnants of heavy metals. The contents of organic waste, nutrients and pathogens in effluent is expected to be low because of the long residence time in the pond.

Further, regular turning of the compost windrows is recommended to maintain an aerobic process which will kill pathogens. This will result into a final compost free of pathogens, safe to be handled and used in agriculture. The inorganic matter that will

remain at FSTP site after sorting out organic waste will be disposed in landfill in the neighbourhood of Feacal Sludge Treatment plant.

6.3.7 Mobilization of labour

The project at construction and operational phase will attract an increased number of people and workers (about 100 workers during construction phase), some of whom might be new to the project area. Some of the people will be permanently located in the PIA while a few will be short term maintenance or delivery staff. These people will bring increased incomes to the community, and there will be interactions with the locals. The likely consequences of social interactions are: sale of products to the plant staff; social conflicts over any number of issues; intermarriages and similar relationships (which could lead to HIV/AIDS infections, pregnancies, etc.); increases in the prices of some items due to the increased purchasing power of the plant staff and increased opportunities for the locals for self-advancement. Business opportunities include improvement in hotels and lodging facilities, restaurants and bars for the benefit of the plant staff.

6.4 Impact assessment

To harmonize positions of the multidisciplinary team on the assignment and reduce subjectivity in evaluating the significance levels of the identified potential environment impacts of the project, there was need to use a method that is flexible, transparent and most importantly free from subjectivity. In this light, Rapid Impact Assessment Matrix (RIAM) developed originally by Pastakia (1998) for EIA was suitably chosen. In Table 29 are explanation of the impact Rank used in RIAM Environmental Scores

Table 29: Impact Ranking according to the Rapid Impact Assessment Matrix.

No.	Impact Rank	Rank	Description of the Rank
1	+5	Major positive change/impact	A 'major change' will occur at a point when the condition extends to a regional/national boundary and is of major importance. Such a change would also be permanent, irreversible, though it could be non-cumulative.
2	+4	Significant positive change/impact	The lower limits of 'significant change' can be taken, as the point when a condition is outside local boundaries but is of major importance, yet is temporary, reversible and non-cumulative.
3	+3	Moderate positive change/impact	A condition of moderate change will lie between the limits of 'change' and 'significant change'.
4	+2	Positive change/impact	A condition of 'change' will occur up to a condition of local importance with significant magnitude, which is permanent, irreversible and cumulative.
5	+1	Slightly positive change/impact	A condition that is local in importance and a slight change from the status quo yet is permanent, irreversible and cumulative, represents the upper limit of the 'slight change' condition.
6	0	No change/status quo	Conditions that have neither importance nor magnitude will score a zero, and can be banded

No.	Impact Rank	Rank	Description of the Rank
			together. Any condition in this band is either of no importance, or represents the status quo, or a no change situation.
7	-1	Slightly negative change/impact	A condition that is local in importance, and a slight change from the status quo, yet is permanent, irreversible and cumulative, represents the upper limit of the 'slight change' condition.
8	-2	Negative change/impact	A condition of 'change' will occur up to a condition of local importance with significant magnitude that is permanent, irreversible and cumulative.
9	-3	Moderate negative Change/impact	A condition of moderate change will lie between the limits of change' and 'significant change'.
10	-4	Significant negative change/impact	The lower limits of 'significant change' can be taken, as the point when a condition is outside local boundaries but is of major importance, yet is temporary, reversible and non-cumulative.
11	-5	Major negative change/impact	A 'major change' will occur at a point when the condition extends to a regional/national boundary and is of major importance. Such a change would also be permanent, irreversible, though it could be non-cumulative.

Whereas positive impacts should be enhanced, negative ones should be mitigated or eliminated. The enhancement measures proposed for every identified project benefits are aimed to scale up or ensure sustainability of the project benefits. For this project, mitigation measures for the identified negative impacts have been defined and proposed in due consideration of the following general rule: -

- Avoidance of major/significant impacts: The strategies are to avoid significant impacts which are generally considered unacceptable, permanent and have potential to impact or extend over a large area.

- Reduction of significant/major and moderate impacts to As Low As Reasonably Practicable (ALARP) by planning, designing and controlling mitigation measures. The mitigation measures are applied until the limitations of cost effectiveness and practical application have been reached. National and international practice will guide on the limitations.

- Implementation of good practices for impacts rated as minor, in order to ensure that impacts are managed within good reason.

The mitigation measures for negative impacts and enhancement measures for positive impacts are proposed alongside the identified impact.

6.5 Potential negative impacts of project construction phase

The potential impacts of these project activities have been identified and ranked according to RIAM approach (Pastakia, 1998). Table 30 presents impacts of construction activities alongside their mitigation measures.

Table 30: Impacts and mitigation measures at the construction phase.

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
1	Loss of top soil/Soil erosion as a result of inappropriate construction methods that accelerate soil loss or erosion	• Hoarding off site during construction works to prevent soil erosion to surface water sources and the nearby drainage channels • Use brushwood to assist with erosion control and rehabilitation. • Covering or protecting stock piles of loose materials	-2	Negative change/impact
2	Excavation of foundation and transmission trenches without backfilling or backfilling with foreign material resulting in mixing of horizons of soil layers	• Removing the top soil prior to dumping any materials and returning later during rehabilitation. • Use of excavated soils for backfilling and levelling within the site premises • Timely removal and disposal of excessive quantities of excavated soil. • Soil erosion checks will be put in place where necessary along the drains.	-1	Slight negative change/ impact
3	Contamination by spilled oil, lubricants, fuels and concrete additives	• Storage of materials like oil, fuel, concrete additives and solvents in the standard recommended packaging materials and appropriately shelved while on-site • Installing leak-proof fuel storages on concrete platform with gutters and grease separators, which are monitored periodically and repaired or replaced when required • Oil, fuels & solvents should be used by trained personnel at a designated workstation to avoid spillage. • Refilling of fuel tanks should be carried out using an appropriate hose pipes strictly in a well-lit area or during day in order to minimize spillage. • Periodic maintenance should be carried out on equipment and project vehicles to prevent fuel and hydraulic oil spills.	-2	Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Continuous inspection & monitoring of equipment to detect any oil leakages at an early stage.		
4	Solid waste generation by workers and construction materials, and pollution by spilled oil, lubricants from construction equipment and vehicles	• Use excavated material for site levelling / backfilling • Remove excess soil in a timely manner and deposit at an approved site or preferably give to brick layers within the project area or disposed in nearby abandoned quarries • appropriately segregate wastes into categories such as non-hazardous or potentially hazardous, metal, plastics, biodegradable, non-biodegradable waste etc. at source • Re-usable waste should be sold or given away to interested parties for recycling • Park vehicles preferably on paved platforms to avoid fuel and oil leakages that contaminate soil and groundwater • Store fuel in leak proof containers that are periodically monitored, and repaired or replaced when necessary. • Re-fuel in a well-lit area or during day by qualified staff through appropriate hose pipes • Develop and implement as solid waste management plan.	-2	Negative change/impact
Water Resources				
1	Sediment build up in River Kochi due to bank erosion and possible runoff from exposed construction sites	• Strict adherence to construction schedule to avoid prolong pollution and impacts on the environment • Plant buffer vegetation at the source to stabilize river banks, control catchment erosion and retard river bank erosion. • Monitor sediment loads and receiving water quality	-1	Slight negative change/impact
2	Pollution by solid waste	• Contain solid wastes to avoid discharge into the river or any other surface water bodies. • Hold and store sanitary and cleaning wastes in appropriate containers to be disposed of at approved sites.	-1	Slight negative change/impact
Air Quality				

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
1	Dust emission from excavation of foundations, transmission trenches access roads. Emissions from ill-serviced fuel-powered machinery, project vehicles can potentially release dangerous by-products of internal combustion engines, such as carbon monoxide (CO), Sulphur oxides, Nitrogen Oxides, Hydrocarbons, Ozone (O_3).	• Hoard off the site before excavations and erect soil barriers • avoid dusty operations such as grading on dry and windy days • Remove excess soil from the site in a timely manner and dispose it at an approved site or preferably will be given to brick layers within the project area • All vehicles transporting excavated loose soils shall be covered and will not be over heaped; • Excessive and unnecessary vehicle movement should be avoided • Provide workers who may unavoidably have to work in dusty areas with nose and mouth masks and other PPE • Suppress dust during dry seasons by sprinkling water to work areas • All project automobiles should be serviced and maintained according to the manufacturers' specifications to reduce production and release of un-burnt carbon to the environment.	-2	Negative change/impact
Noise				
1	Noise emission and vibration by heavy vehicles and equipment. Intermittent emissions from operations such as excavation and drilling	• The site will be hoarded off during construction to limit the noise impacts from the site; • Features to reduce noise generation and vibrations will be fitted to motorized equipment and generators; • Provide workers on site with the necessary PPE such as ear muffs or ear plugs or as found appropriate; • Working in shifts is advised to limit the duration of exposure to noise; • Limit Construction, excavation activities and movement of haulage vehicles to day time since the noise impact is less felt during the day than during night; • Schedule noise intensive works at the least noise-sensitive time of the day (work between 7 am and 7 pm) or from 6 am - 10 pm as stated	-1	Slight negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		in the National Environment (Noise Standards and Control) Regulations, 2003. • Switch off engines for all the machines/vehicles which are not in use • Through a local radio and Local Council Leadership, inform the local community of the work program and adhere to it.		
Biodiversity				
Flora and fauna				
1	Loss of vegetation as a result of site clearing at water intake, WTP and storage reservoirs, along transmission route and Feacal Sludge Treatment plant site	• Limit clearance of vegetation to only that piece of land that is required for development. • Limit clearance of vegetation to only transmission route • Where possible, avoid felling trees (both planted and indigenous trees) along the transmission • Provide a fair compensation for trees, fruits and planted crops that have to be cut down so that a farmer can re-establish them elsewhere. • In an effort to compensate for the lost vegetation cover, it is recommended to do habitat restoration and re-vegetate using indigenous plant species, to reinstate benefits/ecosystem services of the respective habitats as they were before project activities.	-1	Slight negative change/impact
2	Loss of terrestrial habitat and eventual migration and loss of fauna	• Limit clearance of vegetation to only that piece of land that is required for development. • Clear only vegetation along the transmission line. • Restore / replant the indigenous trees species. • Adhere to construction schedule and complete in time to avoid prolong construction period that is detrimental to the flora and fauna. • Sensitize workers on importance of nature conservation and dissuade them from harassing animals. • Rescue animals found on site during any project phase.	-1	Slight Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
3	• Loss of habitat for aquatic organisms	• Minimization of wetland loss, restoration of wetlands and other natural sites • Development and Implementation of an Integrated Catchment Management for the basin of river Kochi to protect it from further degradation that jeopardises the ecological resources.	-2	Negative change/impact
Social Environment				
Socioeconomic aspects				
1	Disruption and interruption to social, cultural and economic activities in the conservative Muslim community as a result of influx of immigrant workers.	• Site hoarding should only follow an advance information to the community. • The local communities have to be informed about the construction program in advance through the most accessible media like FM radio stations or through the LC system. • Provide temporary access ways with the approval of local authorities where access roads are closed. • Traffic management plans should be set up at points of partial or complete closure. • Sensitize workers on proper social behaviour and conduct with regard to community systems and the acceptable societal norms.	-2	Negative change/impact
2	Loss of land. In total, 15.677 acres of land will be acquired for WTP, storage reservoirs, Feacal Sludge Treatment plant and part of the transmission route	• Ensure adequate and prompt compensation for project affected property like land, crops, tress and structures using the agreed and fair compensation in accordance with the Resettlement action plan	-2	Negative change/impact
3	Gender inequality at employment	• Give both men and women equal job opportunity. • A non – discrimination policy must be enforced at recruitment.	-2	Negative change/impact
4	Child Labour	• Sensitize against child labour and Implement child labour act	-2	Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Demand birth certificate or any identify that clearly shows the age of a job applicant • Issue each worker with an applicant letter with well spelt out terms of engagement		
5	Child abuse and early age pregnancies	• Implement a strict employment code of conduct. • Sensitization against molestation of children. • Emphasize penal code punishment for concealment or cover up child abuse by employer	-3	Moderate negative change/impact
Community and occupational Health and safety				
1	Increased accidents within and around project area from careless driving of project vehicles, falling debris and falling in excavated areas by residents and livestock	• The work sites (especially excavation works) have to have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. • Access to restricted areas must be with permission • Hoard off work sites and provide proper lights and reflective safety signs and restriction tapes especially at night • Inform the local community about the construction program in advance and adhere to it	-2	Negative change/impact
2	Spread of HIV and other STIs. Influx of immigrant labour into the community may disrupt social networks; increase prostitution and the abuse of the girl child.	• Sensitize workers on proper social behaviour and safe sexual behaviour to prevent spread of HIV/AIDS and other Sexually Transmitted infections (STIs). • Sensitize workers against indulging in sexual relations with underage girls and married women. • Implementing the HIV/AIDS policy at workplace. • Liaise with other agencies to provide free HIV/AIDS testing, counselling and Condom	-2	Negative change/impact
3	Occupational health and safety issues such as working under noisy conditions, lifting heavy	• Secure site boundaries with fences or hoarding as appropriate. Fence all dangerous areas especially excavated pits. • Provision of work platforms, scaffolds to ensure safe working heights	-2	Negative change /impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, TEREMUNGA GROUND SERVICE RESERVOIR AND APPA ELEVATED STORAGE RESERVOIR, TRANSMISSION MAINS AND FEACAL SLUDGE TREATMENT PLANT		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	objects, handling hazardous materials, poor sanitary conditions for workers, falling off heights, working in confined spaces	• Adequate supervision by ensuring regular inspection of formwork, and temporary supports for their safety • Use of appropriate PPE, such as safety glasses with side shields, face shields, hard hats/ helmets, and safety boots; • Establish emergency entrances, exits and amenities • Provision of first aid kits at work place		
4	Poor human waste management and sanitation	• Provide sanitation facilities including mobile toilets at all active construction sites and enforce their use. These should be separate for men and women; • Ensure that mobile toilets are periodically emptied by a licensed cesspool provider to any designated facility; • Inspect regularly to identify sanitation non-conformances and address it timely • Seek guidance from the District Health Officer on any other requirements to meet hygiene and sanitation standards	-2	Negative change /impact
5	Collapse of facilities and buildings.	• Geotechnical investigations carried out to determine the bearing capacity of soils to support the proposed developments; • Topographic surveys carried out to determine the terrain of the site; • Use of approved site layout plans and the building designs • Thorough supervision should be carried out by qualified engineers at the construction site during project execution.	-2	Negative change /impact

Table 31: Impacts and mitigation measures of boreholes at construction phase.

	BOREHOLES (to augment water sources)	**Mitigation measures**	**Project Phase: Construction**	
No	**Potential impact**		**ES Rank**	**Description of ES**
	Physical Environmental			
	Soils			
1	Loss of top soil/Soil erosion as a result of drilling methods that accelerate soil loss or erosion	• Hoarding off site during construction works to prevent soil erosion to surface water sources and the nearby drainage channels • Carry out work should under mild weather; avoid strong rains or winds. • Remove and store topsoil stored in separate piles and reinstate after refilling of trenches, to enable natural re-vegetation. • Use brushwood to assist with erosion control and rehabilitation. • Covering or protecting stock piles of loose materials	-1	Slight negative change/impact
2	Contamination by spilled oil, lubricants, fuels and drilling fluids	• Storage of materials like oil, fuel and drilling fluids in the standard recommended packaging materials and appropriately shelved while on-site • Installing leak-proof fuel storages on concrete platform with gutters and grease separators, which are monitored periodically and repaired or replaced when required • Oil, fuels & solvents should be used by trained personnel at a designated workstation to avoid spillage. • Refilling of fuel tanks should be carried out using an appropriate hose pipes strictly in a well-lit area or during day in order to minimize spillage. • Periodic maintenance should be carried out on equipment and project vehicles to prevent fuel and hydraulic oil spills. • Continuous inspection & monitoring of equipment to detect any oil leakages at an early stage.	-2	Negative change/impact

	BOREHOLES (to augment water sources)	**Mitigation measures**	**Project Phase: Construction**	
3	Solid waste generated by workers, drilled and construction materials	• Use excavated material for site levelling / backfilling • Remove excess soil in a timely manner and deposit at an approved site or preferably give to brick layers within the project area or disposed in nearby abandoned quarries • appropriately segregate wastes into categories such as non-hazardous or potentially hazardous, metal, plastics, biodegradable, non-biodegradable waste etc. at source • Re-usable waste should be sold or given away to interested parties for recycling • Develop and implement as solid waste management plan.	-2	Negative change/impact
	Water Resources			
1	Pollution by drilling sludge, solid waste, eroded soils from drill site and chemicals such as spilled oil, lubricants from construction equipment and vehicles	• No solid waste, fuels or oils should be discharged into water flows. • Drilling methods should follow standard procedures to prevent surface water and groundwater contamination during the process. • Hold and store sanitary and cleaning wastes in appropriate containers to be disposed of at approved sites. • Vehicles should preferably be packed on paved platforms. • Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. • Any area storing contaminating liquids should have a bund that will contain 110% of the liquids stored. • Pave sites for cleaning, fuelling and maintaining vehicles to prevent leakage or fuelling and car servicing should be carried out at designated fuel stations.	-2	Negative change/impact
Air Quality				
1	Dust and CO2 emissions from drilling equipment and project vehicles	• Hoard off the site before excavations and erect soil barriers • Avoid drilling on windy and dry conditions. Drill when the weather is mild.	-2	Negative change/impact

	BOREHOLES (to augment water sources)	Mitigation measures	Project Phase: Construction	
		• Remove excess soil from the site in a timely manner and dispose it at an approved site • Avoid excessive and unnecessary vehicle movement • Provide workers who may unavoidably have to work in dusty areas with nose and mouth masks and other PPE • Suppress dust during dry seasons by sprinkling water to work areas		
Noise				
1	Intermittent noise emissions from drilling and vibration of moving heavy vehicles and equipment	• Through a local radio and Local Council Leadership, inform the local community of the work program prior to work commencement and adhere to it. • Hoard off during borehole drilling to limit the noise impacts from the site; • Fit on motorized equipment and generators features to reduce noise generation and vibrations • Provide workers on site with the necessary PPE such as ear muffs or ear plugs or as found appropriate; • If extreme, schedule workers in shift to limit the duration of exposure to noise; • Limit drilling, excavation activities and movement of haulage vehicles to day time since the noise impact is less felt during the day than during night; Schedule noise intensive works such as drilling at the least noise-sensitive time of the day (work between 7 am and 7 pm) or from 6 am - 10 pm as stated in the National Environment (Noise Standards and Control) Regulations, 2003. • Switch off engines for all the machines/vehicles which are not in use	-2	Negative change/impact
	Biodiversity			
	Flora and fauna			

	BOREHOLES (to augment water sources)	**Mitigation measures**	**Project Phase: Construction**	
1	Vegetation loss resulting from clearing sites	• Limit clearance of vegetation to only that piece of land that is required for borehole development. • Provide a fair compensation for trees, fruits and planted crops that have to be cut down so that a farmer can re-establish them elsewhere. • Restore and replant adequate grass cover and bushes on sloping areas to reduce erosion loss. Emphasize on replanting indigenous tree species in the project site.	-1	Slight negative change/impact
2	Loss of terrestrial habitat and biodiversity of birds, butterflies and small mammals at borehole site	• Limit clearance of vegetation to only that piece of land that is required for borehole development. • Restore / replant the indigenous trees species. • Adhere to construction schedule and complete in time to avoid prolong construction period that is detrimental to the flora and fauna. • Sensitize workers on importance of nature conservation and dissuade them from harassing animals. • Rescue animals found on site during any project phase. • Develop and implement a water source protection plan	-1	Slight negative change/impact
	Social Environment			
	Socio - economic aspects			
2	Disruption and interruption to social, cultural and economic activities by introducing behavioural changes	• Site hoarding should only follow an advance information to the community. • Inform the local communities about the borehole drilling and development program in advance through the most accessible media means such as through the LC system. • Provide temporary access ways with the approval of local authorities where access roads are closed. • Sensitize workers on proper social behaviour and conduct with regard to community systems and the acceptable societal norms	-1	Slight negative change/impact

	BOREHOLES (to augment water sources)	**Mitigation measures**	**Project Phase: Construction**	
		• Protect any items and/or sites of archaeological or cultural value (e.g. private graveyards) discovered during works with the aid of the appropriate authorities. • Provide adequate and prompt compensation for project affected property like land, crops, tress and structures		
4	Loss of land and livelihood as borehole sites are gazetted	• Ensure adequate and prompt compensation for project affected property like land, crops, tress and structures using the agreed and fair compensation in accordance with the Resettlement action plan	-1	Slight negative change/impact
	Health and safety			
1	Increased accidents likelihoods within and around project site possibly from careless driving of project vehicles	• Inform the local community about the construction program in advance and adhere to it • Hoard off work sites and provide proper lights and reflective safety signs and restriction tapes especially at night	-1	Slight negative change/impact
2	Spread of HIV and other STIs. Influx of people into the community may disrupt social order and prostitution would be likely. This aids spread of STIs	• Sensitization of workers on proper social behaviour and safe sexual behaviour that would prevent them from contracting HIV/AIDS and other Sexually Transmitted infections (STIs). • In addition, workers should be sensitized to not engage in sexual relations with underage girls and married women. • Implementing the HIV/AIDS policy at workplace.	-2	Negative change/impact
3	Occupational health and safety issues such as working under noisy conditions, lifting heavy objects, handling hazardous materials, poor sanitary conditions in workers camps	• Secure site boundaries with fences or hoarding as appropriate. Fence all dangerous areas especially excavated pits. • Use of appropriate PPE, such as safety glasses with side shields, face shields, hard hats/ helmets, and safety boots; • Establish emergency response plan • Provision of first aid kits at work place • Provide social amenities	-2	Negative change/impact
4	Human waste disposal issues.	• Put in place sanitation facilities including mobile toilets for use by workers at all active construction sites and enforce their use. • have separate sections for women and men	-2	Negative change /impact

	BOREHOLES (to augment water sources)	**Mitigation measures**	**Project Phase: Construction**	
		• Ensure that mobile toilets are periodically emptied by a licensed cesspool provider to any designated facility; • Inspect regularly to identify sanitation non-conformances and address them timely		

6.6 Potential negative impacts of project operational phase

The impacts of the highlighted activities and all others during operation and maintenance phase have been identified and evaluated for each component and are as presented in the tables below.

Table 32: Mitigation measure at the Intake and WTP at Operation Phase

No.	INTAKE WORKS AND WATER TREATMENT WORKS: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Physical Environmental				
Soils				
1	Contamination by spillage of chemicals such as chlorine and Aluminium Sulphate (Alum) and sludge containing Alum from WTP. Chlorine corrode metal.	• Chemicals such as aluminium sulphate and brine for making Free Available Chlorine should be stored in the standard recommended packaging materials and appropriately shelved while on-site • Chemicals for water treatment such has brine and aluminium sulphate should be used by trained personnel at a designated workstation to avoid spillage. • Sludge containing Alum should be dried, caked and handed over to NEMA certified waste handler for safe Disposal	-2	Negative change/impact
Water Resources				
1	Reduction in River Kochi as a result of abstraction	• At no moment should abstraction exceed river flow rate. • Limit abstraction to permitted abstraction rate which is issued based on the safe yield. The safe yields for abstraction are recommended at 2/3rd of the low dry season flow or Q95 flow (MWE, 2013). • Install river flow gauge at the downstream of the intake point to monitor continuously the environmental flow • Develop and Implement a source protection and comprehensive catchment management plan	-4	Significant negative change/impact
2	Sedimentation build-up of screened coarse particulate at intake sump	• Manually remove built up screened coarse material from the river	-2	Negative change/impact
3	Pollution by backwash effluent and chemicals have potential of poisoning water and depriving	• Chemicals such as aluminium sulphate and brine for making Free Available Chlorine should be stored in the standard recommended packaging materials and appropriately shelved while on-site	-3	Moderate negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	other aquatic organisms of oxygen	• Chemicals for water treatment such has brine and aluminium sulphate should be used by trained personnel at a designated workstation to avoid spillage. • Backwash water should be clarified and the extracted sludge thickened, caked and handed over to NEMA certified waste handler for safe Disposal • Regularly monitor river water quality for contaminants according to NEMA, Uganda standards and instantly take corrective measures • Regularly check Storage containers for leakage. If any leakage is detected, the chemical should be removed and the container repaired immediately. If the containers cannot be repaired, they should be disposed according to NEMA regulations regarding disposal of solid wastes containing hazardous materials		
	Flora and fauna			
1	Associated loss of aquatic habitat as a result of reduced river Kochi flow	• Minimization of wetland loss, restoration of wetlands and other natural sites • Develop and Implement an Integrated Catchment Management for the basin of river Kochi to protect it from further degradation that jeopardises the ecological resources.	-2	Negative change/impact
Health and safety				
1	Exposure to occupational health and safety hazards such as handling hazardous materials and chemicals, lifting heavy objects, working in confined places,	• All chemicals are to be handled by trained technicians with full understanding of safety precautions • provide safety guidelines to guide all operations; • Enforce use of appropriate PPE, such as safety glasses with side shields, face shields, hard hats/ helmets, and safety boots; • Establish emergency entrances, exits and amenities; • Provide workers with first aid kits • Ensure safe working heights through provision of work platforms, scaffolds	-2	Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Install caution signage around the site to discourage the public from being close to the site, for example, "falling debris", "keep off the site" etc.		
2	Increased accidents within WTP and Water intake especially from fire outbreaks, electrocution, working in confined space and falling from heights.	• Employ qualified technical personnel with basic understanding of safety measures. • Use certified electricians for wiring and electrical installations. • Provide workers with first aid kits • Put in place a comprehensive fire plan to guide workers in case of fire outbreak. • Display on all notice boards contacts of emergency response teams such as fire brigade, nearest police station and medical centre and ambulances • Establish emergency entrances, exits and amenities;	-2	Negative change/impact

Table 33: Mitigation measures of water mains at Operation Phase.

No.	PIPELINES FOR TRANSMISSION AND DISTRIBUTION: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Physical Environmental				
Soils				
1	Inspection & maintenance works for the mains may require clearance of sites vegetation, and excavation works, possibly using heavy equipment. This may induce or accelerate erosion.	• Limit excavation to only transmission routes • Remove the top soil prior to dumping any materials and return it after rehabilitation. • Use excavated soils for backfilling and levelling within the site premises • Remove timely excessive quantities of excavated soil and dispose it in abandoned quarries or give to brick layers within the project area.	-2	negative change /impact
Biodiversity				
Flora and fauna				
1	Loss of vegetation and habitat of associated fauna as a result of maintenance works.	• Limit vegetation clearance to the transmission route only • Where possible, avoid felling trees (both planted and indigenous trees) along the transmission	-2	Negative change /impact
Social Environment				
Socio - economic aspects				
1	Disruption and interruption to social, cultural and economic activities and arrangement through road blockage and traffic diversion during maintenance	• Site hoarding should only follow an advance information to the community. • Provide temporary access ways with the approval of local authorities where access roads are closed. • Minimize obstruction of access roads or occupation of roads, footpaths and bridges • Traffic management plans should be set up at points of partial or complete closure. • Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible	-2	Negative change /impact

No.	PIPELINES FOR TRANSMISSION AND DISTRIBUTION: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Sensitize workers on proper social behaviour and conduct with regard to community systems and the acceptable societal norms.		
Health and safety				
2	Occupational health and safety problems may arise during maintenance of the pipelines. These may include: lifting of heavy and sharp objects, transportation of materials for maintenance, storage, handling and use of dangerous substances.	• Ensure safe working heights through provision of work platforms, scaffolds • Install caution signage around the site to discourage the public from being close to the site, for example, "falling debris", "keep off the site" etc.; • provide safety guidelines to guide all operations; • Enforce use of appropriate PPE, such as safety glasses with side shields, face shields, hard hats/ helmets, and safety boots; • Establish emergency entrances, exits and amenities; • Provide workers with first aid kits	-2	Negative change/impact

Table 34 Mitigation measures at Teremunga and Appa WR at Operation Phase.

No.	STORAGE RESERVOIRS (TEREMUNGA GSR AND APPA ESR: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Aesthetics				
1	Obstruction to beautiful and natural scenes. Loss of aesthetic value and pristineness of the natural environment into a built up environment	• Renovate or rehabilitate the structures to blend beautifully with the environment. • Use culturally accepted materials for renovation	-1	Slight negative change /impact
Socioeconomic aspects				
1	Disruption and interruption to social, cultural and economic activities and arrangement such as fencing which, can deny the community access things of cultural value such as herbs	• Minimize obstruction of access roads or occupation of roads, footpaths and bridges • Provide temporary access with the approval of local authorities where access roads are closed. • Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible during maintenance • Sensitize maintenance workers on proper social behavior and conduct with regard to community systems and the acceptable societal norms. • Under supervision, the community members maybe allowed access to the things of cultural value within the enclosure	-2	Negative change /impact

Table 35: Mitigation measures of bore holes at the Operation Phase

No	BOREHOLES	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Physical Environmental				
Water Resources				
1	Excessive drawdown and drop in groundwater level and related reduction in the flow river Kochi as a result of over abstraction	• Conduct hydrogeological investigations including pumping tests to determine the safe yield for abstraction. • Limit abstraction to the safe yield of the aquifer and the permitted abstraction rate. At no instance should abstraction exceed the recharge rates of the aquifer. • For wells working on bank filtration principle, both groundwater monitoring station and river flow gauging station have to be installed to ensure adequate flow is left in the river. • Conduct periodic surveillance and monitoring of the groundwater level, river water flow and quality to ensure conformity with NEMA requirements.	-3	Moderate negative change /impact
Noise				
1	Noise pollution from water pumps and generator.	• Fit on generator, features to reduce noise generation and vibrations • Routinely maintain and service the generator as recommended by manufacturers.	-2	Negative change
Health and safety				
1	Public health risks to water users as a result of contaminated water	• Ensure good housekeeping at the borehole. • Draw and implement water source protection plan • Follow standard operation and maintenance of the borehole, pumps and generator. • Regularly monitor water quality for any contamination following well completion, e.g. at least on weekly basis for the first year of operation. • Involve the public in the detection of potential contamination through awareness creation and opening of a complaint desk.	-2	Negative change/impact

Table 36: Mitigation measures of Feacal Sludge Treatmentat the Operation Phase.

No	FEACAL SLUDGE TREATMENT PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Physical Environmental				
Soils				
1	Accumulation of non-biodegradable component of solid waste at Feacal Sludge Treatmentplant Delivery/illegal dumping of hazardous waste including medical waste to the site	• Enforce waste sorting at source/generation. Ensuring only sorted biodegradable waste is delivered to Feacal Sludge Treatment plant site • Avail enough waste skips; • Inspect the waste delivered for medical and other hazardous waste; • Secure a section for disposal of rejects from the composting process; • Fence off the site and provide security to restrict access to mitigate illegal waste dumping; • Trace waste and penalize illegal waste dumpers.	-1	Slight negative change
Water Resources				
1	Discharged treated wastewater and leachate will contain pathogens, high nutrients and heavy metals that can cause pollution of the receiving environment. Accumulation of heavy metals from the leachate and effluent pollutes the environment.	• Utilize a closed loop system by reusing the leachate in the composting process; • Ensure that the leachate tanks are roofed and drains covered to avoid storm water that would cause the leachate to overflow; • Treat properly the leachate in the water treatment pond designed as a component of the Feacal Sludge Treatment plant • Further purify or polish the effluent from the water treatment pond in a vegetation buffer around the Feacal Sludge Treatment plant fence. • Locate point water sources, wells and surface water at a minimum distance of 300 m from the Co-compost plant discharge point	-3	Moderate negative change /impact

No	FEACAL SLUDGE TREATMENT PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Air Quality				
1	Improper operation of the composting process Accumulation of waste due to equipment breakdown and attracting birds and insects nuisance Foul smell (odour) from decomposing waste, which are seldom turned. This may attract flies.	• Monitor the critical parameters of the composting process to ensure they are within the design values. Management will have to procure a thermometer, an oxygen meter and a moisture meter for monitoring purposes; • Develop a Composting Operations Manual to provide guidance to staff running the site. This will be complemented by the ESMP; • Maintain equipment (skip loader or tractor) to ensure timely turning of windrows; • Sprinkle a slurry of cow dung to the waste (has proved to reduce flies at Mbarara composting Plant); • Constant liaison and dialogue with the community to address/resolve any grievances; • Corporate Social Responsibility (CSR) as a token of appreciation to the community for accepting the composting facility. This can be through identifying community needs such as water supply and addressing them. • Enforce appropriate operation and management of the Composting process such as regular turning of windrows • The unsorted solid waste and the sludge have to be neatly arranged in windrows • Fence Feacal Sludge Treatment area with hedges of not less than 1 meter high in order to prevent the wind blowing and dispersing foul smell to neighbouring communities.	-2	Negative change
2	Accumulation of compost onsite and therefore creating space problems	• Develop a Marketing Plan for the compost to mitigate accumulation onsite; • Price the compost in a manner to encourage its adoption and use. • Establish demonstration gardens onsite to entice farmers to use compost.	-2	Negative change/impact

No	FEACAL SLUDGE TREATMENT PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Socioeconomic aspects				
2	The compost manure will have pathogens mostly worms if not properly composted. This will lead to contamination of agriculture land where the manure is applied. The pathogens may end up in the food chain.	• Ensure appropriate operation and management of the Composting process • Increasing the composting time to make a pathogen free compost that is safe for handling • Testing of the compost (e.g. on a biannual or quarterly basis) to ensure it is fit for purpose; • Train farmers on the application of compost through establishment of demonstration gardens on site;	-2	Negative change/impact
Occupational and Community Health and safety				
1	The mixing of sludge and biodegradable municipal solid waste exposes workers at Feacal Sludge Treatment plant to pathogens which may infect them with diseases such as dysentery, cholera, and typhoid worms. Risk of accidents by waste trucks, Injuries to waste sorters and improper sanitation HIV/AIDS due to interaction of staff (sorters, truck drivers, senior staff, neighbours, etc.)	• Enforcing use of PPE such as mouth and nose masks, hand gloves, gumboots etc. • Mechanical mixing of sludge and biodegradable waste • Disinfection and hand washing after handling of sludge and organic waste mixture • Workers should be made aware of the available sanitary facilities and their location; The toilets should be separate for both men and women • Undertake regular inspection of the sites to identify sanitation non-conformances and ensure timely re-address • Restrict access by the public; • Maintain waste trucks in sound mechanical condition and recruit experienced drivers to reduce the risk of accidents; • Immunization of waste sorters against tetanus; • Maintain a stocked First Aid kit;	-2	Negative change/impact

No	FEACAL SLUDGE TREATMENT PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Sensitize the workers on HIV/AIDS and provide condoms;		
2	Pools of stagnant water may form in pits, holes and sludge treatment plant and create suitable habitats for disease vectors such as mosquitoes	• Fill up all depressions to avoid formation of pools of stagnant water • Fumigation of Feacal Sludge Treatment site against vectors and insects	-2	Negative change/impact

6.7 Analysis of potential positive impacts of the project

6.7.1 Improved standard of living through increased coverage of water

Generally, the living standard and well-being of the residents of Koboko Town and the communities of Lobule and Godia Sub Counties will improve. The project will increases overall access to safe water to 90% from 4% in Koboko Town and increase production of the pipe water supply in Koboko town to 166 m³/day. It will increase provision of safe water closer to the households and boost the piped water coverage, which currently is only at 4%, characterized by intermittent services and waiting time longer than four hours at the water points

There are no water and sanitation facilities planned within the informal settlements, instead informal settlements will be beneficiaries because water will be extended to them. Safe water will be provided at water kiosks and yard taps constructed within a radius of 100 m in the informal settlements. This will improve public health and hygiene in the project areas. This will reduce reliance and overcrowding at point water sources, which are prone to contamination. Moreover, the location of yard taps within a short walking distance will reduce the burden of carrying water on head for long distance and reduce waiting time at water points in dry seasons. This would bring about gender equity as women and children who often walk long distances to collect water will have water at yard taps near their homes. As a result, women will have sufficient time to engage in gainful economic activities while children especially the girl child will concentrate in school. The positive impact is ranked as a significant positive impact with RIAM Environmental Score (ES) of +4ve.

Enhancement measures

i. Supply of safe water and provision of sanitation services to the population should be without discrimination and at affordable rates to realize the benefits of the project, thus ensuring its sustainability. This should be accompanied with transparent criteria for charging users. Timely billing indicating quantity of water consumed and fees charged are recommended. Keeping users up to date on the status and functionality of the various project facilities will ensure reliability and guarantee functionality and sustainability.

ii. The Construction supervision team must ensure yard (and / or stand) taps are provided at a radius of 100 m. Sensitization efforts must be made towards management of the water supply and sanitation system. If a Community Based Management System will be adopted for the scheme management, presence of women in the Water Supply and Sanitation Board is highly recommended. This is to ensure the views of women are well represented since they are the most affected by the failure of supply schemes.

6.7.2 Improved sanitation, hygiene and reduction of water borne disease incidents

Currently, the sanitation facilities in Koboko MC is inadequate to guarantee public health. The town population is served mainly by pit latrines that makes up 73.8% of the sanitation facility for faecal disposal. The flush toilets and septic tanks serve only administrative buildings while at public sanitation facilities in town charge users' UGX 200 per use. The town has no faecal sludge treatment plant; few homes, hotels and offices that can afford, empty their filled up pit latrines and septic tanks and deposit

the sludge in an area designated by town council while most households just abandon their filled up latrines and build new ones. This practice requires more land.

The proposed sanitation system that include public waterborne latrines and Feacal Sludge Treatmentplant for faecal sludge and organic waste treatment will greatly reduce the risks of poor sanitation related disease burdens. It will bring an end to the current practice of abandoning filled up toilets or depositing faecal sludge without treatment. The end result of a well-managed sanitation system is a healthy community that can pursue economic prosperity because of reduced disease burdens. The water borne toilet systems proposed within the urban centres will reduce reliance on rudimentary sanitations systems that have promoted uncontrolled disposal of faecal sludge. According to RIAM Environmental Score, this is a positive impact ranked +4ve implying a significant positive change/impact.

In addition, the compost manure from the Feacal Sludge Treatment plant would be available for soil amendment and improve the agricultural output. This benefit will improve farmers' agricultural productivity and eventually eradicate poverty among rural farmers. This has a cumulative effect as it can benefits farmer from within the region and far, therefore it is predicted to bring a moderate positive impact with a RIAM ES rank of +3ve.

Enhancement measures

i. For maximum utilization of the project, sensitization and awareness campaigns to improve sanitation are recommended so that people adapt water borne toilet systems at their homes. Social responsibility actions such as drama and sports activities should be organised to increase knowledge of the systems and attract new users. Ultimately, service levels may improve from pit latrines to septic tanks, or even to a small sewerage system, depending on the number of people included in the system. Water borne toilet systems are the future of efficient sanitation systems in urban centres as there will be inadequate land in future to construct pit latrines.

ii. Compost manure from the Feacal Sludge Treatment plant should be well managed and sold to farmers at reasonable prices to encourage use of compost manure to enhance soil fertility.

iii. The communities who join the system or deliver faecal sludge and organic waste for Feacal Sludge Treatment should be given a reasonable tariffs on the basis of economies of scale. As more households join the system, there should be a concomitant tariff rebate given to the community.

6.7.3 Reduction of domestic violence

As many parts of Uganda, in Koboko, it is the duty of women and children to collect water. Lack of water in the house may lead to domestic violence where the husband beats up the wife or children. Whenever women and children go to collect water a suspicious husband or father may think the wife or children have been involved in promiscuity. This is particularly true if women or children spend unaccountable time at the water source. This may lead to domestic violence against the women or children. The project will bring water near to the household where a suspicious husband/father may be able to monitor the movement of his wife or children since it will be short

distance from home. The nearness of water to a home will lead to the reduction of domestic violence. This impact is ranked a positive +2 impact.

Enhancement measures
The project should bring water to every homestead in the project area. In informal settlements, water kiosks, a public stand tap or yard tap should be within a radius of 100 m.

6.7.4 Increased employment

There will be various employment opportunities for professionals such as engineers, consultants, contractor and unskilled labours. These opportunities are available during pre-construction, construction, operation and maintenance phases. At the height of construction about 150 people will be employed. This has potential to employ all categories of people including women and the youth.

Generally, the benefits rank from positive impact (with ES rank +2ve) at operation and maintenance as fewer skilled people are employed to moderate positive change (ES + 3ve) during construction. This is so because at construction of project components, numerous skilled labour will be drawn all over the region including international citizens and numerous unskilled labour from neighbouring communities. Employment opportunities will reduce in the operation and maintenance phase, as only skilled labour will run the systems.

During consultation, local stakeholders expressed enthusiasm in the project and expect to get jobs once the project construction starts. This should benefit every willing person and therefore benefit the Ugandan economy in terms of revenue collection.

Enhancement measures

- In sourcing for a contractor and system operator, preferences should be given to capable Ugandan companies or international companies with more Ugandan employees.

- To drive ownership of the project and maintain the enthusiasm local communities exhibited in regard job prospects, both the contractor and system operator should give employment priority to local community with skills and training. Where possible, interested communities should be trained in scheme management. The local community should provide the entire unskilled workforce.

- Women, youth and persons with disabilities should not be discriminated. All employees should be issued with appointment letters that clearly spell out terms of employment and remuneration. The contractor and scheme operator must ensure prompt payment of workers.

6.7.5 Market for locally available materials and produce

There will be markets for locally available raw materials such as cement, iron bars, timber, wood, aggregates, sand, electro-mechanical equipment and pipes during the construction, operation and maintenance phases. Since there will be an influx of workers from different places to the construction site, the local communities will have markets for their food produce and products. This is a positive change ranked as +1ve.

Enhancement measures
The sourcing of the project materials should give priority to local suppliers and service providers with capacity. Before importing materials, proof of inability of local suppliers to provide the service must be provided. Local restaurants or food dealers should be contracted to provide catering service to workers.

6.7.6 Skills training and technology transfer

At all phases of the project, skills and technology transfer is anticipated to take place, although at the construction phase, the skills and technology transfer will be more noticeable because of the large number of people involved. The skills transfer is viewed as very important and cumulative in effect as the technology and skills can be adopted to ensure system sustainability. It's ranked as a moderate positive impact with a RIAM ES rank of +3ve.

Enhancement measures
The contract terms for contractor and even construction supervision should emphasize skills transfer. The contractor should incorporate interested members of the local community and other interested persons or run an internship / apprenticeship program with Ugandan students to facilitate knowledge and technology transfer.

Before contracting foreign companies, they shall be required to form joint ventures with local companies to build capacity of local companies in similar projects.

6.7.7 Economy

The economic benefits to the Uganda are forecasted to accrue during the operational and construction phases as Government will charge project employees' taxes. The revenue inflow to the Ugandan economy will be from tax remittances such as Value Added Tax (VAT), With Holding Tax (WHT), Pay As You Earn (PAYE), Local Taxes, etc. This is ranked as moderate +3ve change/impact.

Enhancement measures
The Central Government through the Uganda Revenue Authority should ensure that the contractor and scheme operator periodically and timely file their tax returns.

6.8 Analysis of potential significant negative impacts

6.8.1 Reduction of River Kochi flow as a result of abstraction

During the operation phase, the water intake and WTP will be abstracting 210 m³/h (equivalent to 58.33 l/s) in the first phase (2030 phase) while in the 2040 phase, because of projected increase in demand, the scheme is designed to abstract 280 m³/h (equivalent to 77.77 l/s). These abstraction rates cannot be supported by the river flows at all times of the year. The field hydrological assessment of river Kochi at the proposed intake point showed that the River flow in March and May of 2015 varied between 30 l/s to 34 l/s as shown in Table 4. In addition, the extreme low flow analysis (discussed in detail in Section 3.1.4) shows that at least once in every 25 years, the lowest daily flow of river Kochi at intake point will be 0.00035 m³/s or lower. This clearly fails a design criteria where a low flow with a 25 years return period is required to be at least two times larger than the water demand.

It must be noted that when the environmental flow is considered at 30%, the demand will not be met every year and for most parts of the dry season. Certainly, during the low flow periods, the river cannot support the planned abstraction rate while conserving the required environmental flow. The project is anticipated to significantly reduce River Kochi flow. This impact is ranked to cause significant negative impacts with RIAM ES of -4ve as it has irreversible impact on the riverine vegetation and aquatic organisms.

Mitigation measures

At no moment should abstraction exceed river flow rate. The abstraction rate should be limited to the permitted abstraction rate. The permitted abstraction rate should be equal to or less than safe yields. Safe yields for abstraction are recommended at 2/3rd of the low dry season flow (MWE, 2013). To ensure compliance and monitoring of compliance with abstraction rate, river flow gauge should be installed at the Downstream of intake point to monitor environmental flow. In addition, a source protection and comprehensive catchment management plan must be developed and implemented to ensure equitable use of the limited water resources.

6.8.2 Excessive drawdown, drop in groundwater level and related reduction of River Kochi flow

In a bid to augment the capacity of River Kochi to meet the water demand, three boreholes are planned to be drilled along the shores of River Kochi. While working on the principle of bank filtration, 10 m³/h of water is planned to be abstracted from each of the well (borehole). Bank filtration, implies the boreholes abstract the river recharge.

Comparing the planned abstraction rates of each well (10 m³/h) with the yield of boreholes around Koboko, certainly, the planned abstraction rates of the boreholes are certainly too high to be supported by the aquifer. This certainly will be a case of excessive abstraction. The possibility of lowering stream flows and land subsidence as a result of excessive groundwater abstraction are common and are well studied phenomena (Baalousha, 2012; Intaraprasong & Zhan, 2009a; Okwir, 2013). There is a concern that River Kochi may experience a reduced flow as the boreholes will be abstracting from its catchment. A reduced river Kochi flow has a cumulative effect and could lead to loss of aquatic habitat and biodiversity. This is a moderate negative impact with a RIAM ES Rank of -3ve.

Mitigation measures

- Conduct hydrogeological investigations including pumping tests to determine the safe yield for abstraction.

- Limit abstraction to the safe yield of the aquifer and the permitted abstraction rate. At no instance should abstraction exceed the recharge rates of the aquifer.

- If boreholes (wells) are working on bank filtration principle, both groundwater monitor station and river flow gauging station have to be installed to ensure adequate flow is left in the river.

- Conduct periodic surveillance and monitoring of the groundwater level, river water flow and quality to ensure conformity with NEMA requirements.

6.9 Analysis of potential cumulative negative impacts

6.9.1 Pollution by backwash effluent

During the operation phase, backwash water from the water treatment plant will be returned to the River Kochi. The backwash water carries toxic aluminium ions from aluminium sulphate and suspended solids. This combination can react and form a chelate of very toxic and dangerous compounds with potential of killing the aquatic organisms including fish. The organic suspended solids from the backwash water will increase turbidity of river water, remove the oxygen from the water as they decompose, which will increase the BOD and COD of the water. Although, the water treatment plant is designed to pre-treat and limit the concentration of suspended solids in backwash water to less than 50 mg/L, continuous disposal into River Kochi will have a cumulative effect. The planned effluent discharge of 11 m³/h from the water treatment plant operating 24 hours a day implies 13.2 kg of solids will be added to the river per day.

The decomposition of the organic matter in the backwash water together with the low dilution effect of river Kochi especially in dry season when the river flow is reduced (about 30 l/s) will cause anoxic conditions, leading to death of aquatic organisms. This impact is predicted to cause a moderate negative impact (RIAM ES -3ve).

Mitigation measures

- Backwash water should be filtered and allowed to settle so that suspended matter are removed before discharging back to river. The extracted sludge cake should be dried, caked, stored and handed over to a NEMA approved contractor for safe disposal.
- Chemicals such as aluminium sulphate and brine for making Free Available Chlorine should be stored in the standard recommended packaging materials and appropriately shelved while on-site
- Chemicals for water treatment such has brine and aluminium sulphate should be used by trained personnel at a designated workstation to avoid spillage.
- Regularly monitor river water quality for contaminants according to NEMA, Uganda standards and instantly take corrective measures
- Regularly check Storage containers for leakage. If any leakage is detected, the chemical should be removed and the container repaired immediately. If the containers cannot be repaired, they should be disposed according to NEMA regulations regarding disposal of solid wastes containing hazardous materials

6.9.2 Pollution by effluent from the Feacal Sludge Treatment plant

In the composting process, leachate and liquid sludge will be drained from the composting mixture of faecal sludge and organic waste. The effluent will be treated in a 110 m² shallow aerobic water treatment pond to remove among others pathogens through UV treatment before releasing into the vegetation buffer within the fence of the Feacal Sludge Treatment plant. Although the treatment in the pond is aimed to reduce organic load, nutrient load and pathogens in the effluent, it is impossible to reduce it to zero. Some effluent will still contain organic matter with high BOD and COD, nutrients, pathogens and heavy metals.

The effluent would increase nutrients such as phosphates and nitrates derived from grey water and sewage into the receiving environment. The continuous release of

organic matter from the effluent will encourage algal blooms. Additionally, the heavy metals from Feacal Sludge Treatment effluent will undoubtedly be carried by running water and deposited in the water courses where heavy metal pollution will occur. These heavy metals will find their way into the food chain because of the adjacent grazing land. This impact is cumulative and is ranked as a moderate negative impact (with RIAM ES of -3ve).

Mitigation measures

The pond designed to treat sewage effluent may not be adequate to remove nutrients, organic matter, pathogens and heavy metals. Hence a constructed wetland and a vegetation buffer is recommended as an additional wastewater treatment step to polish the effluent before it is released into the receiving environment.

Point water sources, wells and surface water should be at a minimum distance of 300 m from the co-compost plant discharge point.

Control of odours, vermin is an important part of the social aspect of this FSTP operation. The operator will outsource the control of flies and vermin to a specialised pest control firm in accordance with the World Bank Pest Management OP 4.09. The types of vermin expected are houseflies, cockroaches, rats, birds, snakes, cats, etc. Larger mammals, especially predators, will be expected.

A well-managed odour and vermin control system will enhance acceptance by the community while these nuisances may lead to rejection of the FSTP by the community. Efforts will be expended to sensitise the community on the benefits of the FSTP and its benefits to the community. The benefits include reduction of solid waste; emptying of their pit latrines and septic tanks; provision of manure from the composting of waste; and generation of biogas.

Most communities do not have large quantities of solid waste to dispose of but cumulatively, even the little that they produce can become a nuisance if not disposed of properly; thus a FSTP in the area would provide a disposal route, which the community can take advantage of. Their pit latrines are emptied occasionally; it is suggested that the impacted communities are given preferential tariffs when they bring in their pit latrine sludge for disposal at the plant. The compost sale should also be at a lower tariff. This will encourage the community to accept the project in their neighbourhood.

The operator shall engage an independent person to routinely audit the operations of the plant with a view to keep the community engaged, informed and to have the operations at a high level of efficiency.

A community complaints procedure will be set up, requiring quick actions to control vermin outbreaks. Members of the community will be drafted in to a community association, which will be responsible for oversight of the operations of the FSTP and generation of benefits such as compost and biogas.

To enhance the social and environmental impacts of the wastewater collection system, it is important to carryout community sensitisation and to give reasonable tariffs on the basis of economies of scale. As more households join the system, there should be a concomitant tariff rebate given to the community. Social responsibility

actions such as drama and sports activities should be organised to increase knowledge of the systems and attract new users. Ultimately, service levels may improve from pit latrines to septic tanks, or even to a small bore sewerage system, depending on the number of people included in the system.

6.10 Analysis of potential significant negative social impacts

6.10.1 Child abuse and early age pregnancies

During construction and operation phase because workers will have disposable income earned from being employed on the project, they might engage in sexual acts with under age children particularly the gild child. This may result in early age pregnancies and an increase in number of girl children dropping out of school. This may psychologically disorient the life of the child and her family. Given that the project employees shall be recruited from within the project area and from different parts of the country with different cultural and sexual backgrounds, it is possible that some of them introduce foreign sexual behaviours in the Conservative Muslim community of Koboko such as having sex with young boys (child molestation). In due consideration of the cultural and religious sensitivity of the project area, this impact is ranked as a moderate negative impact (RIAM ES – 3ve).

Mitigation measures

Employers at both the construction and operation phase should have a strict employment code of conduct. At the induction of employees the employer should emphasize that molestation of children is punishable by taking the culprit to court. An employer who tries to shield or cover up for the employee caught in the act will equally be prosecuted, according to the penal code.

6.10.2 Child Labour

It is anticipated that local labour will be employed especially as casual labourers, even the community leaders and members are waiting in high anticipation. Although it is likely to improve household income due to employment of local labour, if not properly managed and coordinated, it could potentially result into recruitment of children to provide labour on the project. Child labour is condemned by Ugandan laws as well as all international conventional instruments such as International Labour Organization (ILO) and the United Nations (UN). This impact is ranked at as a moderate negative impact (-2ve).

Mitigation measures

During construction and the operational phase, the project implementation team should put a mechanism in place to identify the presence of all persons under the age of 18 and ensure that they are not employed on the project.

6.10.3 Increase in HIV/AIDS and STDs

Like any other project with mass recruitments, influx of immigrant labour at the construction phase is bound to occur. Most often these workers will not come with their families and some may be single. This will encourage the formation of new social networks with the resident community, increasing the risk of prostitution and the spread of HIV/AIDS and STDs. These practices may raise HIV/AIDS prevalence. Although HIV/AIDS and STDs spread can be controlled, its impact is permanent,

chronic, regional in content due to mobility of people, thus, its impact is ranked a negative impact wit RIAM ES of –2ve.

Mitigation measures
Sensitize workers on proper social behaviour and conduct with regard to community systems, HIV/AIDS and other sexually transmitted diseases. HIV/AIDS policies be developed at workplace. Free HIV/AIDS testing, counselling and condom distribution be encouraged for both workers and local community. The project needs to work in a coordinated manner to strengthen community structures involved in HIV/AIDS e.g. VHTs, different HIV committees and village and municipal council levels.

6.10.4 Loss of land, physical structures and livelihood

The land to be acquired include site for WTP, storage reservoirs, Feacal Sludge Treatment plant and some sections of transmission pipelines to the facilities. Most of the transmission mains will pass through road reserves.

Overall, there are 22 PAPs of which 13 (shown in Table 37) will have portion of their land taken by the project while 9, especially those along the transmission lines will have crops destroyed. Out of the total 15.677 acres required, 10.298 acres will be for Feacal Sludge Treatment plant, which is already owned by Koboko Municipal Council. The properties to be destroyed are: one grass thatched residual house valued at Uganda shillings 875,000/= and crops such as banana clumps and trees such as Teak, Eucalyptus, Nsambya, Acacia, Mutumba. The total budget for compensation including a 30% disturbance allowance is Uganda shillings 302,621,800/= (Three hundred and two million, six hundred and twenty one thousand, eight hundred shillings). The total compensation for land is 280,914,400/= while compensation for crops is 21,707,400/=.

Although majority of the affected land is also the principal land of residence and where PAPs derive their livelihood. In all sites, there will be no resettlement. The affected structures do not have people living in. Further, the land to be taken from the PAPs and Project Affected Institutions are so small compared to the total land they own (average is 3.5 acres) to warrant resettlement neither displacement. The project will only cause a negative impact of RIAM ES rank -2ve.

Mitigation measures
Ensure adequate and prompt compensation for project affected property like land, crops, tress and structures using the agreed and fair compensation in accordance with the Resettlement action plan.

Table 37: PAPs whose land will be taken for the project.

No	Item	Village	Parish	Sub County	Land to be taken
					Acres
1	Intake Works				
1	Ayila Dada	Nyarabu	Asunga	Midia	0.169
2	Water Treatment Works				

No	Item	Village	Parish	Sub County	Land to be taken
					Acres
1	Ozubu Central Forest Reserve	Nyarabu	Asunga	Midia	1.746
2	Karala Hussein	Nyarabu	Asunga	Midia	1.528
2	Feacal Sludge Treatment plant (Faecal Sludge Treatment Plant)				
1	Koboko TC	0	Asunga	Midia	10.298
3	Teremunga Ground Service Reservoir				
1	Midia Pacayo	Gbulabulanga	Teremunga	Koboko MC	1.478
4	Appa Elevated Storage Reservoir				
1	Koboko Police Station	Central cell	Mengo ward	Koboko TC	0.096
5	Transmission Line				
1	Midia Pacayo	Gbulabulanga	Teremunga	Koboko TC	0.044
2	Data Noah	Gbulabulanga	Teremunga	Koboko TC	0.072
3	Data Noah	Gbulabulanga	Teremunga	Koboko TC	0.071
4	Abdul Magidu	Gbulabulanga	Teremunga	Koboko TC	0.043
5	Yunus Yasin	Gbulabulanga	Teremunga	Koboko TC	0.044
6	To Be Identified	Gbulabulanga	Teremunga	Koboko TC	0.029
7	Tabu Yunus	Gbulabulanga	Teremunga	Koboko TC	0.061

6.10.5 Loss of Ozubu Central Forest Forest land

As noted earlier, part of land required to be acquired for the WTP is in Ozubu CFR (1.746 acres) see section **Error! Reference source not found.**. This means the teak plantation will have to be cut. The impact of cutting a forest plantation and replace it with a built up environment of WPT will have the following consequences: -

There will be vegetation cover removal. This will cause direct solar radiation on the ground hence this will increase the soil and ambient atmosphere temperature of the surrounding local area. The result is that the local area will have warm weather. The removal of trees will reduce carbon fixation, hence cause the increase of greenhouse gases, which in turn cause the greenhouse effect. The greenhouse effect is a precursor of the global warming phenomenon. At the world warms, there will be variation in climate, which will result in climate change. Therefore, this impact is classified as -4ve impact.

Mitigation measures

Because of the intricacies of acquiring central forest reserve land (see legal implications in section **Error! Reference source not found.**), it is recommended that MWE acquire the equivalent land from private land owners outside the forest.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The Environmental and Social Management Plan (ESMP) for Koboko Water and Sanitation Project has been prepared in accordance with Environmental and Social Assessment Procedures of the World Bank. The ESMP aims to ensure that the project does little or no harm to the environment at large; at the same time protects the vulnerable groups from impacts that may emanate as a result of the project implementation.

The key objectives of the ESMP are: -

- to outline mitigation measures against the possible impacts;
- to provide environmental and social monitoring indicators;
- to provide the time frame and monitoring frequency;
- to estimate cost of monitoring;
- to ensure that the program will comply with relevant environmental legislation of Uganda and other requirements throughout construction and operational phases and;
- to identify roles and responsibilities of key strategic stakeholders

7.1 Proposed work programs, timing and budget estimates

The Environmental and Social Management Plan are attached in Table 38 and Table 39.

Table 38: Environmental and Social Management Plan at the Construction Phase

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
WATER INTAKE AND WATER TREATMENT PLANTS, PIPELINES, STORAGE RESERVOIRS & FEACAL SLUDGE TREATMENT PLANT: CONSTRUCTION PHASE								
A. MONITORING PLAN FOR POSITIVE IMPACTS								
	P:1 Employment Creation	**P:1:1** Give job preferences to capable Ugandan companies or international companies with more Ugandan employees **P:1:2** Give employment priority to local community with skills and training. **P:1:3** The entire unskilled workforce should be provided by the local community. **P:1:4** Employ women, youth and persons with disabilities without discrimination **P:1:5** Issue appointment letters to all employees with clearly spells out terms of employment. **P:1:6** Ensure prompt payment of workers	➢ Certificate of registration in Uganda ➢ For international companies, proof of Ugandan employees in the company ➢ No. of people from local community employed ➢ Issuance of appointment letters ➢ Non-discrimination policy	At all project phase	➢ Employment Act	0	Contractor	Local authorities Gender and Labour Ministry
	P:2 Increase in skilled labour and technology transfer	**P:2:1** Emphasize skills transfer in contracts for contractor and construction supervision **P:2:2** Ensure foreign companies have joint ventures with local companies to facilitate technology transfer. **P:2:3** Have internship program for students	➢ Proof of joint venture with local company	At all project phases	➢ Employment Act ➢ Company Act	0	Contractor	Local authorities Gender and Labour Ministry

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
			➢ Clear internship program for students					
	P:3 Markets for locally available resources	**P:3:1** Source materials from local suppliers and service providers with capacity. **P:3:2** Provide proof of inability of local suppliers to provide the service before importing	➢ Proforma invoice from local suppliers ➢ Domestic bidding	At all project phases	➢ Company Act	0	Contractor,	Local authorities PPDA
B. MONITORING PLAN FOR POSITIVE IMPACTS								
A. Soils	**A:1** Loss of top soil/Soil erosion as a result of inappropriate construction methods that accelerate soil loss or erosion	**A:1:1** Hoarding off site during construction works to prevent soil erosion to surface water sources and the nearby drainage channels **A:1:2** Removing the top soil prior to dumping any materials and returning later rehabilitation. **A:1:3** Use brushwood to assist with erosion control and rehabilitation.	Area of the site hoarded off. Complaints from the local community. Siltation of nearby water bodies	Before and during the construction phase).	➢	10,000,000	Contractor	Construction supervisor NEMA
		A:1:4 Covering or protecting stock piles of loose materials such as sand to prevent them from being carried away by rain water / runoff	➢ Covered stockpiles of loose materials like sand.	Each time it rains		10,000,000	Contractor	Construction supervisor NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	A:2 Excavation of foundation and transmission trenches without backfilling or backfilling with foreign material resulting in mixing of horizons of soil layers	**A: 2:1** Removing the top soil prior to dumping any materials and returning later rehabilitation. **A:2:2** Use of excavated soils for backfilling and levelling within the site premises	➢ Presence of Gulley of soil erosion. ➢ Presence of Soil erosion checks	During construction	➢ The National Environment (Minimum Standards For Management of Soil Quality) Regulations		Contractor	Ditto
		A:2:3 Use of excavated soils for backfilling and levelling within the site premises **A: 2:4** Timely removal and disposal of excessive quantities of excavated soil. Can be disposed in abandoned quarries or given to brick layers within the project area.	All depressions filled No visible stockpiles of excavated materials on site ➢ Records of disposed excavated materials	During and after construction	➢ The National Environment (Minimum Standards For Management of Soil Quality) Regulations	10,000,000	Contractor	Construction supervisor NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	A:3 Soil Contamination by spilled oil, lubricants, fuels, and concrete additives	**A:3:1** Materials like oil, fuel, concrete additives and solvents should be stored in the standard recommended packaging materials and appropriately shelved while on-site **A:3:2** Installing leak-proof fuel storages on concrete platform with gutters and grease separators, which are monitored periodically and repaired or replaced when required	➢ Appropriate use of standard Packaging materials ➢ Written down spillage protection procedures	Weekly	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.	10,000,000 per annum during construction	Contractor, scheme operator during operation phase	Construction supervisor Koboko District Environment officers NEMA
		A: 3:3 Oil, fuels & solvents should be handled by trained personnel at a designated workstation to avoid spillage. **A: 3:4** Refilling of fuel tanks should be carried out using an appropriate hose pipes strictly in a well-lit area or during day in order to minimize spillage.	➢ Qualified personnel employed	Weekly	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.	-	Contractor, scheme operator during operation phase	Construction supervisor Koboko District Environment officers NEMA
		A: 3:5 Carry out periodic maintenance of equipment and project vehicles to prevent fuel and hydraulic oil spills.	➢ Records of vehicle and equipment maintenance and inspections	Weekly	➢ Occupational safety and health Act	10,000,000	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		A: 3:6 Continuously inspect & monitor equipment to detect any oil leakages at an early stage.						
	A:4 Solid waste generation by workers and construction materials	**A:4:1** Use excavation material for site levelling / backfilling within the foundation of facilities and buildings. **A:4:2** Remove excess soil from the site in a timely manner and deposit at an approved site or preferably give to brick layers within the project area or dispose in nearby abandoned quarries	➢ No visible stockpiles of excavated materials on site ➢ No. of trips of disposed excavated materials	Weekly	➢ The National Environment (Minimum Standards For Management of Soil Quality) Regulations	-	Contractor	Koboko District Environment officers NEMA
		A:4:3 Provide different waste bins so as to appropriately segregate wastes into categories such as non-hazardous or potentially hazardous, metal, plastics, biodegradable, non-biodegradable waste etc. at source **A:4:4** Sell or give away Re-usable wastes to interested parties for recycling **A:4:5 D**evelop and implement waste management plan with waste inventory, the appropriate waste	➢ Written down solid waste management plan ➢ No sight of Indiscriminately disposed waste	During Construction	➢ Waste Management Regulation	60,000,000	Contractor	Koboko District Environment officers NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		management approach with details of collection, temporary storage, transport and final destination of each waste type.	➢ Waste management facilities like waste bins, waste disposal site and tarpaulins for covering trucks during waste transport					
B. water resources	**B:1** Sedimentation build in the river as a result of bank erosion and possible runoff of construction materials to water	**B:1:1** Strict adherence to construction schedule to avoid prolong pollution and impacts on the environment **B:1:2** Plant buffer vegetation such at the source to stabilize river banks, control of catchment erosion and retard river bank erosion. **B:1:3** Monitoring of sediment loads and performing quality analysis **B:1:4** Monitor of downstream flora and fauna to identify potential damage and reverse situation early **B:2:5** Install soil erosion checks, scour checks and silt traps to prevent siltation of surface water sources and the drainage channels around the site.	➢ Project schedule and progress reports ➢ Water quality tests and monitoring ➢ Presence of silt traps along the drains	Quarterly	➢ Water Act ➢ Environment Act ➢ The National Environment (Minimum Standards for Effluent discharge) Regulations	-	Contractor	Construction supervisor MWE

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	B:2 Pollution by solid waste, construction wastes, chemicals such as spilled oil, lubricants from construction equipment and vehicles	**B: 2:1** Contain solid wastes so that no solid waste, fuels or oils should be discharged into surface water bodies.	➢ Monitoring reports on status of waste management	Weekly	➢ Waste Management Regulation	-	Contractor	Construction supervisor Koboko District Environment officers
		B:2:2 Test water samples and monitor river water quality for contaminants according to NEMA, Uganda standards and advise appropriately	➢ Water quality analysis results	Bi - annually	➢ Water Act ➢ Environment Act	10,000,000	Contractor	
		B:2:3 Hold and store sanitary and cleaning wastes in appropriate containers to be disposed of at approved sites.	➢ Designated sanitary, hazardous and special waste bins	During construction	➢ Public Health Act	None	Contractor	Ditto
		B:2:4 Park vehicles preferably on paved platforms to avoid fuel and oil leakages that contaminate soil and groundwater **B: 2:5** Fuel should be stored in leak proof containers that periodically monitored, and repaired or replaced when necessary. **B: 2:6** Sites for cleaning, fuelling and maintaining vehicles should be able to prevent leakage (*e.g.* paved). **B:3:7** Fuelling should be done in a well-lit area or during day by qualified staff through appropriate hose pipes	➢ Monitoring reports on parking of vehicles and status of fuel storages	During construction	➢ Water Act ➢ Environment Act	30,000,000	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
C. Air	Dust emission from excavation of foundations, transmission trenches and greenhouse gas emissions such as carbon monoxide, sulphide, nitrogen oxide, hydrocarbon from ill-serviced fuel-powered machinery, project vehicles	**C:1:1** Hoard off the site before excavations and erect soil barriers; avoid dusty operations such as grading on dry and windy days	➢ Hoarding around the site boundaries;	During the construction phase.	➢ The National Environment (Waste Management) Regulations, 1999.	10,000,000	Contractor	Construction supervisor Koboko District Environment officers
		C:1:2 Remove excess soil which is not used for construction works shall from site in a timely manner and deposit it at an approved site or preferably give to brick layers within the project area;	➢ Complaints from the local community		➢ The National Environment (Waste Management) Regulations, 1999.	30,000,000	Contractor	Ditto
		C: 1:3 Cover with tarpaulins all vehicles transporting excavated loose soils. Avoid excessive vehicle movement	➢ No Visible dust emissions	Daily			Contractor	
		C:1:4 Record of trips of excavated soils including timing and volume shall be kept by the site construction manager	Volume of the excavated soils at the site.	Daily	➢ Public Health Act	10,000,000	Contractor	Ditto
		C:1:5 Provide workers who may unavoidably have to work in dusty areas with nose and mouth masks	PPE Distribution lists and stock of nose and mouth masks in store Percent of workers using PPE	During construction	➢ Occupational Safety and Health Act	10,000,000	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		E:1:6 Suppress dust during dry seasons by sprinkling water to work areas	Records / frequency of water sprinkling	Dry season or when necessary	➢ Public Health Act	10,000,000	Contractor	Koboko District Environment officers
		E:1:7 Maintain vehicle and equipment according to manufactures' specifications **E: 1:8** Use standard fuel and lubricants.	➢ Complaints from the local community; ➢ Visible gaseous emission by project vehicles; Maintenance records of project vehicles.	During construction phase	➢ The Public Health Act, Cap 281. ➢ The Constitution of the Republic of Uganda, 1995. ➢		Contractor	Ditto
D. Noise	**D: 1** Noise and vibrations from construction works and delivery trucks.	**D:1:1** The site will be hoarded off during construction to limit the noise impacts from the site;	➢ Site hoarding in place;	During construction phase.		-	Contractor	Construction supervisor Koboko District Environment officers
		D:1:2 install or fit features to reduce noise generation and vibrations on motorized equipment and generators;	➢ Silencers installed in noise emitting machines	Weekly		30,000,000	Contractor	

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		D: 1:3 ¨Provide workers on site with the necessary PPE such as ear muffs or ear plugs or as found appropriate; Workers operating equipment generating noise levels greater than 80 dBA continuously for 8 hours or more will use earmuffs while those exposed to prolonged noise of 70 – 80 dBA will wear earplugs. Working in shifts is advised to limit the duration of exposure to noise;	➢ Use of PPE by workers on site; ➢	Daily	➢ The National Environment (Noise Standards and Control) Regulations, 2003	10,000,000	Contractor	Ditto
	➢	**D:1:4** Limit Construction, excavation activities and movement of haulage vehicles to day time since the noise impact is less felt during the day than during night; **D:1:5** Schedule noise intensive works for the least noise-sensitive time of the day (work between 7 am and 7 pm) or possibly as per time frame (6 am - 10 pm) as stated in the National Environment (Noise Standards and Control) Regulations, 2003.	➢ Noise levels recorded during construction. ➢ Complaints about noise from community and neighbours	Daily		-	Contractor	Construction supervisor Koboko District Environment officers
		D: 1:6 Maintain vehicle and equipment according to manufactures' specifications.	➢ Maintenance records	Monthly		-	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		D:1:7 Engines should be switched off for all the machines/vehicles which are not in use	➢ Equipment log sheet	Daily		-	Contractor	Ditto
		D:1:8 Through a local radio (FM) or Local Council (LC) Leadership, inform the community about the work program and it must be strictly adhered to	➢ Receipts from radio stations for announcements	Monthly		10,000,000	Contractor	Ditto
E. Flora and fauna	**E: 1:** Loss of vegetation as a result of site clearing at water intake, WTP and storage reservoirs, along transmission route and Feacal Sludge Treatment plant site	**E: 1:1:** Limit clearance of vegetation to only that piece of land that is required for development. **E: 1:2** Where possible, avoid felling trees (both planted and indigenous trees) along the transmission	Extent of site clearance.	Monthly	➢ The National Forestry and Tree planting Act. ➢ Environment Act	-	Contractor	Construction supervisor District Forestry Officer
		E: 1:3 Provide a fair compensation for trees, fruits and planted crops that have to be cut down so that a farmer can re-establish them elsewhere.	Evidence of used of approved compensation rates	Twice in a year	➢ Land Act ➢ Land Acquisition Act ➢ WB OP on Involuntary Resettlement	See RAP Report	Construction supervisor	Chief Government Valuer

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		E: 1:4 Upon completion of construction works, adequate grass cover and bushes should be restored or planted on sloping areas to reduce erosion loss. Emphasize on replanting indigenous tree species in the project site	Extent of restoration works. Coverage of replanted vegetation or trees	Quarterly	➢ The National Environment Act Cap 153.	-	Contractor	Construction supervisor Koboko District Environment Officer. NEMA
	E: 2: Loss of terrestrial habitat and eventual migration and loss of fauna biodiversity	**E: 2:1** Limit clearance of vegetation to only that piece of land that is required for development. **E:2: 2** Upon construction completion, replant the indigenous trees species	Extent of site clearance. Coverage of replanted vegetation or trees	Quarterly	➢ Environment Act ➢ Wildlife Act ➢ National Forestry and Tree Planting Act	-	Contractor	Ditto
		E:2:3 Adhere to construction schedule and complete in time to avoid prolong construction period that is detrimental to the flora and fauna	Construction schedule and work progress	Quarterly	➢ Environment Act ➢ Wildlife Act ➢ National Forestry and Tree Planting Act	-	Contractor	Construction supervisor
		E:2:4 Sensitize workers on importance of nature conservation and dissuade them from harassing animals	Minutes of sensitization meetings	Quarterly	➢ Environment Act ➢ Wildlife Act	30,000,000	Contractor	Construction supervisor NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		E:2:5 Rescue animals found on site during any project phase	Records of rescued animals		➢ National Forestry and Tree Planting Act			
	A3 : Loss of habitat for aquatic organisms	**A3:1** Minimization of wetland loss, restoration of wetlands and other natural sites	Evidence of wetlands restoration	Quarterly	➢ Environment Act ➢ Wildlife Act ➢ National Forestry and Tree Planting Act	50,000,000	Contractor	Koboko District Environment officers NEMA
		A3:2 Development and Implementation of an Integrated Catchment Management for the basin of river Kochi to protect it from further degradation that jeopardises the ecological resources.	Development & implementation of River Kochi Catchment management plan	Quarterly	➢ Water Act ➢ Wildlife Act ➢ National Environment Act		MWE	Directorate of Water Resources Management, MWE
F. Socio - Economic aspects		**F: 1:1** Site hoarding should only follow an advance information to the community. Inform the local communities about the construction programme in advance through the most accessible media like FM radio stations or through the LC system	➢ Written communication to the community ➢ Copy of radio announcements	Before construction begins	➢ Public Health Act	-	Contractor	Construction supervisor Koboko District Environment officers, District Engineer

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	F: 1 Disruption and interruption to social, cultural and economic activities in the conservative Muslim community as a result of influx of immigrant workers.	**F: 1:2** The obstruction of access roads or occupation of roads, footpaths and bridges have to be minimized. Traffic management plans should be set up at points of partial or complete closure. **F: 1:3** Provide temporary access ways with the approval of local authorities where access roads are closed. **F:1:4** Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible	➢ Traffic management plan and evidence of implementation ➢ No. of access roads created ➢ No. of interference	When deemed necessary	➢ Traffic Act	20,000,000	Contractor	Construction supervisor District Engineer
		F: 1:5 Protect archaeological sites, sacred or sites such as graves and natural features such as trees, rocks with cultural value when discovered during works. Consult the opinion leaders and local authorities on best protection method or rituals required if any	➢ Minutes of stakeholders engagement	When deemed necessary	➢ Historical Monument Act	20,000,000	Contractor	MWE, LC 1 Construction supervisor
		F: 1:6 sensitize workers on proper social behaviour and conduct with regard to community systems and the acceptable societal norms.	➢ Report of sensitisation workshop	At the start of construction	➢ Occupational Safety and Health Act	5,000,000	Contractor	MWE Construction supervisor

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	F: 2 Loss of land and interference with the livelihood. In all, 15.677 acres of land will be acquired for project facilities and part of the transmission route	**F: 2:1** Align all pipelines along the road reserves to avoid as much as possible the need for land take. **F:2:2** Ensure adequate and prompt compensation for project affected property like land, crops, tress and structures using the agreed and fair compensation in accordance with the Resettlement action plan	➢ Complaints from community ➢ Records of project affected persons and compensation received	Bi-annual	➢ Land Act ➢ Land Acquisition Act ➢ World Bank Involuntary Resettlement Safe Guard	See RAP Report	Contractor	Construction supervisor MWE World Bank
	F: 3 Gender inequality at employment	**F: 3: 1** Give both men and women equal job opportunity. **F: 3: 2** Enforce a non – discrimination policy at recruitment.	➢ Ratio of female to male workers	Bi – annual	➢ Employment Act	5,000,000	Contractor	Construction supervisor Local authorities Gender and Labour Ministry
	F:4 Child Labour	F:4:1 Sensitize against child labour and Implement child labour act F:4:2 Demand birth certificate or any identify that clearly shows the age of a job applicant F:4:3 Issue each worker with an appointment letter with well spelt out terms of engagement	➢		Employment act Child Act	0	Contractor	

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	F:5 Child abuse and early age pregnancies	**F: 5:1** Implement a strict employment code of conduct. **F: 5:2** Sensitization against molestation of children. **F:5:3** Emphasize penal code punishment for concealment or cover up child abuse by employer	➢ Complaints record ➢ Presence of employment code of conduct and evidence of adherence	Quarterly	➢	0	Contractor	MWE, World Bank, Labour, Gender and Social Development Ministry
G. Safety and health aspects	**G:1** Increased risks of accidents such as fire outbreaks, collapse of structures, vehicle accidents	**G: 1:1** The work sites (especially excavation works) have to have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. Access to restricted areas must be with permission **G:1:2** Ensure that work sites especially in the night have proper lights and reflective safety signs and restriction tapes **G:1:3** Inform the local community about the construction program in advance and adhere to it **G:1:4** Develop and implement a comprehensive traffic management plan	➢ Site hoarding ➢ Safety signs ➢ Demarcation of restricted access areas ➢ Written down traffic management plan ➢ Record of all accidents	During construction	➢ Occupational Safety and Health Act ➢ Public Health Act ➢ Traffic Act	30,000,000	Contractor	Construction supervisor Koboko District Health inspector Environmental health inspector, MWE

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	➢	**G: 1:5** Employ and deploy Reflective signage and flag men to direct traffic to designated areas. **G: 1:6** Install Speed limit signage and speed reduction humps at crossings and crowded places such as at school, market, hospital. **G: 1:7** Sensitize drivers to observe speed limits.	➢ Visible road signs and humps ➢ Record of all accidents		➢ Traffic Act		Contractor	Construction supervisor Koboko District Engineer Environmental health inspector, MWE
	➢	**G: 1:8** Employ/use certified electricians for all electrical installations /wiring to reduce risks of fire outbreaks,. **G: 1:9** Put in place a comprehensive fire plan to guide the workers in case of fire outbreak. **G:1:10** Display for all workers t(at all notice boards) the contacts of emergency response teams such as fire brigade, nearest police station and medical centre and ambulances	➢ Fire management plan ➢ Electrical wiring certification ➢ Fire Assembly area within work area and camps ➢ Fire fighting equipment	During the construction phase.	➢ Occupational Safety and Health Act ➢ The Workers Compensation Act, Cap 225.	20,000,000	Contractor	Construction supervisor Koboko District Engineer Environmental health inspector, DOSH, MWE
	G: 2 Collapse of facilities and buildings.	**G:2:1** Carry out geotechnical investigations carried out to determine the bearing capacity of soils to support the proposed developments;	➢ Quality of construction materials and design works;	During the construction phase.	➢ The Occupational Safety and Health Act, 2006.	30,000,000	Contractor	Construction supervisor

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		G:2:2 Topographic surveys carried out to determine the terrain of the site; **G:2:3** Use of approved site layout plans and the building designs **G: 2:4** Thorough supervision should be carried out by qualified engineers at the construction site during project execution.	➢ Geotechnical survey results; ➢ Approved site layout plans and building designs; ➢ Expertise of the contractor and supervisor/ structural engineer.		➢ The Workers Compensation Act, Cap 225.			Koboko District and Town Council Engineer Koboko District Physical Planner
	G:3 Increased risks of spread of HIV/AIDS and other STIs	**G: 3:1** Sensitize workers on proper social behaviour and safe sexual behaviour that would protect them from contracting HIV/AIDS and other Sexually Transmitted infections (STIs). In addition, workers should be sensitized to not engage in sexual relations with underage girls and married women. **G: 3:1** The Contractor and Operator should have an HIV/AIDS policy at workplace. The contractor should liaise with other agencies to provide free HIV/AIDS testing, counselling and condom	➢ Written HIV policy ➢ Report of Sensitization workshop on HIV ➢ Records of testing, provision of voluntary counselling and testing	Quarterly	➢ Public Health Act	20,000,000	Contractor	Construction supervisor Koboko District Health inspector and Environmental health inspector, MWE

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	G: 4 Occupational health and safety hazards to workers and the public.	**G: 4:1** Secure site boundaries with fences or hoardings as appropriate; Fence all dangerous areas especially excavated pits. **G:4:2** Inform communities in advance about the construction schedule	➢ Site hoarding ➢ Receipts of radio announcements ➢	Daily during the construction phase.	➢ The National Environment Act CAP 153. ➢ Occupational Safety and Health Act	-	Contractor,	Koboko District Environmental and Health inspection officers.
		G:4:3 Ensure safe working heights through provision of work platforms, scaffolds and adequate supervision by ensuring regular inspection of formwork, and temporary supports before loading or pouring concrete;	➢ Written down Health and Safety Management Plan	Daily		10,000,000	Contractor	Ditto
		G:4:4 Install caution signage around the site to discourage the public from being close to the site, for example, "flying debris", "keep off the site" etc.; **G:4:5** Provide safety guidelines for all operations	Caution signage in place. ➢ Occupational safety and health measures at the site;	Daily	➢ Occupational Safety and Health Act	5,000,000	Contractor	Ditto
		G:4:6 Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats/ helmets, and safety boots;	➢ Percentage of workers with PPE	Daily	➢ Occupational Safety and Health Act	-	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		G:4:7 Establish emergency entrances, exits and amenities; **G:4:8** Provide first aid kit for workers at construction site;	➢ First aid kits ➢ Accident records in accident books recorded by safety officer	Daily	➢ Occupational Safety and Health Act ➢ Public Health Act	-	Contractor	Construction supervisor Koboko District Environmental and Health inspection officers.
		G:4:9 Appropriate technical personnel should be engaged during the construction;	➢ Qualification of employed workers ➢ Employment Appraisal	Bi-annual	➢ Employment Act	Part of the remuneration to employees	Contractor	
	G:5 pools of stagnant water that turn into habitats for disease vectors	Fill up all depressions to avoid pools of stagnant water that may form in pits, holes and excavated ditches, which can create suitable habitats for insect disease vectors such as mosquitoes which cause malaria.	➢ -All excavated depressions re-instated, filled and re-vegetated.	Each time it rains	➢ The Public Health Act, Cap 281.	10,000,000	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	G: 6 Human waste disposal issues.	**G:6:1** Put in place mobile toilets for use by workers during construction; **G:6:2** Ensure that mobile toilets are periodically emptied by a licensed cesspool provider and disposed at designated facility; **G:6:3** Workers should be made aware of the available sanitary facilities. Provide separate sections for women and men **G:6:4** Inspect regularly to identify sanitation non-conformances and address it timely	➢ Complaints from the local community; ➢ Sanitary facilities in place; ➢ Human waste disposal means.	During the construction phase.	➢ The Public Health Act, Cap 281.	40,000,000	Contractor	Construction supervisor Koboko District Environmental and Health inspection officers.

Table 39: Environmental and Social Management Plan at Operation Phase.

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
WATER INTAKE AND WATER TREATMENT PLANTS, PIPELINES, STORAGE RESERVOIRS & FEACAL SLUDGE TREATMENT PLANT AT OPERATION AND MAINTENANCE PHASE								
A. MONITORING PLAN FOR POSITIVE IMPACTS								
Socio – Economic benefits	**P:1** Improved standard of living through increased coverage of safe water	**P:1:1** Provision of water and sanitation services to the population without discrimination at affordable rates **P:1:2** On-time billing and keeping users up to date on the status and functionality of the various project facilities. **P:1:3** Construct yard taps within a radius of 500 m as recommended in the water supply design manual. **P:1:4** Sensitize the community on the management of the water supply and sanitation system. **P:1:5** If a Community Based Management System will be adopted for the scheme management, presence of women in the Water Supply and Sanitation Board is highly recommended.	➢ Functionality reports of the system ➢ Provision of safe water ➢ Reports of sensitization workshops ➢ Formation of Water supply and Sanitation board ➢ Presence of women in key position of the Water and Sanitation board	Quarterly	➢ Water Act		Local Authority	Local Authority, MWE World Bank
	P:2 Improved sanitation, hygiene and reduction of water borne	**P:2:1** Conduct sensitization and awareness campaigns to improve sanitation aimed at driving adoption of improved water borne toilet systems at their homes.	➢ Sanitation improvement reports ➢ Sensitization workshops	Quarterly	➢ Public Health Act		Local Authority, Health	District Health Inspector, Local Authority,

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	disease incidents	**P:2:2** Compost manure from the Feacal Sludge Treatment plant should be well managed and sold to farmers at reasonable prices	➢ Sales record of compost				Inspector	MWE, World Bank
	P:3 Employment Creation)	**P:3:1** In sourcing for a system operator, give preferences capable Ugandan companies or international companies with more Ugandan employees **P:3**:2 Employ members from the local community with skills and training. **P:3**:3 Give women, youth and persons with disabilities equal employment opportunities **P:3**5 Issue all employees with appointment letters that clearly spells out terms of employment. **P:3**:6 Promptly pay workers	➢ Certificate of registration in Uganda ➢ For international companies, proof of Ugandan employees in the company ➢ No. of people from local community employed ➢ Issuance of appointment letters ➢ Non-discrimination policy	At all project phase	➢ Employment Act	0	Contractor	Local authorities Gender and Labour Ministry
	P:4 Increase in skilled labour and technology transfer	**P:4:1** The contract for scheme operator should emphasize skills transfer. **P:4:2** Foreign companies would be required to have a joint venture with local companies to build their capacity.	➢ Proof of joint venture with local company	At all project phases	➢ Employment Act ➢ Company Act	0	Contractor	Local authorities Gender and

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		P:4:3 The scheme operator should have a clearly defined internship programs	➢ Clear internship program for students					Labour Ministry
B. MONITORING PLAN FOR NEGATIVE IMPACTS								
J. Soils	**J:1** Inspection & maintenance works for the mains may require clearance of sites vegetation, and excavation works, and may induce or accelerate erosion.	**J:1:1** Hoarding off site during excavation to prevent soil erosion **J:1:2** Limit excavation to only transmission routes **J:1:3** Remove the top soil prior to dumping any materials and returning later during rehabilitation.	Area of the site hoarded off. Complaints from the local community.	During pipeline maintenance	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.	5,000,000 per annum	Operator	NEMA
		J:1:4 Use excavated soils for backfilling and levelling within the site premises **J: 1:4** Remove timely excessive quantities of excavated soil and dispose it in abandoned quarries or give to brick layers within the project area.	All depressions filled No visible stockpiles of excavated materials on site	During maintenance			Operator	Koboko District Environment officer NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	J:2 Contamination by spilled oil, fuel, lubricants, chemicals such as chlorine and Aluminium Sulphate (Alum), sludge containing Alum	**J:2:1 Store m**aterials like oil, fuel, concrete additives and solvents in standard recommended packaging materials and appropriately shelved them while on-site **J: 2:2** Oil, fuels & solvents should be used by trained personnel at a designated workstation to avoid spillage.	➢ Use of standard Packaging materials ➢ Written down spillage protection procedures	During maintenance	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.	-	Operator	Koboko District Environment officer and Town Health inspectors NEMA
		J: 2:3 Use appropriate hose pipes in well-lit areas or during day to refill fuel tanks should	➢ Qualified personnel employed	During maintenance	➢ Environment Act ➢ Water Act	-	Operator	
K. water resources	**K:1** Reduction of River Kochi flow	**K:1:1** At no moment should abstraction exceed river flow rate **K:1:2** Limit abstraction to permitted abstraction rate which is issued based on the safe yield. The safe yields for abstraction are recommended at 2/3rd of the low dry season flow or Q95 flow (MWE, 2013). **K:1:3** Install river flow gauge at the downstream of the intake point to monitor continuously the environmental flow	➢ Surveillance and monitoring report ➢ Records of flow time series data	Data collection on daily or hourly interval	➢ Water Act	10,000,000 per annum	Directorate of water resources Management, MWE	MWE NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		K:1:4 Develop and Implement a water source protection and comprehensive catchment management plan						
	K:2 Excessive drawdown and drop in groundwater level and related reduction in the flow river Kochi a result of over abstraction	**K:2:1** Conduct hydrogeological investigations including pumping tests to determine the safe yield for abstraction. **K:2: 2** Limit abstraction to the safe yield of the aquifer and the permitted abstraction rate. At no instance should abstraction exceed the recharge rates of the aquifer. **K:2:3 Install both** groundwater monitoring and river flow gauging stations to monitor impacts of wells working on back filtration principle, **K:2:4** Conduct periodic surveillance and monitoring of the groundwater level, river water flow and quality to ensure conformity with NEMA requirements.	➢ Well drilling log ➢ Pumping test reports ➢ Abstraction permit ➢ Groundwater monitoring station and reports	Data collection on weekly or even shorter intervals	➢ Water Act	10,000,000 per annum	Directorate of water resources Management, MWE	MWE NEMA
	K:3 Build-up of screened coarse particulate at intake weir	Manual removal of built up screened coarse material from the river	➢ Clear and neat water intake	Daily	➢	10,000,000 per annum	Scheme operator	MWE

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	K: 4 Pollution by backwash effluent, solid waste and chemicals such as spilled oil, lubricants. Has potential of depriving aquatic organisms of oxygen	**K: 4:1** Contain solid wastes so that no solid waste, fuels or oils should be discharged into surface water bodies.	➢ -Monitoring reports on status of waste management	During maintenance	➢ Waste Regulations	-	Operator	Koboko District Environment officers
		K:4:2 Alum and chlorine should be stored in leak proof containers and checked regularly for leakage	➢ Neat storage containers	Daily	➢ Environment Act	5,000,000	Operator	Ditto
		K:4:3 Backwash water should be clarified and the extracted sludge thickened, caked and handed over to NEMA for safe Disposal	➢ Packages of caked sludge ➢ Sludge handover report	Bi – annually	➢ Environment Act	-	Contractor	Ditto
		K:4:4 Test water samples and monitor river water quality for contaminants according to NEMA, Uganda standards and advise appropriately	➢ Water quality analysis results	Bi-annual	➢ Environment Act	20,000,000 Ugx annually	Operator	Ditto
		K: 4:5 Regularly check storage containers regularly for leakage. If any leakage is detected, the chemical should be removed and the container repaired or dispose it in according to NEMA regulations regarding disposal of solid wastes containing hazardous materials	➢ Inspection report	Quarterly	➢ Environment Act ➢ Occupational Safety and Health Act	-	Operator	Koboko water and Environment officers Koboko District Health Inspector

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		K:4:6 Point water sources, wells and surface water should be at a minimum distance of 300 m from the solid waste compost site **K: 4:7** The compost leachate should first be polished through a vegetation buffer.	➢ Minimum distance water source ➢ Monitoring reports on receiving water quality	Quarterly	➢ Water Act ➢ Environment Act	-	Operator	Directorate of water resources management
L. Air Quality	**L:1** Improper operation of the composting process resulting into a foul smell from decomposing waste Accumulation of waste due to equipment breakdown and attracting birds and insects nuisance	**L:1:1** Monitor the critical parameters of the composting process to ensure they are within the design values **L:1:2** Develop a Composting Operations Manual to provide guidance to staff running the site. **L:1:3** Maintain equipment (skip loader or tractor) to ensure timely turning of windrows; **L:1:4** Sprinkle a slurry of cow dung to the waste to reduce flies **L:1:5** Corporate Social Responsibility (CSR) as a token of appreciation to the community for accepting the composting facility. This can be through identifying community needs such as water supply and addressing them.	Presence of a thermometer, an oxygen meter and a moisture meter for monitoring purposes; Fence off area of the Feacal Sludge Treatmentplant Complaints from the local community	Weekly	➢ Environment Act	20,000,000	Project / Contractor	District and Municipal Environment officers Directorate of water resources management

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	Foul smell from decomposing waste which are turned infrequently	**L:1:6** Operate and manage the Composting process as recommended in the manual to foul smell (odour), flies nuisance and waste accumulation **L:1:7** Neatly arrange unsorted solid waste and the sludge in windrows Fence of the Feacal Sludge Treatment area with hedges of not less than 1 meter high in order to prevent the wind blowing and dispersing foul smell to neighbouring communities. **L:1:8** Fence off the area of the Feacal Sludge Treatment plant by a hedge of not less than 1 meter high in order to prevent the wind blowing and sending off foul smells to neighbouring communities. **L:1:9** Operate the plant strictly according to recommended procedures. Enforce appropriate operation and management of the Composting process such as regular turning of windrows **L:1:10** The unsorted solid waste and the sludge has to be neatly arranged in windrows						

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	L:2 Accumulation of compost onsite and therefore creating space problems	**L:2:1** Develop a Marketing Plan for the compost to mitigate accumulation onsite; **L:2:2** Price the compost in a manner to encourage its adoption and use. **L:2:3** Establish demonstration gardens onsite to entice farmers to use compost.	➢ Sales and marketing report ➢ Demonstration garden	Quarterly	➢	5,000,000	Operator	District Environment officer,
M. Noise	**M:1** Noise pollution from water pumps and generator.	**M:1: 1** Fit on generator features to reduce noise generation and vibrations **M:1: 2** Routinely maintain and service the generator as recommended by manufacturers.	➢ Complaints from the local community	Quarterly	➢ The National Environment (Noise Standards and Control) Regulations, 2003	1,000,000 per annum	Scheme operator	Koboko District Health Inspector
N. Aesthetics	**N:1** Obstruction to beautiful and natural scenes. Loss of aesthetic value and pristineness of the natural environment into a built up environment	**N:1:1** Renovate or rehabilitate the structures to blend beautifully with the environment. **N:1:2** Use culturally accepted materials for renovation	➢ Complaints from the local community	Annually	➢	2,000,000 per annum	Scheme operator	Koboko District Health Inspector

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
H. Flora and fauna	**H:1** Loss of vegetation, crops destruction of property, and infrastructure like pavement, sidewalks, roads as a result repair works on transmission and distribution pipelines	**H: 1:1** Limit vegetation clearance to only that piece of land required for development.	Extent of site clearance.	During maintenance	➢ The National Forestry and Tree planting Act.	-	Operator	Construction supervisor
		H: 1:2 Upon completion of repair works, adequate grass cover and bushes should be restored or planted on excavated pipeline segment. Emphasis should be on replanting the lost tree.	Extent of restoration works.	During maintenance	➢ The National Environment Act Cap 153. ➢ National Forestry and Tree planting Act	5,000,000	Operator	Koboko District Water and Environment Officer. NEMA
	H: 2 Restriction on movement of animals as a result of excavations.	**H:2:1** Excavated trenches should be backfilled or reinstated immediately after maintenance on the pipeline so as to allow free movement of animals **H:2:2** Adhere to maintenance schedule and complete work within schedule	➢ No open trenches ➢ Maintenance schedule	During maintenance	➢ Wildlife Act	-	Operator	Ditto
		H:2:3 Sensitize workers on importance of nature conservation and dissuade them from harassing animals **H:2:4** Rescue animals encountered on site during maintenance	➢ Minutes of sensitization meetings ➢ Records of rescued animals	During maintenance		-	Operator	NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	H:3 Loss of aquatic habitat as a result of deposition of clarified water containing Aluminium sulphate	**H:3:1** Reduce concentration of total suspended solids to acceptable levels before discharging to the receiving water **H:3:2** Reduce concentration of compounds such as Aluminium sulphate in effluent water because it can combine/reaction with other chemicals to cause plant kill	Monitoring reports on water quality of receiving water Monitoring reports for aquatic diversity	Daily	➢ Environment Act ➢ Water Act ➢ NWSC Act	3,000,000	Operator	NEMA Directorate of water resources, MWE
S. Socio - Economic aspects		**S: 1:1** Inform the local community of the program prior to site hoarding. Use the most accessible accessible media like FM radio stations or through the LC system	➢ Written communication to the community ➢ Copy of radio announcements	Before maintenance begins	➢ Access to information Act	3,000,000 per annum	Operator	Koboko District and Municipal Environment officers, District Engineer
		S: 1:2 The obstruction of access roads or occupation of roads, footpaths and bridges have to be minimized. Traffic management plans should be set up at points of partial or complete closure.	➢ Traffic management plan and evidence of implementation	When there is need	➢ Traffic Act			
		S: 1:3 Temporary access ways should be provided with the approval of local authorities where access roads are closed.	➢ Temporary access roads	During maintenance	➢ Traffic Act	15,000,000	Operator	Koboko District & Town Engineer

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	S:1 Interruption to social, cultural and economic activities through road blockage and traffic diversion during maintenance, fencing which, can deny the community access things of cultural value such as herbs	**S:1:4** Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible **S:1:5** Sensitize maintenance workers on proper social behaviour and conduct with regard to community systems and the acceptable societal norms. **S:1:6** Under supervision, allow the community members access to the things of cultural value within the enclosure	➢ Minutes of workers sensitization on societal norms	During maintenance	➢ Land Act	30,000,000	Operator	Ditto
T. Safety and health aspects		**T: 1:1** The work sites (especially excavation works) have to have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. Access to restricted areas must be with permission	➢ Site hoarding ➢ Safety signs ➢ Demarcation of restricted access areas	During maintenance	➢ Occupational Health and Safety Act	5,000,000	Operator	Koboko District Health inspector & Environmental health inspector

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	T:1 Increased risks of accidents such as fire outbreaks, collapse of structures, Accidental ruptures of reservoirs and pipelines exposing water to the risks of contamination	**T:1:2** Develop and implement a comprehensive traffic management plan	➢ Written down traffic management plan ➢ Record of all accidents	During maintenance works	➢ Traffic Act	-	Operator	Koboko District & Town Engineer
		T:1:2 Employ and deploy Reflective signage and flag men to direct traffic to designated areas. **N T:1:3** Speed limit signage and speed reduction humps have to be installed at crossings of many such as at school, market, hospital. **N T:1:4** Sensitize drivers to observe speed limits.	➢ Visible road signs and humps ➢ Record of all accidents	During maintenance	➢ Traffic Act	5,000,000	Contractor	Koboko District & Town Engineer
		T:1:5 To reduce risks of fire outbreaks, maintenance of all electrical installations /wiring should be carried out by certified electricians. **T:1:6** Put in place and implement a comprehensive fire plan to guide the workers in case of fire outbreak. **T:1:7** Display for all workers on all notice boards the contacts of emergency response teams such as fire brigade, nearest police station and medical centre and ambulances	➢ Fire management plan ➢ Electrical wiring certification ➢ Fire Assembly area within work area and camps ➢ Fire fighting equipment	Daily	➢ Occupational Safety and Health	15,000,000 per annum	Operator	Koboko District Health inspector Environmental health inspector, MWE

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	T:2 Occupational health and safety issues such as lifting heavy objects, handling hazardous materials	**T: 2:1** Secure site boundaries with fences or hoardings as appropriate; Fence all dangerous areas especially excavated pits. **T: 2:2** Inform communities in advance about the construction schedule	➢ Site hoarding ➢ Receipts of radio announcements ➢	During the maintenance phase.	➢ The National Environment Management Policy, 1994. ➢ The National Environment Act CAP 153.	8,000,000 per annum	Operator	Koboko District Environmental and Health inspection officers.
		T: 2:3 Ensure safe working heights through provision of work platforms, scaffolds and adequate supervision	➢ Written down Health and Safety Management Plan	Monthly		10,000,000	Operator	
		T: 2:4 Install caution signage such as falling debris", "keep off the site" etc. around the site to discourage the public from being close to the site, **T: 2:5** Provide safety guidelines for all operations;	Caution signage in place. ➢ Occupational safety and health measures at the site;	Monthly	➢ Occupational Safety and Health Act ➢ Environment Act	10,000,000	Operator	Ditto
		T: 2:6 Ensure workers put on appropriate Personnel Protective Equipment (PPE) such as safety glasses with side shields, face shields, hard hats/ helmets, and safety boots;	➢ Percentage of workers with PPE	Monthly	➢ Occupational Safety and Health Act	-	Operator	Ditto
	➢	**T: 2:7** Establish emergency entrances, exits and amenities **T: 2:8 Provide** workers access to a first aid kits	➢ First aid kits ➢ Accident records in accident books recorded by safety officer	Monthly	➢ Occupational Safety and Health Act	1,000,000 per annum	Operator	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		T: 2:9 Ensure qualified technical personnel are engaged for maintenance;	➢ Qualification of employed workers	Monthly	➢ Employment Act	-	Operator	Ditto
	T: 3 Pools of stagnant water pits, holes and sludge treatment plant may create habitats for disease vectors such as mosquitoes.	**T: 3:1** Fill up all depressions to avoid pools of stagnant water that may form in pits, holes and excavated ditches which can create suitable habitats for insect disease vectors such as mosquitoes which cause malaria. **T: 3:2** Fumigate the buildings, ponds and Feacal Sludge Treatment plant to get rid of vectors and vermin	➢ -All excavated depressions re-instated, filled and re-vegetated.	When there is need	➢ Public Health Act	1,000,000 per annum	Operator	Koboko District Environment and Health inspection officers Koboko
	T: 4 Public health risks to water users as a result of contaminated water	**T: 4:1** Ensure good housekeeping at the borehole. **T: 4:2** Draw and implement water source protection plan **T: 4:3** Follow standard operation and maintenance of the borehole, pumps and generator. **T: 4:4** Regularly monitor water quality for any contamination following well completion, e.g. at least on weekly basis for the first year of operation.	➢ Water source protection ➢ Operation manual for operation and maintenance of the borehole, pumps and generator ➢ Water quality monitoring report	Weekly	➢ Public Health Act	10,000,000 per annum	Opertor	Koboko District Environmental and Health inspection officers Koboko District Water Officer

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		T: 4:5 Involve the public in the detection of potential contamination through awareness creation and opening of a complaint desk.						
	T: 5 Increased risks of spread of HIV/AIDS and other STIs	**T: 5:1** Sensitize workers on proper social behaviour and safe sexual behaviour that would protect them from contracting HIV/AIDS and other Sexually Transmitted infections (STIs). In addition, workers should be sensitized to not engage in sexual relations with underage girls and married women. **T: 5:1** The Contractor and Operator should have an HIV/AIDS policy at workplace. The contractor should liaise with other agencies to provide free HIV/AIDS testing, counselling and condom	➢ Written HIV policy ➢ Report of Sensitization workshop on HIV ➢ Records of testing, provision of voluntary counselling and testing	Quarterly	➢ Public Health Act	1,000,000 per annum	Contractor	Construction supervisor Koboko District Health inspector and Environmental health inspector, MWE
	T: 6 Exposure of Co-compost plant workers to pathogens when mixing sludge and organic waste. It poses the workers to risks of infectious	**T: 6:1** Enforcing use of PPE such as mouth and nose masks, hand gloves, gumboots etc. **T: 6:2** Mechanical mixing of sludge and biodegradable waste **T: 6:3** Disinfection and hand washing after handling of sludge and organic waste mixture	Use of PPE Distribution list of PPE Presence of disinfectant and hand washing facility at Feacal Sludge Treatment plant	Quarterly	Occupational Safety Health Act Public Health Act	5,000,000	Operator	Koboko District and Municipality Environment and Health inspection officers.

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	diseases such as dysentery, cholera, and typhoid							
	T: 7 The compost manure will have pathogens mostly worms if not composted properly. This can contaminate agricultural land where the manure is applied.	**T: 7:1** Appropriate operation and management of the Composting process **T: 7:2** Increasing the composting time to make a pathogen free compost that is safe for handling **T: 7:3** Testing of the compost (e.g. on a biannual or quarterly basis) to ensure it is fit for purpose; **T: 7:4** Train farmers on the application of compost through establishment of demonstration gardens on site;	Records of composting time Testing of compost Farmers training report and attendance list					Koboko District and Municipality Environment and Health inspection officers.
	T: 8 Human waste disposal issues.	**T: 8:1** Put in place water borne toilet at water treatment plant for use by workers during operation and maintenance phase; **T: 8:2** Ensure periodic emptying by a licensed cesspool provider to any designated facility; **T: 8:3** Workers should be made aware of the available sanitary facilities and their location; **T: 8:4 R**egularly inspect sanitation facilities to identify sanitation non-conformances and ensure timely re-address	➢ Complaints from the local community; ➢ Sanitary facilities in place	Daily	➢ The Public Health Act, Cap 281. ➢ Environment Act	10,000,000	Operator	Koboko District and Municipality Environment and Health inspection officers.

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation and regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	T: 9 Due to low wages given to children the Contractor may be enticed to use Child Labour	**T: 9:1** Sensitize against child labour and Implement child labour act **T: 9:1** Demand birth certificate or any identify that clearly shows the age of a job applicant **T: 9:1** Issue every worker with an appointment letter with well spelt out terms of engagement	➢		Employment act Child Act	0	Contractor	MWE, World Bank, Minsitry of Labour, Gender and Social Development
	T:10 Child abuse and early age pregnancies	**T:10:1** Implement a strict employment code of conduct. **T:10:2** Sensitization against molestation. **T:10:3** Emphasize penal code punishment for concealment or cover up child abuse by employer	➢ Complaints record ➢ Presence of employment code of conduct and evidence of adherence	Quarterly	➢	0		

7.2 Stakeholders to be involved in the implementation of the ESMP

The management and supervision of the ESMP is strictly the responsibility of the Ministry of Water and Environment as the Developer. During construction, the Contractor will be responsible for the day-to-day implementation of the ESMP while at operation phase, National Water and Sewerage Corporation (NWSC) who may take over management of the project will be responsible for the implementation of the ESMP. The Developer, the Contractor and the Operator should employ an Environmentalist with relevant academic qualification and work experience. At the local level Koboko Municipality Council and Koboko District Local Government I will be responsible for the day-to-day monitoring of the ESMP in their areas of jurisdiction.

At the National level two institutions i.e. NEMA and the Department of Occupational Safety and Health (DOSH) of the Ministry of Gender, Labour and Social Development will be involved. The role of NEMA is to monitor the project as per the Environment Act Cap 135 section 7 and to approve external environmental compliance audits as per the Environmental Audit Regulations (2006). The role of DOSH is to issue permits and periodically inspect the project site. DOSH will issue workplace Certificates every six months it the project meets working conditions as set out Occupational Safety and Health Act 2006. The District and municipal councils will approve construction and occupancy permits in their area of jurisdiction.

As a means of impartiality Local NGO's or CBOs will be involved in the implementation of ESMP. Their role is to be neutral observers. They should have experience in environmental management and skills in conflict resolution.

7.3 Staffing and training requirements

The following personnel are proposed for each ESMP implementing stakeholder: -

7.3.1 Ministry of Water and Environment (Project Support Unit)

- Water Engineer
- Sociologist
- Environmental Health Officer

7.3.2 Contractor

- Site Engineer
- Site Supervisor
- Site Foreman
- Contractor's Environmental officer

7.3.3 District

- District Environmental Officer

- District Water Officer
- District Engineer
- District Community Officer

7.3.4 Municipal Council

- *Koboko Municipality*
- Environmental Officer
- Water Officer
- Municipal Community Development Officer

7.3.5 NEMA

- Environmental Audit Officer

7.3.6 DOSH

- Occupational Health and Safety Officer

7.3.7 NWSC

- Environmentalist

7.3.8 NGO or CBO

- Representative with skills in environmental management and conflict resolution

7.3.9 Directorate of Museums and Monuments

- One Archaeologist

It is the onus of each ESMP implementing stakeholder to ensure that all its personnel to be involved in implementation of this ESMP are adequately qualified and are appointed based on their qualification and suitability for their respective roles. Therefore there is no training provided for them under this ESMP.

7.4 Client assistance in coordinating the ESIA with relevant agencies

The Water Management and Development Project, through Component 3 – Strengthening Institutions for Effective Project Implementation; under Sub-component 3.3: Implementation, management and monitoring for results (MWE/DWD) has provided US $ 0.56 million to DWD. DWD through the Water Services Liaison Division (WSLD) will be responsible for implementing sub-component 2.2 (Water and Sanitation Project in small towns) and will assign adequate staff to implement, manage and monitor these tasks; and ensure that the incremental costs associated with project implementation are fully funded throughout the project duration. DWD will work closely with Water Sector Development Facility WSDFs who will support the day-to-day implementation and liaise with local governments in which the sub-projects are housed. These costs will be funded through a combination of project and in kind or

cash contributions including core staff costs (existing and or new, full time or contract), consumables, logistics, fuel and communications.

Key agencies the project will have to interact in order to implement the ESIA and ESMP are National Environment Management Authority for environmental audit compliance certificates, the Department of Safe and Health for Certificate to Register a Work Place. The District and Municipal Council to provide construction permits.

7.5 Stakeholder concerns on the shared water resources

In this respect, MWE is currently broadening its Sector Wide Approach (SWAp) to include a comprehensive and coherent program of support for water resources, water supply and the environment across agencies. The Project will be aligned with the SWAp to strengthen the capacity for IWRM in the agencies implementing the project, including: DWRM – establishing functional WMZs; DWD – improving sustainability of urban water supply and sanitation in fast growing towns; DEA – enhancing environmental services in order to ensure sustainability. The Project will also closely coordinate with the Government and development partner members of the Working Group (WESWG), which is responsible for making important sector planning and budget decisions, vetting new project proposals, and advocating for policy and institutional reforms under the Joint Water and Environment Sector Support Program (JWESSP). The Bank will work with the WESWG members to harmonize approaches and coordinate activities, with a view to further integrating the WMDP within the JWESSP at midterm. For example, WESWG and its structures will provide oversight of the project to improve alignment with the SWAP.

7.6 Monitoring and evaluation

During construction, monitoring will be the responsibility of MWE Project Support Unit. NEMA and DOSH will periodically monitor the project as per their constitutional, legal and regulatory mandate. The major activities to be done during monitoring will include site inspection, review of grievances logged by stakeholders and discussions with PAPs, construction workers and the local community who live near the project facilities in order to get neighbourhood issues. The Local Councils (LC) of each project site, particularly the Chairman of the Environmental Committee should be involved during each site inspection. Community grievances should be discussed and solved at this level.

It is recommended that the Project Support Unit should monitor the project every month by making a site inspection.

As part of the evaluation strategy two types of environmental audits are recommended i.e. internal and external audits. The Contractor with the supervision of the Project Support Unit should carryout quarterly internal environmental audits. While an external annual environmental audit should be carried out by a NEMA registered and certified Environmental Auditor. During the operational phase environmental audits will be commissioned by NWSC the Operator. This should be in accordance with the Environmental Audit Regulations 2006.

During the construction phase, the Contractor will compile concise monthly monitoring reports. At the end of each quarter the Contractor will write an Internal Quarterly Environmental Audit Report. The Project Support Unit will review the reports

and approve them. The annual external environmental audit report should be commissioned by the Project Support Unit on behalf of MWE as the Developer. It will be submitted to NEMA for a Compliance Agreement. During the operational phase, the NWSC should submit an annual environmental audit report to NEMA for approval.

7.7 Measures for emergency response to accidental events

The Contractor/Developer/Operator should each prepare an Emergency Response and Preparedness Plan (EPRP). The EPRP should assess the risks and impacts from project activities and set out the methods for dealing with emergencies arising during the construction, operation and decommission phases. Particularly attention should be paid to those potential effects on the workers, neighbouring and wider communities. The EPRP will also set out the means by which these measures will be communicated to affected communities in a culturally appropriate manner.

The EPRP should have Best Practices, which include working with local and national agencies like the fire brigade, police, hospitals, counter terrorism units etc. The following are key emergencies, which the project should be prepared to handle:

- Fire
- Electricity stocks and electrocution
- Bomb threat
- Civil disturbance
- Hostage
- Terrorist incident
- Death of a worker on the project site
- Suicide
- Shooting or stabbing
- Disasters e.g. landslides, earth quake, lightening, collapse of excavation walls
- Large-scale hazardous material spill
- Mass casualties
- Health epidemics
- Rapture or leak of equipment and
- Flooding, etc.

7.8 Stakeholder Analysis and Engagement Planning

The World Bank's OP 4.01 requires the stakeholders and communities to be informed of the ESIA implementation process. All stakeholders need to be kept informed during project implementation so as to accord the necessary support and advice. This consultation and public participation will be on-going process that will continue throughout the implementation of the ESIA. This will ensure that all affected individuals and households are well informed and adequately involved in the entire

implementation of the ESIA process. Key stakeholders identified include but not limited to: -

- Local Council and Community Members in Midia Sub County
- Koboko District Local Government;
- Koboko Municipal Council (now Koboko Municipality)
- National Environment Management Authority;
- National Water and Sewerage Corporation and;
- NGO's operating within Koboko District among others.

All the relevant stakeholders should be kept informed and up to date on issues pertaining to the project activities especially those, which affect them or where they have influence. Information sharing and disclosure can be done in the following ways:

- Public meetings with local communities should be held to engage them to get their views how the project is impacting them. This strategy is central to the successful management of risks and impacts on communities affected by the project in addition to adding value to the acceptance of the project. To ensure this, regular public meetings will be organized paying special attention to vulnerable groups like the disabled, elderly, children especially the girl child and women. Their views should be considered in future plans.

- The project will continue interact with National and Local Regulatory Authorities will conduct regular meetings with both national and local authorities to ensure that they are all always kept well informed. Some information to some of the central agencies can be channelled through submission of monitoring reports.

- As a means of preventing conflict of interest Environmental Non-government Organization (NGOs) or Community Based Organizations CBOs should be involved in the monitoring of the ESMP.

- Consultation method whether by surveys, meetings, focus group discussions or key informant interviews should be documented and records kept. Among the things that should be documented include date and location of the consultation meetings, list of attendees, their affiliation and contact address. Proper minutes with action plans and follow up should be recorded.

- A stakeholder engagement plan whose purpose is to have an open productive working relationships, based on principles of transparency, accountability, accuracy, trust, respect and mutual interests with affected communities and other stakeholders should be developed by Ministry of Water and Environment and NWSC.

A sample stakeholder engagement plan in Table 40 has been proposed to ensure the full involvement of stakeholders.

Table 40: Stakeholder engagement plan.

Target Group	Tasks/Methods	Frequency	Responsibility	Project Phase
Project Affected Persons	• Compensation; • Working Group Meetings; • Regular household visits	• When required and in accordance with the law.	MWE/DWD/Contractor	Construction phase
Directly and Indirectly affected Persons.	• Sensitisation local communities on health, safety, cultural and environmental issues related to the project • Health promotion and awareness programmes on HIV/AIDS.	When required and in accordance with the law.	MWE/DWD/Contractor/NWSC	All phases
Local and central government agencies	• Provision of regular updates and submission of monitoring reports to relevant agencies as required. • Payment of attention to the licences required for the project • Internal Environmental Audit • External Environmental Audit	Quarterly Quarterly Every six months Annual	MWE/DWD/Contractor/NWSC MWE/DWD/Contractor/NWSC MWE/DWD/Contractor MWE/DWD/Contractor/NWSC	All phases All phases Construction Phase All phases
Community Consultation	• Continuous consultations with the community members. • Use Grievance Redress Mechanism to settle com-plaints	As required	MWE/DWD/Contractor/NWSC	All phases
NGO Organisations	• Provide regular updates on the key project information	As required	MWE/DWD/Contractor/NWSC	All phases
Vulnerable groups	• Identify support that may be required to ensure vulnerable people can access project benefits	As required	MWE/DWD/Contractor/NWSC	All phases

8 A CHANCE FINDS PROCEDURE

8.1 Introduction

This project will involve excavations. There is a likelihood of discovering chance finds during excavation, which may be of archaeological and/or paleontological importance. This will trigger the World Bank Safeguard Policy on Physical Cultural Resources, OP 4.11, and the Uganda Historical Monument Act, 1967.

8.2 Chance Finds Committee

A working committee on chance finds should be formed before the commencement of construction. It should be composed of the following: -

- The Sociologist from the Project Support Unit as Chair;
- The Site Engineer;
- The Site Construction Supervisor;
- The District Cultural Officer; and
- One Staff from Directorate of Museums and Monuments.

Before commencement of construction the Project Support Team and the Contractor should induct the construction personnel on how to look out for chance finds. This should include how to identify them, who to inform when a chance find has been discovered and how to protect the site.

8.3 Chance Finds Procedure

In the event a chance find is discovered the following procedure should be followed:

- 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 present until the responsible local authorities (District Cultural Officer) and the Directorate of Museums and Monuments take over;
- The Site Construction Supervisor should notify the Site Engineer who in turn will notify the responsible local authorities (District Cultural Officer), The Sociologist

from the Project Support Unit and the Directorate of Museums and Monuments under the Ministry of Tourism, Wildlife and Antiquities (within 24-48 hours or less);

- The Directorate of Museums and Monuments should take 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 the archaeologists of the Directorate of Museums and Monuments (within 24 hours). 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;

- Decisions on how to handle the finding shall be taken by the Directorate of Museums and Monuments. 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 the Directorate of Museums and Monuments;

- Construction work could resume only after permission is given from the responsible local authorities (District Cultural Officer) and the Directorate of Museums and Monuments concerning safeguard of the heritage;

- These procedures must be referred to as standard provisions in construction contracts, when applicable. During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered;

- Relevant findings will be recorded in World Bank Implementation Supervision Reports, and Implementation Completion Reports will assess the overall effectiveness of the project's cultural property mitigation, management, and activities, as appropriate.

9 GRIEVANCE REDRESS MECHANISM

9.1 Introduction

Regardless of its scale, construction projects normally have disputes and grievances. These are likely to come from dust, flooding, blasting (noise, vibration, evacuation), lost access, dangers to life, damage caused to public roads from heavy machinery, deteriorating water quality and quantity, damage to property and crops, soil erosion and disruption of social cultural setting of the community. Timely redress of such grievances is vital for satisfactory construction implementation and resettlement in order for the project to be completed on schedule. There is need to ensure that procedures are in place to allow affected people to lodge a complaint or a claim without cost and with the assurance of a timely and satisfactory resolution of that complaint or claim.

In addition, the project may have to make special accommodations for women and members of vulnerable groups particularly the girl child to ensure that they have equal access to grievance redress procedures. Such accommodation may include employment of women or members of vulnerable groups to facilitate the grievance redress process or to ensure that group representing the interests of women and other vulnerable groups take part in the process.

9.2 Grievance Redress Committee (GRC)

In order to handle grievances at the project site a Grievance Redress Committee (GRC) is proposed. It will be responsible for receiving and logging complaints and resolving disputes. The GRC will work with the MWE to resolve each grievance or dispute to ensure that redress actions are implemented. If affected persons are not satisfied the grievance redress structures, they will be entitled to seek redress through either the District Land Tribunals or Ugandan Courts of Law. It is important that the GRC be set up as soon as construction starts. Disputes can arise from construction activities and it is therefore important that the mediation mechanisms be available to cater for claim, disputes and grievances at the early stage.

9.3 Proposed Mechanisms of Grievance and Appeals

In this regard grievances are best redressed through Project Support Team for matters of coordination but actual resolutions undertaken by local government staff, political leadership or reputable leaders as identified by the communities; our observations revealed that most community members rely on their political and technical leaders. As first step MWE should appoint a Grievances Redress Co-ordinator within among the existing staff. This should be a preferably a Sociologist with the adequate experience in handling conflicts.

9.3.1 Reconciliatory Procedure

This is an informal mechanism that will be applied to reach a resolution whenever minor contradictions and disagreements that may occur. It will include and oral or written appeal to the Grievance Redress Committee based conflict resolution structure constituting of the Contractor/Operator Representative, LC I Chairman, LC I Women Secretary, LC I Disabled Secretary and LC I Secretary for Defence**.** This

approach is a mutual coordination mechanism to guarantee that mutual interests are served and disputes and contradictions are solved.

9.3.2 Written Complaints to MWE

When the complainant is dissatisfied and feels that a member of the Reconciliatory Committee has infringed upon his legal rights and interests or is dissatisfied with the decision made he or she can write to the MWE to lodge a written complaint. If the complainant cannot write the Grievances Redress Co-ordinator is required to write the person's complaint. This complaint should be addressed within two weeks of receipt.

9.3.3 Grievance Redress Procedure

The Grievance Redress Committee will receive a written grievance or complaint. Preferably these should be those, which the Reconciliatory Committee has failed to handle. This Committee will dispense grievances/complaints as described below.

9.3.4 Legal Redress

If the complainant feels dissatisfied with the administrative arbitration decision by the Grievance Redress Committee (GRC), the complainant will then seek legal redress in courts of law. If the complainant is not satisfied with the decision made above, he or she may lodge an appeal to the civil court.

9.4 Proposed Process of Grievance Management

The ESMP recommends the following process, which should be adopted by the project support team: -

9.4.1 Lodging Complaint

The Grievance Management Coordinator/Officer will receive complaint from the PAP in the local language and complete a Grievance Form, which will be signed by the leader of the Local Grievance Management Committee and the PAP/complainant. This will then be lodged in the Grievance Log/Register provided by the Grievance Management Coordinator/Officer.

9.4.2 Determining Corrective Action

If in their judgment, the grievance can be solved at this stage and the Grievance Management Coordinator/Officer and a representative of an NGO/CBO will determine a corrective action in consultation with the aggrieved person. A description of the action; the time frame in which the action is to take place; and the party responsible for implementing the action will be recorded in the grievance database.

Grievances will be resolved and status reported back to complainants within 30 days. If more time is required this will be communicated clearly and in advance to the aggrieved person. For cases that are not resolved within the stipulated time, detailed investigations will be undertaken and results discussed in the monthly meetings with affected persons. In some instances, it may be appropriate to appoint independent third parties to undertake the investigations.

9.4.3 Meeting the Complainant

The proposed corrective action and the timeframe in which it is to be implemented will be discussed with the complainant within 30 days of receipt of the grievance. Written agreement to proceed with the corrective action will be sought from the complainant (e.g. by use of an appropriate consent form). If no agreement is reached, the above step will be re-visited.

9.4.4 Implementation of Corrective Action

Agreed corrective actions will be undertaken by the Project or its Contractors/Operators within the agreed timeframe. The date of the completed action will be recorded in the grievance database.

9.4.5 Verification of Corrective Action

To verify satisfaction, the aggrieved person will be approached by the Grievance Officer to verify that the corrective action has been implemented. A signature of the complainant will be obtained and recorded in the log and/or on the consent form. If the complainant is not satisfied with the outcome of the corrective action additional steps may be undertaken to reach agreement between the parties. If additional corrective action is not possible alternative avenues maybe pursued.

9.4.6 Action by local leaders and contractors

If the Grievance Co-ordinator and NGO/CBO representative cannot solve the grievance, it will be referred to relevant parties such as local leaders, District Officers, NEMA, Valuer and MWE, for consultation and relevant feedback provided.

9.4.7 Action by Grievance Redress Committee

If the complainant remains dissatisfied and a satisfactory resolution cannot be reached, the complaint will be handled by the Grievance Redress Committee. A dedicated Grievance Committee will be established to assess grievances that arise from disputes. This will include the following members: -

- MWE Chair,
- WMDP Project Coordinator,
- Resettlement Officer/Social Scientist Secretary,
- Project's Environmental Focal Point,
- The Chair of the local community (LC I Chairman),
- A member of a recognized non-government organization,
- A Community Leader.

This committee must have a quorum of at least two thirds persons. Decisions will be reached by simple majority. The Grievance Committee should be constituted for as long as no more grievances are lodged. Once the Grievance Committee has determined its approach to the lodged grievance, this will be communicated to the

GO, who will communicate this to the complainant. If satisfied, the complainant signs to acknowledge that the issue has been resolved satisfactorily. If the complainant is not satisfied however, the complainant notes the outstanding issues, which may be re-lodged with the Grievance Committee or the complainant may proceed with judicial proceedings.

The effectiveness of the GRM will be evaluated during the periodical performance reporting and as part of the Environmental Audits.

The GRM should be assessed on the following parameters: -

- Number of complaints:
- Grievance issues by type and how they were resolved:
- Total received, total justified,
- Total resolved at various levels including the type of agreement reached,
- Total referred to legal system/courts of law, including clarification on who initiated (local leaders, PAP or MWE) the referral and subject matter.

9.5 TOR for Grievance Management Coordinator/Officer

In line with MWE's resettlement policy framework, projects need to adopt appropriate measures that minimise the risks relating to constructing the water supply and sanitation project. Based on consultations with stakeholders in both districts, effective management of grievances strongly enhances the performance of projects through elimination of construction delays, proper expectation management and increasing community support for the project the current situation suggests that community members incur high transaction costs to ensure that their grievances are handled. Therefore, MWE will seek the services of a grievance management coordinator to support the existing framework in documenting, analysing and engaging stakeholders on how to manage project related grievances as a way of minimising to delays in works related to unresolved grievances. The roles and responsibilities of the grievance management coordinator will include: -

- To coordinate the work of the Grievance Committee, including calling and chairing scheduled meetings;
- Help train Community and Local Government staff engaged in grievance management for land and crops;
- Provide advice and assistance to such persons;
- Monitor progress of grievances;
- Inform Members of outcome of vote on whether or not to proceed to grievance;
- Act as primary Association contact with lawyers and liaise with legal counsel regarding on going grievance issues; and

- Report on informal disputes and grievances to MWE Project Implementation Unit on a regular basis.

Training and Qualifications: Minimum of a relevant university degree with 5 years' experience in grievance handling in rural communities with solid working knowledge of environment, resettlement and compensation issues in Uganda.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

This ESIA report is for the proposed Koboko Municipality Water Supply and Sanitation Project. The project specifically aims at improving the water supply infrastructure and faecal sludge management in the Koboko Town Council, parts of Midia sub-county and villages of Ombachi and Dwonga, Godia Parish in Lobule sub-county

When implemented, Koboko Water Supply and Sanitation Project will offer several benefits including improvement of standard of living through increased coverage of safe water within an easy reach of households (RIAM ES ranked +4ve) and at least within a radius of 500 m to homes in rural areas, increased coverage of sanitation facilities and improved handling of faecal sludge and solid wastes with RIAM ES positive impacts rank of +4ve. These benefits are cumulative and come along with benefits such as; reduced walking distance to water points, reduced incidence of domestic violence that may result when women and children spend unaccountably long time collecting water, reduced incidences of poor sanitation related diseases, reduced burdens of carrying water on the head, thereby maintaining a health community that can spur economic development besides bringing dignity to women and children whom traditionally carry these roles. Moreover, the time saved collecting water can be spent on gainful economic activities while girl children can concentrate in school. The overcrowding water points as observed currently will be no more and the risks of sexual abuses on women and children as they trek long distances at night in search water will significantly reduce.

Additionally, at faecal sludge treatment plant , the compost manure from the Feacal Sludge Treatment plant will be used to enhance soil fertility and consequently improve farmers' productivity and returns. As well during the construction phases of the project, there will be increased market for the locally available materials and produce, and increased employment opportunities to the people of Koboko Town and other neighbouring communities. Generally, the project aims to improve the standard of living and is tandem with the Uganda's vision 2040. There are enhancement strategies proposed to upscale these benefits and deliver the project objectives.

However, the project does have negative impacts too. There are no major significant impact with RIAM ES of -5ve. The significant negative impacts (RIAM ES -4ve) is the anticipated reduction in the flow river Kochi and lowering of the groundwater levels near the river as a result of over abstraction. Statistical analysis of the observed low flow of river Kochi reveals that there is a probability that once in every 1.4 years, the flow of river Kochi at planned water intake will be less than the planned abstraction rate of 210 m^3/h (58.3 l/s). This abstraction rate will have a major negative impact (with RIAM ES rank of -4) on the flow on river Kochi. Attempts to boost water supply by drilling three boreholes near the river working on bank filtration principle may similarly reduce the river flows and cause problems such as land subsidence discussed by Larson, Basagaoglu, & Marino (2001). Placing three boreholes with a total abstraction rate of $30m^3/h$ near river Kochi will eventually reduce the river flow. Phenomena of stream flow reduction as a result of over exploitation of groundwater are well illustrated by Intaraprasong & Zhan (2009b) and Okwir (2013). This is predicted to have a major negative with a RIAM ES Rank of -4.

Furthermore, Koboko water supply is anticipated to pollute the water sources and soil by backwash effluent, solid waste and chemicals such as spilled oil, lubricants, chlorine and Aluminium Sulphate (Alum), sludge containing Alum. These pollutants have potential of depriving aquatic organisms of oxygen. The presence of pollutants combined with a reduced river flow could have a cumulative effect and cause biodiversity loss to aquatic organisms. These impacts are ranked to cause moderate negative impacts (-3ve). The likely social impacts of the project include increase in the spread of HIV/AIDS and other STIs, child abuse and early pregnancy, child labour and loss of land and property.

In cognizance of the fact that Koboko Town Council (Now Municipality) is a water stressed area and aware of the desire and enthusiasm the community have for this project, with due consideration of the identified positive and negative impacts above and the fact that all negative impacts have practical mitigation measures as drawn in the ESMP, the ESIA team recommend to NEMA to approve this ESIA to expedite the implementation of Koboko Municipality Water Supply and Sanitation Project.

10.2 Recommendations

For success and sustainability of Koboko Water supply and Sanitation project, the benefits outlined have to be enhanced while mitigating the negative impacts. The proposed Environmental and social Management plan (ESMP) spells out measures which the contractor, scheme operator must adhere to. The ESMP are limited to project components listed in this report. In case any sub project or new structures/ expansion not described in this report takes place, it will be considered separate and an ESIA with the project brief will be prepared by the client and submitted to NEMA for approval

This project should be developed in conformity with all legal requirements, notable among which, include acquisition of water abstraction permit from DWD, a wastewater discharge permit from DWRM) and a Wetland/Riverbank use Permits from NEMA.

Throughout engagement with the local community for this ESIA assignment, it emerged that the community was worried about losing their land and livelihood to the project. Compensation for land take, property destruction or cutting crops and trees should be fair and in full compliance with the World Bank policies on Involuntary Resettlement. During compensation, gender and disadvantaged groups issues should be addressed appropriately

Protection of the various facilities' catchment areas, especially the intake, Feacal Sludge Treatment plant are essential for meeting the Project objectives of provision of sufficient water and sanitation services of good quality to the Municipality. For this purpose, it is necessary to protect the river and its catchment from pollution and to maintain a high retention potential of precipitation in the upper catchment. It's recommended that the formation of a Catchment Protection Unit (CPU), one of the activities under Component 1.2 of the WMDP be fast tracked with the aim of protecting the Catchment area of the rivers and streams in the region.

In compliance with Environmental Impact Assessment Regulations and Environmental Audit Regulations, regular Environmental Audits for the project with its components should be carried out by certified environmental auditors and reports submitted to

NEMA for review and recommendation on the best environmental practices. This is to comply with Section 31 (2) of the Environmental Impact Assessment regulations, which requires the developer to undertake an initial environmental audit after project completion in not less than 12 months or within a period not exceeding 36 months.

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APPENDIX 1: APPROVED NEMA TOR

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

NEMA House
Plot 17,19 & 21, Jinja Road.
P.O.Box 22255, Kampala, UGANDA.
Tel: 256-414- 251064, 251065, 2510
342758, 342759, 3427
Fax: 256-414-257521 / 232680
E-mail: info@nemaug.org
Website: www.nemaug.org

NEMA/4.5

13th March, 2015

The Permanent Secretary,
Ministry of Water and Environment,
KAMPALA.
Tel: +256 (0)414 505945 / 221198

Attn: Eng. Richard Matua

RECEIVED
20 APR 2015
Time:.....

RE: REVIEW AND APPROVAL OF SCOPING REPORT AND TERMS OF REFERENCE PERTAINING TO THE PROPOSED THREE WATER SUPPLY AND SANITATION SYSTEMS, IN KATWE–KABATORO TOWN COUNCIL, KOBOKO TOWN COUNCIL AND RUKUNGIRI MUNICIPAL COUNCIL

This is in reference the Scoping Reports and Terms of Reference (TOR) for carrying out environmental and social impact assessments (ESIAs) for **three** proposed Water Supply And Sanitation Systems in each of the locations indicated in the subject above, which you submitted to this Authority on 18th March, 2015, for review and consideration for approval. This Authority has finalised the review and grants formal **APPROVAL** of the Scoping Reports and TOR relating to the said project areas.

In addition, you are advised to consider the key aspects outlined below, during the conduct of the EIAs and preparation of the EIA reports.

(i) **Separate ESIAs reports should be prepared for each** of the three proposed project areas; and, the respective ESIA reports should contain the **full details of locations** that will accommodate the project components and infrastructure, including the water source (river/stream) – by *name of zones, village, parish, ward, division (whichever administrative units are applicable).*

(ii) Carry out comprehensive stakeholder consultations involving, among others, the respective Town Council and Municipal Council Authorities, Directorate of Water Resources Management, and the concerned local communities; and, ensure that the **concerns/views of the stakeholders are well documented and appended to the EIA report.**

(iii) Provide comprehensive **baseline information and data particularly relating to the proposed project areas** that will accommodate the project components and characteristics of the immediate environs, other existing facilities, and regulated areas.

1 of 2

(iv) Provide **coloured location / google maps** *(preferably covering A-4 or A-3 paper size)* that are clear, well-labelled and legible and showing the alignment / siting of the proposed project infrastructure; as well as a set of **GPS coordinates and coloured photographs** showing the current state of section of each project area.

(v) Provide comprehensive narratives on all the **proposed project components, activities,** and the size of the workforce.

(vi) Where applicable, append to each ESIA report **authentic land acquisition and ownership documents,** as well as narratives on any identified project-affected communities/entities and the related compensation aspects, respectively.

(vii) Provide comprehensive **analyses of alternatives/options,** in terms of the project design, type technology, alignment of infrastructure, and other aspects.

(viii) Provide **detailed evaluation of the potential environmental impacts and risks** associated with the proposed project components and activities.

(ix) Include in each of the ESIA reports **comprehensive mitigation and environmental management and monitoring plans,** respectively *(preferably in table matrix format)*, that relate to the identified potential environmental impacts.

(x) Consider other any critical environmental aspects/concerns not been foreseen during the preparation of the TOR, and **include evaluations of such concerns** in the respective ESIA reports.

(xi) Indicate the **total project (investment) cost** covering all the project components and activities.

This is, therefore, to recommend that you proceed with carrying out the ESIAs for the proposed projects. We look forward to receipt of three sets of copies of a comprehensive environmental and social impact statements, for our further action.

Margaret Aanyu
FOR: EXECUTIVE DIRECTOR

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APPENDIX 2: WATER QUALITY RESULTS

NATIONAL WATER AND SEWERAGE CORPORATION
CENTRAL LABORATORY - BUGOLOBI.
P.O.BOX 7053 KAMPALA.
E-mail: waterquality@nwsc.co.ug
CERTIFICATE OF ANALYSIS

CLIENT: SAVIMAXX LTD
Address:P.O.Box 25250
Tel: 0712654651
Email:savimaxxcompanylimited@gmail.com
Date Sample Received: 01-June-2015

Ref No: LS090/INV/2015/474
Sampled by: Client
Type of container: Plastic
Sample Source: Surface Water
Date of Report: 15-June-2015

Table of Analytical Results

Parameters	Units	River Kochi	*National Standards for potable water. (un-treated water)*
WS Sample Nr	--	**K2207/2015/C/B**	
pH	--	7.31	***6.5 – 8.5***
Electrical Conductivity (EC)	µS/cm	106	***2500***
Total Dissolved Solids (TDS)	mg/L	68	***1200***
Total Suspended Solids (TSS)	mg/L	**9**	***0***
Colour: Apparent	PtCo	**34**	***15***
Turbidity	NTU	**14.3**	***10.0***
Alkalinity: total as $CaCO_3$	mg/L	60	***500***
Hardness:Total	mg/L	40	***500***
Magnesium: as Mg^{2+}	mg/L	1.92	***50***
Flouride: F	mg/L	0	**1.5**

Table of Analytical Results

Chloride- Cl^-	mg/L	2.0	*500*
Nitrate – N	mg/L	0.03	*5.0*
Sulphate: SO_4^{2-}	mg/L	4	*200*
Calcium: Ca^{2+}	mg/L	14.4	*75*
Ammonia-N	mg/L	0.30	*1.0*
Bio-Chemical Oxygen Demand (BOD)	mg/L	6.0	*Not specified*
Chemical Oxygen Demand (COD)	mg/L	775	*Not specified*
Total Phosphorus (TP)	mg/L	0.16	*Not specified*
Total Nitrogen (TN)	mg/L	0.9	*Not specified*
Ortho Phosphate	mg/L	0.14	*5.0*
Fat oil and Grease	mg/L	11.5	*Not specified*
Bacteriological: Faecal Coliforms	CFU/100mL	**20**	*0*

Remarks

The sample showed good physio-chemical characteristics with the exception of colour, TSS and Turbidity. However, the bacteriological characteristics didn't comply with the National standard for potable water.

ANALYSED BY: Robinah Muheirwe and Kennedy Araa

AUTHORISED BY: ..... **MANAGER, Central Laboratory Services**

APPROVED BY: ..... **SENIOR MANAGER, Water Quality Management Department**

NB: The NWSC certificate of analysis by no means constitutes a permit to any person or company undertaking to conduct business.

NATIONAL WATER AND SEWERAGE CORPORATION
EXTERNAL SERVICES
P. O. Box 7053, Kampala, Uganda
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APPENDIX 3: MINUTES OF CONSULTATION MEETINGS

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR WATER SUPPLY PROJECT IN KOBOKO MUNICIPAL COUNCIL.

Minutes of Meeting held with Community Members of Mindrabe Village on 26th May 2015 at 3.40 pm.

Agenda

1. Communication by the parish chief
2. Communication by the LCI chairman
3. Presentation by the Sociologist
4. Discussion
5. Closure

SITE: Mindrabe-Sewage plant.

TIME: 3.40 p.m.

ATTENDEES:

Find attached the list of attendees.

Table 41: Minutes of Meeting held with Community Members of Mindrabe Village on 26th May 2015.

Min. no.	Item/Description	Action by	Date
1.	**Communication by the Parish Chief.** The parish chief welcomed the consultants and the community members to Mindrabe the proposed site for the sewage plant. He indicated that it is a very great opportunity for the community members of Mindrabe to receive officials from the MWE to provide detailed information about the upcoming water supply for Koboko Municipal Council. He asked community members to listen very carefully to the officials and to ask all questions that they have concerning the project. At this point he invited the chairman L.C 1 to officially welcome and to open the meeting	Parish chief	
2.	**Communication by the L.C 1 Chairman.** The LC.1 Chairman also welcomed the visitors as well as the community members. He said that they have been hearing about this project from the leaders at the higher level but that this was going to be their first time to have an interface with the project officials. He noted that their community is already used to seeing trucks carrying garbage to an existing site	Chairman	

Min. no.	Item/Description	Action by	Date
	which is located in their area. He mentioned that although the people did not like the site to come to the area, being law abiding citizens, they accepted it because they support government development programs. He asked the consultants and the official from the MWE to also consider providing water to the host community members because they also need the water like people in the town do. He also asked the community members to listen carefully and internalize the proposed project		
3.	**Presentation of the project to the community members by the sociologist.** The presentation started with brief self-introductions of the consultants by their names and specific roles and responsibilities they have on the project. Edward the sociologist then provided an overview of the project and its background to the community members. He mentioned that the MWE is in the process of implementing the water project which shall supply water to Koboko Municipal Council. He informed them that the existing garbage collection site in Mindrabe was going to be improved to encompass sludge management. He also mentioned that the project intends to abstract water from River Kochi and that two other sites were also identified; one for the full treatment plant and another one for the instruction of the new reservoir tank. He informed the community members that the main reason for visiting their area was to consult them about their perceived positive and negative impacts of the proposed project and whether they have any suggestions on how to mitigate these negative impacts. He further informed them that he had a small guide which he wanted to use to capture their opinions about the project and at this point, he asked them to listen and understand his questions and then respond accordingly. He asked them to raise any thing they had whether positive or negative relating to the project. the discussion proceeded as follows	Sociologist	
4.	**Question and answer session.** **Qn. What are the main sources of community livelihoods?** **Community member's responses** • Some people are laying bricks • Some plant eucalyptus trees and camerina trees. • Others are farmers who grow crops like cassava, maize, beans, and ground nuts etc. • Some grow cash crops like tobacco. • Some are carpenters but we also have people who do businesses like retail shops and restaurants. • There are also people who are into formal employments and are earning salaries like the	Community members	

Min. no.	Item/Description	Action by	Date
	teachers. But farming is the main activity that employs most people in this community. **Qn. How many seasons do you have and how are their productivity?** **Community member's responses.** • We have two seasons in the year. The first one starts from March and ends in July. Then the second one starts from August and ends December. • The productivity of the season depends on the rain fall pattern. The season that comes with more rain fall is the one that is also more productive. **Qn. In this area generally, what is the average income per month per house hold?** **Community member's responses.** • Most people earn about 50,000 shillings per month • People here are involved in a many activities and it is difficult for us to establish the average monthly income. • But on average each household can spend about 100,000 shillings per month. • Others spend more than 100,000 shillings per month but many people spend more money than they earn because some of them borrow money from friends to survive. **Qn. How do the women in this community spend their money?** **Community member's responses.** • They buy food • They also buy small things for home consumption like salt, soap and paraffin. • Some of them pay medical bills when their children fall sick and when their husbands have no money • Others buy clothes and some also assist their husbands to pay school fees for their children **Qn. What about the men?** **Community member's responses.** • The men mainly spend on paying school fees for their children • Many of them also spend their money on alcohol, tobacco and mairungi. • The men also are the ones who build houses and to take care of the day to day needs of the family. **Qn. what about the youth?** **Community member's responses.** • Some youths also pay their school fees when their parents don't have the money.		

Min. no.	Item/Description	Action by	Date
	• Others buy for themselves clothes • Some use their money on gambling particularly sports betting **Qn. What are you sources of water?** **Community member's responses.** • We have 3 bore holes and 1 shallow well. • We also have 4 protected springs • We also have 2 streams • We get water for drinking from the boreholes and them for other activities, we collect it from the streams. **Qn. Do you have schools in this area?** **Community member's responses.** • We have Mindrabe primary school • We also have a technical school called Koboko Youth Center. **Qn. Do you have any health center in this area?** **Community member's responses.** • No we do not have any health center in our area but we have 1 drug shop **Qn. What are the 4 most common diseases arranged in order of severity?** **Community member's responses.** • Malaria is the most common disease in this area • Then we have typhoid • Then diarrhea • Then we have flue and coughs **Qn. Do you have any cultural sites in this area?** **Community member's responses.** • No we do not have any in this community. **Qn. Are there any known gender roles in this area?** **Community member's responses.** • Cooking is a job for the women • The men are the ones who do the hard work like building and molding bricks • Women are the ones who fetch water • The women do the light activities because they have so many things do in a day compared to men • Home management generally is a duty for the women **Qn. What positive impact do you envisage from the project?** **Community member's responses.** • e believe we shall get jobs from the project and even our small businesses shall boom • Some people whose land shall be taken by the project shall get money from the project and set up businesses in town. • We shall also get fertilizers cheaply or free of charge from the sewage plant.		

Min. no.	Item/Description	Action by	Date
	• Even our road shall be expanded. **Qn. What will be the negative impacts from this project?** **Community member's responses.** • The workers who will come from other places might come with HIV/AIDS and they spread it to our people • We might lose our assets like land, trees and other crops • Pollution which might be risky for our people • Some of our school girls shall drop out of school because the men shall deceive them with small gifts in exchange for sex. • Accidents might increase due to speeding trucks. Our animals shall die • Even the thieves shall increase in our community. **Qn. What would be the mitigation measures?** **Community member's responses.** • People at the site must be sensitized • Protective gears must be provided to the workers **Qn. What kind of corporate Social responsibility would you like the project to do for this community?** • We need a health center in our community because the nearest is about 4 kilometers away from this area. We already prioritized it in our village plan. • We need safe water sources in this community in some parts of the village • We also need staff quarters in Mindrabe primary school You must financially support the elders in the community to organize their cultural function in which they shall bless the project		
5.	Closing remarks The community meeting in Mindrabe was officially closed by the chairman LC 1 who thanked the facilitator for helping them to identify critical community concerns related to the project. He assured the team of consultants about their commitment to support the project and on behalf of the community members, he granted permission for the project to move ahead. He also thanked the consultants for providing all the information they needed about the project.		

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date 26/05/2015 Time 5:00 P.M Town Koboko

Sub County Midia Parish Aswaga Village Mindrabe LC 1

No	Name	Designation	Email	Phone No.	Signature
01	[illegible] JOHN	LCI C/P.		0772785644	
02	[illegible]	Community Meb		–	
03	Kenji moses	Community member		–	
04	ALEMI CHARLES	Community Mebr		–	
05	APINTSA MARGRET	Community Member		-	
06	ABUSALA DUBA	Community Member		–	
07	OMEGA CHARLES	Community mbr		–	
08	MORO JACKSON	Community		–	
09	AYIKI STEPHEN	Community MEMBER		0782934963	
10	SANYA JOHN	11		0794529246	
11	META WILLIAM	11		0794965705	
12	ANYOLE COSMAS	11		0793170911	
13	ELLY BOBOLI	11		-	

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date 26-05-2015 Time 1:31 PM Town KOBOKO

Sub County MOJA Parish AGUNGA/DRICILE Village NYARABU/MOJE/KANGAY LC 1 HUSSEIN KARAL-A

No	Name	Designation	Email	Phone No.	Signature
1	LOMO MOSES	NYARABU VILLAGE		0778492936	
2	AJOBE RASUL	NYARABU VILLAGE		0771451875	
3	AMANI ARABA	MOJE VILLAGE			
	ALUMA SWABIK	MOJE VILLAGE			
	TIRILI RAZAKI	MOJE VILLAGE			
	DADA SAFI	MOJE VILLAGE			
	IKULE RAMB	NYARABU V			
	JELLA ABASI	KANGAY V			
	BOY RAZAKI	MOJE V			
	IZARUKU SABIRI	MOJE V			
	CHIRIGA MANSURU	MIIKA V			
	BURUGA SWAIBU	MOJE V			
	ANGOLIGA RICHARD	MOJE			

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR WATER SUPPLY PROJECT IN KOBOKO MUNICIPAL COUNCIL.

Minutes of Meeting held with Community Members of Nyarabu / Kangai / Mojje Villages on 26th May 2015 at 1.20 pm.

AGENDA

1. Communication by the parish chief
2. Communication by the LCI chairman
3. Presentation by the Sociologist
4. Discussion
5. Closure

SITE: Nyarabu Intake.

TIME: 1.20 p.m.

ATTENDEES:

Please See attendance list attached

Table 42: Minutes of Meeting held with Community Members of Nyarabu / Kangai / Mojje Villages.

Min. No	Item /Description	Action by	Date
1.	**Communication by the Parish Chief.** The parish chief welcomed the consultants and the community members to Nyarabu intake site. He indicated that it is a very great opportunity for the community members of Nyarabu, Kangai and Mojje as well as the parish in general to receive officials from the MWE. He said that indeed this could be an opportunity for the community to benefit from the upcoming government program which intends to develop a new water project their area. He asked community members to listen very carefully to the officials and to ask all questions that they have concerning the project. At this point he invited the sociologist to come and address the community members		
2.	**Communication by the L.C 1 Chairman.** The LC.1 Chairman also welcomed the visitors as well as the community members. He said that they were happy to learn that that site at the river Kochi is the one which was identified as the most suitable for supplying water to Koboko Municipal Council. He noted that their community is also facing severe challenges related to access to safe water even when they are close to the river. He asked the consultants and the official from the MWE to also consider		

Min. No	Item /Description	Action by	Date
	providing water to the host community members because they also need the water like people in the town do. He also asked the community members to listen carefully and internalize the proposed project		
3.	**Presentation of the project to the community members by the sociologist.** The presentation started with brief self-introductions of the consultants by their names and specific roles and responsibilities they have on the project. Edward the sociologist then provided an overview of the project and its background to the community members. He mentioned that the MWE is in the process of implementing the water project which shall supply water to Koboko Municipal Council. He informed them that that spot of the river was identified as the most appropriate site from which water shall be pumped from the river to water treatment plant. He also mentioned that two other sites were also identified; one for the reservoir and another one for the sewage. He informed the community members that the main reason for visiting their area was to consult them about their perceived positive and negative impacts of the proposed project and whether they have any suggestions on how to mitigate these negative impacts. He further informed them that he had a small guide which he wanted to use to capture their opinions about the project and at this point, he asked them to listen and understand his questions and then respond accordingly. He asked them to raise any thing they had whether positive or negative relating to the project. the discussion proceeded as follows:		
4.	**Question and answer session.** **Qn. What are the main sources of community livelihoods?** **Community member's responses** • Most people in this community are farmers. They grow crops like tobacco, ground nuts, beans, maize, sims im, sorghum and potatoes. • Other are brick layers • Some have nursery beds where they sell seedlings for tree. • Some are into stone quarrying • Very many are casual laborers • Some people burn charcoal, others fetch fire wood and sell in the town and others cut grass and sell it to people staying in Koboko Municipal Council. • Some have planted oranges and lemons for sale. • Others sell cassava in big markets. **Qn. How many seasons do you have and how are their productivity?** **Community member's responses.**		

Min. No	Item /Description	Action by	Date
	• We have two seasons but the productivity per season depends on which one receives more rains than the other. • The first season starts in March and ends in July • Then the second one starts in July and ends in November. **Qn. In this area generally, what is the average income per month per house hold?** **Community member's responses.** • For us we do not get monthly incomes, we earn in seasons and therefore, it is very difficult to determine our average monthly incomes. • Most people earn about 15,000 shillings • Some earn about 100,000 shillings per month • Majority earn 15,000 shillings per month. . **Qn. How do the women in this community spend their money?** **Community member's responses.** • They use their money to buy food and source from the market • Some of them buy clothes for their children • There are a few who pay school fees for their children. **Qn. What about the men?** **Community member's responses.** • Men pay school fees for their children • Pay medical bills • Hire casual laborers to dig in their gardens • They build houses • They also buy clothes for their family members **Qn. what about the youth?** **Community member's responses.** • Some of them pay school fees for their siblings • Some support their parents in solving household problems • Some of them buy chicken and goats to rare at home as they prepare for their marriage. • Others buy fancy clothes **Qn. What are you sources of water?** **Community member's responses.** • We get water from unprotected springs • Some get water from the river **Qn. Do you have schools in this area?**		

Min. No	Item /Description	Action by	Date
	Community member's responses. • We have only one primary school called Osubu Primary school. We do not have any secondary school in this area. **Qn. Do you have any health center in this area?** **Community member's responses.** • No we do not have any health center in our area. **Qn. What are the 4 most common diseases arranged in order of severity?** **Community member's responses.** • Malaria is the most common disease in this area • Then we have typhoid • Then worms **Qn. Do you have any cultural sites in this area?** **Community member's responses.** • There is a place in this area called Marukuru. If you enter it without the permission of the land lord, you become sick immediately and for you to get better, you have to pay 5 cows. I remember it happened some time back during Amin's time when a tractor was brought to dig in this land without the consent of the owner and it got stack. When the community members went to consult him, he asked those people who brought the tractor to pay 5 cows. • That same person is the one who has control over this site and his title is Tamule which means one who will be two. All of us are his tenants. **Qn. Are there any known gender roles in this area?** **Community member's responses.** • Grinding on stone is work for the women • Even cutting grass for thatching a house is work for the women • Pots are made by women • Even cooking is for women • Knitting clothes is for women • Making hoe handles is for men • Men are also the ones who look after cows • The men are also the ones who dig pit latrines and slaughter animals. **Qn. What positive impact do you envisage from the project?** **Community member's responses.** • We think we shall get first priority when giving out jobs for constructing the intake facility. • Our brothers and sisters who stay in Koboko town shall get good quality water. Qn. What will be the negative impacts from this project? **Community member's responses.**		

Min. No	Item /Description	Action by	Date
	• The contractor might employ us and he does not pay us all the money. • They may also bring people from far away to work on the project and they leave out the community members. • The pipes might go through our land, destroy our crops and trees and they do not compensate us. The water shall be pumped from this site and taken to the town council. For us we shall not benefit yet the water comes from our area.		
5.	**closing remarks** The community meeting at the intake was officially closed by the chairman LC 1 who gave a recap of the major activities earmarked to be implemented in the project. He assured the team of consultants about their commitment to support the project and on behalf of the community members, he granted permission for the project to move ahead.. It is important to note that all participants applauded the consultants for conducting the sensitization workshop and for providing additional information regarding the project which enabled them to understand the project.		

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date: 26-08-2015 Time: 1.31 PM Town: KOBOKO

Sub County: MIDIA Parish: ASUNGA Village: NYARABU/MOJE/KANGAI LC 1: HUSSEIN KARALA

No	Name	Designation	Email	Phone No.	Signature
1	TABUGA MANISURU	MIIIKA VILLAGE			
2	DRANI RAIIBU SEBBI	KANGAI VILLAGE			
3	SIRAJI NOAH	KANGAI VILLAGE			
4	SULAIMAN ALIJABU	MOJE VILLAGE			
5	ABUI RASHID	MIIIKA "			
6	AMAKU ISMAIL	KANGAI "			
7	JAKANI RASHID	MOJE "			
8	AIAJI SALILA	MOJE "			
9	RUBA HAREJI	MOJE "			
10	APAYI TAIBO	KANGAI "			
11	ONZIGA RASHID	NYARABU			
12	AIAMA MUSTAFA ADAM	MOJE			
13	DADA AJILA	NYARABU			

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date 26-05-2015 Time 1:31 PM Town KOBOKO

Sub County MUDIA Parish ASUNGA/DRICILE Village NYARABU/MOJE/KANGAY LC 1 HUSSEN KARALA

No	Name	Designation	Email	Phone No.	Signature
1	LOMO MOSES	NYARABU VILLAGE		0778492936	
2	AJOBE RASUL	NYARABU VILLAGE		0771451875	
3	AMAN ARABA	MOJE VILLAGE			
	ALUMA SWADIK	MOJE VILLAGE			
	TIRILI RAZAKI	MOJE VILLAGE			
	DADA SAFI	MOJE VILLAGE			
	IKULE RAJIB	NYARABU V			
	JELLA ABASI	KANGAY V.			
	BOY RAZAKI	MOJE V.			
	IZARUKU SABIRI	MOJE V.			
	CHIRIGA MANSURU	MIIKA V.			
	BURUGA SWAIBU	MOJE V.			
	ANGOLIGA RICHARD	MOJE			

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date 26-5-2015 Time 1:31 PM Town KOBOKO

Sub County .... Parish .... Village NYARABU / MOJE / KANGAYI LC 1 HUSSEIN KARALA

No	Name	Designation	Email	Phone No.	Signature
1	AZIGA NASURU	MIIKA V.			[signature]
2	KHEMISH RAJABU	NYARABU V.			[signature]
3	GALU SADAMU	KANGAI V.			[signature]
4	BADUGA GABUREIL	MIIKA V.			[signature]
5	HUSSEIN KARALA	NYARABU V			[signature]
6	ALIDRIGA HASSAN	NYARABU V		–	[signature]
7	ALUMA SWAH	NYARABU V			[signature]
8	SIJASA MAKA	MOJE VILLAGE			[signature]
9	NJAMA ONZIMA	MIIKA VILLAGE			[signature]
10	ROPAN FLORENCE	KANGAI V.			[signature]
11	ALIOMA SHABITHY	Kangai V.			[signature]
12	ISMAIL AMISH	MOJE V.			[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR KOBOKO WATER SUPPLY PROJECT

Minutes of Meeting held with Madam Goro Grace, the Deputy District Chairman on the 26th May 2015 at 11010 am.

Agenda

1. Presentation by the official from MWE
2. Presentation by the Sociologist
3. Question and answer session
4. Closing remarks

SITE: Koboko District Headquarters.

TIME: 11.10 am

Table 43: Minutes of Meeting held with Madam Goro Grace, the Deputy District Chairman.

Min. no	Item /Description	Action by	Date
1.	**Presentation by the official from MWE.** Mr. Wanok introduced himself to the Deputy Chairman as the environmentalist from the ministry of water and environment attached to this project. He informed her that the government of Uganda through the MWE was going to implement a water management and development project in 8 towns in Uganda and that Koboko Municipal Council is one those 8 towns that were going to benefit from this project. He further informed her that the MWE had contracted Canadian firm to undertake the earlier activities from which technical designs were produced and latter shared out with all the different stake holders including the technical staff of the district. He mentioned that within this second phase, the MWE had contracted two Ugandan companies namely Survesis and Savimaxx limited to undertake two critical assignments namely; developing the Resettlement Action Plan (RAP) and Environmental and Social Impact Assessment (ESIA) reports. At this point, he introduced the consultants from these two companies who had moved with him. Mr. Matagi Vivian Samuel introduced himself as the project manager and also an environmentalist while MR. Jjuuko Edward introduced himself as the sociologist on the project.		
2.	**Presentation by the Sociologist.** Mr. Jjuuko Edward once again introduced himself to the deputy Chairman of the district as the sociologist. Being a sociologist, he said that he was the one responsible for all social issues including concerns, fears, negative and positive impacts and coming up with mitigation measures. He mentioned that to be able to get these issues, wide consultations with the different stake holders have to be undertaken at all levels in the project area. He therefore asked the		

Min. no	Item /Description	Action by	Date
	deputy chairman to give him some time to discuss a few things related to the project and she accepted. The discussion moved as here bellow:		
3.	Question and answer session. Qn. Madam Grace, what is your opinion about this project? Response: As a political leader, we are really very happy that we are going to get a project like this in our area and particularly for the people of Koboko Municipal Council. This town council is very unique because it could be the only one that boarders two countries namely; South Sudan and DRC Congo. For that reason, we have very many people who come into this town from these two countries to get services. So this town really needs water because some times during the dry season, the cost of a 20 liter jerry can of water goes up to 1500 shillings. That is why we are saying that this project is very much welcome for us as the leaders and for the people of Koboko. People are suffering a lot to get water because water sources are very few and yet the population of the town council is very high. Sometimes the women go out of their homes late in the night to go and fetch water and in a way, this has led to gender based violence in the town because when the women go, the men use this as an opportunity to go for other women. The only challenge is that even people in the other 7 sub-counties will start putting pressure on us to give them piped water. I also think that when the water supply project starts, the water level in the river shall reduce further and I believe this could have severe consequences on the environment of this area. Qn. Do you have any cultural site or any site of great cultural significance to the people of this area? Response: Not here in the town but we have a few in the rural sub-counties. Like we have water falls in a place known as Adologo in Rudra Sub-county. In Kulba Sub-county in a place called Salemsale in the mountains is where the leaders of the Kakwa tribe meet although they rarely meet these days. The most important issue however is that culturally, people believe that for all projects of this nature, the elders must be consulted and facilitated to hold a function which is meant to bless the project activities. For this function to take place, these cultural leaders might ask for a sheep and cassava floor from the project. Qn. What happens in case there is a grave to be relocated? Response: You have to sit down with the people concerned and agree. They might ask for transport and costs of other expenses		
4.	Closing remarks. In her closing remarks, Mr. Jjuuko thanked the Vice chairman for her time and for the views she shared with him about the project. She also thanked him and all the other people on the team for coming and for consulting them as leaders before they implement the project. She asked the consultants to consider the issue of community sensitization very critically because people must		

Min. no	Item /Description	Action by	Date
	understand everything about the project particularly about the road reserves where the pipes shall pass. You need to go to the media and talk to the people. You can also go directly to their communities and talk to them or you can use Brazas. She also talked about the need to negotiate with the people at the different places where the project facilities shall be constructed particularly those who encroached on the river. She however pledged full district support to the project and promised its commitment to deal well with anyone who will try to resist the project.		

DISTRICT OFFICIALS

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date 26/05/2015 Time 9:29 Am Town KOBOKO

Sub County KOBOKO T/C Parish Village LC 1

No	Name	Designation	Email	Phone No.	Signature
01	Samuel Vivian Mitegi	Project Manager	Savimaxxcompany limited@gmail.co	0712654...	[signature]
02	Walalciva Paul	CAO	Paulwalalciva@gmail.com	0772424078	[signature]
03	Aligah Yunus Arua	DEO	Yaligahyunua@gmail.com	0772523503	[signature]
04	Akandru Mariam	Ag. DNRO	akandru_mari@yahoo.com	0772573262	[signature]
05	Bada Fred	D/Planner	fredbada@yahoo.com	0772386465	[signature]
06.	Wanok Harold	Env. Health officer	harold.wanok@mwe.go.ug	0757647008	[signature]
07	Ejuuko Edward	Sociologist	ejjuuko@gmail.com	0772952552	[signature]
08	Atayi Jane Butigah	DCDO	atayijane@gmail.com	0772550211	[signature]
09	GORO GRACE	V/chair	gorograce2012@gmail.com	0772967257	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR KOBOKO WATER SUPPLY PROJECT

Minutes of Meeting held with Koboko District officials on Tuesday 26th May 2015 at 9.29 AM

AGENDA

1. Presentation by environmentalist from the ministry of water
2. Presentation by the project manager
3. Reactions
4. Question and answer session
5. Closing remarks

SITE: Koboko District Headquarters.

TIME: 9.29 am.

ATTENDEES:

Attendance list attached

Table 44: Minutes of Meeting held with Koboko District officials.

Min. No	Item/description	Action by	Date
1.	**Presentation by the Environmentalist / MWE.** Mr. Wanok Harold introduced himself as an environmentalist from the ministry of water and environment. He introduced the consultants from Survesis and savimaxx limited who had been contracted by the MWE to conduct the ESIA on the proposed water project. He mentioned that the government of Uganda through the MWE had secured a loan to implement a water project which was going to supply water in Koboko Municipal Council. He further informed the district officials that the first phase of project implementation had been completed and that the technical designs had already been produced and shared with both the town council and the district staff. At this point he asked the team leader and the project manager for the ESIA team to introduce himself and to make his presentation to the district staff.	MWE Representative	
2.	**Presentation by the Project Manager.** Mr. Matagi Samuel first introduced himself and the sociologist as consultants from Survesis and Savimaxx who were given a contract by the MWE to conduct an environmental and Social Impact assessment of key activities in this project. He mentioned that his team had conducted a reconnaissance in which they visited all the	Mr. Matagi/Team Leader	

Min. No	Item/description	Action by	Date
	proposed sites for the project and that this was now a follow up visit in which actual data collection is going to be conducted. Within the follow up visit, many activities are going to be undertaken. Apart from consultations with different stake holders, a team of ecologists and a hydrologist were already on ground doing ecological surveys on plants, frogs, mammals, and butterflies and also doing water quality analysis. He informed them that the ESIA is aimed at looking at the different impacts particularly those that are likely to arise from project activities and based on that to design appropriate mitigation mechanisms. At this point, he introduced the sociologist and asked him to engage the district staff.		
3	**Reactions** The Chief administrative officer thanked the team for coming into the district and for their efforts to come and talk to the technical team of the district. He however noted that the district was never consulted in all the earlier activities that were mentioned by the official from the MWE and that as a district they were hearing about the project in rumors. Meaningful consultations were conducted mainly with the town council and the district was neglected. He asked for more consultations with the district officials because the project was not only for the town council but was going to serve even other areas outside the boundaries of the town council. This to him was a very big project which needed the active involvement of the district staff as well as the lower local governments that are going to be affected either directly or indirectly by the project.	CAO	
4.	**Question and Answer Session.** Before Mr. Jjuuko started asking the questions, he first apologized for the mistake highlighted by the CAO where he felt that the teams who conducted earlier project activities had not involved the district staff. He indicated that within the scope of the ESIA, they are going to widely consult all the different stake holders at all levels and that the views of the district technical staff are quite critical given their level of understating of the issues related to the environment and the social aspects of people in the entire district. At this point, he asked the officials to give him a few minutes of their time to give their views and opinions on the key issues related to the project. The discussion went as follows; **Qn. What is your opinion about the proposed project?** CAO: I want to make it clear at the begging that here in Koboko district land is generally owned communally but individual land ownership is beginning to take shape in the	CAO and District Staff	

Min. No	Item/description	Action by	Date
	town council. So the project shall need to take land from the people, it shall be difficult for us to find one person owning a particular piece of land but we shall have to sit down with all people concerned and negotiate. Secondly, people here plant their crops everywhere including the road reserves. The good thing is that people here easily surrender when they are talked to by their leaders. We used their leaders on the road and electricity projects and we did not find any resistance. The community members want the water because water is very scarce in the town council. So the idea to maintain the old water supply system is good but our request is that it must be expanded because people are willing and they have the ability to pay for water services. I have also heard from your presentations that the project envisages a situation where pit latrines shall continue to be used until 2040. If this is the proposal they have, I think as a district we are not comfortable with it. We need a much near starting date than 2040 because the district is growing at a very fast rate. The district is bordering two countries namely; DRC Congo and South Sudan. These two countries are looking at us their model because they are using our schools and rely on us nearly for all services. We need to keep moving and to maintain that picture. District Planner: The population growth rate for the district is very high because in the past we were put at 6%. We cannot wait for 2040 to get a critical mass and be able to start using water born toilets. Remember in a few months to come, Koboko Municipal Council shall be declared a municipality because all the technical work has been done and we found to be eligible for a municipality. This means that the population in the town shall increase and generally the economic and social activities shall increase because right now the roads are done and power will be coming to the district soon. I think we need to rethink about this proposal of 2040 Secondly, we need to be sure that the design engineers did a good job particularly about their choice for the intake. Our neighbors in Arua are suffering because during the dry season, the water source dries up and water cannot get water particularly during the day. Water comes at night when people are sleeping. We need to identify a reliable water source so that our people do not suffer like those in Arua. Otherwise people are in dire need of water in the town council and for that reason; the project shall not find any resistance. DCDO: The biggest challenge shall be about land acquisition because we shall have to compensate the people whose land shall be taken by the project. The		

Min. No	Item/description	Action by	Date
	people who dig in the road reserves should not be a problem because that land belongs to government. But where people's land is affected, we must pay them adequately because these days people know the value of land. The project has to be careful and cautious when compensating people. We have just gone through compensation processes on other projects and people shall compare their rates with those who have just received their compensation from other projects **Qn. Do you have any specific concerns / fears or issues that you think should be given ample considerations?** ADNRO: Regarding the environment, yes we have some fears because on the roads project, the contractors left a lot borrow pits because it seems they did not have a provision for their mitigation. This should not be the case in this project.		
5.	**Closing Remarks** The meeting ended prematurely because there a number of activities going on in the district including conducting interviews to fill up vacant positions. However the CAO was very grateful to the team and pledged all their support. Mr. Jjuuko also thanked the district officials for availing themselves to provide their opinions about the proposed project which shall inform the development of the ESIA report and consequently be integrated into project implantation		

DISTRICT OFFICIALS

ESIA AND RAP FOR EIGHT SMALL TOWNS WATER SUPPLY AND SANITATION SYSTEMS, MINISTRY OF WATER AND ENVIRONMENT

Date 26/05/2015 Time 9:29 Am Town KOBOKO

Sub County KOBOKO T/C Parish .... Village .... LC 1 ....

No	Name	Designation	Email	Phone No.	Signature
01	Samuel Vivian Mutegi	Project Manager	Savimaxxcompany limited@gmail.co	0712654...	[signature]
02	Walakira Paul	CHO	Paulwalakira@gmail.com	0772242607	[signature]
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04	Akandru Mariam	Ag. DNRO	akandru_mari@yahoo.com	0772573262	[signature]
05	Bada Fred	D/Planner	fredbada@yahoo.com	0772386465	[signature]
06.	Wanok Harold	Env. Health officer	harold.wanok@mwe.go.ug	0757547003	[signature]
07	Jjuuko Edward	Sociologist	ejjuuko@gmail.com	0772952552	[signature]
08	Atayi Jane Buligah	DCDO	atayijane@gmail.com	0772550211	[signature]
09	GORO GRACE	V/chair	gorograce2012@gmail.com	0772967257	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR KOBOKO WATER SUPPLY PROJECT

Minutes Of Meeting Held With Mr. Mangasa Stanislaus, Town Clerk For Koboko Municipal Council On Monday 25TH MAY 2015

AGENDA:

1. Presentation by environmentalist from the ministry of water
2. Presentation by the project manager
3. Question and answer session
4. Closing remarks

VENUE: KOBOKO MUNICIPAL COUNCIL OFFICES

TIME: 5:11 PM

ATTENDEES:

Find attached the attendance list

Table 45: Minutes of Meeting Held With the Town Clerk, Koboko Municipal Council.

Min. No	Item/Description	Action by
1.	**Presentation by environmentalist from the Ministry of Water** In his presentation, Mr. Wanok Harold informed the town clerk that the Ministry of Water and Environment had secured a loan from the World Bank to implement a water management and development project in eight towns in Uganda including Busia, Ngora-Kumi, Pallisa, Rukungiri, Katwe- Kabatoro and Koboko Municipal Council. He informed him that the project shall be implemented in phases by different consultants. The first phase of the project was conducted by design engineers who developed the technical designs and the general lay out. Within this phase, the consultants identified the suitable locations for the intake, the treatment plant, the reservoir and the sewage plant and that these designs were produced and also shared with the relevant town council and district authorities in Koboko to which the town clerk consented. He noted that the second phase of project implementation entails conducting detailed Environment and Social Impact Assessment activities related to the project and developing a Resettlement Action Plan. At this point, he introduced Mr. Matagi Samuel Vivian, the project manager and environmentalist and Mr. Jjuuko Edward, the sociologist as consultants from Survesis and Savimaxx limited who were contracted by the MWE to undertake this assignment. He also informed the town clerk that the MWE is currently in advanced stage to recruit a contractor who shall construct the	**Mr. Wanok**

Min. No	Item/Description	Action by
	project facilities namely; the intake, the treatment plant, the reservoir and the sewage plant. Actual ground works he said was expected to commence at the begging of 2016.	
2.	**Presentation by the Project Manager.** Mr. Matagi Samuel first introduced himself and the sociologist as consultants from Survesis and Savimaxx who were given a contract by the MWE to conduct an environmental and Social Impact assessment of key activities in this project. He informed the town clerk that in addition to the environmentalist and the sociologist, there was another big team of ecologists including one for butterflies, mammals, plants and frogs he had travelled with to assess the impact of the project regarding those different ecological systems in the project area. At this point he called in the sociologist to come and engage the town clerk	**Mr. Samuel Vivian Matagi**
3.	**Question and Answer Session.** Before he started asking questions, Mr. Jjuuko first informed the town clerk that in conducting an environmental and social impact assessment, wide consultations must be undertaken with all the key stakeholders in the project. The town council is very key in this project and therefore the views of the town clerk are very important for a successful implementation of this project. He therefore asked the town clerk to provide all his opinions and concerns so that they can be integrated into the ESIA report. He noted that he had a few a questions he was going to ask the town clerk to this effect. The interview went as follows; **Qn. What is your opinion about the proposed project?** **Response:** For us as the town council we warmly welcome the project in our area. Actually we have already waited for soo long because we have a very big problem of water in this town council. Before we got a mini water project in 2009, the cost of a 20 liter jerry can was 1,000 shilling and at some point, water had become a serious social problem in the town council. Women would go to the water sources late in the night and spend long hours waiting in the line and this became another source of domestic violence in many homes. Before we got this mini water scheme, we had about 3 production wells but only one of them had sufficient water yields. The population of Koboko Municipal Council is increasing at a very fast rate. In the recent population census, Koboko Municipal Council alone is estimated to have a total population of 40,000 people. This implies that we have a very high demand for water but for a very long time, we have not had corresponding water supply to satisfy the existing demand. I also believe that with this new water project, the disease burden in the town council shall reduce because with inadequacies in water supply, people turn to contaminated water sources and for this	**Mr. Juuko** **Town Clerk**

Min. No	Item/Description	Action by
	reason, cases of typhoid are very many in the town council. During the rebellion, many people moved from the villages and came to the town and formed a kind of IDP. This affected the quality of water because water sources were contaminated with fecal substances due to many toilets that were constructed and this led to an increase in the prevalence of typhoid cases in the area. We also believe that with this new project, the amount of time people spend at the water sources shall reduce. Due to the limited number of water sources, there are normally very long queues, people quarrel and at times they fight at the water sources. The women leave their homes at 4 am to go and fetch water. Men became very suspicious about this and in a way it contributed to the high level of domestic violence existing in this area. Although the situation slightly improved due to the introduction of the mini water supply scheme in 2009, the quantity supplied is still low compared to the existing demand. The introduction of this new water project therefore shall be a very big relief to us and shall further improve the water problem in the town council. **Qn. Is there any negative impact that you envisage to arise from this project?** **Response:** My concern is about the design of the project. Large pieces of land shall be required for the construction of the different facilities like the intake, the treatment plant and the reservoir which consequently might result into displacing people from their land. People's gardens shall be destroyed thereby affecting their livelihoods and ultimately putting a lot of financial demand on the local governments in form of compensations to acquire the required land. The good thing however is that people are very willing to surrender their land to the project as long as they are compensated **Qn. What do you propose as the appropriate mitigation measures for the identified negative impacts?** **Response:** We have already started engaging the community members and we are continuing to sensitize them about the project. the project should also start engaging the people early enough together with the local government officials concerned so that people get prepared to receive the project in their respective communities because in a way, this will help to reduce on the compensation. **Qn. Do you know of any cultural sites or features of cultural significance that are likely to be affected by the project?** **Response:** I don't think there is any in the town because the forest that carries cultural significance in this district is not here in the town	

Min. No	Item/Description	Action by
	council. However, at some point before commencement, it will be very important for the project team to meet with chiefs and seek for their blessings. The project must facilitate the chiefs to organize a small festival in which they shall perform cultural functions as a formality to bless the project. **Qn. Do you have any specific concerns/fears or issues that you think should be given ample considerations?** **Response:** The first one is about the catchment area. There are so many economic activities particularly farming that are going on along the river. People have cut down trees along the river and this is likely to affect the water level in the river. We have encouraged the local leaders to talk to the people residing along the river to sensitize them about the need to plant more trees at the river banks. With little water in the river, we are very afraid that even the new project may not provide sufficient amount of water to satisfy the existing demand. The water level in the river is very low and it is worse during the dry season. We suggest that the project should consider supplementing the proposed water source with the existing bore holes.	
4.	**Closing Remarks** In his closing remarks, Mr. Jjuuko thanked the town clerk for his time and contributions he made which he said were very important in informing the development of the ESIA report. The town clerk also thanked the team for coming and for their efforts they have made to consult the people on issues regarding the project. He however mentioned that people in the town council and Koboko district in general are not used to doing casual labor. He said that the project should give first priority to the people in the area while giving jobs but also mentioned that it should have alternative B in case they are noting willing to offer themselves to work. He said that within the region, Lugbara from Arua are the only ones known for casual labor but not people from Koboko	**Mr. Juuko the Sociologist.**

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR KOBOKO WATER SUPPLY PROJECT

Minutes of Meeting held with Mr. Alli Khalifan, the Sub-County Chief of Midia sub-County in Koboko District 26th May 2015 at 11.50 am.

AGENDA

1. Presentation by the sociologist
2. Question and answer session
3. Closing remarks

SITE: Midia Sub-County Headquarters.

TIME: 11.50 am.

ATTENDEES:

- Edward Jjuuko- sociologist.
- Matagi Vivian Samuel / Project manager / Environmentalist
- Harold Wanko / Environmentalist / MWE
- Todoko Josha / Parish Chief
- Acikule Bran / Chairman LC 111

Table 46: Minutes of Meeting held with Mr. Alli Khalifan, the Sub-County Chief of Midia sub-County.

Min. No	Item/description	Action By	Date
1	**Presentation by the sociologist.** The presentation started with brief self-introductions of the consultants by their names and specific roles and responsibilities they have on the project. Edward introduced himself as the sociologist on the team; Mr. Matagi introduced himself as the project manager and environmentalist from Savimaxx, while Mr. Wanok Harold introduced himself as an environmentalist from the MWE. Edward also informed the sub-county officials that there were many other people they had moved with charged with different roles and responsibilities on the project who included those in charge of frogs, mammals, butterflies and plants. Edward then proceeded to provide an overview of the project and its background to the officials. He mentioned that the government of Uganda through the ministry of Water and Environment is in the process of implementing the water management and development project for the Koboko Municipal Council. He further informed them that earlier activities had been accomplished in which technical designs for the project were drawn		

Min. No	Item/description	Action By	Date
	and also shared with the relevant stakeholders for this project. He informed them that in the current phase, the ministry of water and environment had contracted services of consultants from Survesis and savimaxx Limited to conduct the environmental and social impact assessment of the key activities in this project and that officials for Midia sub-county had been identified as a key stakeholder to provide views and concerns that can be integrated into the project implementation At this point, Mr. Jjuuko requested them to give him a few minutes to provide their opinions particularly on issues of concern including what they thinks would be the positive and negative impacts arising from the project and their suggestions on how such negative impacts can be mitigated. The discussion went as follows		
2	**Question and answer session.** **Qn. What are your opinions about this project?** **Sub-county Chief:** This project is good for district because we have a very big challenge of accessing clean and safe water in the town council. Water is scarce and during the dry season, it becomes very expensive. We know the first target is Koboko Municipal Council but we also believe that sometime in the future the people of Midia sub-county shall also benefit since the intake for the project is located in this sub-county. But we also think that some places within Midia sub-county which are very close to the town council shall benefit. The most important thing however, is to ensure that people are engaged at all times and those whose land shall be taken by the project are paid adequately. Some people have already started complaining and asking questions. They want to know how they are going to benefit from this project since water is going to be pumped from the river and taken to the town council. They believe the project shall give them first priority while recruiting people to work as casual laborers during construction. **Chairman:** For us we have no objection at all for this project because the town council is surrounded by our sub-county. This means that every development in that comes in the town council, our people shall benefit from it in one way or the other. However, we shall need technical guidance on how we should deal with people who encroached on the land surround the proposed intake site but we shall also try to talk to them as their leaders. Some people have grown trees right up to the source without asking for permission from the local leaders. **Qn. Is there any negative impact that you envisage to arise from this project?**		

Min. No	Item/description	Action By	Date
	Chairman: When we were still young in the early 70s, the water level in that river was very high. Now days it has greatly reduced due to a number of reasons and I believe the level shall continue reducing because people use the river for watering their animals and for supporting agricultural activities particularly those near the river. This water project shall pump large quantities of water from the river and I think this shall affect the rain fall pattern in the area. **Qn. What do you propose as the appropriate mitigation measures for the identified negative impacts?** **Chairman:** We have to sensitize the people about the negative issues of cultivating along the river. We shall also need additional support from the experts on what else we need to do to protect the catchment. Chief: People also need to be involved in some of the activities of the project. If they see the benefits, they will support the project but if they don't see any benefit, we shall find a lot challenges in persuading them to stop encroaching on the source. **Qn. Are there any cultural sites in this area?** **Chairman:** There is a place around 100 meters from the water source where people were massacred long time ago even before the colonialists came. That point is still known although it was not gazetted. Before we start implementing the project, we need to ask for the blessings of their leaders. The Nyarabu clan leaders shall ask for a lamb to give blessings to the project because this land belongs to this clan		
3	**Closing remarks** In his closing remarks, the chairman for Midia Sub-county thanked the consultants and the Government for supporting the development of the water supply project in their area. He pledged the support of the sub-county particularly when a time comes to talk to the people to surrender their land for the project. He said that the people of their area are very cooperative when mobilized to support initiatives like this one. He however asked the project to also think about providing water points to the people along the road where the pipe lines shall pass saying that this shall increase the sense of ownership towards the project.		